Final Environmental Impact Statement
for the Revised Land and Resource Management Plan

National Forests and Grasslands in Texas

The National Forests and Grasslands in Texas (NFGT) are located within the following 15 counties: Angelina, Fannin, Houston, Jasper, Montague, Montgomery, Nacogdoches, Newton, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Walker, and Wise Counties.

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COOPERATING AGENCIES: U.S. Department of the Interior, Bureau of Land Management and U.S. Fish and Wildlife Service.

ABSTRACT: Ten alternatives were developed, all of which provide maintenance of habitat for the red-cockaded woodpecker (RCW). Comparisons of the management strategies in these alternatives is summarized as follows: Alternative 1 is the no-action or current prescription alternative; Alternative 2 emphasizes highest levels of commodities; Alternative 3 emphasizes moderate to high levels of commodities; Alternative 4 emphasizes maximum RCW habitat; Alternative 4a emphasizes the same allocations of areas as Alternative 4, but with minimum RCW Habitat Management Area (HMA); Alternative 4b emphasizes corridors between RCW habitat management areas; Alternative 5 emphasizes protection of natural values through special area designations; Alternative 6 emphasizes wilderness and uneven-aged management using no fire or herbicides; and Alternative 7 emphasizes wilderness and uneven-aged management, but allows the use of fire and herbicides. Alternative 8 was developed between draft and final to address comments received from the public. **Alternative 8 has been identified as the Forest Service's selected alternative in this Final EIS.**

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Chapter I

Purpose

Introduction

This Environmental Impact Statement (EIS) explores ten alternatives for revising the Land and Resource Management Plan (LRMP) for the National Forests and Grasslands in Texas (NFGT). The alternatives are all analyzed and discussed, including identifying their environmental effects and values, including social and economic responses, should they be implemented on the land.

This document is written to ensure that policies and goals defined in the National Environmental Policy Act (NEPA) are integrated into the programs and actions of the NFGT.

Why Revise the Plan?

The National Forest Management Act (NFMA) of 1976 requires that each National Forest be managed under a Forest Plan. Forest Plans, or Land and Resource Management Plans, direct all resource management activities in the National Forests. NFMA also requires Plans to be reviewed every five years and revised "from time to time when the Secretary finds conditions in a unit have significantly changed, but at least every fifteen years".

The LRMP and Final EIS (FEIS) for the NFGT was approved May 20, 1987. Several individuals and groups appealed the Plan and the supporting FEIS. While these appeals were pending, three parties in ongoing lawsuits against the Forest Service amended their complaints to include claims regarding timber management's effects on the red-cockaded woodpecker (RCW). On June 17, 1988, the East Texas Federal District Court issued a permanent injunction enjoining the Forest Service from failing to implement certain practices and activities within 1,200 meters of active and inactive RCW cluster sites. The court's orders affect the management of approximately one-third of the National Forest lands in Texas. In response to this situation, the NFGT initiated the process of revising the Forest Plan in October, 1990.

The Forest Service appealed the East Texas Federal District Court's decision and on March 4, 1991, the Fifth Circuit Court of Appeals upheld the District Court's ruling on the takings and jeopardy issues; but also found that the East Texas District Court improperly prescribed details for management of RCW habitat in the the National Forests in Texas. The Fifth Circuit ordered the Forest Service to prepare a Plan for management of the RCW. The court-ordered Comprehensive Plan is to remain in effect until the court agrees with a new Plan developed in consultation with appropriate agencies.

The Five-Year Review of the Forest Plan conducted in 1992, revealed several areas where changes were needed. Most of these changes, by themselves, would not have required a revision; however, amendments would be needed to implement many of the proposed changes. The Revision of the Forest Plan provides the opportunity to fix all identified problems, update inventories, and to analyze the effects of those changes within one integrated analysis. This EIS provides the analysis of various ways to address the proposed changes and select the best alternative to address issues developed during scoping and the Five-Year Review.

change production levels of goods and services predicted in the current Forest Plan. The Revision process gives the Forest Service the opportunity to recheck the level of goods and

services that can be provided into the next decade and the environmental quality achieved during that period.

The Revised Forest Plan needs to be readily understood by the public and agency professionals, as well as provide resource protection. It must be easily implemented by having clear management direction and it must identify specific areas where this management is to be applied.

Purpose and Need

The purpose and need for this Forest Plan Revision is to provide direction and limitations for future site-specific decisions, which when viewed at the forest-wide level will provide a strategy which maximizes net public benefits and accomplishes the mission of the USDA Forest Service. This direction and these limitations are framed in the following list of decisions to be made.

What Decisions Will Be Made?

The Regional Forester intends to make programmatic decisions on the following policies and to publish them in a Record of Decision document at the conclusion of this Revision effort:

*Forest-wide multiple use goals and objectives, 36 Code of Federal Regulations (CFR) 219.11(b);
*Forest-wide management requirements, 36 CFR 219.27;
*Management area direction, 36 CFR 219.11(c);
*Lands suitable for timber production, NFMA Section 6(g)(2)(A) and 36 CFR 219.14; and establishment of Allowable Sale Quantity (ASQ) 219.16;
*Monitoring and evaluation requirements, 36 CFR 219.11(d);
*Recommendations for Wilderness, Wild and Scenic Rivers, 36 CFR 219.17;
*Determine how much and which land can be leased for mineral development and what conditions are placed on these lands available for lease, 36 CFR 228.102 (c) and (d). The decision to lease is also being made, 36 CFR 228.102 (e).

Public Involvement

The Notice of Intent (NOI) to prepare this EIS was first published in the Federal Register on October 23, 1990. This notice, along with local media and individual notification requesting comment on the Revision by November 30, 1990, generated over 4,000 comment letters. Comments before and after the official comment period did not raise any new significant issues. The forest IDT, comprised of resource specialists, identified 15 major issues, 53 sub-issues, and about 500 unique comments from these letters.

Forest officials met with individuals and groups throughout the process to provide information and explanations of the Revision. Newsletters and other Planning News mailings were sent to over 850 individuals, organizations, and agencies and are used to keep the public informed and involved in the Revision process.

expanded the scope of the Revision, and revised the availability dates for the draft and final EIS. The revised NOI was needed because of findings during Monitoring and Evaluation for the Analysis of the Management Situation (AMS), and the required Five-Year Review of the current Forest Plan. Scoping also identified the need to reconsider existing allocations of Scenic Areas, protective corridors, and Research Natural Areas, which were not part of the scope identified in the earlier NOI. The Draft EIS and Draft Plan were made available for public review and

comment. These draft documents reflected information obtained through public involvement since scoping was initiated. Over 1,800 comment letters were received in response to these drafts, which can be reviewed in Appendix K of this EIS.

Issues of the Revision

Public comments expressed in letters and appeals, the Chief's directives, and concerns of Forest Service professionals are contained in the 15 issues. These issues guide the direction of the Forest Plan Revision.

The first issue, **BIODIVERSITY**, deals with maintaining the natural mix of plant and animal species on the NFGT. Concerns include native versus exotic species, management indicators, old growth, unique, rare or special ecosystems, ecosystem management, and species diversity. These concerns are addressed as follows:

- Standards and guidelines provide direction for management of non-native vegetation and for re-establishment of native species.
- Species management and use of Management Indicators in management activities are provided through direction within the Ecological Classification System (ECS), which is described for each management area.
- Each management area allocations for old growth.
- Specific direction for management of unique or special ecosystems is provided for in Management Areas 4, 6 and 8 (MA-4, MA-6, and MA-8).
- Protection for areas of unique, rare or special ecosystems, less than 10 acres in size, is provided for in the Forest-wide standards and guidelines, and within each management area.
- The ECS is used to help determine the best or most appropriate areas to manage for selected plant and animal species.

The **VEGETATION MANIPULATION** issue deals with the topics of use of prescribed fire, even-aged, two-aged, and uneven-aged management, chemical use, and pine-hardwood management. These concerns are addressed as follows:

- Standards and guidelines provide direction for the use of prescribed fire.
- Standards and guidelines limit clearcutting and allow flexibility for silvicultural activities.
- Standards and guidelines provide direction for the use of pesticides and herbicides.
- Incorporates standards and guidelines for Vegetation Management in the Coastal Plain/Piedmont FEIS and ROD.
- ECS provides direction for selection of species to be managed for, including a mix of species.
- Standards and guidelines provide direction for range management on the National Grasslands (see MA-3).

Scenic Areas, Wild and Scenic River Corridors, Research Natural Areas, and other Special Areas. These are addressed as follows:

-Land allocations are made for Special Areas. Management direction for Special Areas is provided in separate management areas.
-Longleaf Ridge Special Management Area is identified for its unique character and ecosystem value.

The **OFF-ROAD VEHICLES (ORV)** or off-highway vehicles issue deals with public ORV recreational opportunities. This concern is addressed as follows:

-Management direction for ORV use is provided for in management areas.
-Guidance for ORV trail inventory, management, and development is described in Plan Appendix E.
-Forest-wide standards and guidelines provide significant protection measures.

The **RED-COCKADED WOODPECKER (RCW)** issue deals with the management of the RCW on the Forests. This issue is addressed as follows:

-A separate management area, MA-2 and MA-6, is designed to provide all elements of management for the RCW.
-Standards and guidelines in MA-2 and MA-6 incorporate the FEIS for the Management of the Red-cockaded Woodpecker and its Habitat on the National Forests in the Southern Region.

The **INTEGRATED PEST MANAGEMENT** issue deals with prevention and control of the southern pine beetle (SPB) and other forest pests. This issue is addressed as follows:

-Standards and guidelines provide for preventative management techniques using the Integrated Pest Management Decision Key.
-Standards and guidelines for SPB control incorporate the Suppression of the Southern Pine Beetle FEIS.
-Standards and guidelines provide detailed direction for SPB management in Special Areas.

The **ROADS AND TRAILS** issue deals with the number of roads and trails, access needs, maintenance needs, closures, and roadside or trailside management. These concerns are addressed as follows:

-Each management area provides direction for road density, road closure(s), and access needs.
-Standards and guidelines for each management area provide direction for trail management.
-Standards and guidelines direct the management of roadsides and trailsides.

The **COMMUNITY STABILITY** issue deals with how the management of NFGT effects local jobs and county budgets for roads and schools. These concerns are addressed as follows:

-The EIS displays estimated returns to counties by alternative.

endangered, sensitive, extirpated and introduced wildlife species. These concerns are addressed as follows:

-An extensive list of Management Indicator Species has been developed to provide specific management objectives for a wide range of wildlife, fish, and their habitats.
-Specific standards and guidelines have been provided in each management area for snags and their secondary benefits to support many less known vertebrate and invertebrate species.

The **RECREATION** issue deals with traditional recreation uses such as picnicking, camping, and hiking as well as interpretative services, hunting, cultural resources, and law enforcement. These concerns are addressed as follows:

-Direction for recreational priorities detailing developed sites, type of development, and priority recommendations are provided in Appendix E to the Forest Plan.

-Standards and guidelines provide direction for the management of cultural resources and ensure compliance with the Heritage Management Plan.
-Better monitoring of hunting and other recreational activities to define potential overuse, indiscriminate shooting, and other violations.
-Direction for law enforcement.
-Each management area provides direction for recreational opportunities and interpretive programs.

The **RESOURCE SUSTAINABILITY** issue deals with providing a sustained yield of resources, water quality and soil productivity, and ecosystem management. These concerns are addressed as follows:

-Standards and guidelines provide direction that ensures air quality meet Federal and State standards.
-Standards and guidelines provide direction that ensures soil, water, and air quality standards are incorporated in prescribed burning plans.
-Standards and guidelines provide direction to ensure a sustained flow of resources.

The **MIX OF GOODS AND SERVICES** issue deals with striking a balance between commodity outputs, amenity values and customer services. These concerns are addressed as follows:

-Management philosophy for each management area is described in the Desired Future Condition of the Forests, Grasslands, and for each management area.

The **PLANNING** issue deals with comments which are related to the planning process itself, including trying new techniques, innovative ideas, or research needs that should be addressed. These concerns are addressed as follows:

-Detailed Plan monitoring and evaluation, including monitoring for social and economic impacts of implementation, are provided in Chapter V of the Revised Forest Plan.
-Direction is provided for research into aquatic systems, biodiversity, and the historical vegetation found on the Forest in Chapter III of the Revised Forest Plan.

be made in the Revision. These concerns are addressed as follows:

-Current trends and projected demands are reflected in the budgets and output projections.

-Each management area describes the minerals resource, minerals exploration and development, impacts of minerals activities, and supply and demand projection.

-Standards and guidelines provide management direction to ensure all endangered, threatened, or sensitive species are protected in areas affected by mineral activities.

-Standards and guidelines provide direction for reclamation and revegetation activities.

-Standards and guidelines provide for minerals exploration and development in wilderness areas to meet legal rights of private landowners.

-Each management area identifies the leasing decisions for minerals and stipulations, if any, that are required.

The **LANDS** issue deals with special use permits for use of NFGT lands, rights-of-way, land purchases, land exchanges, and property boundary management. These issues are addressed as follows:

-Standards and guidelines provide direction for outfitter and guide services in wilderness areas.

-Each management area provides direction for rights-of-ways.

-Landownership adjustment plans and priorities have been revised.

Forest Profile

The planning area consists of the Angelina, Davy Crockett, Sabine, and Sam Houston National Forests in east Texas, and the Caddo and Lyndon B. Johnson National Grasslands in north central Texas. There are approximately 637,000 National Forest acres in 12 counties. Approximately 38,100 acres of National Grasslands are located in three counties.

The Forest Supervisor's office in Lufkin, Texas, directs the management of these public lands. The Forests have seven Ranger Districts with offices in Lufkin, Hemphill, San Augustine, Apple Springs, Crockett, New Waverly, and Cleveland, Texas. The Caddo and LBJ National Grasslands Ranger District is based in Decatur, Texas.

The NFGT are located in the Gulf Coastal Plain having topography nearly level to rolling, except for a few sharp, steep slopes associated with major streams. The highest elevations are found on the Caddo National Grasslands ranging from 500 feet to 700 feet mean sea level (MSL). The elevations on the National Forests range from 140 feet to 590 feet MSL.

Three major reservoirs exist on or are adjacent to the National Forests. These reservoirs store a portion of the runoff water that leaves the forest as streamflow. Sam Rayburn Reservoir stores runoff from the Angelina and Sabine National Forests; the Toledo Bend Reservoir between Texas and Louisiana stores some of the runoff from the Sabine National Forest; and Lake Livingston collects some of the runoff from the Sam Houston National Forest.

Many small lakes are found on the NFGT. Most of these are man-made and were constructed for watershed protection, and/or recreational purposes, and flood control.

The National Forests are within a two hour drive of the Houston, Beaumont, and Port Arthur metropolitan areas and the Grasslands are within two hours of the Dallas-Ft. Worth metroplex

recreational use impacts.

All the Forests and Grasslands have very fragmented ownership patterns, with many private or industrial lands intermingled within their proclamation boundaries.

The Revision Process: What to Expect

Two draft documents were published and these two final documents have been published by the Forest Service during the Revision process. A Record of Decision statement is issued with this final document. The FEIS and the accompanying Revised Forest Plan are products of a Revision effort that began in October, 1990.

Alternatives were developed by an interdisciplinary team, District Rangers and their employees, and the Management Team in response to the issues generated through public involvement by individuals, special interest groups, and other agencies. The Forest Service began formulating these alternatives in January, 1992, which was as soon as scoping input was analyzed and the Five-Year Review and AMS was completed. The development process has been an ongoing process since then and until the analysis found in this document was completed. The preferred alternative, identified as 4b was modified to include portions of other alternatives to create alternative 8, the new preferred alternative, in response to public comments.

A summarized comparison of alternatives at the end of Chapter II offers the reader an opportunity to weigh the effects of each alternative.

Following the alternatives in Chapter II, Chapter III presents the current environment in discussion first, then the environment as it would be if the alternatives were implemented.

The companion document to this EIS is the Revised Forest Plan. It presents a detailed disclosure of Alternative 8 that the Forest Service is recommending for implementation. Copies of the EIS and Revised Forest Plan have been mailed to interested individuals, organizations, and to affected agencies.

The Preferred Alternative

Alternative 8 has been identified as the Forest Service's preferred alternative in this EIS. The preferred alternative is defined as being the one maximizing net public benefits, and best accomplishes the mission of the Forest Service in managing the forest. The mission, by law, is to accommodate the variety of uses and values of the Forest that the public demands; to sustain these uses and values for future generations; and to accomplish it all in an economically efficient and environmentally sound manner.

Alternative 8 has been developed into the Revised Forest Plan in response to public, organizations, and agencies for review and comments. After the 90-day review period for the draft EIS, and as a result of comments received during that period another alternative (Alternative 8) was developed and identified as the preferred alternative in this final document. The Regional Forester is the deciding official for this action.

The Regional Forester's decision, and the supporting rationale, will be published in the Record of Decision. A FEIS and the final version of the Revised Forest Plan will be companion documents

after publication of the Notice of Availability of the FEIS in the Federal Register.

Following implementation, the Revised Forest Plan will be monitored and evaluated for effectiveness and validation. The Plan will be reviewed at least every five years to determine whether or not conditions have changed enough to warrant another Revision or significant amendment. If not, regulations require a Revision within 10 to 15 years from the date of implementation.

Relationship to Other Documents

This EIS incorporates, by reference, the environmental analysis from the following three Regional programmatic decisions:

1. The FEIS and ROD for the Suppression of the Southern Pine Beetle dated April 6, 1987, as amended;
2. The FEIS and ROD for Vegetation Management in the Coastal Plains / Piedmont dated February 27, 1989, as amended; and
3. The FEIS and ROD for the Management of the Red-cockaded Woodpecker and Its Habitat on National Forests in the Southern Region.

These documents are available for review at the Forest Supervisor's Office, at the address shown in the next section.

Planning Records

The Forest Interdisciplinary Team (IDT) is responsible for developing the Revised Forest Plan. The IDT was provided detailed explanations of each Revision process step, which can be found in the process (or planning) records. This EIS contains summaries of the process records and includes references to the parent records which are on file in the Forest Supervisor's Office in Lufkin, Texas. Copies of records can be obtained by writing to:

Forest Supervisor
National Forests and Grasslands in Texas
701 North First Street
Lufkin, Texas 75904

Chapter II

Alternatives Including the Proposed Action

Introduction

This chapter summarizes the alternatives developed for comparisons of the potential management strategies that could be used in the National Forests and Grasslands in Texas (NFGT) Forest Plan Revision. A number of alternatives were developed and considered by the Forest IDT. The alternatives developed are the culmination of years of public involvement, collaboration and internal USFS discussion. These alternatives are designed to incorporate a wide range of issues, then fully analyzed using a FORPLAN computer application of each alternative, benchmark, and outputs as explained in FEIS Appendix B. For the purposes of this chapter, the term "**alternatives**" will describe management strategies the Forest Management Team and ID Team analyzed in detail for the Revision effort.

This chapter of the environmental document has been called the heart of the Environmental Impact Statement (EIS). It describes possible alternative strategies to accomplish or complete a proposed action. It is comprised of six main parts:

A.Discussion of alternative development;
B.Alternative refinement;
C.Alternatives eliminated from detailed study;
D.Management Area Development;
E.Description of the various alternatives;
F.Comparison of the various alternatives; and
G.Summary of environmental consequences of alternatives by issues.

It is important to recognize that the alternatives described within this chapter were developed to provide a choice by which the Regional Forester for the Southern Region of the U.S. Forest Service (USFS) can make an informed decision of a preferred alternative. In selecting a preferred alternative, the Regional Forester must consider National goals set by Congress, goals of the Southern Region, and the needs and desires of the public.

A. Discussion of Alternative Development

This Plan and EIS for the NFGT was developed with an emphasis on the "need to change" concept. The basis for change was due to monitoring and evaluation, changes in legal requirements, litigation, and public demands. During the scoping phase of the Revision, and during development of the Analysis of the Management Situation (AMS), a number of possible alternative scenarios or themes were heard internally as well as externally. The NFGT planning team communicated with a wide audience of publics, as well as our internal NFGT family, to identify their vision for the Forests and Grasslands. We asked people what they wanted and didn't want the NFGT to be. We also looked at what can be provided. After full review of our AMS with the Regional Forester and Regional Office IDT, six themes were developed that appeared to provide a range of alternatives that responded to the public's vision of the future for the NFGT.

represent the first attempt to meet the public's varying, and often conflicting wants and needs; while the USFS remains responsible stewards of the land. These themes were a beginning, with

expectations that they would probably be modified and developed into alternatives after closer analysis and review was conducted.

Criteria Governing the Strategy for Initial Themes

The implementing regulations for the National Environmental Policy Act (NEPA) require a "No Action" alternative and a reasonable range of alternatives to address issues identified during scoping. During scoping for the Forest Plan Revision in 1990, over 4,400 comment letters were received. From these comments, 15 issues and 53 sub-issues were identified.

All issues raised during scoping have been considered in the planning process. These issues are addressed in the EIS and/or in the Plan standards and guidelines, management area prescriptions, and monitoring requirements.

Theme 1, the "No Action" alternative, is the current Forest Plan, as amended. The way this plan dealt with the issues raised during scoping was analyzed. Six themes were then developed to address the issues in various ways. A desired future condition (DFC) that would result from implementation of each theme was described using the newly developed Ecological Classification System (ECS). The ECS was then used to develop management activities to help achieve the DFC. See Appendix B for more detail on theme development.

Management for the red-cockaded woodpecker (RCW) is addressed in all themes. The Southern Region of the USFS recently released a Environmental Impact Statement for the Management of the Red-cockaded Woodpecker and its Habitat on the National Forests in the Southern Region (RCW EIS), which provided RCW management guidance for the NFGT. The NFGT utilizes standards and guidelines that were developed for the Final RCW EIS in Themes 2 through 6. Theme 1 implements the court order.

The next step in formulation of the preliminary themes was to establish the variation between themes for each issue, and to describe the desired future condition of implementing each theme.

B. Alternative Refinement

A major emphasis in the development of the original six Forest and Grasslands alternatives was full involvement of the NFGT employees. The Forest planning team met with each district to explain the six themes and to request their help in developing the Forest of the future. Each district was asked to develop three strategies based on the original themes, the public issues, and incorporation of an ecological approach to management.

The Ecosystem Management philosophy (or ecological approach to management) became a formative vehicle for initial management area delineation. Ecological units of the ECS became focal points to address issues like biodiversity, vegetation management, and identification of Special Interest Areas. By January 1993, the Forest had developed the original alternatives, proposed and mapped management areas to address the alternatives, and developed a strategy to implement Ecosystem Management through the alternatives.

and the original 15 issues suggested additional alternatives should be considered. This was verified at an April 1993, Management Team meeting that focused on the 15 issues and concerns, priorities regarding these issues, and incorporation of the issues and concerns into land allocations and management strategies. It became evident additional alternatives were needed to address a wider range of land allocations for RCW management areas, Wilderness and Special

Areas, and management direction that incorporated ECS. Greater emphasis needed to be placed on off-road vehicle (ORV) use and recreational shooting on the Grasslands.

Four New Alternatives

The 4 new alternatives, 4a, 4b, 7 and 8, were developed based on the Management Team's recommendations. Three alternatives (4a, 4b, & 7) were developed and described in the DEIS. The fourth alternative (8) was developed between DEIS and FINAL to reflect a variety of public comments. Alternative 7 was developed with the same land allocations as Alternative 6. However, the use of herbicides was allowed. Alternative 7 would also allow greater management flexibility and promote fire in longleaf and shortleaf ecosystems.

Alternative 4 was developed to provide a wider range in land allocations and activities, as directed in implementing management from the RCW FEIS. It was developed with most upland forest acres managed as directed in the RCW FEIS. This management direction is described as Habitat Management Area (HMA) for RCW and associated plant and animal species, requiring forest characteristics as described in the RCW FEIS.

Alternative 4a was developed with the same land allocations as alternative 4 for streamside zone management, special areas, and recreation (but with the minimum HMA). Alternative 4b mirrored most aspects of management in 4 and 4a, but included corridors between RCW habitat that linked isolated sub-populations.

Between Draft and Final EIS alternative 8 was developed to deal with public comments and reconcile concerns for various resource issues. This tenth alternative is the selected alternative, which has similar land allocations as alternative 4 for streamside zones and recreation areas, but differs in allocations for MA-1, MA-2, (HMA) special areas (MA-8) and identifies a new allocation for Longleaf Ridge (MA-6). This alternative addresses concerns relative to Special Area and Texas Natural Heritage sites, Longleaf Ridge, RCW management and transitioning the Plan direction to better deal with local and regional effects of reduced timber harvests.

C. Alternatives Eliminated from Detailed Study

During alternative development, one alternative was eliminated from detailed study. This alternative tripled the wilderness area of the NFGT. The wilderness scenario was considered infeasible due to the large areas of essential RCW habitat it rendered "unmanageable" for this and other endangered species. These "proposed" wilderness or roadless areas are evaluated in Appendix D.

All roadless areas reviewed contained a number of attributes that, when evaluated according to the standard criteria, found them to be undesirable wilderness candidates. Most roadless areas evaluated (with the exception of the Stark Tract on the Sabine National Forest, which has historical records only of the bird) were found in identified RCW 1,200-meter zones, or in potential habitat management areas for the RCW (Management Area 2). Management that

conflicts with wilderness designation.

D. Management Area Development

Each alternative examined in detail in the Revision documents has an associated map displaying the allocation of different portions of the NFGT to management areas. By definition, manage

ment areas (MA's) are areas of the NFGT with similar management objectives where compatible management prescriptions are applied.

The Revised Forest Plan has identified the following management areas:

MA-1 Upland Forest Ecosystems (218,000 acres)
MA-2 RCW Emphasis (250,000 acres)
MA-3 Grassland Ecosystems (34,500 acres)
MA-4 Streamside Management Zones (49,800 acres)
MA-5 Major Aquatic Ecosystems (16,300 acres)
MA-6 Longleaf Ridge (32,300 acres)
MA-7 Wilderness (37,200 acres)
MA-8 Special Area Management (15,800 acres)
MA-9 Recreation Areas (6,600 acres)
MA-10 Administrative and Special Use Sites (9,700 acres)
MA-11 SFA Experimental Forest (2,600 acres)

MA-1 Upland Forest Ecosystems: This management prescription contains portions of the forest that are managed for timber emphasis using either even-aged, two-aged, or uneven-aged timber cutting methods. Lands within this management area provide a range of timber products in as efficient and economical a manner as is consistent with multiple-use management and NFGT goals and objectives. (This prescription was originally established to deal with areas that were predominately longleaf pine ecosystems).

MA-2 RCW Emphasis: This management prescription contains portions of the forest that are managed to provide continuing habitat for the RCW. Timber harvest, using either even-aged, two-aged, or uneven-aged cutting methods will be used to provide desired present and future RCW habitat. (This prescription was originally established to deal with areas that were predominately mixed forest ecosystems).

MA-3 Grassland Ecosystems: This management prescription contains both the Caddo and LBJ National Grasslands, and is managed to provide grazing, wildlife, and recreational opportunities in as efficient and economical a manner as is consistent with multiple-use management and NFGT goals and objectives.

MA-4 Streamside Management Zones: This management area contains those riparian areas which are managed for a variety of uses, while providing the desired future condition of the riparian areas. On-the-ground ecological conditions determine the width of individual riparian areas, but a primary and secondary zone will be delineated on intermittent and perennial streams.

MA-5 Major Aquatic Ecosystems: This management area contains man-made lakes and reservoirs, and the lands inundated by these water bodies. The adjacent riparian ecosystems are included in Management Area 4.

MA-6 Longleaf Ridge Special Management Area: This 32,300 acres was originally within the MA established for RCW management (MA-2) in the DEIS. This management area

but more importantly develop and improve the longleaf pine ecosystem in Texas. This change was based on comments received from individuals, organizations, and agencies.

MA-7 Wilderness: This management area contains the existing wildernesses on the forest and any roadless areas that are recommended for wilderness study designation. Lands within this management area are administered to maintain or achieve a natural state. The area is generally maintained in a natural condition by allowing physical and biological processes to operate without human intervention. Activities are integrated in such a way that current human use leaves only limited and site-specific evidence.

MA-8 Special Area Management: This management area contains lands requiring special management because of biologic, historic, or geologic values.

MA-9 Recreation Areas: This management area contains most of the existing and future developed recreation sites on the forest.

MA-10 Administrative and Special Use Sites: This management area contains the administrative sites, utility corridors, and communication sites on the NFGT.

MA-11 Stephen F. Austin Experimental Forest: This management area contains the Stephen F. Austin Experimental Forest, which is managed for research.

E. Description of the Various Alternatives

Alternative 1 implements the court-ordered management for 1,200-meter zones for active and inactive RCW clusters. Alternatives 2 through 8 implement the RCW FEIS.

Alternative 1 is the current Forest Plan, as amended. It represents the no action alternative for comparison of the other alternatives. The court-ordered management for 1,200 meter zones for active and inactive RCW clusters is implemented on approximately 26 percent of the NFGT. The remaining forested land is managed under the 1987 Forest Plan, and additional direction set forth by the Chief of the Forest Service. Clearcutting has been reduced from the 1987 projections. Uneven-aged management is used in some areas. On most of the four forests, off-road vehicle use is open unless signed Closed or restricted to a small area on the Sam Houston National Forest. Most roads are open. Five wilderness areas, five scenic areas, and one protective river corridor are managed to protect these special sites.

Timber management activities are summarized as follows:

-General Forest (MA-1) - 52%
-Maximum regeneration size of 80 acres;
-All regeneration methods available; however, even-aged techniques are predominant;
-Rotation ages: loblolly-70, longleaf/shortleaf-80
-Up to 10 BA hardwood is left during site prep;
-Most seed-trees/shelterwood trees are removed;
-Pines are thinned to 70-90 BA;
-All site prep methods are available;
-Pine/hardwood is not a recognized management type;
-Slash pine is converted to longleaf pine and/or shortleaf pine based on management type; and
-Streamside management zone (MA-4) - Intermittent 66 ft., and Perennial is 100 ft.
-Court Order - 1,200 Meter Zone (26%)
-Thin to 60 BA;
-No regeneration is allowed; and

No new roadless areas are recommended for wilderness study. No new allocations are made for special interest areas.

Approximately 6,000 acres of slash pine in MA-1 and MA-2 will be converted to longleaf pine within the next 40 years.

Implementation of the court-ordered management for the 1,200 meter zones has reduced the Forest Allowable Sale Quantity (ASQ) from 126 MMBF to approximately 119 MMBF. Computer generated estimates used in this Revision estimate timber production at 112 MMBF.

Minerals lease decisions are the same as currently exists. This alternative provides the greatest available acreage for mineral leasing with fewest acres of "no surface occupancy". Mineral leasing with surface occupancy is available on 416,966 acres, with an additional 40,229 acres with "no surface occupancy (NSO)".

The Caddo and LBJ National Grasslands employ a variety of range management practices to produce forage and ecological conditions. Recreation, wildlife, and other amenity values are also emphasized. All areas are managed recognizing the predominantly urban user's needs and values. One existing special area, Cross Timbers RNA, is managed to preserve its special characteristics.

The planning records contain a more detailed explanation of this alternative. It includes, by referencing Management Area Prescriptions and Standards and Guidelines, the mitigation measures incorporated into the alternative.

Alternative 2 emphases commodity production with less emphasis on amenity values. Approximately 35 percent of NFGT is in MA-2, which provides habitat needs essential to ensure RCW population recovery and stability. This alternative has the minimum RCW Habitat Management Area (HMA) as identified in the RCW FEIS. The Sam Houston National Forest is managed at management intensity level (MIL) 3, and the remaining forests at MIL-4.

The following chart, "Summary of Proposed RCW Management by MIL", shows three management intensity levels for HMA's. MIL's 2, 3, and 4 show criteria for managing different size population habitats.

SUMMARY OF PROPOSED RCW MANAGEMENT
BY MANAGEMENT INTENSITY LEVEL (MIL)

Risk Level Criteria	**Moderate Risk** **MIL2**	**Severe Risk** **MIL3**	**Extreme R** **MIL4**
Population Size & Trend (# RCW Breeding Pairs)	>250 decreasing or 125-249 increasing	50-249 decreasing or 25-124 stable/	<25 all trends or 25-49 decre
Rotation Age	120 Years-longleaf 80 Years-loblolly/	Same as MIL 2	Same as MI

Silvicultural Practice	Even-aged and uneven-aged management emphasizes irregular shelterwood shelterwood areas leaving 6 trees per acre	Similar to MIL 2, but leaves 25-30 BA of pine in irregular shelter-wood areas	MIL 3, but leaves 4 of pine in
Maximum Regeneration	40 acres	25 acres	25 acres
Nesting Habitat	Extended rotations, and an average of 6 trees per acre would remain in regen. areas	Same as MIL 2, except that 25-30 BA of pine trees would remain in regen. areas	Same as MI except that BA of pine would rema regeneratio
Fragmentation MIL Prevention 3	Extended rotat. regen. method and patch size limits	Same as described MIL 2, plus no even-aged mgmt. within 1/4 mile of active clusters	Same as

Note: The RCW populations facing higher risk of extirpation are given progressively higher levels of habitat protection.

Alternatives 2 through 8 incorporate the following Standards and Guidelines from the RCW EIS into MA-2:

-Longleaf pine can be cut to leave 6 trees/acre when regeneration is established;
-No more than l2.5% of loblolly or shortleaf and 8.3% of longleaf can be less than 10 years old (unless for longleaf or shortleaf pine restoration over 1.5 miles from active clusters);
-All openings such as SPB spots, storm damage, and well sites count towards the percentage allowed in openings;
-Pines are thinned to 70-90 BA;
-No planned regeneration can occur within 1/4 mile of clusters; and
-Adequate foraging that must be available before thinning or regeneration can occur as described in the following:

*At least 8,490 square feet of basal area (BA) in pine stems larger than 5 inches;
*At least 6,350 pine stems 10 inches in diameter or larger and 30 years old or older;
*Must be within 1/2 mile of geometric center of the cluster;
*Must be continuous and contiguous with the cluster;
*Clusters, replacement, and recruitment stands count toward this requirement;
*Shelterwood cuts with at least 30 square feet of BA of pine are suitable foraging;
*Include only pine and pine-hardwood stands.

In Alternative 2 forested areas not in the HMA are managed under current management, with the following exceptions:

-Old Aldridge Sawmill site is designated as a Special Area;
-Streamside management zones, MA-4, extend to the limit of the floodplain soil;

-The minimum widths of 66 feet for intermittent streams and 100 feet for perennial streams are still applicable; and
-Additional recreation trails are built.

Harvest/regeneration methods in MA-1 will be the same as in Alternative 1, except for the following:

-All regeneration methods are available; however, classic even-aged and two-aged methods are predominant;
-Average 10 BA hardwood is left during site prep; and
-ECS is used to determine management type.

ASQ is 144.5 MMBF.

No roadless areas are recommended for wilderness study.

Minerals availability and potential for development is the second highest in this alternative. Acres available for lease are 401,631 and the area available with NSO is 55,534 acres.

The Caddo and LBJ National Grasslands are managed with a commodity output emphasis. Production of forage for grazing and oil or gas production is emphasized. Some areas of the Grasslands are managed recognizing the urban user's needs and values. Only the existing Cross Timbers RNA is managed to preserve botanical communities identified by the Texas Natural Heritage Program (TNHP).

The planning records contain a more detailed explanation of this alternative. It includes, by referencing management area prescriptions and standards and guidelines, the mitigation measures incorporated into the alternative.

Alternative 3 emphasizes moderate to high levels of commodities. Approximately 35 percent of the forest is managed as an HMA (MA-2). The Sam Houston National Forest is managed at MIL-3, and the remaining forests are managed at MIL-4. Outside the HMA's, the forests are managed to produce moderate to high levels of commodities, and low to moderate levels of amenities. This alternative has twelve special areas, four bottomland areas, five wilderness areas, and one wild and scenic river corridor.

Stream corridors are somewhat wider than the minimum needed to maintain clean water and viable populations of wildlife. Developed recreational opportunities are emphasized. Off-road vehicle (ORV) travel is not permitted on the Sam Houston National Forest and southern Angelina National Forest, except on designated trails. The other forests remain open to ORVs. Some local roads have been closed in portions of the forests.

Timber management activities in MA-1 are the same as Alternative 1, with the following exceptions:

-Rotations ages: loblolly-70, shortleaf-80, longleaf-90;

predominant;
-Average 10-20 BA hardwood is left during site prep;
-ECS is used to determine management type;
-Some seed-trees/shelterwood trees are removed; and
-Pine/hardwood is recognized as a management type.

ASQ is 130.4 MMBF.

No roadless areas are recommended for wilderness study. Special areas designated are Angelina River bottom, Angelina River Corridor, Attoyac River, Ayish Bayou, Boykin Springs, Catahoula Barrens, an additional area to Big Creek, Big Woods, Neblitts Creek, Bear Creek, and additional acres to Beech Ravines.

Minerals availability is about the same in Alternatives 3 through 4b. Acres available for lease in Alternative 3 are 398,842, with area of NSO about 58,323 acres.

The Caddo and LBJ National Grasslands are managed primarily for livestock grazing and recreation. Some non-commodities are produced, but production of forage for grazing and oil or gas production is emphasized. Only the Cross Timbers RNA is managed to preserve botanical communities identified by the TNHP.

The planning records contain a more detailed explanation of this alternative. It includes, by referencing management area prescriptions and standards and guidelines, the mitigation measures incorporated into the alternative.

Alternative 4 emphasizes RCW habitat. Except for five existing wilderness areas, eleven special areas, four bottomland areas, two wild and scenic river corridors, and approximately 13,500 acres on the Sabine National Forest, the remaining NFGT forests are managed as a HMA (MA-2 = 73 percent). Timber harvest occurs as a by-product of RCW habitat management. Stream corridors are somewhat wider than the minimum needed to maintain clean water and viable populations of wildlife.

Developed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina Forest are managed as "urban forests". ORV travel is open with restrictions on designated trails, and most local roads are open.
MA-1 is restricted to Compartments 51, 52, 58, 65 through 70, and 140 through 142 on the Sabine National Forest. Timber management emphasizes clearcutting and planting to restore longleaf pine to some of its historical range.

MA-2 on all of the Sam Houston National Forest will be managed at MIL-3. On the southern Angelina, Davy Crockett, and Sabine National Forests the designated HMA (MA-2) will be managed at MIL-4. The remaining portions of the forests will be managed at MIL-2.

Minerals availability is slightly more than Alternative 3. Acres available are about (399,195) acres, with area of NSO about (58,250) acres.

ASQ is 93.8 MMBF.

from Alternative 3 include removal of Nebletts Creek, Big Woods, and Angelina River bottom from special designation. Area added to special status includes Winters Bayou and the Wild and Scenic River protection of Winters Bayou Creek.

The Caddo and LBJ National Grasslands are managed for a mix of amenity and commodity outputs. Opportunities for developed recreation, wildlife, and other recreation values are emphasized. Some commodities are produced including gas and oil. Non-native pastures which once constituted about one-fifth of the Grasslands will be replaced with native little bluestem, Indiangrass, and switchgrass prairie. Some livestock grazing occurs.

All areas of the Grasslands are managed recognizing the predominantly urban user's needs and values. In addition to the existing Cross Timbers RNA, one other site is managed to preserve the special natural heritage characteristics.

The planning records contain a more detailed explanation of this alternative. It includes, by referencing management area prescriptions and standards and guidelines, the mitigation measures incorporated into the alternative.

Alternative 4a emphasizes commodities and amenities. Wilderness and special areas are the same as Alternative 4. This alternative has the minimum HMA allowed (MA-2 = 35 percent). The area outside MA-2 emphasizes jobs, revenue, and market commodities. Commodity production occurs in the RCW management area as a by-product of habitat management.

Developed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina are managed as "urban forests". ORV travel is only permitted on designated trails on these forest areas. The Davy Crockett and the Sabine National Forests remain as open areas for ORVs, and most local roads are open.

In MA-1, harvest and regeneration methods will be the same as Alternative 4, with the following exceptions:

-All regeneration methods are available; however, classic even-aged and two-aged methods are predominant;
-Rotation ages: loblolly-70, shortleaf-80, longleaf-100;
-Average 10-20 BA hardwood and pine is left during site prep;
-Some seed-trees and shelterwood trees are removed;
-Pine-hardwood is recognized as a management type; and
-ECS is used to determine management type.

For MA-2, the Sam Houston will be managed at MIL-3. The remaining forests will be managed at MIL-4.

ASQ is 110.6 MMBF.

No roadless areas are recommended for wilderness study. Special areas are the same as Alternative 4.

Minerals availability is slightly greater than Alternative 3. Acres available for lease are about 399,131 acres, with an area of NSO about 58,134 acres.

The Caddo and LBJ National Grasslands are managed for a mix of amenity and commodity outputs. Opportunities for developed recreation, wildlife, and other recreation values are emphasized. Some commodities are produced including gas and oil. Non-native pastures which once constituted about one-fifth of the Grasslands will be replaced with native little bluestem, Indiangrass, and switchgrass prairie. Some livestock grazing occurs.

All Grasslands areas are managed recognizing the predominantly urban user's needs and values. In addition to the existing Cross Timbers RNA, one other site is managed to preserve the special natural heritage characteristics.

The planning records contain a more detailed explanation of this alternative. It includes, by referencing management area prescriptions and standards and guidelines, the mitigation measures incorporated into the alternative.

Alternative 4b emphasizes corridors between RCW habitat management areas. HMA's (MA-2) are consolidated to connect isolated RCW sub-populations by providing habitat corridors on the Angelina, Sabine, and Davy Crockett National Forests. The area within MA-2 is approximately 50 percent of NFGT lands. The entire Sam Houston National Forest is designated as an HMA and no corridors are needed. Commodity production occurs in the RCW management area as a by-product of habitat management. Outside MA-2 a little more than half of the forest is managed to produce jobs, revenue, and market commodities; most of the remainder is managed for wildlife and recreation. Wilderness and special areas are the same as in Alternative 4.

Developed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina are managed as "urban forests". ORV travel is only permitted on designated trails on these forest areas. The Davy Crockett and the Sabine National Forests remain as open areas for ORVs, and most local roads are open.

In MA-1, harvest and regeneration methods are the same as Alternative 4, with the following exceptions:

- All regeneration methods are available; however, classic even-aged and two-aged methods are predominant;
- Rotation ages: loblolly-70, shortleaf-80, longleaf-100;
- Average 10-20 BA hardwood and pine is left during site prep;
- Some seed-trees and shelterwood trees are removed;
- Pine-hardwood is recognized as a management type; and
- ECS is used to determine management type.

For MA-2, the following MIL's apply:

	Angelina	Davy Crockett	Sabine	Sam Ho
Inside HMA	MIL-4	MIL-4	MIL-4	MIL-3
Corridor	MIL-2	MIL-3	MIL-3	MIL-3

398,394 acres, with an area of NSO about 58,871 acres.

ASQ is 101.6 MMBF.

No roadless areas are recommended for wilderness study. Special areas are the same as Alternative 4.

The Caddo and LBJ National Grasslands are managed for a mix of amenity and commodity outputs. Opportunities for developed recreation, wildlife, and other recreation values are emphasized. Some commodities are produced including gas and oil. Non-native pastures, which

once constituted about one-fifth of the Grasslands will be replaced with native little bluestem, Indiangrass, and switchgrass prairie. Some livestock grazing occurs.

All areas of the Grasslands are managed recognizing the predominantly urban user's needs and values. In addition to the existing Cross Timbers RNA, one other site is managed to preserve the special natural heritage characteristics.

Alternative 5 emphasizes protection of natural values. Approximately 38 percent of the forest is managed as a HMA or MA-2. Outside MA-2, the primary emphasis is on recreation and wildlife. There are 5 wilderness areas, 2 proposed wilderness areas, 17 special areas, 4 bottomland areas, and 3 wild and scenic river corridors.

Restoration of longleaf pine and shortleaf pine to it's historical range is emphasized. Stream corridors wider than normally needed are established to not just maintain but improve water quality and viable populations of wildlife. Single tree selection is a commonly employed regeneration method. Developed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina are managed as "urban forests". ORV travel is not permitted except on designated trails on these forest areas. Some local roads are open for public use.

In MA-1, harvest and regeneration methods are the same as Alternative 4, with the following exceptions:

-Selection and two-aged methods are most commonly used;
-Some seed-trees and shelterwood trees are removed, but most are left;
-Clearcut and plant is used to convert some stands to longleaf and shortleaf pine;
-Rotation ages: loblolly-80, shortleaf-100, longleaf-120;
-Average 20-30 BA hardwood and pine is left during site prep;
-Pine-hardwood is recognized as a management type;
-Conversion to longleaf pine and/or shortleaf pine per ECS is conducted; and
-ECS is used to determine management type.

For MA-2, the Sam Houston National Forest is managed at MIL-3. The remaining forests are managed at MIL-4.

Minerals availability is reduced due to no lease options on the Grasslands, with about 358,350 acres available. Lands with NSO increase to 63,164 acres.

Two additional areas, Big Woods and Winters Bayou on the Sam Houston National Forest and an additional area added to Indian Mounds, are proposed for wilderness.

Special area status in addition to areas described in Alternative 4 include: Big and Green Creek bottoms; Compartments 25, 27, 29, 31, and 39 on Angelina National Forest, McGee Bend, Pophers Creek, Big Creek addition, Fox Hunter's Hill, Six Mile Creek, an additional area to Beech Ravines, Stark Tract, and the recommendation of Henry Lake Branch as a Wild and Scenic River.

The Caddo and LBJ National Grasslands are managed for a vegetation mosaic de-emphasizing commodity outputs. Some commodities are produced; however, oil and gas leasing does not occur. The production of recreation, wildlife, and other amenity values are emphasized. The

LBJ Grassland is managed recognizing the predominantly urban user's needs and values. In addition to the existing Cross Timbers RNA, several additional sites are managed to preserve special qualities composed of roughly equal parts of woodlands and grasslands.

The planning records contain a more detailed explanation of this alternative. It includes, by referencing management area prescriptions and standards and guidelines, the mitigation measures incorporated into the alternative.

Alternative 6 emphasizes uneven-aged management using no herbicides. Single-tree selection is used forest wide to maintain tall, large forest cover and provide regeneration. Small pockets of young trees are distributed throughout the forest. Prescribed burning is seldom used. The use of herbicides is not permitted. No distinction is made in silvicultural management activities between MA-1 and MA-2.

This alternative has more areas in wilderness or special designation for a total of five wilderness, which include: Longleaf Ridge; Harmon Creek; Alabama Creek; Beech Ravines; Stark Tract; and those identified in Alternative 5. Four riparian/wildlife areas, eleven special areas, and five wild and scenic river corridors are also included in this alternative, most of which were described in Alternative 6 (with the addition of the Attoyac River as Wild and Scenic, Boykin Springs, and Colorow Creek as RNA's). Late successional plant communities are common in the wide stream corridors and trail management zones. These areas are preserved as old growth to provide aesthetics and wildlife habitat connecting wilderness and other special management areas.

Developed and dispersed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina are managed as "urban forests" recognizing the amenity values held by many of the predominantly urban users. ORV use is prohibited. The number of roads built and the public driving on the roads are significantly reduced. Few local roads are open for public use.

Minerals activity is the lowest in this alternative with no lands available for lease.

ASQ is 62.9 MMBF.

The Caddo and LBJ National Grasslands are managed primarily for livestock grazing, wildlife, and recreation. Several areas are managed to protect high quality examples of native plant communities. Much of the non-native pasture, which once comprised a little over one-fifth of

redcedar are the most common woodland communities.

Commodity outputs are de-emphasized. Some commodities are produced; however, oil and gas leasing does not occur. Recreation, wildlife, and other amenity values are emphasized. The LBJ Grassland is managed recognizing the predominantly urban user's needs and values. In addition to the existing Cross Timbers RNA, several additional sites are managed to preserve special qualities.

Alternative 7 emphasizes uneven-aged management but allows the use of herbicides. Single-tree selection and group selection are used forest wide to maintain tall, large forest cover. Herbicides are used to ensure pine regeneration. Small pockets of young trees resulting from group selection are distributed throughout the forest. This is most common in longleaf pine. Prescribed burning is seldom used except in longleaf pine stands. Little distinction is made between MA-1 and MA-2.

The five existing wilderness areas, six proposed wilderness areas (the same as found in Alternative 6 with the exception of Longleaf Ridge which was changed to a special area), twelve special areas, four bottomland areas, and five wild and scenic river corridors make up about one-third of the forests. Late successional plant communities are common in the wide stream corridors and trail management zones. These areas are preserved as old growth to provide aesthetics and wildlife habitat connecting wilderness and other special management areas.

Developed and dispersed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina are managed as "urban forests" recognizing the amenity values held by many of the predominantly urban users. ORV use is limited to the current existing system of designated trails. The number of roads built and the public driving on the roads are significantly reduced. Few local roads are open for public use.

Minerals leasing is second lowest in this alternative with 317,053 acres available for lease and 104,460 acres available with NSO.

ASQ is 68.6 MMBF.

The Caddo and LBJ National Grasslands are managed primarily for livestock grazing, wildlife, and recreation. Several areas are managed to protect high quality examples of native plant communities. Much of the non-native pasture, which once comprised a little over one-fifth of the Grasslands, has been restored to native rangeland. Post oak, blackjack oak, and eastern redcedar are the most common woodland communities.

Commodity outputs are de-emphasized. Some commodities are produced; however, oil and gas leasing does not occur. Recreation, wildlife, and other amenity values are emphasized. The LBJ Grassland is managed recognizing the predominantly urban user's needs and values. In addition to the existing Cross Timbers RNA, several additional sites are managed to preserve special qualities.

Alternative 8 This alternative was developed after the draft in response to comments received. It identifies Longleaf Ridge (MA-6) as a special area, and identifies Texas Natural Heritage sites for special management. It also emphasizes a transition between RCW habitat management

allows RCW management to develop as described in the RCW EIS, but in such a way as to have minimal economic impact on local communities and timber harvest activities.

The area within MA-2 and MA-6 is approximately 42 percent of NFGT lands. Much of the Sam Houston National Forest is designated as an HMA creating corridors between subpopulations to enhance recovery. Outside MA-2 and MA-6 approximately an equal amount of forest is managed to produce jobs, revenue, and market commodities; with added emphasis for management of wildlife and recreation. Wilderness areas are the same as in Alternative 4. The same special areas are found in Alternatives 4 and 8, but some changes have been made to enhance recognition and management. In addition Longleaf Ridge and the many micro-habitats within that area have been identified for special management and restoration of the longleaf pine ecosystem.

Developed recreational opportunities are emphasized. The Sam Houston National Forest and southern Angelina (Longleaf Ridge MA-6) are managed to provide for the needs of urban metropolitan areas. ORV travel is only permitted on designated trails on these forest areas. The Davy Crockett, northern Angelina and the Sabine National Forests remain as open areas for ORV's, and most local roads are open.

In MA-1, harvest and regeneration methods are:

-All regeneration methods are available; however, classic even-aged and two-aged methods are predominant;
-Rotation ages: loblolly-70, shortleaf-80, longleaf-100;
-Average 10-20 BA hardwood and pine is left during site prep;
-Some seed-trees and shelterwood trees are removed;
-Pine-hardwood is recognized as a management type; and
-ECS is used to determine management type.

For MA-2, the following MIL's apply:

	Angelina	Davy Crockett	Sabine	Sam Ho
Inside HMA	MIL-4	MIL-4	MIL-4	MIL-4

Minerals availability is similar to Alternative 4b. Acres available for lease are about 399,394 acres, with an area of NSO about 58,871 acres.

ASQ is 113.4 MMBF.

The Caddo and LBJ National Grasslands are managed for a mix of amenity and commodity outputs. Opportunities for developed recreation, wildlife, and other recreation values are emphasized; however ORV use is prohibited in this Alternative. Some commodities are produced including gas and oil. Non-native pastures, which once constituted about one-fifth of the Grasslands will be replaced with native little bluestem, Indiangrass, and switchgrass prairie. Some livestock grazing occurs.

values. In addition to the existing Cross Timbers RNA, all other Texas Natural Heritage sites are managed to preserve the special natural heritage characteristics.

The planning record contains a more detailed explanation of this and other alternatives. It includes, by referencing management area prescriptions and standards and guidelines, the mitigation measures incorporated into the alternatives.

Part I. Alternative Comparisons

How the Alternatives Relate to the Issues}

Since this EIS serves as both a NFMA and a NEPA document, the information used to compare the alternatives is not limited to environmental effects. Much of the information used to compare the alternatives is contained in Chapter III of this document. Where there is additional information in other portions of this document, (the appendices), a reference is included in the discussion. Some of the information, however, has been extracted directly from process papers on file in the Forest Supervisor's Office.

This portion of Chapter II describes how the alternatives address the issues and sub-issues in a brief narrative, graph, or table. The issues are discussed in more detail in EIS Appendix A.

Issue 1. Biodiversity

Management of the NFGT in all alternatives incorporates both biological and physical components of the Ecological Classification System (ECS) that is detailed in Plan Appendix A. This ECS provides definition to the Natural Values concept of this issue that was described fully in the AMS (1992). It was a basis for Management Area delineation and will continue to be a major consideration in the implementation of any alternative of this Revision.

Native versus exotic species

In all alternatives natural succession is encouraged so that exotic species will be replaced over time with native species.

Management Indicators

The management indicator list is the same for 1-7 alternatives; but adjustments were made between draft and final and a revised list used in alternative 8.

Old Growth

Scientifically definitive characteristics of old growth for the ecosystems on the forest are lacking. Potential old growth, or areas where old growth will be allowed to develop over time is shown below:

Alternative 1 - Wilderness areas.
Alternative 2 - Wilderness areas.
Alternative 3 - Wilderness areas and streamside management zones (MA-4).
Alternative 4, 4a, and 4b - Wilderness areas, MA-4, and special areas.
Alternatives 5, 6, 7 and 8 - Wilderness areas, MA-4, special areas and Natural Heritage sites.

Alternative Nos.	**Number**
Acres	
Alternative 1	37,162
Alternative 2	68,258
Alternative 3	119,076
Alternative 4,4a,& 4b	125,340
Alternative 5	145,084
Alternative 6	230,991
Alternative 7	230,991
Alternative 8	152,254

Special Ecosystem - Riparian, Bottomland and Streamside Zones

These systems are found throughout the NFGT and ensure clean water, as well as provide adequate corridors for many species of wildlife. These zones are minimal in Alternatives 1 and 2; wider as determined by width of the riparian vegetation in Alternatives 3 through 5 and 8; and over 300 feet in Alternatives 6 and 7.

Ecosystem Management and Species Diversity

The Ecological Classification System (ECS) will be used in all alternatives to determine management action for the most appropriate plant and animal species. The ECS is also a major factor in identification of restoration potential of sites that may have historically been part of a larger longleaf, shortleaf, bottomland hardwood or other desired landscape vegetation. The restoration of these landscapes through time will enhance recovery of many rare or unique species and communities.

TOTAL LONGLEAF/SHORTLEAF RESTORATION

Alternative Nos.	**1ST DECADE**	
5TH DECADE		
Alternative 1	9,417	21,777
Alternative 2	32,732	65,721
Alternative 3	29,198	56,563
Alternative 4	553	39,459
Alternative 4a	4,497	27,684
Alternative 4b	4,005	30,187
Alternative 5	11,305	23,039
Alternative 6	2,803	5,711
Alternative 7	1,460	17,631
Alternative 8	13,475	56,544

Issue 2. Vegetation Manipulation

Alternative 1 - Usually clearcut and plant or seed-tree is used in loblolly and shortleaf stands. Shelterwood is usually used in longleaf. The seed trees are removed.

The 1,200 meter zone surrounding RCW clusters is thinned to 60 square feet of basal area. There is no regeneration except that slash pine can be converted to longleaf pine where adequate foraging exists.

Alternatives 2, 3, 4, 4a, 4b and 8 - The selection of harvest methods and regeneration techniques is made on a project-level, site-specific analysis. Seed-tree, shelterwood, seed-tree with reserves, shelterwood, and two-aged regeneration methods with reserves are most often used. Stands to be converted to longleaf/shortleaf pine are clearcut and planted. Some single-tree selection and group selection is used. This is applicable to both MA-1 and MA-2.

Alternatives 6 and 7 - Mostly single tree selection and group selection is used in both MA-1 and MA-2.

ACRES OF 0-10 EARLY SUCCESSION BY ALTERNATIVE

Alternative Nos.	**1ST DECADE**	**5TH DECADE**
Alternative 1	139,019	129,919
Alternative 2	119,436	39,392
Alternative 3	113,731	36,906
Alternative 4	84,219	54,540
Alternative 4a	97,127	41,242
Alternative 4b	91,258	38,014
Alternative 5	96,115	53,635
Alternative 6	101,715	19,471
Alternative 7	85,888	42,364
Alternative 8	102,551	58,518

Reforestation/Intermediate Stand Management

Alternatives 1, 2, 3, 4, 4a, 4b, 5, and 8 - Regeneration size is limited to 80 acres in MA-1 and 25 acres in MA-2. Natural regeneration is usually used, except when converting a stand to longleaf/shortleaf pine. Uneven-aged management (see FEIS Appendix J) through the use of diameter limits is used in all alternatives, ranging from 18 to 28 inches, based on site-specific analysis. Rotation ages in MA-1 are as follows:

	Alt 1	Alt 2	Alt 3	Alt 4a,4b	Alt 5	Alt 6*
Loblolly	70	70	70	70	80	*
Shortleaf	80	80	80	80	100	*
Longleaf	80	80	90	100	120	*
Hardwoods	120	120	120	120	200	*
Mixed	100	100	100	100	120	*

* Less than 10 percent of all forest acres.

Rotation ages in MA-2 for all alternatives are: Loblolly, shortleaf pine 80 years; and longleaf pine and hardwood pine mixes - 120 years.

Prescribed Fire

Alternatives 1 through 5 and 8: A three to five year burning cycle is used in MA-1, and a two to five year burning cycle is used in MA-2 and MA-6. There may be additional burns prescribed for brown spot needle rust in all MA's.

Prescribed fire will have limited use in Alternatives 6 and 7.

TOTAL PRESCRIBED FIRE ACRES BY ALTERNATIVE

5TH DECADE

Alternative 1	354,734	375,383
Alternative 2	876,588	915,745
Alternative 3	893,347	934,317
Alternative 4	828,279	847,264
Alternative 4a	996,481	1,031,305
Alternative 4b	997,159	1,068,852
Alternative 5	909,060	960,830
Alternative 6	109,497	112,135
Alternative 7	942,982	975,564
Alternative 8	992,623	1,069,636

Use of Chemicals

The use of chemicals both herbicides and pesticides are not allowed in Alternative 6. Use of chemicals in Alternatives 1 through 5, 7, and 8 comply with the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) for Vegetation Management in the Coastal Plain/Piedmont.

Pine-Hardwood

Pine-Hardwood is not a recognized management type in Alternative 1. In Alternatives 2 through 8, all management types (including pine-hardwood) are determined based upon a site-specific environmental analysis using ecosystem characteristics.

Issue 3. Special Management Areas

Special area designations provide clear direction to manage specific allocations for a particular attribute or activity. Wilderness areas and Wild and Scenic River corridors can be recommended by the NFGT for congressional designation. Research Natural Areas provide long-term research for natural ecosystems. Texas Natural Heritage sites were considered as individual management areas in each alternative, with many of the smaller sites identified as inclusions within larger management areas. In Alternative 8 those sites that were not identified as a special management area in 4b, were consolidated into a new management area designation, replacing the botanical designation in other alternatives. Other special areas exemplify some botanical, scenic, historical, or bottomland character. Each alternative has a mix of these areas as described below.

NUMBER OF SPECIAL AREAS BY ALTERNATIVE

	Alt 1	Alt 2	Alt 3	Alt 4, 4a,4b	Alt 5	Alt 6	Alt 7	Alt 8
Wilderness	5	5	5	5	7	12		
RNA	1	2	2	2	2	4		
Scenic	3	2	3	2	1			
Botanical	2	2	4	4	7	2		
Historical	1	2	3	3	3	2		
Bottomland	0	0	6	5	10	7		
Wild & Scenic River	1	1	1	2	3	4		
Heritage Sites	0	0	0	0	0	0		

Special area allocations are more pronounced in both number of areas recommended and acreage dedicated to these management areas. Longleaf Ridge (MA-6) was added into Alternative 8, essentially adding 32,300 acres that is not described as special (MA-8) management in the table that follows. Wilderness, Research Natural, Wild and Scenic, and other Special Areas acreage by alternative is described below.

SPECIAL AREA ALLOCATIONS (ACRES)

	Alt 1	Alt 2	Alt 3	Alt 4, 4a,4b	Alt 5	Alt 6
Wilderness	37,162	37,162	37,162	37,162	42,229	97,413
RNA	380	605	605	605	605	1,185
Wild and Scenic	1,950	1,950	1,950	2,210	2,460	6,040
Other Special	2,737	5,149	10,485	9,338	20,096	1,958

Issue 4. Off-Road Vehicles (ORV's)

<u>ORV Trails in the Forest</u>

Alternative 1 - There are 55 miles of designated trails on the Sam Houston National Forest. The other forests are open without restrictions for ORV use. ORV use on the Grasslands in prohibited.

Alternative 2 - MA-1 and MA-2 are open for ORV use. Approximately 45 miles of trails will be built on the Sam Houston and Angelina National Forests. ORV use on the Grasslands in prohibited.

Alternative 3 - The Sabine and Davy Crockett National Forests are open to ORV use forest wide. The Angelina and Sam Houston National Forests are closed to ORV use except on designated trails. Approximately 200 miles of trails are to be built. ORV use on the Grasslands in prohibited.

Alternative 4, 4a, and 4b - Approximately 250 miles of trails will be built on the Sam Houston and southern part of the Angelina National Forests. The Sam Houston will have no open areas for ORV use. The area of the Angelina National Forest north of Sam Rayburn reservoir, and the Sabine and Davy Crockett National Forests will be open for cross country use. ORV use on the Grasslands is strictly regulated on permanently marked trails, if suitable sites are identified.

and Davy Crockett National Forests will be open for ORV use. The only designated trail is the existing 55 miles on the Sam Houston National Forests. No new trails will be built. ORV use on the Grasslands is prohibited except for the possibility of limited access on permanently marked trails.

Alternative 6 - All forests are entirely closed to ORV use. ORV use on the Grasslands is prohibited except for the possibility of limited access on permanently marked trails.

Alternative 7 - Approximately 250 miles of designated trails will be constructed on all four forests. There are no open areas. ORV use on the Grasslands is prohibited except for the possibility of limited access on permanently marked trails.

Alternative 8 - Similar to 4, 4a, and 4b; approximately 300 miles of trails will be built on the southern part of the Angelina (Longleaf Ridge MA-6) and Sam Houston National Forests. The Sam Houston will have no open areas for ORV use. The area of the Angelina National Forest north of Sam Rayburn reservoir, and the Sabine and Davy Crockett National Forests will be open for cross country use. ORV use on the Grasslands will be prohibited. See issue 7 (Roads and Trails) for ORV miles by alternative.

Issue 5. Red-cockaded Woodpecker (RCW) Management

Management for RCW

Alternative 1 - The court-ordered 1,200 meter zone for RCW clusters is implemented. Pine stands within 1,200 meters of active and inactive clusters are thinned to 60 square feet of basal area, and burned at two to five year intervals. No regeneration is permitted; however, slash pine stands may be converted to longleaf pine if adequate foraging exists. This is approximately 26 percent of all forested lands on the NFGT.

Sam Houston National Forest Clusters	541
Davy Crockett National Forest Clusters	330
Angelina/Sabine National Forests Clusters	514
Total Clusters	1,385

Alternatives 2 through 8 - The RCW EIS is implemented in MA-2 and MA-6. Population objectives are established in the table above. Approximate allocations of the forests by alternative are as follows:

Alternative Nos.	**Percentage**	**1,000 acres**
Alternative 2	35	234.9
Alternative 3	35	234.6

Alternative 4a	35	235.0
Alternative 4b	50	338.9
Alternative 5	38	255.2
Alternative 6	32	212.8
Alternative 7	32	212.8
Alternative 8	41	282.2

Issue 6. Integrated Pest Management

Addressing SPB in the Forest Plan Revision - SPB Control Measures

Alternative 1 - Pine stands in the 1,200 meter zones are thinned to 60 square feet of basal area. Pine stands outside the 1,200 meter zones are thinned to 90 to 110 square feet of basal area. The Southern Pine Beetle Environmental Impact Statement (SPB EIS) and environmental analyses are implemented for SPB control in other forest areas.

Alternatives 2 through 5 and 8 - Pine stands are thinned to 70-90 square feet of basal area as recommended in The Integrated Pest Management Decision Key for National Forest in Region 8. Conversion of loblolly pine to longleaf pine and shortleaf pine will occur. Alternative 5 increases the rotation ages in MA-1. Control measures are implemented in both MA-1 and MA-2 using the SPB EIS and site-specific environmental analyses.

Alternatives 6 and 7 - Pine basal area will be maintained at approximately 60 and 75 square feet with single-tree selection.

Issue 7. Roads and Trails

Road and Trail Management

The following table details the miles of roads constructed and/or reconstructed by each alternative for the first and second planning periods.

Alternative Nos.	**1st Period**	**2nd Period**
Alternative 1	671	381
Alternative 2	624	396
Alternative 3	654	316
Alternative 4	932	233
Alternative 4a	933	266
Alternative 4b	870	264
Alternative 5	677	230
Alternative 6	639	244
Alternative 7	505	168
Alternative 8	821	302

In addition, the following table details the existing and planned trail mileage by alternative. The Forest and the Grasslands are shown separately.

			ORV	Hiking	Horse	Mountai
Bike						
Alt 1	- Forest		55*	184*	52*	15*
	Grasslands	0*	4*	35*	0*	
Alt 2	- Forest		100	199	78	35
	Grasslands	0	10	50	0	
Alt 3	- Forest		255	199	78	35
	Grasslands	0	14	60	20	
Alt 4-4b	- Forest		305	199	142	65
	Grasslands	10-50	10	60	10	
Alt 5	- Forest		55	184	78	15
	Grasslands	20-40	10	60	20	
Alt 6	- Forest		0	184	142	15
	Grasslands	20-40	10	60	20	
Alt 7	- Forest		305	184	78	15
	Grasslands	20-40	10	60	20	
Alt 8	- Forest		355	199	142	65
	Grasslands	0	29	70	18	

* Existing Trails

Community stability is manifested in the NFGT's effects on local economics, jobs related to forest management, and subsequent revenues to the counties from forest commodities. The major factor related to jobs and commodity production on the NFGT is timber related. Alternatives 1, 2, and 3 provide the highest production; while Alternatives 6 and 7 are lowest by about one-half of that in Alternative 2.

Mineral production remains high in each alternative with the exception of Alternative 6 (which has no new leases) on the forest and Alternatives 5, 6 and 7 (with no new leases) on the Grasslands.

Grazing is de-emphasized in most forest alternatives, and remains consistent to current levels on the Grasslands.

ESTIMATED NUMBER OF JOBS PRODUCED
AND INCOME TO COUNTIES BY ALTERNATIVE

Alternative Nos.	**25% Fund (MM)**	**Est. Jobs**
Alternative 1	5.58	4,765
Alternative 2	6.63	5,361
Alternative 3	6.30	5,234
Alternative 4	5.04	4,488
Alternative 4a	5.73	4,875
Alternative 4b	5.54	4,681
Alternative 5	4.54	4,272
Alternative 6	3.08	3,621
Alternative 7	3.86	3,817
Alternative 8	5.89	4,966

Issue 9. Wildlife and Fisheries

Wildlife and fisheries management were incorporated in every alternative. Game-oriented management was emphasized in Alternatives 1 through 3, and de-emphasized in Alternatives 6 and 7.

In all alternatives, Threatened, Endangered, and Sensitive Species (PETS) were considered and management was proposed to assure recovery of known populations. This effort is directed through an expanded list of Management Indicators which are fully incorporated within the ECS, and restoration of communities is based on this system.

Issue 10. Recreation

General Recreation and Management of Developed Recreation Sites

Alternative 1 - There are 18 developed recreation areas on the Forest, and 3 on the Grasslands. Three additional developed recreation sites are proposed for the Sam Houston National Forest, and two developed recreation areas are proposed for the Grasslands.

two on the Grasslands.

Alternatives 4, 4a, 4b and 8 - Five additional developed recreation sites are proposed on the Forest, and four on the Grasslands.

Alternatives 5 and 6 - Four additional developed recreation sites are proposed on the Forest, and seven on the Grasslands.

Alternative 7 - Three additional developed recreation sites are proposed on the Forest, and seven on the Grasslands.

Dispersed Recreation Management

Proposed new trails by alternative are detailed in the Roads and Trails Issue No. 7.

Alternative 1 - There are no shooting ranges on either the Forests or Grasslands.

Alternatives 2 and 3 - No shooting ranges are proposed on the Forests; however, one is proposed for development on the Grasslands.

Alternatives 4, 4a, 4b and 8 - At least one shooting range per Forest is proposed, and between two to five ranges are proposed for the Grasslands.

Alternatives 5, 6 and 7 - One shooting range each is proposed for the Angelina and Sam Houston National Forests. Two to five shooting ranges are proposed for the Grasslands.

Cultural Resources

Heritage (Cultural) Resources are protected in all alternatives. In Alternatives 2 through 8 Old Aldridge Sawmill and Town site on the Angelina National Forest are given special interest area designation. In Alternatives 3 through 8 areas along the Attoyac and Ayish Rivers on the

Angelina National Forest and a segment of the Cochino Bayou on the Neches Ranger District are given special interest area designation. In Alternatives 4 through 8 Lake Fannin Organizational Camp is designated a special interest area.

Law Enforcement

Law enforcement efforts will need to increase as the number of recreation sites, ORV use and special areas increase in Alternatives 3 through 5 and 8. The increased wilderness areas in Alternatives 6 and 7 will need greater enforcement efforts to ensure wilderness integrity. As resource values increase, theft of valued resources such as timber would need increased emphasis.

Interpretive Services

Interpretive needs do not change by alternative.

Hunting

vary by alternative.

Issue 11. Resource Sustainability

Soil Productivity, Water Quality, Clean Air, and Timber Harvest

No alternative will result in long term reduction of soil productivity. All alternatives meet State Water Quality Standards. In all alternatives, air quality meets the National Ambient Air Quality Standards.

The number of acres of suitable timber and ASQ is shown by alternative below:

Alternative	**Suitable Timberland (Timber) ASQ Acres**	
Alternative 1	1.120 BBF	509,952
Alternative 2	1.445 BBF	490,814
Alternative 3	1.304 BBF	486,635
Alternative 4	.938 BBF	485,703
Alternative 4a	1.106 BBF	487,078
Alternative 4b	1.016 BBF	486,643
Alternative 5	.895 BBF	474,520
Alternative 6	.629 BBF	388,212
Alternative 7	.686 BBF	388,212
Alternative 8	1.134 BBF	486,072

Range Management/Grazing

Range management and grazing opportunities are provided in each alternative. Approximately the same acres suitable for grazing in the No Action Alternative (Alternative 1) exists in Alternatives 2, 3, 4, 4a, 4b, 5, and 8. This suitable grazing area is almost 600,000 acres for the Forest, and 38,000 acres for the Grasslands. In forest Alternatives 6 and 7, more wilderness and special area designations impact the suitable grazing lands, as well as restrictions on management activities and use in 300 foot wide streamside zones. Though grazing is suitable for forest lands, it will be strongly de-emphasized; whereas on the Grasslands, management emphasis will continue at approximately current levels.

Ecosystem Management

species to manage for.

Issue 12. Mix of Goods and Services

Balance of Multiple-Uses and Implementation of the Forest Plan

Forest budgets have traditionally only been about 70 percent of planned, although some programs have been better funded than others. Budgets for each alternative are detailed at the end of Appendix B.

ESTIMATED BUDGETS BY ALTERNATIVES (MM$)
FOR THE FIRST PERIOD

Alternatives	Rec. **Budget**	**Wildlife Budget**	**Range Budget**	**Ti Buc**
Alternative 1	2.78	2.54	.274	4.8
Alternative 2	5.16	4.68	.274	5.7
Alternative 3	5.21	4.81	.274	5.8
Alternative 4	6.03	5.10	.274	5.3
Alternative 4a	6.03	5.12	.274	6.1
Alternative 4b	6.03	5.12	.274	5.8
Alternative 5	5.10	4.79	.274	4.3
Alternative 6	5.10	3.78	.197	3.0
Alternative 7	4.67	4.98	.274	4.7
Alternative 8	6.03	4.95	.274	5.6

The NFGT provide a variety of resources for communities including, recreation, wilderness, wildlife, range, timber, and minerals. These activities are balanced in different ratios between alternatives; but, all were a significant aspect considered in alternative definement. These main areas include:

Recreation - The NFGT offer both developed and dispersed recreation. Recreation opportunity is driven by availability of various sites such as campgrounds, shooting ranges, picnic areas, and wilderness or primitive recreational experiences. Total recreation activities are highest in Alternatives 4, 4a, 4b and 8.

Wildlife - Both game and non-game species are managed and will be part of the implementation process of any alternative offering opportunities for hunting and viewing. Estimates of hunting related recreational opportunities are highest in Alternative 4b.

Range - Grazing is most significant on the LBJ and Caddo National Grasslands. Grazing on the forest has low demand and will be de-emphasized, but will provide limited grazing activity. Grasslands alternatives will provide substantial grazing opportunities in all alternatives, while Alternative 4a will provide the most potential grazing on the Forests.

acres of timberland in East Texas. Within the southeast portion of East Texas, where most National Forest land is located, National Forests comprise 8 percent of the commercial forest land. Land that is suitable for timber management is land that is producing, or is capable of producing crops of industrial wood and not withdrawn from timber utilization. Alternatives 2 and 3 provide the largest potential for timber production.

Minerals - Minerals are a valuable resource on the NFGT. Income derived from minerals is largely obtained through royalties or lease fees. All alternatives except Alternative 6 offer a continuation of the minerals leasing program, with Alternatives 2 and 3 offering the most land available for leasing without surface occupancy restrictions.

Alternative	**Developed & Dispersed Recreation (MMRVD's)**	**Timber**
Alternative 1	25.457	112.0
Alternative 2	25.807	114.5
Alternative 3	25.807	130.4
Alternative 4	26.207	93.8
Alternative 4a	26.207	110.6
Alternative 4b	26.207	101.6
Alternative 5	25.475	89.9
Alternative 6	25.630	62.9
Alternative 7	25.555	68.6
Alternative 8	26.207	113.4

Issue 13. Planning

Adequacy of the Revision, Public Involvement, and Research Needs and New Ideas

Annual and Five-Year Monitoring and Evaluation Reports have been completed, and a detailed Socio-Economic Assessment was prepared in 1991. In addition, cooperative projects with The Nature Conservancy, the TNHP, the Kisatchie National Forest, and others were initiated to consolidate available information regarding the management of the ecosystems and sensitive plant species found on the NFGT. Numerous research projects pertinent to the NFGT have been initiated. These include studies concerning wildlife, timber management, uneven-aged management, forest pest management, streamside management zones, grazing, and water quality. These concepts will be incorporated on a continual basis into land management planning for NFGT.

Issue 14. Minerals

Leasing, Exploration, and Development

Alternative 1 (No Action) - Under this alternative, there would be no change in the anticipated number of wells drilled, nor their impacts to the surface. The economic benefits from drilling the

average of $430,000 per year in product value; this estimate includes ncome from current producing wells and additional leased sites on NFGT.

Alternative 2 - Under this alternative, there would be no change in the anticipated number of wells drilled nor their impacts to the surface. The economic benefits from drilling the wells would be substantial. Drilling of 16 wells and the 13 producing wells would produce an average of $430,000 per year in product value; this estimate includes income from current producing wells and additional leased sites on NFGT. This alternative places a high emphasis on commodity production, one third would be managed for the RCW, and some emphasis would be placed on amenity values.

Alternative 3 - Under this alternative, there would be a slight drop in the anticipated number of wells drilled and their impacts to the surface. The economic benefits from drilling the wells would be substantial. Drilling of 15 wells and the 12 producing wells would produce an average of $430,000 per year in product value; this estimate includes income from current producing wells and additional leased sites on NFGT. This alternative focuses one third of the area managed for the RCW, with emphasis on moderate to high commodity production, low to moderate amenity values, small amount recreation and wildlife, with special areas and urban use.

Alternative 4 - Under this alternative, there would be a moderate decrease in the anticipated number of wells drilled and their impacts to the surface. The economic benefits from drilling the

wells would be high. Drilling of 11 wells and the 10 producing wells would produce an average of $420,000 per year in product value; this estimate includes income from current producing wells and additional leased sites on NFGT. In this alternative all of the forest is managed for the RCW.

Alternative 4a - Under this alternative, there would be a slight change in the anticipated number of wells drilled and their impacts to the surface. The economic benefits from drilling the wells would be substantial. Drilling of 15 wells and the 12 producing wells would produce an average of $430,000 per year in product value; this estimate includes income from current porducing wells and additional leased sites on NFGT. This alternative sets identifies one third of the forest for the RCW. There is moderate to high emphasis on commodity production and some emphasis on recreation and wildlife. Again, there are special areas set aside an urban forests.

Alternative 4b - Under this alternative, there would be a slight decrease in the anticipated number of wells drilled and their impacts to the surface. The economic benefits from drilling the wells would be substantial. Drilling of 13 wells and the 11 producing wells would produce an average of $420,000 per year in product value; this estimate includes income from current producing wells and additional leased sites on NFGT. This alternative establishes two-thirds of the forest for the RCW. There is moderate to high commodity production, and some emphasis on recreation and wildlife. There are special areas and urban forests.

Alternative 5 - Under this alternative there is less commodity production, and the emphasis is on special areas, uneven-aged management, RCW, and primary recreation and wildlife. There would be a decrease in the anticipated number of wells and their impacts under this alternative. Less money would be generated and there would be more impact on surrounding private lands. Under this alternative, approximately 13 wells would be drilled, with 11 being producers with an annual average of $420,000 per year; this estimate includes income from current producing wells and additional leased sites on NFGT.

Alternative 6 - This alternative focuses on low impact. One-third of the forests would focus on wilderness, botanical research, and natural areas. There would be little drilling on Federal surface under this alternative. The money from royalties and business in the local communities would not be generated. There may be less additional jobs and salaries that are typically associated with the oil and gas industry. Industry will move from Federal surfaces, and drill on private land and drain the Federal interests with more surface disturbance on private. Under this alternative, there would probably not be more than five wells drilled. Currently active well sites would continue to produce income of about $300,000 per year; this income would steadily decrease as active well sites are closed out.

Alternative 7 - Under this alternative there is less commodity production, the emphasis is on special areas, uneven-aged management, RCW, and primary recreation and wildlife. Herbicides and fire would be tools that could be used. There would be a decrease in the anticipated number of wells and their impacts under this alternative. Less money would be generated and there would be more impact on surrounding private lands. This alternative approximately 10 wells would be drilled, with 8 being producers, for an average of $400,000 per year; this income would steadily decrease as active well sites are closed out.

Alternative 8 - Under this alternative, there would be only a slight decrease in the anticipated number of wells drilled and their impacts to the surface. The economic benefits from drilling the wells would be substantial. Drilling of 14 wells and the 12 producing wells would produce an average of $430,000 per year in product value; this income would steadily decrease as active well sites are closed out. This alternative emphasizes just 40% of the forest for the RCW. There

is moderate to high emphasis on commodity production and some emphasis on recreation and wildlife. Again, there are special areas set aside an urban forests.

AREA AVAILABLE FOR MINERAL LEASES (ACRES)

Alternative	**Unrestricted ***	**No Surface Occupancy**
Alternative 1	416,966	40,299
Alternative 2	401,631	55,534
Alternative 3	398,842	58,323
Alternative 4	399,195	58,250
Alternative 4a	399,131	58,134
Alternative 4b	398,394	58,871
Alternative 5	358,350	63,164
Alternative 6	0	0
Alternative 7	317,053	104,460
Alternative 8	399,394	58,871

* More specifically described as lease acres with controlled surface use and timing limitations only.

Management of lands will not vary a great deal between alternatives. In general, purchase of lands would increase in alternatives with more special area designations, with Alternatives 6 and 7 higher than the Current Alternative (Alternative 1) objective of 800 acres per year.

Exchange of lands or property adjustment, special authorizations, and boundary management are not expected to vary by alternative.

Part II. Environmental Consequences Summary of Alternatives by Issue

This portion of Chapter II summarizes the environmental consequences of the alternatives as related to the issues and sub-issues. The issues are detailed in Appendix A. Full disclosure of environmental consequences of the alternatives on the biological, physical, social, and economic environments of the NFGT is found in Chapter III.

Issue 1. Biodiversity

Native versus exotic species concerns have been addressed in all alternatives. Planting, stocking, or regeneration of any species (tree, plants or wildlife) other than those identified below will not be a prescribed management practice. Alternatives 1 through 4b and 8 allow some "put and take" stocking of cool water fish (trout) in recreation area lakes. This type of stocking has no known adverse affect on native fisheries; however, trout may provide a prey base for some fish (natural predators) during spring, summer, and early fall.

Alternatives 1 through 3 allow limited maintenance of existing non-natives species such as grassland pastures. These pastures of bermuda or lovegrass are managed to complement native prairie land and increase grazing capacity. Generally this type of management requires mechanical maintenance, fertilization, and some herbicide use. All alternatives allow revegetation of disturbed areas by the most efficient means to stabilize soil and decrease erosion; however, these are site specific and each alternative prescription stipulates these will be converted to natives species through time and in subsequent actions. These subsequent actions are not considered soil disturbing.

Ecosystem Management, Management Indicators, Old Growth and Species Diversity were elements developed in all alternatives. The Ecological Classification Systems (ECS) provides general direction for diversity and includes the Vegetation Management Issue of **Pine-Hardwood**. Diversity, through implementing the ECS, will be based on native or in some cases naturalized species that occur on the NFGT. Allocations for Old Growth and selection of Management Indicators by vegetation groups (EIS Appendices F and I) use this ECS approach and are primary examples of the Ecosystem Management philosophy. Old-growth allocations increase by alternative, with maximum acres in Alternatives 6 and 7. Management for more naturally occurring species has some adverse affect on commodity production in the short term, but may increase long term productivity and viability of less common species.

Special Ecosystem - Riparian, Bottomland and Streamside Zones are found throughout the NFGT and provide corridors for many species of wildlife. Management prescriptions found in Alternatives 1 and 2 may not provide adequate habitat for species such as gray squirrel and

these same species, but substantially reduce timber and other commodity outputs.

Issue 2. Vegetation Manipulation

Harvest Methods/Silvicultural Systems include even-aged clearcutting, seed-tree and shelterwood regeneration methods as well as two-aged and uneven-aged management systems. In Alternatives 1 through 5, and 8, even-aged methods will create openings usually between 10 and 80 acres, increasing sedimentation and water runoff temporarily. The regenerated areas will initially lose some understory species and temporarily gain some early successional species (in the understory). Daylighting the forest floor in regenerated areas will bring on a flush of plant species (those that benefit from the increased light conditions) and associated animal life. Two-aged methods will have similar effects as above; however, the number of trees remaining after harvest will be greater than normal shelterwood applications. Uneven-aged systems will have the least impact on soil productivity and sedimentation, but will produce a minimal amount of the early successional flush of vegetation and associated animal life.

Reforestation/Intermediate Stand Management. The effects of retaining trees in regeneration areas vary with the density and spacing of the reserve trees as well as the silvics of the species being regenerated. Without adequate site preparation, pine seedlings may not become established and grow, resulting in a loss of pine stands.

Site preparation prepares a seed bed for the new stand of trees. The intensity varies with the site characteristics and silvics of the species being regenerated. **Use of Chemicals** will be necessary for some longleaf restoration and cause the stand to remain in early successional stages for an extended period of time. The use of herbicides in single-tree selection may be necessary to ensure adequate pine regeneration and will result in fewer and smaller hardwoods in a stand.

Prescribed Fire cycles of two to five years in Alternatives 1 through 5 and 8 [Management Area 2 (MA-2) and longleaf pine-little bluestem sites within Management Area 1 (MA-1)] will reduce woody species and increase perennial herbaceous species. Limited prescribed burning as prescribed within Alternatives 6 and 7 will decrease herbaceous species and increase woody species, shrubs, and vines. A successful fire management system, through prescribed return cycles and seasonality, will be a major factor in re-establishing longleaf and shortleaf pine dominated communities and associated wildlife species.

Issue 3. Special Management Areas

Few negative effects occur in either the biological or physical environment with special area designations. One negative effect has been the inability to fully manage an area such as wilderness or Research Natural Areas for the endangered RCW. In other special area designations this negative affect does not occur. Special areas also decrease the amount of land available for timber and other commodity related production and have a negative effect economically.

Issue 4. Off-Road Vehicles (ORV's)

ORV use is prohibited in Alternative 6. In Alternatives 2 through 4b, 7 and 8, designated trail mileage increases from the current 55 miles up to 355 miles. ORV trails on the Grasslands vary

miles in Alternatives 4, 4a and 4b; no ORV use is permitted on the Grasslands in Alternative 8. The effects of trail construction are similar to road construction in that it will cause an increase in erosion, sedimentation, and water yield. Construction or maintenance of trails will include relocating portions of existing trails, surfacing with gravel, constructing dips, and installing culverts; all of which will reduce the sediment yield once in place.

In Alternatives 1 and 2, the entire forest is open for ORV use. Open areas will be restricted to the northern Angelina, Sabine, northern Angelina and Davy Crockett National Forests in Alternatives 3 through 5 and 8. Alternative 7 has no open areas for ORV's and Alternative 6 prohibits ORVs entirely. Uncontrolled ORV use may have an adverse impact to soil and water values. Areas of concentrated use will have a decrease in soil productivity caused by compaction and soil loss. Water quality may also be affected by sedimentation on stream channels.

Vegetation may be damaged or destroyed in areas of concentrated use. Animals may be disturbed and even displaced from their home range by the noise. When ORV use is intense, reproductive success for some species can be lower.

Issue 5. Red-cockaded Woodpecker (RCW) Management

Management for RCW effects the Forests and not Grassland areas. All alternatives have a specific allocation for MA-2; generally the larger this area the greater the chance to reach RCW population objectives in a shorter time. The management directed for RCW benefits species that inhabit older upland pine communities and reduces the habitat for early successional, sub-canopy, and upland hardwood associated species.

Management Area 2 (MA-2) has restrictions on the use of certain silvicultural methods. Clearcutting is limited, and overall regeneration activities are reduced with significant residual trees left in the stand. This may reduce the volume of timber during harvest in MA-2. Oil and gas exploration may also be adversely affected by the reduction in areas open to surface

occupancy (well sites); however, no negative impact to leasing areas for exploration is anticipated.

Recreation areas and trails (especially ORV trails) may be impacted by RCW cluster sites. The impact will increase as the population expands. New trails and campgrounds will not be permitted in existing clusters. Wilderness areas are excluded from essential RCW habitat status, making control actions for southern pine beetle (SPB) to protect RCW in wilderness virtually unnecessary.

Issue 6. Integrated Pest Management

Addressing SPB in the Forest Plan Revision - SPB Control Measures will include standards as detailed in the Environmental Impact Statement (EIS) for the Suppression of the Southern Pine Beetle in the Southern Region (USFS). Also aggressive restoration of longleaf pine in Alternatives 2 through 5 and 8 will reduce the SPB hazard. Extended rotation ages for shortleaf pine in MA-1 in Alternative 5 will increase the SPB hazard. Increased wilderness in Alternatives 6 and 7 increases potential for spread of uncontrolled SPB.

Issue 7. Roads and Trails

Road and Trail Management. Miles of roads to be reconstructed does not vary significantly between alternatives. Road reconstruction will cause an increase in erosion, sedimentation, and water yield. Mitigation measures for these actions are in place within the standards and guidelines to maintain sediment and water quality within acceptable levels. Road reconstruction will include relocating portions of the road bed, surfacing with gravel, constructing dips, and installing culverts; all of which will reduce the sediment yield once in place.

Issue 8. Community Stability

Community Stability is a significant aspect addressed in all alternatives. This is best described through payments to counties, jobs, and Federal income taxes projected for each alternative.

Alternative 1 shows an increase ($5,581,000) over actual levels and compares very closely to Alternatives 8, 4a and 4b. Alternatives 2 and 3 are comparable with the highest projected income, $6.6 and $6.3 million respectively, and county returns. Alternatives 4 and 5 through 7 show a decrease from proposals in Alternative 1. Alternative 6 shows the largest drop ($3.1million) followed closely by Alternative 7 ($3.9 million). The additional recreation use in all alternatives will afford local areas an opportunity to gain income and jobs by bringing visitors to the National Forest in Texas; however, this increase does not offset the effects on timber related jobs and income.

Grazing receipts from permittees on the Caddo and LBJ National Grasslands is greatest in Alternatives 1, 2, and 3 and lower in Alternatives 4 through 8; however, this difference is minimal and may be be offset by the increase in recreational opportunities in Alternatives 4 through 8.

Issue 9. Wildlife and Fisheries

Wildlife and Fisheries considerations deal with both traditional vertebrate species like game species, as well as non-game species and invertebrates. More common wildlife and fish resources are impacted directly in proportion to the habitat that is increased or reduced. The best small game species habitat and resulting hunter opportunity occurs in Alternative 5 during the

first period, but shifts to Alternative 4b after the fifth period. The Current or No-Action Alternative (Alternative 1) benefits small game habitat least in all periods. Alternative 4b provides the best big game habitat in all periods. Alternative 1 provides the least habitat during the first period, but that changes to Alternative 6 after 50 years due to lack of burning and small regeneration acreage.

Threatened and endangered species comprise a variety of obscure types, with the exception of the RCW. All alternatives provide for the recovery of the RCW; however, Alternative 4 has the most acres specifically for that purpose. Other species should benefit from the ecological management approach and management indicators objectives that promote adequate natural habitat forest-wide. Management indicators, as described by habitat group, will provide emphasis to move toward population recovery of these species.

The fisheries resource is not greatly affected by the range of alternatives. Much of the aquatic acres fall within Management Area 5 (MA-5), or large lakes and reservoirs, that are not impacted by NFGT management. Small streams, ponds and natural lakes or sloughs are affected; primarily by erosion and sedimentation which is greatest in Alternative 2 (first period) and 4a

except for uneven-aged timber management Alternatives 6 and 7, due to the aggressive fire management program and timber management activities.

Issue 10. Recreation

General Recreation and Management of Developed Recreation Sites. There are currently 18 developed recreation areas on the Forests and 3 on the Grasslands. Demand for use of these facilities is expected to increase. All alternatives propose to construct some new facilities. Concentrated use is primarily along the shoreline of lakes and presents solid and human waste treatment problems. In all alternatives, developed recreation sites and dispersed recreation use is dealt with and provided mitigation through standards and guidelines. Interpretive services and law enforcement likewise is expected to increase with associated increases in developed recreation sites. Alternatives 2 and 3 have the fewest developed sites proposed, while Alternatives 4 through 5 and 8 will have the highest number of sites.

Additional miles of hiking, horse, canoe and mountain bike trails are proposed in Alternatives 2 through 8. The effects of trail construction is similar to road construction and is mitigated in all alternatives through plan standards and guidelines. Alternatives 4 through 5 and 8 have the most miles of trails proposed and would therefore have the highest potential for impacts. Hunting and fishing related recreation causes localized conflicts with other resource users, soil erosion and compaction along lakeshores. Alternatives with the most hunting opportunity (4b) and highest level of recreational development, have the greatest potential for hunting related conflicts.

Issue 11. Resource Sustainability

Soil Productivity, Water Quality, and Clean Air is impacted greatest in Alternatives 2 and 3 due to more intensive management practices for timber, grazing, and other commodity related activities. Generally air quality is not affected by many NFGT management practices; however, the prescribed fire prescriptions in alternatives with large RCW areas call for a two to five year return cycle. Soil and water affected by soil disturbance and vegetation removal is most pronounced in Alternative 2.

Timber Harvest is highest in Alternatives 2 and 3 respectively, and lowest in Alternative 6. These alternatives prescribe a variety of harvest strategies. Though the NFGT comprise less than

5 percent of the timber market share in east Texas, the production of sawtimber on NFGT is a very important segment of the economy. Alternatives 8, 1, 2, 3, 4a, and 4b are projected to meet or exceed current harvest levels.

Range Management/Grazing activities are permitted in all alternatives. Forest management of the grazing resource is de-emphasized in all alternatives; however, various management applications of the alternatives provide a continual supply to meet any future demand. Grazing receipts (in total) are projected to be lower than currently exists, due to reduced Forest estimates. Grazing activity on the Grasslands is expected to remain constant at or just below current levels in all alternatives.

Issue 12. Mix of Goods and Services

Balance of Multiple-Uses and **Implementation of the Forest Plan** are met in the mix of goods and services provided by the various alternatives. The alternatives clearly describe the difference

cost more than the Current No-Action Alternative (Alternative 1) projected at $18,960,000. Alternatives 8,4, 4a, and 4b will cost $25 to $26 million dollars to implement; Alternatives 2 and 3 about $24 million; and Alternatives 5 through 7 will cost $20.6 to $23 million dollars to implement. Much of this increase is due to larger wildlife and recreation programs proposed.

Issue 13. Planning

Adequacy of the Revision and Public Involvement are aspects of the Plan Revision that are closely related. The Revision responds to public demands, appeals, and other public involvement processes.

Research Needs and New Ideas. A major change in this Revised Plan is the identification of research needs section. This section will help evaluate Plan implementation and provide direction for new ways of improving NFGT resource management. This section emphasizes the desire to manage the NFGT in an ecologically sound manner, while providing the mix of goods and services demanded by the public.

Issues 14 and 15. Lands and Minerals

Mineral Leasing, Exploration, and Development is the major area of influence within this issue. All other areas of the lands program vary little between alternatives. The minerals activity with the greatest potential impact to other resources and to the human environment is in the area of oil and gas development. Leasable energy resources are permitted in all alternatives except Alternative 6. Alternatives 5 through 7 do not permit mineral leasing on the Grasslands. Predicted scenarios for these alternatives indicate the Current or No-Action Alternative (Alternative 1) to have the highest potential oil and gas development; followed closely by Alternatives 2, 3, 8 and 4a. These alternatives provide the greatest returns to local communities and jobs related to the oil and gas industry.

Chapter III

The Affected Environment: Before the Alternatives
Environmental Consequences: After the Alternatives

Introduction

The purpose of this chapter is to present before-and-after views of the Forest environment, to discuss the environment as it is currently, and as it would be if the alternatives were implemented. See "National Environmental Policy Act (NEPA) Requirements Addressed" below for a more complete discussion of the purpose of Chapter III. The environmental discussions begin following this overview.

This chapter combines the "Affected Environment" and "Environmental Consequences" required by Sections 1502.15 and 1502.16, respectively, of NEPA implementing regulations (40 CFR 1500).

This chapter also briefly describes the existing biological, physical, and socioeconomic environments that will be affected and/or created by the alternatives considered. The data and analyses are consistent with the importance of the issues and impacts to the environment. Succinct descriptions of the environment and various settings provide a general overview, to avoid excess detail that can be found in other documents and resource material. [See National Forests and Grasslands in Texas (NFGT) Five-Year Review/Analysis of the Management Situation (AMS)].

Affected Environment and Environmental Consequences

The descriptions that follow are limited to the background information necessary for understanding how Forest Plan alternatives may affect the environment. These issues are discussed in detail in the AMS; reference to this document is beneficial in understanding the details of these various resource areas.

After the discussion of current condition of a resource, the potential effects (environmental consequences) associated with implementation of each alternative are discussed. All significant or potentially significant effects--including direct, indirect, and cumulative effects--are disclosed. Where possible, the effects are quantified. Where this is not possible, a qualitative discussion is presented. Scientific and analytical comparisons include the impacts of all alternatives (as compared to the Current or No Action Alternative), to include the selected alternative or proposed action. Direct and indirect effects and their significance, as well as the planned measures to mitigate adverse environmental impacts, are discussed.

The effects of alternatives are disclosed with the mitigating measures in place. **Direct** environmental effects are those occurring at the same time and place as the initial action. **Indirect** effects are those that occur later than the action or are spatially removed from the activity. **Cumulative** effects result from the incremental effects of actions added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individual actions, and from collectively significant actions taking place over a period of time (regardless of the party taking the action).

Irreversible and Irretrievable Commitments

Potential adverse environmental effects which cannot be avoided result from managing the land for one resource at the expense of the use, value, or condition of other resources.

Irreversible and irretrievable commitments of resources are normally not made at the programmatic level of a Forest Plan. Irreversible commitments are decisions affecting non-renewable resources such as soils, minerals, plant and animal species, and cultural resources. Such commitments of resources are considered irreversible because the resource has been destroyed or removed, or the resource has deteriorated to the point that renewal can occur only over a long period of time, or at a great expense. While a Forest Plan can indicate the potential for such commitments, the actual commitment to develop, use, or affect non-renewable resources is normally made at the project level.

Irretrievable commitments represent resource uses or production opportunities which are foregone or cannot be realized during the planning period. These decisions are reversible, but the production opportunities foregone are irretrievable. This includes resources that are not utilized and subsequently lost (e.g., productive timber that is not harvested and lost by mortality). The commitment is irretrievable rather than irreversible in the sense that technical advances, changes in management direction, or natural processes over time may again allow the option to produce or use the renewable resource. Irreversible and irretrievable commitments are not specifically identified as such in the discussions contained in this chapter.

Programmatic versus Site Specific

For estimating the effects of alternatives at the programmatic Forest Plan level, the assumption has been made that the kinds of resource management activities allowed under the prescriptions will, in fact, occur to the extent necessary to achieve the goals and objectives of each alternative. However, the actual location, design, and extent of such activities is generally not known at this time. These specifics can be found in the individual site-specific (project-by-project) decisions. Thus, the discussions here refer to the potential for the effect to occur, realizing that in many cases these are only estimates. The effects analysis is useful in comparing and evaluating alternatives on a Forest and Grassland-wide basis, but is not intended to be applied directly to specific locations on the Forest.

Chapter III Organization

The following discussions are divided into three environments: (1) Biological; (2) Physical; and (3) Socioeconomic. Implementation of the different alternatives may effect each environment differently. The effects are disclosed in this section.

Under each environment, the facet of each environment that may be effected by implementation of an alternative is described in its current condition. The environmental consequences of implementing the various alternatives are then described. Each environment is broken up into sections, and discussed in the order shown below.

Part I. Biological Environment

(b)Wildlife and Fisheries; and
(c)Special Management Areas.

Part II. Physical Environment

(a)Soil, Water, Air, Fire, Lands, Roads and Facilities, Developed Recreation; and
(b)Geology and Minerals.

Part III. Socioeconomic Environment

(a)Social and Economic Setting, and
(b)Dispersed Recreation Uses, Scenery/Visual Quality, Recreation Opportunity Spectrum (ROS), and Cultural Resources.

Part I (a)

The Biological Environment

Vegetation

This section will describe the general vegetation environment found on the National Grasslands in north Texas and the National Forests in north and east Texas and some of the factors that affect this vegetation. These relationships will be discussed in the following areas:

1.Major disturbances that affect this vegetation;
2.Management practices used by National Forests and Grasslands in Texas (NFGT) to reproduce these disturbances and;
3.The various vegetation groups that will be affected by the management strategies proposed.

Many plants and animals found on NFGT are dependant on habitat created by natural disturbances and management practices that replicate these processes. Originally disturbances were created by natural forces (wind, fire, and rain) which affected large areas. Today these large scale disturbance regimes are limited by fragmented ownership patterns and land uses. The alternative prescriptions mimic some of these disturbances on a small scale through a variety of timber harvesting methods, silvicultural practices, and grazing. The timber harvesting options include even-aged, uneven-aged, and two-aged regeneration methods and various thinning actions. The silvicultural practices include control burning (prescribed burning) and the use of hand tools and/or pesticides in preparing sites for reforestation or tending to the growing of desired tree species in existing stands.

The Forests and Grasslands Today

Affected Environment - National Grasslands in Texas

The climate in north Texas tends to be more suitable for grassland vegetation, except in areas of more sandy soils where woodlands occur. The Pre-1800 landscape was an oak savannah in which grasses were the climax. Overgrazing and control of fires since the 1800's has favored tree growth over grasses, across the landscape as a whole. This is particularly pronounced since

and redcedar to reach dominant status due to fencing and fire suppression.

The prairies and woodlands of north Texas were favorably selected as settlement areas because they offered both open prairie and a source of timber. The Chisolm Trail extended north through the present day grasslands, which slowly gave way to ranches and farms. Peak grazing pressure was evident between 1880 through 1900; records indicate year-round cattle densities reached as much as one cow per seven acres. During the same period cattle numbers increased the best land

was being put into cultivation which intensified the impact of grazing. Overgrazing and poor farming practices led to major soil erosion and sedimentation problems, prompting the development of grassland acquisition and restoration programs.

Affected Environment - National Forests in Texas

Early settlers described the forests and timber resources of east Texas as almost pure stands of "southern yellow pine" with dense hardwood creek and river bottoms. These pine stands were "large, widely-spaced trees with open, grassy understories". Hardwoods dominated the moist bottomlands with canebrakes, baygalls, and thickets adding to the diversity of the landscape. The open understories of the pine stands were maintained by fires. Records of these settlers describe the following groups of east Texas timber belt vegetation: (1) Swamp and bayou forests; (2) hardwood forests; (3) mixed loblolly and hardwood forest; (4) longleaf forest; and (5) hardwood and shortleaf forest.

Early settlements, agriculture, and subsequent land use practices resulted in much of forests being cleared. By the 1930's, much of the original forests had been heavily logged over. When Congress authorized The National Forests in Texas, their objective was to manage the remaining forests and to establish new forest cover on logged over, eroded land. The Civilian Conservation Corp (CCC), under the direction of the U.S. Forest Service, planted many of the pine trees seen today in the National Forests.

Loblolly and slash pine seedlings survived and grew better than most other seedlings. They were also more plentiful. Those plantations have either reached or are approaching existing rotation age - approximately 68 percent of the forests on NFGT is more than 50 years old.

This replanting and managing the timber on NFGT has permitted the Forest Service to achieve one of the main objectives of the 1897 Organic Administration Act, "...to furnish a continuous supply of timber...".

Today, restoration of the longleaf woodlands and the shortleaf pine-oak communities on the National Forest in east Texas has been identified as a goal and an objective as described in Chapter IV of the Revised Forest Plan. Restoration of these ecosystems will provide the environment where many sensitive plants once thrived, and provide increased potential habitat for the endangered red-cockaded woodpecker (RCW).

Disturbance Factor - Fire

Historically, lightning-caused fires were a major force in shaping the vegetation of north and east Texas. Depending on the frequency of such fires, certain forest types may have been more open than they are now. The pine-dominated uplands burned more frequently and more intensely than the bottomland hardwoods and riparian areas.

Human-caused uncontrolled fire (through Native Americans) was also a factor in the Grasslands and Forests. Burns occurred primarily in the fall and winter (different from the more intense late spring and summer lightning burns). The fires improved habitat for deer and buffalo, and made gathering of nuts easier.

Burning practices continued until purchase of the National Forest System lands. After the Forests became part of the System, a significant reduction in the number of human-caused uncontrolled fires was evident.

Controlled Fire

Fire as a forest management tool in Texas began with administrative studies in the late 1930's. It became an operational tool in 1943, and has continued since that time.

The initial use of controlled (also called prescribed fire or prescribed burning) fire was to reduce fuels available for wildfires. It is also now used as a vegetation management tool to:

-Improve wildlife habitat;
-Increase range forage production;
-Prepare sites for reforestation;
-Control brownspot disease in longleaf pine seedlings; and
-Influence understory composition and density for various purposes.

The presence of controlled fire has helped re-establish and maintain fire-dependent ecosystems on the NFGT. A site specific burning plan is prepared per Forest Service Manual (FSM) 5140 prior to any prescribed burn. Fire suppression has kept wildfire to a minimum. Consistent with current Forest Service policy, all wildfires on the Forest will be suppressed. For additional information on wildfire see "The Physical Environment", Part II of this Chapter III.

There are five wilderness areas in the NFGT (see Chapter III, Part I(c)). Fire has been almost completely excluded from these areas since they were designated wilderness in 1984; there has been no prescribed burning and the area burned by wildfire has been insignificant.

Environmental Consequences of the Alternatives

(Fire)

Generally, MA-1 will have 3 to 5 year burning cycles and MA-2 and 6 will have a 2 to 5 year burning cycle. Emphasis on growing season burning will be the direction in MA-2, 6 and longleaf areas in MA-1. Growing season burns are more intense than dormant season burns. Therefore, they will suppress more woody vegetation. Dormant season burns burn with less intensity than growing season burns because of higher humidity. Frequent prescribed burns reduce woody species like youpon and wax myrtle and increase herbaceous species dominated by perennial grasses and forbs. Frequent burns result in less vigorous sprouts and fewer sprouts as more rootstocks are killed during each successive burn. This will greatly reduce or eliminate some of the hardwoods from these areas.

Generally, loblolly and shortleaf pine plantations will not be prescribed burned until they are 10 to 15 feet tall, or 3 to 4 inches in diameter at ground level. This may take from 10 to 30 years

will also develop into saplings creating a hardwood component within the pine plantations.

Prescribed burning in Alternative 6 and in stands managed for uneven-aged conditions in Alternatives 1 through 5 and 8 will be severely limited, unless a longleaf pine-little bluestem community is established. Prescribed burning in Alternative 7 will be done in association with timber harvest. Pine seedlings and saplings will usually be present at all times in uneven-aged management. Controlled fire will destroy many seedlings even on a 10-year burning cycle. A 10-year fire frequency would not suppress hardwoods sufficiently to ensure adequate pine regeneration. The hardwood component in the areas not burned will increase to eventually dominate these sites. Loblolly pine will probably again dominate the area after a natural disturbance such as a hurricane. Historically hurricanes have resulted in creating large areas of even-aged pine stands.

Disturbance Factor - Insects and Disease

Insect and diseases are a significant component of the forest ecosystem. These organisms contribute to many ecological processes of forests, including nutrient cycling, plant succession, and forest dynamics. In most cases, these organisms are recognized as integral components of forests. In some instances, insects and diseases cause unacceptable resource damage or loss and adversely affect ecological, economic or social values, and are then deemed pests.

Forest pest problems may develop around an interaction of stress factors which simultaneously or sequentially predispose the trees to attack. These factors may include forest stand and site conditions, environmental impacts such as drought, or the cumulative actions of previous or current pest complexes.

The major pest in the NFGT is the southern pine beetle (SPB). The minor insect pests include town ants, Ips bark beetles, black turpentine beetle, reproduction weevils, tip moths, and sawflies. Diseases include annosus root rot, fusiform rust, and brown-spot needle blight.

The SPB has been a persistent problem on the NFGT. Cyclic epidemics appear to begin in Texas and spread east. This cyclic activity is expected to continue in east Texas. While the cause(s) of these epidemics is unknown, overmature timber, large and/or dense stands of pines, and drought-induced stress may increase the severity of the outbreaks.

Treatment techniques used for SPB suppression in all alternatives are cut and remove, cut and leave, cut and hand spray, and pile and burn. Cut and remove is the most efficient and effective method, and is the most frequently used. The use of behavioral chemicals for SPB control is currently being tested. Full application of integrated pest management (IPM) techniques will continue to be implemented outside of special management areas on NFGT. This program will primarily consist of SPB suppression and SPB hazard reduction.

Wildernesses, Research Natural Areas (RNAs), Botanical Areas, and other Special Management Areas where SPB control is limited will continue to lose much of their pine component, though some limited regeneration of pine will come back. Adjacent general forest area will also be impacted by SPB spots expanding out of these special areas.

All alternatives contain direction to reduce susceptability to SPB infestation through applying silvicultural practices such as thinning and restoring longleaf pine to its historical range, and regenerating mature and over-mature timber. These silvicultural practices should reduce the impacts of future SPB epidemics. The use of the IPM Decision Key will also help identify high hazard sites for SPB and other insect and disease problems, and recommend methods to reduce or eliminate the hazard.

Environmental Consequences of the Alternatives

(Insects and Disease)

SPB Control - The environmental impacts of SPB control have been documented in the Final Environmental Impact Statement (FEIS) for the suppression of the southern pine beetle (1987). In general, SPB control measures prevent losses of large amounts of pines, though felling and/or removal of pines may cause some changes in the vegetative structure, such as increasing numbers of shade-intolerant species. The openings created by SPB control may be beneficial or detrimental to wildlife, depending on the species. Control may increase fragmentation locally,

preserving pine stands. The protection of mature pine stands is vital for providing foraging and

nesting habitat for RCW. Mitigation measures for SPB control procedures outlined in the Forest standards and guidelines will minimize long and short-term impacts to soil, water quality, visual quality objective (VQO), and cultural resources.

Limited or No SPB Control - The environmental consequences of no control are also given in the FEIS for Suppression of SPB (1987). Uncontrolled infestations may grow quite large, killing pines in all age classes. Natural regeneration in these openings would change the pine component from the previous uneven-aged condition to a more even-aged condition. The hardwood component should also increase. Old-growth pines, which are more susceptible to attack, would be reduced. Sites of large infestations would be unsuitable for recreation activities for 5 to 10 years due to the hazard from dead trees falling. Increased timber losses would also lead to greater economic losses, though control costs would be greatly reduced.

As acreage in wilderness and special areas increases, so will impacts from no or limited SPB control. Alternative 1 would have the least impact, with Alternatives 6 and 7 having the most. The converse is true for the environmental consequences of SPB control.

Alternatives 1 and 2 should maintain the current situation. The aggressive restoration or conversion to longleaf pine in suitable areas (in Alternatives 3 through 8), will reduce SPB hazard. However, increases in brown-spot needle blight may result. As the rotation age increases for shortleaf pine and loblolly pine in Alternative 5, SPB hazard will also increase. Uncontrolled or increased pest problems in MA-2 or special areas may also spread into MA-1. Alternatives 6 and 7, with large additions in wilderness area, would have the greatest potential for impacts to MA-1 areas from this spread. As the pine component is reduced in wilderness or other special areas by pests, impacts to other forest areas from these special management areas will decrease.

Within the 1200-meter zones in Alternative 1, tree loss due to insects and diseases should increase as the trees become older. The Habitat Management Areas (MA-2) in Alternatives 2 through 8 have older rotation ages than the General Forest Management Area (MA-1), indicating the HMA's would have increased pest problems (particularly with SPB). Regeneration is allowed within MA-2, thereby reducing the amount of timber highly susceptible to SPB, but the amount is limited due to restrictions in openings allowed. Therefore, the overall SPB hazard would increase with the size of the HMA, thus Alternative 4 would have the highest SPB hazard.

Trees left in site preparation may become focal points for insect and disease problems due to advanced age or increased likelihood of lightning strikes; however, the spread rate would be low, but it would be high initially when 40 basal area (BA) is required. The impacts of SPB infestation in these trees would be greatest during periods of low activity, when numbers of individual or small groups of infested trees can greatly influence population trends.

The uneven-aged management in Alternatives 6 and 7 could modify the SPB hazard due to the low basal area left after each entry (45-70 BA). Trees damaged during the selection cuts may initially be more susceptible to bark beetle attack, but spread of the infestation from the infested trees would be hampered by the low pine basal area. The increased number of entries to conduct uneven-aged management could also increase the incidence of annosus root rot or reproduction weevils, though tip moths risk would be reduced.

(Alternative 1) due to increased rotation ages and increases in special management area acreage. Alternatives 2, 3, 8 and 4a should have a slight increase in SPB hazard, while Alternatives 4b, 6, and 7 should have a moderate increase. Alternative 4, with its maximum HMA (MA-2) for red-

cockaded woodpecker, and Alternative 5, with its increased rotation ages in MA-1 and MA-2, should have the highest SPB hazard.

Disturbance Factor - Timber Harvest

Timber harvest includes commercial thinning and regeneration methods of the even-aged, two-aged, and uneven-aged silvicultural systems. A complete discussion of silvicultural systems and their associated regeneration methods can be found in Appendix J of the EIS. The basis for the timber harvest program, supply of timber, and timber demand can be found in Part III(a) of this chapter. These timber harvest methods are briefly described below:

Clearcutting affects vegetation by removing the merchantable trees in a stand in one cutting operation. Clearcutting and planting superior stock has been the most frequently used regeneration method in the past.

Clearcutting creates an opening in the tree canopy and is usually between l0 and 80 acres in size. Usually there is more site disturbance and vegetation damaged than with other methods. More sunlight reaches the forest floor than with any other regeneration method. Appropriate site preparation to control competing vegetation should be used before planting. Planted pine seedlings grow faster and generally dominate a site quicker than with any other regeneration method.

It is anticipated that clearcutting will be used for restoring longleaf and shortleaf pine communities in Alternatives 1 through 5 and 8 in MA-1, 2 and MA-6. This is especially true in areas that require full conversion (slash or loblolly to longleaf); the clearcutting method will not be needed when sufficient residual desired species occur on the site. In many cases however, clearcutting is the optimal method for restoring shortleaf and longleaf pine because it is the most biologically efficient method to accomplish the objective (RCW EIS, Page 50). **Clearcutting** will be used in MA-1 when it is determined to be the optimum regeneration method in even-aged stands throughout the National Forests.

Clearcutting with reserves will be used in Alternatives 1 through 5 and 8 when a site-specific analysis determines some trees on the site need to be retained.

The **seed-tree** regeneration method involves removal of all but 6 to 15 trees per acre which are left to seed the area. The seed trees are removed after the seedlings are established, usually 2 to 5 years. The **seed-tree with reserves** regeneration method retains some or all of the seed trees after regeneration is established. These two regeneration methods will be used in Alternatives 1 through 5 and 8 in MA-1 when determined by a site specific analysis to be the appropriate method of regeneration.

The **shelterwood** method of regeneration involves removal of all but approximately 20 to 30 trees per acre that are left to provide seed and shelter for the seedlings. The seed trees are removed once seedlings are established and the need for shelter has passed. Longleaf pine has a heavier seed than loblolly or shortleaf pine, and rarely falls further than about 100 feet from a parent tree. Longleaf also tends to be a sporadic seed producer. A residual leave basal area of

MA-1 in Alternatives 1 through 5 and 8.

The **shelterwood with reserves** regeneration method, also called irregular shelterwood or two-aged management, creates a stand of trees that contains two age classes for long periods of time. The two-aged method will be used in MA-1 in some loblolly and shortleaf pine stands when

retention of some overstory trees is desirable (i.e. where the visual quality objective is retention or partial retention). This method will be used for regeneration of loblolly, shortleaf and longleaf pine in MA-2 and MA-6 as shown in the following table.

Required Number of Reserve Trees by MIL[1]

Management Intensity Level	Number of Reserve Trees per Acre	Basal Area (Sq.Ft./Acre) of Reserve Trees
MIL 1	0 (6 Optional) *	0 *
MIL 2	6 *	Not Specified *
MIL 3	10	25-30 **
MIL 4	10	40 **

1 Management Intensity Level (MIL).
*****Loblolly pine at high risk may be managed on 80-year rotation which requires a minimum of 10 reserve trees (25-30 sq. ft. BA) for MIL 1 through MIL 3 populations.
******Except for longleaf pine which would be subsequently cut to MIL 2 specifications (6 trees/acre) when regeneration is established.

The number of trees per acre at 25, 30, and 40 square feet of basal area varies by diameter, as shown in the following table.

Number of Trees Per Acre by Diameter Class
and Basal Area (BA)

DBH	**25 BA**	**30 BA**	**40 BA**
14	23	28	37
15	20	24	33
16	18	21	29
17	16	19	25
18	14	17	23
19	13	15	20
20	11	14	18
21	10	12	17
22	9	11	15
23	9	10	14
24	8	10	13
25	7	9	12
26	7	8	11
27	6	8	10

29	5	7	9
30	5	6	8

Most longleaf stands on NFGT are approximately 50 to 70 years old. There will probably be no regeneration of these stands before 2015. Longleaf regeneration will be concentrated in stands of other pines that will be restored to longleaf. The decision to restore to longleaf will be made

after a site-specific environmental analysis is conducted using Ecological Classification System (ECS) guidelines. Where available, six relic longleaf trees per acre will be left.

Shade and root competition increase as the number of parent trees retained increase. This competition will effect the establishment, growth, and development of the new stand. The younger trees will succumb to droughty conditions much sooner. Basal area growth of young longleaf was reduced more than 80 percent during a 35-year period where 18 square feet of basal area was retained, and about 55 percent under 9 square feet of basal area as compared to a stand where the shelterwood trees were removed. (RCW EIS 1995)

It is estimated that mortality will offset growth in loblolly at 80 years of age, and shortleaf at 120 years of age in Texas.

Single tree selection involves the removal of individual trees from all merchantable diameter classes. Regeneration is established is the spaces left by the harvested trees, thus there are always trees on the area. The stand must be harvested at intervals of 3 to 15 years, depending on the growth of the trees.

Since loblolly and shortleaf pine are intolerant species adequate sunlight must reach the forest floor to ensure seedlings and saplings become established and grow. Control of competing vegetation is necessary for adequate sunlight to be available. Herbicides are the most effective control method. (Baker 1987)

Prescribed burning will probably have little use with single tree selection as seedlings must become established approximately every 10 years to maintain the stand structure. Burning would prevent seedling establishment at least until the young trees are 3 to 4" DBH and 12 to 15 feet tall.

Group selection involves removal of trees, usually the oldest and largest trees in scattered patches ranging from one-fourth (1/4) acre to two acres in size, about every 10 years. This is repeated indefinitely to encourage the continuous establishment of regeneration. Both group selection and single tree selection can be used in MA-1, 2 and MA-6 in all alternatives.

Thinning involves the removal of selected individual trees throughout a stand or area. Loblolly and shortleaf pine stands will be thinned per the IPM Decision Key (Uhler, et al 1990), usually to 70 to 90 square feet of basal area, in both MA-1 and MA-2. This is slightly less than the Regional Thinning Guides for optimum growth, but it will reduce the risk of southern pine beetle (SPB) attack.

All of the above harvest methods involve tree removal. Some vegetation will be damaged and/or destroyed. This will allow more sunlight to reach the forest floor and cause a flush of intolerant plant species and associated animal life.

Environmental Consequences of the Alternatives
(Timber Harvest)

See Environmental Consequences of the Alternatives under Vegetation Groupings and Descriptions, found later in this chapter.

Disturbance Factor - Site Preparation

Site preparation is applying one or more silvicultural practices to prepare a site for reforesting. The reforesting may be done by tree planting, preparing seed-bed conditions for natural seed fall (pine and/or hardwood) or stump and root sprouting (hardwoods). The intensity of site preparation is a function of site characteristics and silvics of the species to be grown. Longleaf pine is very intolerant of competition from all sources, both above ground from vegetation and below ground from roots. The seeds require contact with bare mineral soil in order to germinate (Boyer, 1989). Control of competing vegetation is necessary and often requires intensive site preparation. By contrast loblolly seed can penetrate a duff layer and therefore logging disturbance is often sufficient site preparation. The use of herbicides will be necessary for restoring longleaf pine and to implement single-tree selection.
Site preparation is accomplished by one or a combination of four types of disturbance: prescribed burning, manual (axes, brush hooks, chain saws, brushcutters), mechanical (mowing, chopping, shearing, scarifying, ripping,piling, raking, bedding, and disking), and herbicides. The environmental effects of these site preparation methods are fully documented in the Final Environmental Impact Statement for Vegetation Management in the Coastal Plain/Piedmont (1989).

ACRES OF SITE PREPARATION

Alternative Nos.	**Period 1**	**Period 5**
Alternative 1	63,891	73,402
Alternative 2	122,665	102,706
Alternative 3	142,849	136,612
Alternative 4	168,515	254,494
Alternative 4a	179,545	216,887
Alternative 4b	175,516	250,713
Alternative 5	92,356	137,515
Alternative 6	19,234	829
Alternative 7	130,354	168,379
Alternative 8	142,070	196,238

Environmental Consequences of the Alternatives
(Site Preparation)

See Environmental Consequences of the Alternatives under Vegetation Groupings and Descriptions, found later in this chapter.

The Ecological Classification System (ECS) identifies areas in Texas that have a high probability of longleaf or shortleaf pine restoration. The areas are usually deep sandy, sandy loam, or coarse loamy soils. Relict trees (trees that were left during early harvests) may be present. These help determine the historical species of the area. Generally, longleaf pine occurred on what is now the Angelina National Forest, southern part of the Davy Crockett National Forest, and the southern part of the Sabine National Forest. Other species were present in the area, but longleaf pine dominated most upland sites. Evidence of shortleaf pine dominated sites occur on the northern portion of the Davy Crockett and northern portion of the Sabine. Historical records indicate the Sam Houston National Forest was occupied by mostly mixed loblolly-hardwood stands.

In Alternatives 2 through 5 and Alternative 8, most forest stands on deep sandy soils in the Mayflower Uplands, Deep Sandy Uplands, and Clayey Uplands Landtype Associations on the southern and central Angelina, Sabine, and Davy Crockett National Forests will be restored to longleaf pine. Existing longleaf pine stands will be maintained wherever they occur. Shortleaf pine, similar to longleaf pine, once occurred over more of NFGT lands and will be restored to these historical locations.

Forested stands on sandy soils in the Sparta Sandhills, Crockett Clay Hills, Redlands, and the Lignitic Uplands Landtype Associations on the northern Sabine and Davy Crockett National Forests will be restored to shortleaf pine. Existing longleaf pine stands will be maintained. The acreage to be restored to longleaf or shortleaf pine does not vary between alternatives because the historical range is not affected by management emphasis. The rate at which restoration of these stands can be restored does vary by alternative due to management practices, rotation age, and other activities.

Clearcutting existing stands that have these non-native or off-site species and planting the desired longleaf or shortleaf species will be necessary on many sites for the restoration of longleaf and shortleaf pine. Sites with sufficient residual objective species, such as longleaf pine relics, will allow the use of less intensive means if fire or herbicides can suppress non-target species. Control of competing vegetation on a site will be required to establish longleaf pine. Site preparation techniques that will permit planting of seedlings will be required for both longleaf and shortleaf pine. All restoration will be done in accordance with 36 CFR 219.27g. Total or cumulative restoration by alternative is described as follows:

TOTAL RESTORATION ACRES

Alternative Nos.	**Period 1**	**Period 1-5**
Alternative 1	9,417	21,777
Alternative 2	32,732	65,721
Alternative 3	29,198	56,563
Alternative 4	553	39,459
Alternative 4a	4,497	27,684
Alternative 4b	4,005	30,187
Alternative 5	11,305	23,039
Alternative 6	2,803	5,711
Alternative 7	1,460	17,631

Environmental Consequences of the Alternatives
(Restoration)

See Environmental Consequences of the Alternatives under Vegetation Groupings and Descriptions, found later in this chapter.

Disturbance Factor - Grazing

Vegetation on range and forest land is a function of climate, fauna, and soils. Range vegetation is defined as grasses, grass-like plants, forbs, and shrubs. Range vegetation is most commonly associated with grasslands and shrublands, but forest lands also support an understory of grasses, grass-like plants, forbs, and shrubs, and as such have played an important part in range considerations on the NFGT. Range vegetation on forest lands is often classified as transitory; it

is the early successional stage or sere of most southern forests with the exception of the longleaf pine/grassland plant communities. This transitory stage is commonly referred to as the grass/forb or shrub/seedling stage in the forest regeneration cycle.

The management of vegetation affects the total production and composition of plant species which in turn affects the mix of range outputs. Grazing and browsing by all domestic and wildlife species effects the vegetation structure as well as individual or groups of plants on any given site. These effects can be negative on the vegetation if not properly managed. In this discussion it will be assumed that proper range management will be applied within the alternatives to achieve the desired condition of the Forests and Grasslands.

Forest Grazing and Range Management

The most highly productive areas are the openings created when a timber stand has been harvested and the site prepared for regeneration. The first year following site preparation often results in forage production of 5,000 pounds or more of air-dried forage per acre. This level of production declines as the seedlings and sprouts begin to recapture the site. Within 6-10 years, the overstory becomes so dense that unless reduced by thinning, much of the sunlight is intercepted before it can reach the grasses, and forage production is substantially reduced. Forage production increases in older upland pine stands that are maintained at lower basal areas, such as in MA-2.

Forage produced in hardwood stands usually is less than 400 pounds per acre, even under favorable conditions. Because of the wildlife use in these stands in the winter and early spring and because hardwood streamsides and bottomlands are present in almost all the range allotments, winter grazing will be discouraged or prohibited on the Forests in all alternatives.

Two factors which significantly affect grazing capacity on the National Forests are low levels of regeneration cutting and prescribed burning. Both practices significantly increase forage production. If planned regeneration cutting is deferred or replaced by thinnings, considerably less forage than predicted will actually be available. Burning, if significantly reduced from planned levels, would have the same effect as reduced regeneration cutting.

Environmental Consequences of the Alternatives - Forest
(Grazing)

Grazing activities will be de-emphasized in all alternatives except Alternative 2. When grazing is permitted, the rule of thumb is to obligate 50 percent of the annual production of grass and grass-like plants. This practice is employed to assure healthy plant growth, allow for other grazing and browsing animals and to protect against overuse or damage to sensitive forest vegetation. When applied properly, and with the general de-emphasis on grazing, little negative impact to forest vegetation would occur across all forest areas.

Most of the allotments have a minimum of facilities to allow for livestock use. Some boundary fences would be needed, especially in areas where county livestock laws have been adopted. Water developments would also be needed before grazing management can be applied on some forest areas. These developments would have some minor impacts on the existing vegetation through direct changes during construction, and indirectly as cattle concentrate near water holes and fences.

Grazing activities in Alternative 2 could have a negative impact on the establishment of populations of sensitive plant species. This would be of most concern in natural open areas such

as barrens on the Angelina and the blackland inclusions on the Sam Houston Forests. Permitted grazing on the Forests would decrease from 15,000 animal unit months (AUM) to just under 10,000 AUM in the preferred Alternative 4b. This level of grazing is anticipated to have minimal effect, however the levels projected in Alternative 2 would range between 25 - 40,000 AUM, which would have a more obvious impact. Other alternatives are similar to Alternative 4b, with Alternatives 6 and 7 having the least impact on the herbaceous plants.

A Texas A&M study on the Forest relative to the impacts of grazing on water quality (Knight 1990) found utilization of about 40 to 60 percent in the most intensively grazed treatments. This study indicates that even where this intensive utilization is occurring, water quality still meets all State, Federal and Forest Plan requirements.

Stormflow and total sediment loss as expected is highest for the intense rotationally grazed watersheds. In general, grazing treatments displayed a trend of increasing stormflow and sediment loss relative to the intensity of grazing pressure. Higher stormflows mainly result from: (1) the removal of protective cover, thus increasing the impacts of raindrops to overland flow; (2) soil surface trampling which decreases infiltration; (3) reduced soil organic matter important to soil aggregation; and (4) increased soil surface crusting which impedes water movement to lower horizons. These same factors that influence stormflow, carry forward to further influence total sediment loss. Removal of plant cover and biomass via livestock grazing, appear to be the major factors influencing stormflow and resulting sediment loss.

Livestock trailing also had a major influence on stormflow and sediment loss, especially when livestock entered the stream channel. Generally trails are readily visible on the intense rotationally grazed areas. Removal of plant cover and biomass from within these zones has a major influence on sediment loss, however, weakening and possible sloughing of stream banks by livestock are probably much more serious threats to potential sediment loss. However, sediment and nutrient losses are usually within the range of losses from undisturbed forest, below the range of losses from mechanical site preparation reported from forest elsewhere and well below potential losses reported from pasture and cropland.

Grasslands Grazing and Range Management

prairie - savanna woodlands (25-35 percent), and prairie grasslands (50-60 percent). The Caddo National Grasslands could produce on the average about 3,800 pounds of forage per acre annually. The average production on the LBJ is approximately 4,100 pounds of forage per acre per year. This data contrasts with estimates in the 1987 Forest Plan which projected average forage production on the Grasslands to be about 6,000 pounds/acre. The 1987 Forest Plan overestimated forage production on the Grasslands by approximately thirty percent.

In site specific analysis for the various Grasslands allotments, the 4,000 pounds/acre average forage production figure should be used. This average could be refined by applying Soil Conservation Service (SCS) productivity values to the current acreage by soil and cover type during site specific project analysis.

Grazing and range management is an integral part of maintaining the ecological approach on these Grasslands. It is anticipated that most acreage on the Grasslands would be available for permitted grazing in every alternative, with the exception of Special Management Areas and Developed Recreation Sites. Allotments with a recreation emphasis would not prohibit grazing; however, this emphasis could reduce some use (season of use or intensity of grazing) on the allotment on a site specific basis.

Environmental Consequences of the Alternatives -

Grasslands (Grazing)

In general, no negative impacts from a sound range management and grazing program are expected in any alternative on the vegetation resource. In areas where sensitive plant populations exist, or are being actively promoted, grazing would be adjusted to provide some seasonal deferment to allow the species or community to develop as needed. Grazing capacity on a specific area will be managed as related to existing forage or grassland available, not calculated on a total acreage figure. This concept ensures misuse of woodlands, bottomland hardwoods and other key areas does not occur.

Burning considerations affect the future grazing potential and native vegetation quality on the National Grasslands. Capacity greatly exceeds demand and use; therefore, no reduction in grazing has been necessary to reflect the impacts of woody encroachment, reduced cutting, and burning. The projected levels of permitted grazing are contingent on these management activities providing the desired grassland conditions.

Vegetation Groupings and Descriptions

Vegetation groupings were used in delineating Historic Landscape Vegetation used in Ecological Classification System (ECS), Management Areas, Old-Growth Groups, and Management Indicators. These vegetation groupings help to understand the changes within the broad landscape level changes that would be impacted by the various alternatives. The vegetation groupings are based on discussions found in the Environmental Impact Statement (EIS) Appendix H, Plan Appendix A (ECS), and old-growth development (Plan Appendix I). Acres of old growth by vegetation group are displayed for each alternative in Plan Appendix I. The following summary of the Grassland and Forested ecosystems gives a brief overview of these communities. A more detailed description can be found in Appendix H of the EIS.

VEGETATION GROUPS

TALLGRASS PRAIRIE
Dominant Series: Little Bluestem - Indiangrass
Inclusional:
Post Oak - Blackjack Oak/Black Hickory
Texas Oak
Ashe's Juniper - Oak

Forest Vegetation

LONGLEAF PINE
Dominant Series: Longleaf Pine - Little Bluestem
Inclusional:
Sphagnum - Beakrush Series
Little Bluestem - N. Goldenrod Series
Shortleaf Pine - Oak
Loblolly Pine - Oak

BAY - SHRUB WETLAND
Dominant Series: Sweetbay Magnolia
(Inclusional within the Longleaf Pine Woodlands)

XERIC AND DRY-PINE-OAK
Dominant Series: Shortleaf Pine - Oak
Inclusional:
Bluejack Oak - Pine

Sweetbay Magnolia
Loblolly Pine - Oak

DRY-MESIC OAK-PINE/MIXED LOBLOLLY - HARDWOOD
Dominant Series: Loblolly Pine - Oak and Shortleaf Pine - Oak
Inclusional:
Gammagrass - Switchgrass
Sweetbay Magnolia
American Beech - White Oak

MESIC HARDWOOD
Dominant Series: Beech - Magnolia/White Oak
Inclusional:
Loblolly - Oak

BOTTOMLANDS and STREAMSIDES
Dominant Series:
Bald Cypress - Tupelo
Overcup Oak
Water Oak - Willow Oak
Swamp Chestnut Oak - Willow Oak
Pecan - Sugarberry

TALLGRASS PRAIRIE

Both the LBJ and Caddo National Grasslands lie within this vegetation group. The surface geology of this environmental zone consists of weathered sandstones and shales. Differential erosion has produced rolling and hilly topography, and the landscape is more broken to the west. In many upland areas, however, overgrazing and cultivation have led to severe erosion and siltation. Thus, many portions of low lying floodplains also have a mantle of recent (post-1850) alluvium.

The savanna or parkland habitat seems more characteristic of the western area or LBJ, while the savannah and forest are more characteristic of the eastern Caddo unit. Woody vegetation (about 30 to 45 percent of total Grassland area) composition of the tallgrass prairie in general consists of 63 percent post oak and 29 percent blackjack oak, with 8 percent consisting of 10 other species (primarily cedar elm and hackberry).

Little bluestem (midgrass) is the dominant grass in communities, co-associated with big bluestem and Indian grass (tall grasses). The Ladonia Unit of the Caddo Grasslands, as well as small areas on the LBJ falls within the Blackland or true Tallgrass Prairie. The soils of the Blackland Prairie are mostly dark calcareous clays derived from the underlying clay, marl, shale, chalky limestone, and other bedrock. Low permiability of Blackland clay soils has inhibited tree growth, except along the many stream courses.

Environmental Consequences of the Alternatives

(Tallgrass Prairie)

TALLGRASS PRAIRIE

More intensive grazing situations developed in Alternatives 2 and 3 would promote species like dropseed (sporobolus so.), silver bluestem, Texas winter grass and paspalums. Increase forbs will also become more evident, especially annual weed species such as broomweed, nightshades and western ragweed. Many times mechanical or chemical control of these species is preferred

due to intensive grazing practices; however, these activities do not promote perennial or preferred native grass and forb species in the same manner as a fire management regime.

In Alternatives 2 and 3, active management of pasture grasses would occur. This type of management would increase grazing capacity, reduce native grass species and habitat for game and non-game wildlife. Fire would be restricted on these pasture, with active management primarily involving mowing and fertilization.

In Alternative 5, 6 and 7 grazing would be reduced from current levels. The season, intensity, and duration of grazing in these alternatives would promote development of tallgrasses and perennial forbs. This situation would also occur without emphasis on fire, which may develop a potential fire hazard situation with buildup of excessive fuels. Soil erosion and water runoff would be minimal.

Development of grazing regimes similar to current use would be the rule in Alternatives 4, 4a & b and 8. Grazing and recreation would be approximately equal in emphasis allowing some areas of tallgrass to develop. Other areas with grazing emphasis will be managed in fair to good range condition, creating a mix of perennial and annual grass and forb species.

LONGLEAF PINE

Communities in this habitat group generally occur east of the Trinity River and extend eastward to the Sabine River and into Louisiana. Some isolated sites occur west of the Trinity River. The best examples of this group are typically found on deep, sandy soils.

by bluestem grasses and an overstory of longleaf pine. Unburned stands tend to lose the grassy herbaceous layer through shrub and hardwood invasion. Shortleaf and loblolly pine also tend to increase in these stands with a low fire frequency.

Most forest stands on deep sandy soils in the Mayflower Uplands, Deep Sandy Uplands, and Clayey Uplands Landtype Associations on the southern and central Angelina, Sabine, and Davy Crockett National Forests will be restored to longleaf pine. Existing longleaf pine stands will be maintained wherever they occur.

Environmental Consequences of the Alternatives

(Longleaf Pine)

Overstory

There are currently 24,800 acres of longleaf pine on the National Forests. The longleaf community will increase in all alternatives but most rapidly in Alternatives 2, 3, 8 and 4a which have fewer acres in MA-2. Maximum regeneration size in MA-2 and MA-6 is 25 acres versus 80 acres maximum area in MA-1. Longer rotations in MA-2 and MA-6 will restrict the acreage that can be in the 0-10 and 0-30 age classes as compared to MA-1. Development of the longleaf pine landscape will be most pronounced in MA-6 of alternative 8. Developed with direction found for RCW management (MA-2), Longleaf Ridge has areas of slash and loblolly pine; restoration through harvest and frequent burning will be evident in MA-6.

The total acres of longleaf pine by alternative at the end of 10 and 50 years is shown in the following table.

ACRES LONGLEAF PINE

Alternative Nos.	**Period 1**	**Period 1-5**
Alternative 1	39,132	48,465
Alternative 2	47,501	53,746
Alternative 3	55,013	59,892
Alternative 4	33,486	78,388
Alternative 4a	42,123	59,544
Alternative 4b	40,525	71,268
Alternative 5	42,644	42,939
Alternative 6	30,656	30,712
Alternative 7	31,748	30,965
Alternative 8	34,060	58,699

Clearcutting will be used for most restoration of longleaf pine in Alternatives 1 through 5 and 8. Site preparation using herbicides, mechanical methods, and burning will need to be used in most areas. This will create an area in which longleaf pine seedlings can become established and grow free from competition in the overstory and midstory canopy levels. Areas with residual target species will allow the use of seedtree or in some cases shelterwood for restoration.
In Alternative 1 only slash pine can be converted to longleaf pine in the 1,200-meter areas. Loblolly and shortleaf pine stands that could be restored to longleaf pine in Alternative 1 and are

natural mortality occurs, longleaf pine seedlings may be planted.

Alternative 7, an uneven-aged management alternative, allows the group selection method for restoration and the use of herbicides. Longleaf pine seedlings are more affected by root competition and edge effect than the other pine species. Many longleaf pine seedlings would still be in the grass stage for l0 to 20 years because of the root competition of adjacent trees (RCW EIS).

Alternative 6, an uneven-aged management alternative, allows single-tree selection. The use of herbicides is not permitted. Longleaf will be very difficult to establish due to competition of nearby trees and shrubs.

Alternatives 1 through 5 and 8 have burning cycles of 2 to 5 years in MA-2, and 3 to 5 years in MA-1. Frequent fire will prevent hardwoods from becoming established in the area. More intense burns achieved in the summer will increase legumes and other forbs and grasses are favored. (Vegetation Management EIS, Page IV-38).

Prescribed burning in group selection in longleaf pine stands usually does not adequately control the hardwoods because of the variations in fuel and fire intensity across the stand. (RCW EIS).

Understory

Management prescriptions to be used in most of the proposed longleaf-little bluestem sites will have a definite effect on the variety, structure, and composition of the understory and midstory vegetation. Frequent fire regimes will increase the composition of perennial grass and forbs such as bluestems, Indian grass, gamma grass and dropseeds; as well cone flower, blazing star, and perennial sunflower. These "finer fuel species will help maintain the fire cycles and provide adequate fuels along with longleaf pine star". Woody understory and midstory species would be decreased except for fire tolerant types such as blackjack, post and blue jack oak.

This herbaceous understory would become more evident in all alternatives if MA-2 prescriptions are applied successfully; this would also be true in Alternative 8 for MA-6. Similar results would be seen in MA-1 for Alternatives 3, 4a, 4b, 4, and 5. In Alternative 2, the herbaceous understory may not develop as fully due to shorter rotations; generally species such as the annual forbs and grasses would be more common, and greater diversity of understory and midstory woody plants would be evident. Selective use of herbicides on Alternatives 2 through 5, 7 and 8 would be used to reduce woody undesirables, allowing better development of the bluestem community.

In areas where single tree or group selection is applied, and especially in Alternatives 6 and 7, the bluestem community will not develop as rapidly. The lack of fire in Alternative 6 will preclude many of the perennial grasses and forbs due to a dense sub-canopy of various woody species. In uneven-age stands, the reduced use of fire and variety of species in the mid-story (both hardwood and pine species) will create a situation that may require mechanical or chemical treatments if the desired condition is the the bluestem community.

BAY - SHRUB WETLAND

These wetlands or "Baygalls" are generally identified as the Sweetbay Magnolia series. These wet sites or wet lands will normally not be harvested in any alternative. Some prescriptions require selective cutting to maintain the diversity of this community or allow development of the wetland into a hillside bog or Sphagnum-beakrush Series. The hillside bog, through natural succession (lack of fire and disturbance) will develop the woody composition more typical of the bay-shrub wetland.

Environmental Consequences of the Alternatives
(Bay-Shrub Wetland)

Alternatives that do not provide frequent fire cycles (> 5 years) in MA-1 and MA-2 will promote increasing acreage in the bay-shrub wetland group. This community will become most prominent in Alternatives 6, followed by 7 and 5. In contrast maintenance of the hillside bog community in Alternatives 1 through 4b and 8 through fire will decrease the extent and prominence of the bay-shrub wetlands.

XERIC PINE AND PINE-OAK

This group was the largest natural timber belt in east Texas. It occurs north of both the longleaf and mixed hardwood-loblolly regions. Uplands in this area were typically open, scattered shortleaf pines, associated with both oaks and hickories. Various shrubs and regenerating overstory species may be located in the mid and understory, especially in areas where fire has been suppressed. Herbaceous ground cover in upland sites has been reduced in some areas due to lack of fire. Natural herbaceous species will become more common when frequent burning regimes are applied. This habitat group also occurs as a shortleaf pine/oak/hickory inclusional community within the longleaf pine belt on finer textured soils.

Most forested stands on sandy soils in the Sparta Sandhills, Crockett Clay Hills, Redlands, and the Lignitic Uplands Landtype Associations on the northern Sabine and Davy Crockett National Forests will be restored to shortleaf pine. Existing longleaf and shortleaf pine stands will generally be maintained in all alternatives within these LTA's.

Environmental Consequences of the Alternatives
(Xeric Pine and Pine-Oak)

Overstory

There are currently 160,628 acres of shortleaf pine on the National Forests. The area to be restored to shortleaf pine does not vary significantly by alternative. Restoration can be accomplished faster in Alternatives 2, 3, 4a, 4b, 5 and 8 since these alternatives have less area in MA-2. Restoration will take longer in MA-2 than MA-1 due to the more restrictive size and age requirements.

The total acreage of shortleaf pine by alternative at the end of 10 years and 50 years is shown in the following table.

ACRES SHORTLEAF PINE

Alternative 1	162,661	165,688
Alternative 2	177,607	204,351
Alternative 3	166,561	189,047
Alternative 4	159,443	153,447
Alternative 4a	154,750	160,516
Alternative 4b	155,856	151,295
Alternative 5	161,037	172,476
Alternative 6	164,523	167,375
Alternative 7	162,088	179,042
Alternative 8	152,601	166,303

Clearcutting will be used to restore shortleaf pine as it is the optimal method for restoring this species. (RCW EIS, Page 50). Site preparation will most often be by mechanical methods, herbicides, and prescribed burning.

The two-aged silvicultural system will generally be used for existing shortleaf pine stands in MA-2 (Alternatives 2 through 5 and 8). Leave pine basal area is 25 to 30 square feet per acre in MIL 3 and 40 square feet in MIL 4. Areas managed with the two-aged method in MA-2 will retain the overstory trees.

The two-aged method may be used in MA-1 when site-specific analysis determines it to be the appropriate regeneration method. The reserve trees will normally be removed at a later time (5 to 20 years). For many years the two-aged structure has an uneven canopy profile. The shade conditions created by the parent trees can cause an increase in shade tolerant hardwoods and may result in decreased growth.

Alternative 6 uses mostly single-tree selection to maintain pine stands. The use of herbicides is not allowed in this alternative. With uneven-aged methods, maintaining an uneven-aged stand structure requires the establishment of reproduction about one year out of 10. Competing vegetation, particularly shade-producing midstory and understory hardwoods, should be controlled periodically to allow for establishment and development of pine reproduction (Baker, 1991). Most hardwood trees and shrubs, unless controlled, can out compete shortleaf pine seedlings under the light and moisture conditions (RCW EIS, Page 255). The pine component, necessary for RCW habitat, will be reduced as the hardwoods become established.

Alternative 7 uses single-tree and group selection methods to maintain uneven-aged stand structure. Herbicides are used to control competing hardwoods allowing the shortleaf pine seedlings to become established. Prescribed burning has limited use in uneven-aged shortleaf stands because seedlings will always be present. Most seedlings and smaller, thin bark saplings would be killed on a 10-year burning cycle (RCW EIS).

In Alternatives 1 through 5 and 8 prescribed burning in even-aged stands should be delayed until an adequate number of pine saplings and poles reach a fire resistant stage. Many hardwoods may reach a fire resistant stage during this period. (RCW EIS)

Understory

vary greatly by alternative. Uneven-aged prescriptions common in Alternatives 5, 6 and 7 will preclude development of an open, pine dominated upland. These alternatives will have areas with a higher composition of loblolly pine and hardwood seedlings and sapling; the dominance of vines (vitis and smilax) and woody shrubs such as french mulberry, yaupon and vaccinniums will become wide-spread.

In Alternatives 1 through 3 and in MA-2 in Alternatives 4, 4a and 4b and 8 a more open understory will occur. The stands will be dominated by shortleaf pine, some fire resistant hardwoods like blackjack post, and bluejack oak and black hickory. Some limited mid-story shrubs and trees will occur such as huckleberry, dogwood and hawthornes; but not of the prominence as would be in Alternatives 5 through 7.

Herbaceous species would be dominated by the perennial grass and forbs in Alternatives 3 through 4b and 8, and to a lesser extent in Alternatives 1 and 2 (which will have a greater diversity of annuals and wood sprouts). Herbaceous species found in Alternatives 5 through 7 would be primarily perennial species, but in low numbers due to infrequent fire cycles and shading from the dense mid-story. Alternatives 3 to 5 (MA-1) and most of MA-2 will allow the most significant development of the lichen, moss and liver wort assehipledge due to longer rotations and frequent fire cycles.

DRY-MESIC OAK-PINE MIXED LOBLOLLY-HARDWOOD

Loblolly trees can thrive on a variety of sites, but better growth is most often associated with better soils. Loblolly will often be found in both longleaf and shortleaf regions, but it is generally restricted to mesic sites, and slopes and terraces associated with streams. In general, loblolly is found in stands with various mixtures of hardwoods with thick understory growth. Much of the historical loblolly region is associated with the traditional "Big Thicket" of east Texas. This broad, loblolly region is found in the southwestern Gulf Coastal Plain subsection. Some areas have a significant component of shortleaf pine.

The loblolly-hardwood group is less fire adapted than the longleaf and shortleaf habitat groups. Windstorms, including re-occurring hurricane events in the southwest Gulf Coastal Plain subsection, and SPB outbreaks are historical large scale disturbances in this group.

Environmental Consequences of the Alternatives

(Mixed Loblolly-Hardwood)

Overstory

There are currently 334,551 acres of loblolly pine on the National Forests. The acreage in

loblolly pine will decrease in all alternatives. In Alternatives 1 through 5 and 8 many loblolly pine stands will be converted to longleaf or shortleaf pine.

The total acreage of loblolly pine by alternative at the end of 10 years and 50 years is shown in the following table.

ACRES OF LOBLOLLY PINE

Alternative Nos.	**Period 1**	**Period 1-5**
Alternative 1	330,054	306,867
Alternative 2	301,819	265,123

Alternative 4	333,998	295,092
Alternative 4a	330,054	306,867
Alternative 4b	330,546	304,363
Alternative 5	333,280	311,512
Alternative 6	331,748	328,842
Alternative 7	332,970	313,619
Alternative 8	327,105	298,153

More hardwood trees will be allowed to become established in stands that are regenerated to loblolly creating more loblolly/hardwood stands. Most occurrences of this community are on the Sam Houston National Forest and will be managed as MA-2, MIL 4. Regeneration will be limited generally to the two-aged and uneven-aged methods. The two-aged method of regeneration in MIL 4 required a leave pine basal area between 40 square feet. The reserve trees will remain until lost to natural mortality. The appearance will be similar to an uneven-aged stand. Herbicides may be required to ensure adequate pine regeneration necessary for red-cockaded woodpecker habitat.

Single-tree selection and group selection will be used in some areas to regenerate loblolly pine. Use of prescribed fire will be limited with the uneven-aged system as seedlings will always be present. Midstory treatments for RCW colonies, replacement stands, and recruitment stands will be with mechanical methods, manual methods, and herbicides.

Alternative 6 does not allow the use of herbicides. The use of herbicides is necessary to ensure adequate pine regeneration for RCW habitat. Hardwoods will become established and out compete pine regeneration limiting foraging habitat. The stands will become pine/hardwood stands and eventually hardwood stands over time.

Understory

Understory species within the loblolly pine-oak communities will be more shade tolerant forbs, vines and shrubs. A wide array of more shade tolerant oaks and other hardwood seedlings (elm and red maple) will also be prominent in the understory. Alternatives that provide frequent burning cycles (MA-2 for all alternatives and Alternatives 1 through 5 and 8 for MA-1) will reduce the diversity of hardwood species in this community and allow the development of some perennial grasses and forbs. Alternatives 6 and 7 and areas in uneven-aged systems will have a wide variety of shade-tolerant species and promote species such as the slender wake robin, Jack-in-the-Pulpit and partridge berry. Loblolly-oak stands managed for longer rotations will develop a rich assemblage of mosses and liverwort in the shaded, more mesic environment.

MESIC HARDWOOD

These forests occur primarily on slopes adjacent to stream bottoms or large river terraces. Although not always present, the most distinctive feature of the vegetation is the presence of American beech. This species reaches the western limits of its distribution near the Sam Houston National Forest, and is limited or nonexistent on the Raven District or the Davy Crockett National Forest. This broad community seems to vary along an east-west gradient on

proposed Mill Creek Cove Research Natural Area.

These forests develop a closed canopy, with multiple canopies and open forest floor appearance. Communities with American beech (and southern magnolia) are often considered the classic "climax" plant community of the southeast. It has been suggested that these communities are relicts from Pleistocene glaciation.

Disturbance of late successional examples of this forest type tend to reiterate succession, while moderate disturbance of young stands may actually speed succession towards climax. Species found in this group are considered fire tender and it is unlikely that the community can develop under a prescribed fire program. Where these habitats occur adjacent to communities (like longleaf pine) an ecotone of variable width will occur. Occasional fire episodes enter these habitats, but the landscape position and fuel composition suggest that few natural fires originate within these communities.

Environmental Consequences of the Alternatives (Mesic Hardwood)

Overstory

No programmed harvest is scheduled for these communities in the foreseeable future. The area will be allowed to develop into old-growth conditions in all alternatives. Prescribed fire will also be limited and thus have no effect. The current acreage of mesic hardwood is approximately 5,500 acres. No alternative changes this vegetation group significantly; however, as old-growth areas develop the mesic hardwood group may increase to a slightly greater area.

Understory

Understory species in the mesic hardwood stands will generally develop a shaded, rich humus loving species mix of herbaceous and woody understory species. Alternative 1 will be approximately the same as currently exists, in Alternatives 2 through 8, increasingly larger areas of this community will develop. This vegetation group normally occurs in association with streams and bottomlands as an upper terrace of the watershed or a side slope community. Alternatives 6 and 7 have the largest streamside management zones (MA-4) with mostly uneven-aged managed stands, creating the most widespread development of this group on all 4 National Forests. Many ferns, beech drops, jack in the pulpit, and other shade loving species will become more prominent in these two alternatives. Fire will not have an effect on this community as prescriptions do not generally promote disturbance in early successional habitat; however, fire could impact the perimeter of existing beech forests, which could have a greater effect in Alternatives 2 through 5 and 8 (MA-1) and all areas in MA-2.

BOTTOMLAND AND STREAMSIDES

These communities occur along streams ranging from constantly wet sloughs and backswamps to infrequently flooded storm related floodplains. With the exception of cypress swamps, each

community type is composed primarily of deciduous hardwoods. The particular species assemblage on a given site is highly dependent on local topographic factors, and even small scale changes can produce important species changes.

these communities, with heavy winds also playing an important role. Natural fires are of rare occurrence and generally play little role in community dynamics in this type. As in the mesic hardwood type (described above), occasional fires may enter these communities from more upland topographic positions, but moisture and fuel characteristics are often sufficient to limit flame spread.

These streamside communities, though very different between the Grasslands and the four Forests, provide very similar habitat, structure and riparian corridors for a myriad of other plant and animal species. Alternatives for the Grasslands areas will not affect much noticeable change from the existing streamsides that occur at present. The greatest difference will be obvious in Alternatives 6 and 7 with 300 foot-wide streamside corridors creating a wooded zone from bottomlands to upland areas. These wider corridors, however would probably comprised of substantial upland situations, as many smaller streamcourses have floodplains less than 300 feet in width. These wide streamside will in many cases extend well beyond the floodplain and allow tree species to encroach on native upland prairie. Forest streamsides have very different species composition as compared to those which occur on the grasslands. The forest streamsides are commonly bottomland hardwood communities consisting of water oak, willow oak, swamp chestnut oak and bald cypress, and have larger areas adjacent to the water. In Alternatives 3 through 8, special riparian areas have been designated that will greatly expand potential habitat for species like the Louisiana Black Bear and canebrake rattlesnake. These areas are on the Angelina and Sabine National Forests. As special areas in Alternatives 3 through 8, riparian wide zones will link the existing Angelina and Neches River corridors with adjacent forest lands and wilderness (such as Turkey Hill) through establishment of the Bear Creek drainage, Ayish and Attoyac Bayous and Upper Angelina River special management areas. The creation of MA-6 Longleaf Ridge (Alternative 8) will develop a landscape with a number of special bottomland communities recognized as special management zones. These areas will develop with structure and dead/down woody material found within any other portions of the Forest.

Very little understory will be present in these areas due to frequent flooding and shade.

Environmental Consequences of the Alternatives
(Bottomland and Streamsides)

There is no programmed harvest scheduled for these communities in any alternative. Old-growth conditions will be allowed to develop naturally. Prescribed fire will also be excluded and thus have no effect. Existing bottomland hardwood groups total approximately 21,000 acres. This is 60 percent of the existing streamside zone acreage; bottomland hardwoods are expected to increase as the streamsides develop, but not significantly as compared to the existing 21,000 acre area.

Part I (b)
The Biological Environment

Wildlife **and Fisheries**

Historically 161 species of mammals inhabited north and east Texas. Approximately 52 of these species are considered to be dependent on habitat found in the National Forests and Grasslands in Texas (NFGT) planning area. (See Appendix F)

Small Mammals

The region supported many small mammals, over 70 species of insectivores, bats, and rodents have been recorded in east Texas. No assessment of small mammal status on NFGT is documented. Fox squirrels and gray squirrels, as well as flying squirrels are common. Gray squirrels need contiguous forests of older hardwood trees (preferably bottomland hardwoods), while fox squirrels tend to prefer open pine and pine-hardwood forests. Historical forest conditions probably favored gray squirrels, except in upland pine forested areas that burned frequently enough to suppress hardwoods.

Large Mammals

Larger mammals generally have extensive home ranges and low tolerance to humans. Currently bobcats and coyotes are fairly common on the NFGT while the red wolf (once widespread) does not exist in the wild today. The Louisiana black bear requires extensive areas of bottomland forests. The NFGT areas historically supported this subspecies of black bear. Viable populations remain only on large tracts of forests in eastern Louisiana. Some occasional reports in and around the NFGT area occur, but verification of its existence and population viability are uncertain.

Birds of the Forest

Some 550 species of birds, including, extinct, extirpated and accidental in occurrence, have been recorded in Texas. A large percentage of the North American birds that winter in the tropics pass through Texas on their migrations, greatly augmenting a large winter and resident population. Just over 300 bird species have been recorded in the pineywoods of East Texas. Approximately 163 species are those that are known or suspected to occur on the planning area and are dependent on forested habitats. (See Appendix F)

A bird checklist of the region shows the fluctuation in numbers of species throughout the year: Spring (March-May) - 261 species; Summer (June-July) - 132 species; Fall (August-November) - 267 species; and Winter (December-February) - 162 species. This shows that the summer and winter resident populations are bolstered during the spring and fall migrations. East Texas forested habitats, even though they may not be essential breeding or wintering habitat, provide many of those species in transit with temporary refuge, resting, and feeding areas.

Birds of the Grasslands

Of the some 550 species of birds recorded in Texas, 273 are known or expected to occur on one or both of the Texas National Grasslands. There are 249 species common to both of the Grasslands. The LBJ has another 14 species not found on the Caddo, for a total of 263 species. Approximately half of these species could be considered dependent on Grassland habitats.

Species associated with early successional forests, such as yellow-breasted chat, indigo bunting, painted bunting, prairie warbler, common yellowthroat, and white-eyed vireo are neotropical migrants that occur in openings or early successional forests. In general, there is an abundance of this type of habitat on adjoining private property, but it tends to be in large blocks. Extensive areas of early successional forest and pasture type habitat pre-dispose neo-tropical species to avian parasites such as the brown-headed cowbird. These parasites also impact the interior, or mature forest bird assemblages, due to the edge effect and the ability of the cowbird to invade the forest interior. This dilemma contributes to declines in neo-tropical bird populations, even though suitable forest habitat at all stages of succession is present. Historical or traditional diversity patterns on NFGT could be considered horizontal. It is theorized that more vertical diversity, or within stand diversity with multiple canopies, would reduce this problem of avian parasites.

Reptiles and Amphibians - Forests and Grasslands

Some 148 species and subspecies of reptiles, and 62 species and subspecies of amphibians have been recorded in Texas (east of the 100th meridian). Of these, 59 reptiles and 30 amphibians are found in the pineywoods of East Texas. These include 19 reptiles and 8 amphibians that are most closely associated with aquatic habitats.

Of the reptiles and of amphibians that have been recorded in the eastern half of Texas, 70 reptiles and 22 amphibians are found on one or both of the Grasslands. Approximately 18 reptiles and 5 amphibians are not considered dependent upon Grasslands habitats.

Invertebrates - Forests and Grasslands

Countless species of invertebrates have and continue to exist on the NFGT. Initial efforts to document historical and current populations of these animals is currently underway. Some specific species such as the Big Thicket Emerald Dragonfly, the American Burying Beetle, and a number of bivalves and gastropods are a concern (Appendix F). Their status and relationship to potential habitat that may be found on the NFGT is being investigated. Some specific species of invertebrates are identified in the Management Indicators list described in Appendix C.

Red-Cockaded Woodpecker

Affected Environment - **Forests**

The red-cockaded woodpecker (RCW) is only found on the four Forests of the NFGT. Currently 176,000 acres of the Forest are managed for RCW habitat; this contrasts to 80,000 acres shown in the 1987 Plan. The effect of management emphasis for RCW has significantly changed the 1987 Plan projections to produce timber. Although there are differences across the four National Forests, habitat management efforts to benefit RCW have been successful. RCW populations have stabilized or increased over the last few years; in contrast to the slow decline that was documented during the late 1980's.

A Biological Assessment (EIS Appendix I) was completed for T&E species that would be affected by implementation of Alternative 8. Alternative 8, as the selected alternative, and Revised Plan was evaluated in more detail by the USFWS (Biological Opinion) through information found in the documents in Appendix I.

The Sam Houston National Forest clusters declined by 68 percent from 1986 to 1991. The Sabine National Forest declined from 24 active clusters in 1986 to 10 in 1991. Current estimates for NFGT now show increases; some which equal or exceed 1986 populations. Current 1995 active cluster status for each Forest is:

Sam Houston - 153	Angelina - 27
Davy Crockett - 38	Sabine - 20

If implementation of direction included in the Environmental Impact Statement for Management of the Red-cockaded Woodpecker and its Habitat on National Forests in the Southern Region (or RCW EIS) is accepted by the court and used in Alternatives 2 through 8, the amount of area benefitting the RCW will increase, continuing the improvements already documented in NFGT RCW populations. The larger habitat area of Management Area 2 (MA-2) will impact other resources, land allocations, and management activities. These will be discussed generally and by each primary area of effect.

Environmental Consequences of the Alternatives - Forests

All alternatives provide habitat management direction for the RCW. Alternative 1 continues the court-ordered direction, all other alternatives implement the strategy described in the RCW EIS. Alternatives 2 through 8 vary primarily in the amount of acreage designated into MA-2.

ACRES IN MA-2 AND MA-6 BY ALTERNATIVE

Alternative Nos.	**Acres**
Alternative 1	176,594
Alternative 2	234,885
Alternative 3	234,627
Alternative 4	488,358
Alternative 4a	235,003
Alternative 4b	338,637
Alternative 5	255,196
Alternative 6	212,824
Alternative 7	212,824
Alternative 8	282,247

In Alternative 1 RCW populations will continue to improve, but may reach habitat limitations within two to four years. Populations will not reach recovery objectives and may decline as habitat, which is restricted to the 1,200-meter or three-quarter (3/4) mile management zones, declines. In this alternative other species associated with RCW habitat will be limited by small parcels of fragmented habitat. Some species like Bachman's sparrow may continue to decline. Management of RCW in Alternative 1 would jeopardize their recovery chances and increase population susceptibility to catastrophic events.

In Alternatives 4 and 4b RCW populations could expand beyond recovery objectives. Associated habitat for other species would be linked and unfragmented to a large extent, allowing unrestricted expansion of these species as well as RCW over time. The long term

ensuring the greatest opportunity for population recovery.

Alternatives 2, 3, 4a, 5 through 8 leave sub-populations of RCW on the Sabine, Davy Crockett, and Angelina National Forests isolated between forested areas. The consequences of this isolation are as follows: (1) RCW populations would expand to recovery levels, with expansion dependent on size of the HMA; (2) associated species preferring this type of habitat will expand to the area as described in the RCW EIS or the larger area in Alternatives 5 and 8; and (3) genetic viability is not assured in those areas where isolation of several sub-populations occur. It is anticipated that the larger HMA's in Alternatives 4, 4b, 5 and 8 will allow expansion to develop gradually to ensure objective levels or greater to be reached.

In Alternative 8 (see EIS Appendix I), non-management of RCW wilderness clusters will likely lead to a loss of some RCW. However, such adverse effects to individuals that are found in the four wilderness clusters at present will be far outweighed by numerous beneficial effects of management for the 1,385 active cluster population objective outside of wilderness. The possible loss of wilderness clusters will not significantly affect meeting the stated RCW recovery objectives.

Silvicultural Management - Silvicultural techniques could be limited due to their effects on RCW. Some small RCW populations that are widely dispersed have been adversely impacted due to even-aged silviculture (primarily clearcutting and seed tree). In contrast, large populations with groups more closely spaced are not adversely effected by even-aged regeneration of forest stands. Examples are RCW populations on the Francis Marion, Kisatchie, and the Apalachicola National Forests. These populations have sustained high RCW densities even with intensively managed, even-aged regeneration methods (primarily clearcutting) for more than 30 years (RCW EIS 1995).

The use of clearcutting is limited in all alternatives based on Management Intensity Level (MIL) within Management Area 2. Clearcutting is generally prohibited completely in Alternatives 6 and 7 except where catastrophic conditions would dictate the need to regenerate an entire stand that did not have any or many desired residual trees remaining. The amount of clearcutting in Management Area 1 will generally vary among the alternatives, being more common in Alternatives 2 and 3, and less in 4 through 5 and 8. These impacts on silvicultural treatments, longer rotations, and harvesting restrict efficient timber management, and reduce volume by 10 to 20 percent in all alternatives. In Alternative 4b, Allowable Sale Quantity in MA-2 compared to MA-1 is approximately 17 percent less (Plan Appendix C). This has the greatest impact in the socioeconomic area, reducing returns to the counties and reducing jobs in the timber related fields. Clearcutting and replanting is summarized in the following table.

Acres Clearcut by Alternative During 1st Period

Alternative Nos.	**Acres**
Alternative 1	56,538
Alternative 2	36,995
Alternative 3	31,250
Alternative 4	1,738
Alternative 4a	14,646

Alternative 5	13,534
Alternative 6	11,234
Alternative 7	3,407
Alternative 8	20,070

PETS - Areas identified for RCW management (MA-2) are considered primary sites for many Proposed, Endangered, Threatened, and Sensitive (PETS) species. The effect of RCW management on these PETS is considered positive. The majority of these PETS species are found in habitats similar to that used by RCW. Alternatives with larger habitat areas (MA-2) for RCW management will improve habitat for other PETS. On NFGT many PETS are found within the longleaf pine vegetation group and associated inclusions communities such as bogs, seeps, and barrens (Appendix F and H and Plan Appendix D). These species would benefit from the frequent burning regimes and other management direction for RCW.

Mast Production - Many wildlife species are dependent to some degree on the production and availability of fruit and nuts (mast). The use of prescribed burning and other methods will be used in all alternatives to intensively reduce or eliminate midstory in clusters, replacement, and recruitment stands. Prescribed burning will be used throughout HMA's (MA-2) to reduce midstory vegetation. There is no direction to intensively control/eliminate midstory within MA-2 outside the clusters, replacement, or recruitment stands).

These activities may reduce the number of mast-producing shrubs and trees and could affect mast-dependent species. The effect of prescribed burning and midstory control on mast-producing species is based on acres treated. Alternatives that will have the greatest adverse effect on mast production will be those with the largest acreage designated for MA-2. In decreasing order, Alternative 4 will have the greatest effect, followed by 4b, and 5; the other alternatives have approximately the same acreage in MA-2. This effect will be most significant on the Sam Houston, and the northern Sabine and Davy Crockett National Forests, which are in Landtype Associations where oak and hickory naturally occur in significant amounts (Plan Appendix A).

Oil and Gas Exploration is affected to some degree by RCW management activities, but not to the extent or with the impact MA-2 management has on timber harvest. The noise associated with drilling activity, increased human disturbance, and clearing of habitats are the major concerns of oil and gas activities that would effect RCW. Generally speaking, the areas in MA-2 are available for leasing, but due to the proximity to clusters there may be added stipulations for surface use (see stipulations described in Lease Notice #34, FEIS Appendix C). As RCW populations expand, more area may be restricted. This effect on mineral production is expected to have some adverse effect on oil and gas returns to the treasury (FEIS Appendix B).

Recreation is impacted primarily through the construction or use of recreation facilities, including off-road vehicle (ORV) trails. MA-2 generally allows ORV use, but may limit the construction of trails through clusters. Recreational interference is primarily a factor for RCW during the nesting season, when human activity may have a negative affect on nesting success and hatching survival. Stipulations are in place to permit construction activities outside the nesting season and ensuring cavity trees are protected. Facilities with heavy concentrated human use, such as camp grounds, would be located outside clusters if possible. Should RCW move into a recreation facility or trail and excavate a cavity, the facility or trail would not be affected

RCW; and/or; (2) the cluster could not be moved to a safer location (RCW EIS).

Wilderness - In all alternatives except 6, RCW within wilderness areas would be considered non-essential. This designation may preclude the management of these clusters in accordance with appropriate guidelines (see FSM 2323.31b for direction on manipulation of wildlife habitat within wilderness). In addition, no control of southern pine beetle (SPB) to protect RCW groups within wilderness or to protect essential groups outside the wilderness boundary would be needed. In all alternatives RCW within wildernesses will be drawn out of the area through

development of recruitment stands with artificial cavities outside the wilderness area boundary, providing better future management of these RCW and result in minimal RCW effects on wilderness.

Threatened, Endangered, and Sensitive Species (PETS)

Affected Environment - Forests and Grasslands

The NFGT supports rich and diverse assemblages of flora and fauna. No known threatened, endangered, rare, or sensitive plant species were documented on the NFGT before 1987. After 1987, the Federally listed species recognized in the Forest Plan were the endangered RCW, endangered bald eagle, and the threatened American alligator. The Navasota ladies' tresses orchid, a Federally endangered plant, was discovered on the Angelina National Forest in 1988. The management and protection of these plants and communities is a priority issue in this Plan Revision. A number of active bald eagle nests have also been discovered on the NFGT since implementation of the 1987 Forest Plan.

Scientists concur that one of the most significant values and contributions of the NFGT to society is the habitat that supports a number of proposed, threatened, endangered, and sensitive (PETS) plant and animal species. The NFGT contains, or is in the range of at least 148 of these species that warrant special consideration and protection. These species include 12 birds, 7 mammals, 7 reptiles, 4 amphibians, 19 fish, 2 insects, 75 plants, 7 bivalves and 5 gastropods (see Plan Appendix D.) This list is based on the best available current information and as new information becomes available, the list is updated.

All alternatives direct the development of additional protection measures and management actions for all of the 12 federally listed species that occur or could occur (or other T&E species if found or newly listed) on the NFGT. Other species with similar habitat requirements to these 12 federally listed species will also be protected through management goals, objectives, standards, guidelines and monitoring actions. The management applications prescribed in the NFGT Revised Plan conform to specific concerns and direction described in existing recovery plans, handbook guidelines, USFWS direction, and/or Plan amendments (see EIS Appendix I).

The only T&E species with a specific recovery plan objective for the NFGT is the RCW. Long-term population objectives are to meet or exceed 1,179 active clusters on the four National Forests. As recovery plans are identified for other T&E species, the NFGT will work closely with the U.S. Fish and Wildlife Service (USFWS) to establish recovery levels of these populations. The NFGT works closely with national and State offices of the USFWS to ensure habitat for T&E species is maintained or enhanced. Consultation, both informal and formal, exists through national and local Memorandums of Understanding (MOU's) and letters of

mandatory prior to any site-specific activity.

Threatened and endangered (T&E) species are identified by the U.S. Fish and Wildlife Service and are under the protection of the Endangered Species Act. These are species that are faced with extinction. **Proposed species** are those that are under review for listing as threatened or endangered, as more information becomes known about them their status would be change to T&E or removed from listing. **Sensitive species** policy is to ensure sensitive species viability and to prevent a need for Federal listing. The NFGT lands are important to the protection and recovery of these species. It is law and policy that habitats for these species be maintained and enhanced.

The NFGT is composed of six major vegetation groups. These groups are used to describe old-growth forest communities (Plan Appendix I), Management Indicators (EIS Appendix H), and for landscape level historical vegetation used in the Ecological Classification System (ECS) found in Plan Appendix A. These vegetation groups or wildlife habitat types are:

1.Longleaf Pine Woodlands;
2.Xeric Pine and Pine-Oak and Dry Forests;
3.Dry Mesic Oak-Pine Mixed Loblolly-Hardwood Forests;
4.Mesic Hardwood Forests;
5.Bottomland Forests and streamsides; and
6.Tallgrass Prairie.

The Longleaf Pine Woodlands group can be subdivided into three sub-groups: (1a) Longleaf Pine Barrens; (1b) Bay-Shrub Wetlands; and (1c) Herbaceous Wetlands. These sub-groups have the most PETS species and are of extreme importance for protection and restoration. Another major association is the upland Mixed Pine Oak communities with special consideration for the Mesic Hardwood habitat group. The Mesic Hardwood group may include aspects of the Shortleaf Pine-Oak-Hickory series and the Loblolly Pine-Oak series, but the most significant component is the Beech-Magnolia series (Orzell 1991). A number of PETS species occur in this group. Both the Longleaf Pine and the Mesic Hardwood group have a significant number of PETS. The remainder of the PETS species are associated with the river floodplain or Bottomlands and Streamside group (Plan Appendix D and Appendix F).

Environmental Consequences of the Alternatives

(Forests and Grasslands)

All PETS species and communities have been analyzed in a programmatic Biological Evaluation (BE) that can be reviewed in the NFGT Planning Process Records. This BE reviewed all alternatives for possible effects on PETS.

Alternatives 1 through 3 and 4a provide basic protection of known populations of PETS (including RCW) and ensure viability levels will remain at current levels. Restoration of the longleaf pine woodlands will occur in these alternatives, but the shorter rotations may not provide some sensitive species sufficient recovery time between treatments.

Alternatives 5, 6, and 7 consequences are as follows: (1) PETS associated with the bottomlands and mesic hardwood forests could expand to higher levels, as more area is managed for that

management methods; (2) associated older forest habitat linking bottomlands to uplands will allow species populations associated with these areas to expand. This is directly related to larger MA-2 areas in association with the streamside zones.

Alternatives 8, 4b and 4 will have larger HMAs (MA-2) that provide extensive upland habitat for a variety of both game and non-game species. Larger HMAs will allow better genetic exchange between RCW clusters; improved potential for viability would improve for some of the isolated populations of other sensitive species and communities associated with the fire-dependent upland pine ecosystems. More unfragmented upland pine habitat, especially after longleaf and shortleaf pine restoration, will enable the RCW sub-populations to expand and improve long term viability. Cumulative effects for these alternatives will be that genetic viability will be enhanced because of linkage of gene pools.

Based on the goals, objectives and management actions proposed in Alternative 8, significant beneficial effects are anticipated for the 12 T&E species evaluated. Upon Revised Plan implementation, habitat development is expected to improve population potential for each species. The Revised Plan clearly states direction for management standards and guidelines, existing and continuing inventories, research and monitoring actions; this is further assured during future site-specific project development and review for T&E species recovery.

It is also expected that habitat improvements through longleaf and shortleaf pine restoration, riparian area protection and special area designations could provide more sites for species like the Texas trailing phlox, American chaffseed, white bladderpod and Louisiana black bear (see EIS Appendix I).

Fisheries and Aquatic including PETS

Affected Environment - Forests and Grasslands

There are about 353 miles of perennial streams on the the NFGT. Natural lakes and ponds account for approximately 25 acres of native fisheries habitat. The majority of fisheries habitat is found in artificial impoundments such as ponds, lakes and reservoirs as described in Plan Management Area 5.

Habitats

Both lake and stream habitats on the forests could be described as infertile and acidic, typified by conductivity values under 100 micromhos, pH less than 7.0, and total hardness under 20 ppm. Streams are characteristically slow-flowing and murky. There is a transition to clearer water and sandy substrates as you proceed eastward on the Forests. Natural lakes are typically stagnant and are recharged during high water events from parent rivers or streams.

Grassland streams are generally higher in pH and fertility, except in the cross timbers area, where there are both acidic and calcareous soils. Several streams on the Caddo National Grassland have been channelized and are highly eroded.

Fishes of the Forests

species were introduced into the State and have successfully become established. Another 48 species are those that typically inhabit brackish or salt water, and enter only the coastal streams. Of the remaining 159 species, 115 have ranges that include the waters of the pineywoods of East Texas. Of the 115 East Texas species, 92 are known or suspected to exist on or immediately adjacent to the lands of at least one of the four Texas National Forests. Nine species are currently listed on the Regional Sensitive List (six of which range within Texas National Forests). An additional species, the smalleye shiner, is native to the mid and upper Brazos River drainage and has not been documented in 20 years. Two species endemic to larger rivers may occur on both the Forests and Grasslands. There are 10 additional fish species and 15 mussel species proposed for sensitive designation on the Forests (Plan Appendix D).

Fishes of the Grasslands

Of the 218 species of fish recorded in the freshwaters of Texas, 83 are known or suspected to occur on one or both of the Grasslands, and 44 species are common to both of the Grasslands. The LBJ has another eight species not found on the Caddo, for a total of 52 species. The Caddo

has 30 species not found on the LBJ, for a total of 74 species. The shovelnose sturgeon is the only current sensitive species that occurs only on the Grasslands (Caddo). Seven of the newly proposed species may occur on both the Forests and Grasslands (6-Caddo, 1-LBJ).

Environmental Consequences of the Alternatives - Forests

Management practices as proposed in the alternatives do not have a significant effect on the fisheries resources in existing ponds, lakes, or reservoirs. All alternatives provide basic water quality and mitigation standards that would ensure sufficient water quality for these water bodies. Impacts of the alternatives are best summarized in the relationships between stream and water quality and those species associated with streams.

Most impacts to stream fisheries and other aquatic species are the result of intensive forest management practices where soil is disturbed or vegetation is removed. This results in erosion and siltation of associated streams and terminal reservoirs. The impact to lake habitats is in the form of silt deposition, and muddy water following storm events. Some stream species are silt intolerant, and sustained periods of siltation can eliminate them from a given area. Alternatives 6 through 7 would produce the best water quality for streams due to minimal timber activity, but could significantly reduce flows with the increase in vegetation in and along the 300 foot streamside corridors.

The Current Alternative (Alternative 1) impacts streams through silt from existing roads, road reconstruction, timber harvest, recreational activities, and oil and gas operations. The extent of these impacts is transient and short term, but improved mitigation and clear standards as proposed in Alternatives 2 through 8 could improve stream quality. Watershed volume in Alternatives 2 through 8 would increase flows through more intensive burning, which reduces water uptake by encroaching trees and brush.

INCREASED WATER YIELD BY ALTERNATIVE

Alternative Nos.	Period 1	Period 5
Alternative 1	104,966	130,120

Alternative 3	155,936	146,726
Alternative 4	129,830	143,605
Alternative 4a	138,604	156,834
Alternative 4b	136,988	151,386
Alternative 5	132,545	134,566
Alternative 6	106,875	113,461
Alternative 7	103,787	119,291
Alternative 8	130,516	146,416

Alternatives 2 and 3 will impact fisheries more than other alternatives due to elevated levels of timber and range activities and resulting siltation. Alternatives 6 through 7 will have the lowest siltation due to minimal erosive timber management activities. Alternative 4 would also result in improved habitat conditions for all areas of fisheries management. Alternatives 4 and 4b would have fewer water quality impacts on fisheries than Alternatives 1 through 3, 8 and 4a due to longer rotations.

Environmental Consequences of the Alternatives - Grasslands

On the Grasslands increased roads, grazing and off-road vehicle (ORV) trails would cause the most adverse impacts to streams. Alternatives 1 through 3 have the highest potential for siltation. Maintaining water quality in higher commodity alternatives will cost money and may negate the increased outputs and economic benefits due to mitigation measures for erosion and silt loading.

Game Species

Affected Environment - Forests and Grasslands

HUNTING SUPPLY AND DEMAND

Texas sells the second highest number of hunting licenses of all states in the country, which is a reflection of the quantity and quality of hunting opportunities available. However, the total number of hunters has remained stable for many years, rather than increasing with the total population. Close to 90 percent of Texas is privately owned and public hunting opportunities are limited.

Hunting is positively correlated with income; those with higher incomes tend to participate in hunting activities more frequently. Residents of Deep East Texas participate in hunting at a rate of 37.1 percent, or over double the statewide average of 16.7 percent. The North Texas Region residents' hunting rate was reported as being 17.5 percent, close to the statewide average.

Big Game

The most important game species on NFGT is the white-tailed deer. This species occupies the majority of the management and recreational interest. The wild turkey, both Eastern and Rio Grande subspecies, have generated considerable interest in recent years. These are the species that are considered "big game" by the Texas Parks and Wildlife Department.

Small Game

Historically small game species have been the primary species of interest in east and north Texas. This demand is however changing steadily and drastically. Squirrel harvest and pressure statewide has declined approximately 20 percent each year since 1987. A similar declining trend in hunter pressure is seen on NFGT lands. Bobwhite quail and quail harvest numbers are relatively low on all areas except the Caddo and LBJ National Grasslands. Harvest of this species is minimal on NFGT as a whole, yielding approximately three to five quail/hunter use day.

HUNTING SUPPLY

The USFS annual Recreation Inventory Management System (RIM) reports estimates of hunting on the NFGT. This information is difficult to verify but TPWD survey information indicates the NFGT estimates may be high, but the trends are very similar to TPWD surveys. RIM reports identified increasing trends for hunter recreation visitor days on the NFGT in recent years. Hunter activity estimates have increased approximately 50,000 RVD's (recreation visitor days) or WFUD's (wildlife and fish user days) between 1985 and 1990. The estimated hunting RVD's are as follows:

HUNTING RECREATION VISITOR DAYS - NFGT

1985	1989	1990
202,700	242,100	248,800

This hunting use equates to approximately 3 acres per RVD's. This contrasts to public hunter pressure estimates statewide that average about 5 acres per hunter trip. This disparity indicates higher hunter pressure on the USFS lands.

HUNTING DEMAND

The Texas Outdoor Recreation Plan (TORP) ranks projected participation in many outdoor recreation activities. The projections are driven primarily by population growth. Hunting is projected to increase at 12 percent in 10 years, somewhat less than other wildlife related activities and fishing, but more than picnicking, ORV use, and swimming.

White-tailed deer have been and continue to be the most important species recreationally and commercially in Texas. The NFGT provides excellent habitat for this species, and recent population surveys indicate just over 10,000 deer occupy NFGT lands. Historically, the deer populations have fluctuated in east Texas primarily as a result of poaching and poor land management practices in the first half of the century. These problems have been addressed in recent years and increased recreational hunting for the white-tailed deer continues to be monitored.

Gray and Fox Squirrels have been the primary small game species hunted in the forests for many years. Gray squirrel populations seem to be more dependent on annual mast production.

habitat from large, contiguous forests to fragmented tracts.

Wild Turkey can be found on the forested and cross timber areas of the NFGT, and some of these areas are capable of supporting abundant flocks of this species. On the NFGT, this species had almost disappeared until a restoration program was initiated in 1987 by the Texas Parks and Wildlife Department. Today, due to these efforts and availability of suitable habitat, this species is found on most NFGT areas. Though only limited opportunities exist for hunting at present, it is anticipated that the recreational opportunity for hunting wild turkey will become more and more in demand.

Bobwhite Quail have long been the most popular upland game bird in Texas. This species is very popular on the Grasslands and to a lesser extent on the Forests. RCW management expected to produce open stands of mature pine in and around clusters, recruitment and replacement stands will also provide quail habitat. As habitat practices like prescribed burning continue to increase, recreation directly involving quail hunting will increase.

Environmental Consequences of the Alternatives - Forests

Alternatives 4-4b and 8 provide the best overall habitat for all game species increase (especially quail), as habitat improves through frequent burning regimes and rotations beneficial to squirrels are longer. Alternative 1 has high rating for some small game due to rotations and actions that favor these species, but big game and squirrel habitat is less than other alternatives. Hunting will increase with expanding game populations and conflicts between hunters and other groups may

become more pronounced. Alternatives 3, 4, 4a, 4b and 8 provide the best habitat for big game (white-tailed deer) for the next 50 years.

BIG GAME USER DAYS

Alternative Nos.	**Period 1**	**Period 5**
Alternative 1	1,068	1,329
Alternative 2	13,179	12,942
Alternative 3	14,011	13,724
Alternative 4	15,762	18,954
Alternative 4a	16,398	17,983
Alternative 4b	16,308	19,443
Alternative 5	11,165	11,495
Alternative 6	3,628	1,305
Alternative 7	11,769	11,958
Alternative 8	14,679	17,317

Small game potential is a combination of upland (quail) and bottomland (gray squirrel) and hardwood associated species (fox squirrel) species. Alternatives 8, 4-4b and 5 indicate high small game potential due to longer rotations and frequent burning regimes that benefit both squirrel and quail respectively. However, Alternative 1 exceeds all alternatives due to the positive response of early successional habitat for quail. Later period development of bottomland hardwood changes alternative comparisons, indicating 4-4b, 5 and 8 have higher potential for small game due to older forest stands benefitting squirrel habitat.

Alternatives 3, 6 and 7 may experience a slight increase in game numbers due to an increase in habitat development. Hunters and and other recreationsist will continue at consistent levels as in the past as game populations remain about the same.

SMALL GAME USER DAYS

Alternative Nos.	**Period 1**	**Period 5**
Alternative 1	229,650	234,470
Alternative 2	165,257	205,313
Alternative 3	158,157	209,906
Alternative 4	177,677	247,897
Alternative 4a	170,113	239,875
Alternative 4b	174,500	252,029
Alternative 5	173,958	236,171
Alternative 6	137,541	206,906
Alternative 7	143,231	191,046
Alternative 8	176,278	230,621

Environmental Consequences of the Alternatives - Grasslands

Hunting and game populations on the Caddo and LBJ National Grasslands would not change significantly in Alternatives 1 through 3. There may be some increase in quail numbers and/or harvest levels due to more clearing for increased grazing. In Alternatives 4 through 8, greater emphasis on wildlife related recreation, habitat improvement, and fewer conflicts between

hunters and permittees would enhance the game species opportunities. The differences in habitat for the various species do not change appreciably between alternatives.

Management Indicators

Affected Environment - Forests and Grasslands

Management indicators (MI) are used to provide management direction through objectives established to achieve the desired future condition and to assess through monitoring the effects of management on an ecosystem. They provide measurable objectives to direct management in support of the entire spectrum of native and desirable non-native species.

The implementing regulations for the National Forest Management Act of 1976 (NFMA) requires the Forest Service to plan the management of wildlife habitats to "maintain viable populations of existing native and desired non-native species in the planning area."

Nine Management Indicator Species (MIS) are identified in the 1987 Plan. Additional species were added during the revision process to provide a large range of indicators for habitats and threatened or endangered species; this large list of species and groups were described in the DEIS. In the DEIS 57 species, communities, or habitat conditions were selected as management indicators to represent the habitat needs for the fauna and flora present on the NFGT; these provided a basis for evaluation and public comment. Between DEIS and Final, a number of changes were made in the Management Indicators list based on comments from the public, USFS research, Texas Parks and Wildlife Department, and university personnel. The revised list was

(see Appendix F). These species are summarized in the following table by vegetation group.

Vegetation Groups	Management Indicator
1 **Longleaf Pine Woodlands & Savannas**	Red-cockaded Woodpecker Incised Groove Burr Slender Gay Feather
Scarlet Catchfly	
Longleaf - Bluestem Series	
***Longleaf Pine Barrens**	Little Bluestem-Rayless Goldenrod Series
Navasota Ladies Tress	
***Herbaceous Wetlands**	Yellow Fringeless Orchid Spagnum - Beakrush Series
***Bay-Shrub Wetlands**	Nodding Nixie Texas Bartonia
Sweetbay - Magnolia Series	
2 **Xeric Pine & Pine-Oak Forests**	Red-cockaded Woodpecker Louisiana Squarehead
Shortleaf-Oak Forests	
3 **Dry-Mesic Oak-Pine Mixed Loblolly Forests**	Red-cockaded Woodpecker Loblolly-Oak Forests Hardwood Forests
4 **Mesic Hardwood Forests**	Southern Ladyslipper Beech - White Oak Series
5 **Tallgrass Prairie**	Bobwhite Quail
Little Bluestem-Indiangrass	
6 **Bottomlands Streamsides**	Neotropical Migrants** Neches River Rose Mallow
Bottomland Hardwood Forests	
7 **Common to All Land Areas**	Snags Whitetail Deer
Eastern Wild Turkey	
Gray Squirrel	
Fox Squirrel	
Yellow Breasted Chat	
Pileated Woodpecker	
8 **Reservoirs and Ponds**	Largemouth Bass Sunfish (Bluegill & Redear)
Channel Catfish	
9 **Streams and**	Paddlefish
Scaly Sand Darter	
Sabine Shiner	
Dusky Darter	
Stonefly Guild	

* Inclusional community or habitat groups within the Longleaf Pine Woodlands.

Flycatcher and others.

Environmental Consequences of the Alternatives - Forests

1. Longleaf Pine Woodlands Group - Alternatives that favor longleaf pine acreage have potential to benefit MIS for longleaf habitats. This habitat grouping will be developed more in Alternative 8 than any other alternative. A more critical factor for the majority of these Management Indicators (MIs) is the frequency and timing of prescribed burning. These MIs depend upon frequent burning (including growing season burns), which is prescribed more aggressively in MA-2 in all alternatives.

TOTAL PRESCRIBED FIRE ACRES BY ALTERNATIVE

Alternative Nos.	**Period 1**	**Period 5**
Alternative 1	354,734	375,383
Alternative 2	876,588	915,745
Alternative 3	893,347	934,317
Alternative 4	828,279	847,264
Alternative 4a	996,481	1,031,305
Alternative 4b	997,159	1,068,852
Alternative 5	909,060	960,830
Alternative 6	109,497	112,135
Alternative 7	942,982	975,564
Alternative 8	992,623	1,069,636

1a. Longleaf Pine Barrens - This herbaceous grassland group is generally small (less than 100 acres in size), and occurs in a complex of oak and longleaf pine. Shallow droughty soils provide a unique environment for a variety of species and forms. Management activities in alternatives

that favor longleaf restoration and frequent burning regimes (MA-2) benefit this group. Designation of Catahoula Barrens as a special area in Alternatives 3 through 5, or within Longleaf Ridge in Alternative 8 is associated with intensive burning regimes and provides the best opportunity to enhance species in this group like the endangered Navasota Ladies Tress.

1b. Herbaceous Wetland Group - Herbaceous wetland MIs primarily represent bogs and seeps associated with longleaf pine savannas. These indicators will primarily benefit from inclusion in special areas as in Alternatives 3, 4, 4a, 4b, and especially 5 and 7. Alternative 8 develops Longleaf Ridge, coordinated with RCW management, as a landscape that will allow this microsite to proliferate. Special area management promotes frequent burning regimes that are site specific and that these areas require. Alternative 4, with its additional wildlife and RCW emphasis also provides the optimum area with appropriate fire regimes. The presence of beakrushes, pitcher plants, and Toothpick grasshoppers are indicative of healthy bogs and seeps. In quality sites, yellow fringeless orchids may occur. Red bay, when in dominance, indicates a need for more frequent burning. The greatest concentration of bogs on the Forest are in Upland Island Wilderness. These may deteriorate in Alternatives 1 and 6 with the lack of prescribed fire.

1c. Bay-Shrub Wetland Group - These communities are composed primarily of evergreen shrub thickets associated with seeps, swamps edges, and ephemeral floodplains. These wetlands are many times associated with herbaceous wetland communities. Though not completely, these

Texas Bartonia, and sweetbay-magnolia community. Due to topographic proximity of this group with mesic hardwoods and the similarities in response to management, the effects of the alternatives can be considered the same.

2. Xeric Pine & Pine-Oak Group - MIs in this group will see benefits in alternatives that allows development of mixed forest in dry upland conditions. Initially, Alternative 6 will provide almost as much pine-oak forest as Alternative 1; but the lack of prescribed fire will ultimately result in a hardwood climax, as the short-lived pines are unable to regenerate in a heavily shaded environment. Alternatives that promote more acreage with frequent fire such as Alternatives 4, 4b and 8 will show more rapid improvement and MI development through time.

3. Dry-Mesic Oak-Pine Mixed Loblolly-Hardwood Group - These MIs will benefit in alternatives that allows development of mixed forest in stream corridors. Stream widths (SMZ's) and special area designations that preserve floodplain areas may include substantial pine-oak habitats. SMZ's in their transition from pine to hardwood, will contain much pine-oak habitat. Alternative 6 will provide almost as much pine-oak forest as Alternative 1; but the lack of prescribed fire will ultimately result in a hardwood climax; this may improve situations for Mesic Hardwood species, but would be detrimental to species like the RCW.

4. Mesic Hardwood Group - Mesic hardwood forests occur primarily on slopes adjacent to stream bottoms or large river terraces. Management Indicator (MI) plant species found in these communities are adversely affected by fire. Alternatives that prescribed fire in these habitats are unfavorable to community maintenance and propagation. Alternative 1 does not provide specific management for these areas. Alternative 2 is similar except for the inclusion of Mill Creek Cove as a Research Natural Area, which possesses a large component mesic hardwood forest. The inclusion of floodplain soils in MA-4 within Alternatives 3, 4, 4a, 4b, 5, 6, 7 and 8 will benefit this group. Alternative 5, with the inclusion of additional special areas in this community type, will afford more protection than other alternatives. Alternative 8 has a greater emphasis on development of the SMZ, with specific objectives for development of the riparian character and a 100 foot zone along all intermittent and perennial streams to enhance soil and water protection.

5. Tallgrass Prairie Group - Tallgrass prairie MIs have been primarily selected for monitoring the health of Grasslands habitats, but may also apply to natural openings and some forested grasslands on the National Forests. Bobwhite quail require a mixture of short and tall grasses and forbs for nesting and foraging. Grassland Alternatives 2 and 3, with increased burning and rangeland may have some beneficial effect, but heavier grazing response to more open grassland. The increase in native grasses under Alternatives 4, 4a, and 4b will improve quail habitat. The presence of cattle in riparian areas will impact the species associated with this community. Little bluestem and Indiangrass plant communities and the occurrence of other plant species will be best represented under Alternatives 4 through 8, with the increases in burning and native grass establishment.

6. Bottomlands and Streamsides (Aquatic) Groups - These species receive the most consideration under Alternatives 6 and 7, where they will represent almost 18 percent of all management area acreage. Alternatives 2, 3, 4, 4a, 4b, 5 and 8 will afford SMZ's on eight percent of the acreage, with additional inclusion of floodplain soils in special areas. Macroinvertebrates like the stoneflies are indicators of water quality. Alternatives that best insulate streams from soil disturbing activities and other proximal activities that impact water

Dobsonfly larvae, and riffle beetles. Dragonfly nymphs, scuds, crayfish, sowbugs, beetle larvae, crane fly larvae, and damselfly nymphs will typify moderate SMZ alternatives. Aquatic worms, midge larvae, blackfly larvae, leechs, and pouch snails characterize alternatives that inadequately protect or impact SMZ's and water quality. Reservoir fishes such as Bass, and the prey sunfishes, and channel catfish are not impacted appreciably in any alternative.

7. Common Habitats - Management Indicators (MIs) common to all areas have been selected due to: (1) Public demand for consumptive and recreational purposes; and (2) the extent of riparian associated species that occur in and through all terrestrial habitats. Some of these species benefit as a by-product of management for other species. For example, deer and especially turkey and quail, benefit from habitat conditions produced in RCW management. Maximum HMA designation, as in Alternatives 4 & 4b, will provide the best habitat for turkey, deer and quail and older forest stands benefitting squirrel. The open pine stands with mid and understory control, through burning and mechanized means, provide a lower successional stage that is manifest in grasses, forbs, and sprouting shrubs and hardwoods. Prescribed burns stimulate the germination of preferred food plants and the prevalence of arthropods, which are critical to the survival of gallinaceous young.

Alternative 4, will provide additional specific management benefits for each of these species. Alternative 4b and 8 will provide more ecotone area or edge than Alternative 4. Ecotone, or edge areas, are important to deer, quail, and turkey for cover and foraging. Of course, alternatives that entail more even-aged timber harvest will benefit deer and quail initially in providing maximum browse and cover. Alternative 4b provides a better mix of management with MA-1 and MA-2 management emphasis. Minimum HMA alternatives (Alternatives 2, 3, and 4a) and moderate HMA alternatives (Alternatives 5 and 7) will provide the same benefits as Alternatives 4 and 4b, but in smaller increments. The lack of prescribed fire under Alternative 6 will be a detriment to deer, turkey, and quail.

Hardwood mast is also an important seasonal component of deer and turkey habitat. Gray and fox squirrels are additional demand MIs that specifically require mature hardwood forests and riparian areas for mast and cavities. Oak-pine, oak-hickory, and oak-gum-cypress forest types are preferred by gray squirrels. Maximum SMZ/bottomland forest alternatives (Alternatives 6 and 7) will benefit gray squirrels, followed by Alternatives 5, 4 through 4a, 3, and 2 as a group.

These combinations of oak-pine (mixed forest) emphasis alternatives, will best suit the fox and gray squirrel.

Wildlife & Old Growth

Affected Environment - Forests and Grasslands

There many references that identify requirements and benefits of old growth forest relative to wildlife, but few are founded in species-specific are derived from long-term data. Interpretation of datasets is also confounded by the use of general forestry descriptors. Most habitats, that could contain "old growth" are typed as "saw timber", (based on size class). The interpretation as to when saw timber is functioning as old growth is highly subjective.

Birds provide the best basis for old growth analysis due to their specific habitat requirements, such as vertical stratification, forest type and block size. The type of tree and forest type are

focus more on a combination of habitat parameters (such as dead, down or snag material).

Amphibians

Pearson et al (1987) showed that amphibian occurrence was more closely tied to the availability of water than differences in stand size classes. He documented 15 taxa in loblolly shortleaf pine sites of all size classes. Scott (1990) found that the relationship between woodland salamanders and their forest habitat is more complex than previously thought. He observed that salamanders persisted after logging, but suggested that reproduction and juvenile survival, over the long term, may be insufficient to maintain populations. Williams and Mullin (1986) observed much greater numbers and diversity of species in loblolly-shortleaf sawtimber than poletimber, sapling or regeneration. He did qualify that there were more water sources in the sawtimber types, however. Whiting (1987) generally found more amphibian abundance and diversity in seedling loblolly-shortleaf than sawtimber, but also cited numerous circumspect hydrologic factors. In longleaf-slash, Williams and Mullin (1987) found much greater numbers and diversity in sawtimber, while Pearson et al (1987) noted uniform distribution across all habitat types.

The habitat preferences of many species are a by-product of old growth forests. Large rotting logs, debris and heavy detritus are typical of forests that are old enough to have dead trees and the prevalence of debris from broomed branches and multiple layers of leaves and needles. Such layering retains ground moisture, preventing skin desiccation and providing for the proliferation of arthropod food items. It is somewhat clear that older forests are important for amphibian diversity and certain species, but can be limiting in the absence of water.

Birds

Most effort in old growth analysis for wildlife has focused on the requirements for various bird species. The Land Manager's Guide to Bird's of the South (Hamel 1992) was beneficial in this process. This work is a compilation of 32 years of census data, cross-referenced with habitat/forest types. The matrices were arranged by grass/forb, shrub/seedling, sapling/poletimber and sawtimber (minimum 9" DBH conifer, 11" hardwood) successional types and specific habitat requirements like leaf litter, overstory and minimum tract size. These were intersected with species occurrence in breeding and/or wintering seasons.

For our purposes, all species that used sawtimber for wintering and/or breeding in Texas, were selected and compiled into tabular form for ease of analysis.

Of particular importance for management parameters, are tree age and minimum block size. Both are rather difficult to qualify in the literature, but some references are helpful. Conner and O'Halloran (1987) found that cavity trees, selected by red-cockaded woodpeckers, averaged 126.4 years in longleaf and 86.9 in loblolly/shortleaf pine types where younger trees were also available. The youngest cavity tree, presumed to be loblolly/shortleaf, was 64 years old. This information is significant in that this bird is the only species that requires living conifers for cavity excavation. An important factor is the presence of red heart fungus (Phellinus pini) in most of these trees. This fungus softens the heartwood, greatly easing the excavation of cavities. Wahlenberg (1946, 1960), in Conner and O'Halloran (1987), found the frequency of heartwood fungi to be low in loblolly pines younger than 75 years and longleaf pines less than 100 years old. Conner and Locke (1982) found that 47% of longleaf (mean age 108 years) and 100%/87% of respective loblolly/shortleaf (mean age 90 years) cavity trees, on the Angelina National

an important requisite for optimal red-cockaded woodpecker habitat, as well as secondary cavity users.

Information on tree age relative to old growth habitat requirements in hardwood forest types is extremely limited or absent in the literature. Most of the work deals with old growth by-products, such as snags and mast production. Numerous studies have been conducted on the habitat benefits of snags and associated "dead and down" material (Conner 1978, Dickson et al 1983, McComb and Noble 1981, Noble and Richardson 1994, Waters et al 1990).

It is important to consider how much old growth is needed for wildlife needs. This question has been extensively probed through bird habitat studies relative to forest fragmentation. Many of these studies and surveys were compiled in Hamel (1992). The unfragmented, forest block size requirements for several species are cited in Hamel (1992) and O'Halloran and Conner (1987).

Wildlife Habitat Fragmentation

Affected Environment - Forests and Grasslands

Fragmentation of forest communities is an issue that is generally defined as the cutting or opening up of closed canopy forests. This effect creates forest "fragments" that may become smaller and smaller patches through time. Some wildlife species benefit from these practices and increased "edge" habitat; other species are negatively impacted by fragmentation. Generally the species with large home ranges are affected most by fragmentation. Grassland species are generally not identified with fragmentation concerns; this section will limit discussion to forested communities and alternative fragmentation potential.

Species identified that may be good indicators to consider related to fragmentation include pileated woodpecker, red-cockaded woodpecker, and a bottomland guild of bird species including the acadian flycatcher, wood thrush and yellow-throated vireo. Pileated woodpeckers have the largest forest block requirement of 1000 acres; the other species range less than 100 acres in size. Discussion of the effects on these species and "impact" of fragmentation in general in relationship to the 10 alternatives is as follows:

Environmental Consequences of the Alternatives - Old growth and Fragmentation

In all alternatives, certain mitigation measures assure limits to fragmentation potential. Opening size or clearcut size is limited to no more than 80 acres in all Alternatives 6 and 7 in MA-1, patch size in MA-2 and MA-6 is generally limited to 25 acres or less. In addition any regeneration site must be separated by at least 330 feet and adjacent regeneration must allow significant growth

before a second site is harvested. Mineral activity has been evaluated regarding its contribution to fragmentation and has been found to be neglible; being generally less than 0.2 percent of the forested areas and with reclaimation activities equalling the exploration activity. Old growth would be available in special areas and streamside zones, generally this allocation increases in alternatives 4-8.

Alternatives 6 and 7 will provide the largest potential for unmodified, closed canopy old growth forest; however the communities would be limited to those that do not require frequent fire. Large riparian areas and mixed forest uplands will benefit pileated woodpecker and the

species. Limited mineral exploration in these alternatives will also decrease fragmentation.

Alternatives 1, 2 and 3 will have the most potential for fragmentation due to fewest special areas and more area with shorter rotations. Old growth conditions would exist at approximately the levels now available. Species such as pileated woodpecker would be most effected.

Alternatives 4, 4a, 4b, 5 and 8 provide increasing amounts of special area designations and larger MA-2 allocations (which have limits to regeneration in the habitat management area). Species such as the bottomland hardwood guild and pileated woodpecker are afforded substantial areas of unfragmented older forest, and MA-2 areas are large providing upland pine forests and woodlands that benefit species associated with RCW.

Part I (c)

The Biological Environment

Special Areas

The ecosystems on the National Forests and Grasslands in Texas (NFGT) encompass a variety of habitats for many native plant and animal species. These ecosystems also provide a natural setting to maintain and protect culturally significant areas providing many historic, educational and recreational benefits. These resource values are many times best managed through designation of special areas. This special designation helps to ensure their exemplary recognition for research, recreation, and for future reference. The character of these areas is both biological and social, however in this document the discussion of the environment and the consequences of implementing the various alternatives will be discussed in the biological segment of this Environmental Impact Statement (EIS). The following sections of Chapter III, I(c) will describe the considerations and consequences of the various alternatives on special area allocations in the following order: Wilderness, Wild and Scenic Rivers, Research Natural, and other Special Areas (Botanical, Scenic, Cultural and Historic).

Wilderness

Affected Environment - Forests and Grasslands

Wilderness areas that are designated and Roadless Areas that are proposed for wilderness in the alternatives are managed according to standards and guidelines that appear in Management Area 7 (MA-7). These wilderness allocations by alternative, have a significant impact on not only the resources and associated activities within their boundaries, but on the activities and resources that are adjacent to wilderness.

While the Wilderness Act of 1964 emphasizes the protection of pristine areas, it also recognizes recreational values of benefit to contemporary Americans. Wilderness areas provide opportunities for solitude in a primitive and unconfined recreational environment. Other uses, such as education, science, habitat preservation, and ecosystem preservation, are also recognized. Species diversity, protection of threatened and endangered species, protection of watersheds, scientific research, and social values, are other consideration in wilderness management.

The NFGT Wilderness were officially designated in October 1984, and then were established as a management area on May 20, 1987, when the Regional Forester signed the Record of Decision for the Final Environmental Impact Statement and Land and Resource Management Plan. This Plan specified standards and guidelines for management of wilderness in Texas. Since 1987, approximately 2,000 acres of wilderness have been added to the five areas through landownership adjustments and purchase. These wilderness areas and current acreages are as follows:

Table 1. Five Wilderness Areas on the NFGT, 1993

Area	**Acreage**
Big Slough	3,639
Indian Mounds	11,091
Little Lake Creek	3,810

Upland Island	13,390
Total	37,216

All five wilderness area are completely within the proclamation boundaries of the NFGT and the Forest Supervisor is delegated the administrative responsibility for the management of these areas.

According to annual Monitoring and Evaluation Reports, registration, monitoring, and site inspections indicate that overall use in wilderness is well within established carrying capacities. The carrying capacity of wilderness is 2.0 Recreation Visitor Days (RVD's) per acre. This capacity is based on management toward a Primitive Recreation Opportunity Spectrum (ROS) opportunity. Current use is only one-tenth (1/10) of the potential use of the existing 37,216 acres of wilderness.

As stated in the current Forest Plan standards and guidelines, "If use should exceed two RVD's/acre/year, methods may be necessary to control the amount of use (i.e. permit system)." Use in some small localities [e.g. in Indian Mounds, Little Lake Creek and Turkey Hill near the southern pine beetle (SPB) treatment sites] has greatly exceeded two RVD's per acre due to the interest in the treatments.

The wilderness boundaries are all well defined and properly marked on the ground. Trail head parking areas have been established adjacent to all five wilderness areas. The trailhead areas provide off-road parking for several vehicles, an information board, and a visitor registration station. Wilderness management as directed in the alternatives varies. Significant management issues in addition to the recreation use and management are as follows:

Grazing in Wilderness

Grazing permits within NFGT wilderness (9-Upland Island, 1-Little Lake Creek and 2-Indian Mounds) is a concern addressed in the Five-Year Review/Analysis of the Management Situation (AMS) in 1992. No new grazing permits are expected to be issued and grazing will be incidental after remaining permittees choose not to have their authorizations renewed or are terminated.

Mineral Ownership in Wilderness

As in the rest of the State of Texas, U.S. land ownership of wilderness does not always include U.S. ownership of mineral rights. On the Big Slough and Little Lake Creek Wilderness Areas all mineral ownership is in U.S. hands. On the remaining three wilderness areas, some of the mineral rights are not in U.S. ownership. Mineral rights on the Upland Island Wilderness are mostly in private ownership held in perpetuity (will not revert to U.S. ownership). On the Turkey Hill Wilderness, there is a small amount of U.S. mineral ownership but most is in private ownership in perpetuity. In the Indian Mounds Wilderness, a sizable percentage of the mineral ownership reverted to the U.S. in 1985 and 1990, but the bulk of the remainder is in shared U.S. and private ownership or in private ownership held in perpetuity. Where the mineral estate is privately owned, the mineral owner/lessee has the right to explore and/or develop their mineral resources, regardless of the wilderness designation. However, the Forest Service works closely with proponents in an effort to minimize impacts to the wilderness resource to the extent possible.

Southern Pine Beetle

The southern pine beetle (SPB) continues to be a major problem in Texas' wildernesses. Existing stands of mature timber in the wilderness are prime targets for the beetle, and when infestations are not controlled, SPB may threaten pines on adjacent private land or general forest area.

Control actions in wilderness to protect endangered species and private land have met with considerable objection from environmental groups because it is thought they conflict with the objectives of wilderness.

Currently, about three-fourths (3/4) of existing pine stands in Indian Mounds and about one-third (1/3) within Turkey Hill have been killed by SPB. The development of these infestations appears to be coincident with epidemic SPB populations in surrounding areas, rather than the causal agent.

Fire

Use of fire to protect and preserve natural communities and to maintain habitat for the endangered RCW are significant concerns. These issues are relevant to wilderness management because some of these natural communities and some RCW habitat occurs in wilderness and have evolved through natural disturbances such as fire.

The Texas Natural Heritage Program (TNHP) Report (1990) recommends prescribed burning for certain wilderness areas where sensitive plants occur. The Stark Tract, a RARE II evaluation area for proposed wilderness, and Upland Island (Graham Creek) Wilderness Area is recommended for prescribed burning to perpetuate longleaf pine community and inhibit woody invasion in the savannas, bogs, and barrens.

Wildfire has occurred in several instances. Currently, a great hazard to firefighters exists due to the tremendous number of standing dead snags within the wildernesses affected by southern-pine beetle infestations. Present management plans call for putting out all fires by handtools unless the intensity of the fire and fire weather conditions indicate that control of the fire is not possible by handtool methods. When this occurs mechanical means are utilized to the extent necessary to control the fire with the least amount of damage. Afterward, firelines are restored to eliminate evidence of mechanical use.

Prescribed burning is not presently a management tool in Texas wilderness. However, prescribed burning has been suggested through public involvement and scoping (Ongoing Limits of Acceptable Change for Wilderness or LAC) to maintain natural conditions or fire dependent ecosystems. Alternatives have various strategies to allow some fire management in wilderness.

Roadless Area Review and Evaluation (RARE II).

In 1979, the Forest Service issued a Final Environmental Impact Statement (FEIS) documenting a review of 62 million acres of roadless and undeveloped areas. The purpose of RARE II was to determine which areas were suitable for wilderness. The RARE II was the basis for recommending that Congress designate 15.1 million acres as wilderness (see FEIS Appendix D).

The National Forest Management Act (NFMA) directs that unless otherwise provided by law, roadless areas within the National Forest System will be evaluated and considered for

Plan Revisions). Roadless areas subject to evaluation include those previously inventoried in RARE II, in a unit plan or in a Forest Plan which remain essentially roadless and undeveloped, and which have not yet been designated as wilderness or non-wilderness by law.

Sevnteen roadless areas were identified as proposals during scoping for the Forest Plan Revision, all but one area was previously identified for NFGT in RARE II (see FEIS Appendix

D). The one area not previously identified, Longleaf Ridge, overlaps one RARE II study area (Jordan Creek) and part of a second roadless area (Graham Creek).

The roadless areas total about 69,000 acres. All of the 17 roadless areas have several qualities in common; the amount of existing wilderness in the surrounding area, landform (ridgetops, floodplains, stream terraces), vegetation and other natural features, all of which are also found in other NFGT wilderness areas.

Alternatives 1-8 all contain existing wilderness areas. Some of the roadless areas evaluated in FEIS Appendix D are included in Alternatives 5, 6 and 7. It was determined that in general these areas were undesirable wilderness candidates. If alternatives 5, 6, and 7 were selected as the preferred however, the roadless areas could be recommended to Congress for wilderness designation if actions were taken to correct those criteria that did not conform to wilderness standards.

Environmental Consequences of the Alternatives
(Wilderness)

Alternatives 1 through 4b and 8 would maintain the same wilderness boundary; however areas would be adjusted to include lands acquired through exchange, increasing the acreage of 37,162 slightly.

Alternative 5 increases wilderness acres to 42,229 acres with the addition of RARE II areas **Big Woods** and **Winters Bayou** on the Sam Houston National Forest, and the **Indian Mounds** addition on the Sabine National Forest.

Alternative 6 adds the following roadless areas evaluated in FEIS Appendix D: **Longleaf Ridge** on the Angelina National Forest; **Harmon Creek** on the Sam Houston National Forest; the **Big Slough** addition and **Alabama Creek** on the Davy Crockett National Forest; **Beech Ravines** and **Stark Tract** on the Sabine National Forest. These roadless areas, in addition to the areas added in Alternative 5, for a total of 97,413 acres. Alternative 7 has 70,470 acres in wilderness. The only difference in Alternatives 6 and 7 is the inclusion of Longleaf Ridge as wilderness in Alternative 6.

The existing wilderness areas are receiving light use with a total of 11,000 Recreation Visitor Days. The existing acreage can easily receive 54,000 Recreation Visitor Days use before being considered fully utilized. Additional wilderness at this time will limit the options for dispersed recreation and wildlife management on those acres considered. Alternative 6 would provide the largest acreage in wilderness and an estimated 275,000 RVD's through the first 10 years, expanding to about 400,000 RVD's at the end of 50 years.

differences may exist in Alternatives 2 through 8 if RCW habitat in wilderness is designated essential or non-essential. Non-essential designation would allow SPB infestations to continue regardless of impact to RCW clusters and habitat within wilderness, control actions in wilderness would only take place if the potential impacts to private landowners adjacent to wilderness or other high valued resource, RCW or other, (such as Endangered Species habitat outside of wilderness) were threatened. In these situations the current strategy would continue as per the SPB EIS.

Prescribed fire could be implemented in Alternatives 2 through 5 and 8, pending site specific prescribed burning plans. These management actions would enhance habitat for a variety of

species, decrease the potential for catastrophic wildfire, and allow the natural processes to work in the fire-adapted upland pine ecosystems.

Wilderness additions have a direct impact on commodity related goods and services. The acreage allocated to wilderness reduces the mineral leasing and exploration, timber harvest, and permitted grazing. Alternatives 6 and 7 indicate the degree of impact (EIS Appendix B) with the lowest combined minerals, timber, and grazing income of $13,500,000 and $16,000,000 respectively; a 30-40 percent decline from 1987 Forest Plan activities.

Wild and Scenic Rivers

Affected Environment - Forests and Grasslands

The 1987 Forest Plan stated "The potential exists for designation of the Neches River as a segment of the National Wild and Scenic River System of Waterways. A few tracts of U.S. land within the Angelina and Davy Crockett National Forests lay adjacent to or near the river and often provide camping and access points for river users. A formal decision on any future designation for the Neches River hinges on initiation and completion of a study of the river by the State. In order to provide interim protection of public lands potentially important in such a designation, protected status is assigned to all National Forest lands within one-quarter of a mile of the Neches River. This status will continue until a study is completed, and a formal recommendation made by the State of Texas. At that time, the protected status of the affected tracts will be changed to be consistent with study recommendations. If a study is not completed prior to the next planning period, the protected status of the properties will be reconsidered."

The Neches River Corridor is a "protective area", covering 1,950 acres on the Angelina and Trinity Ranger Districts, and is one of six areas within the general forest that are special management areas in the 1987 Forest Plan.

The 1987 Forest Plan did not consider any other than the Neches River because only the Neches was both identified on the Nationwide Rivers Inventory and is adjacent to Forest Service lands. Rivers identified as potential candidates by the State, such as the Angelina were not examined.

The Forest Plan did not determine eligibility of the Neches and did not determine potential classification as wild, scenic, recreational, or a combination of the three classifications. The Plan did provide protection to the Neches River Corridor (including no timber harvesting) and is currently managing the one-quarter mile corridor under a special interest area prescription, Management Area 14 in the current Forest Plan. No other rivers were addressed or identified as

(WSR) status.

The AMS provided the following information regarding potential Wild and Scenic Rivers and Private Land:

The Forest Service Manual (FSM) 1924.03 states Forest Service policy regarding wild and scenic river evaluation. River studies should be completed as expeditiously as possible while giving priority to studying those rivers most threatened by adverse developments and use and those bordered by the greatest proportion of private lands. River studies should be conducted in close cooperation with affected Federal and State agencies. The studies include a determination of possible State participation in the preservation and administration of the river if added to the System.

Where an identified river touches only a small part of a National Forest (NF), the lead responsibility for studying the river should rest with either another Federal agency or the State depending on who has jurisdiction over the largest proportion of the lands involved. In this case, use the following approach [Forest Service Handbook (FSH) 1909.12, section 8.14]:

1. "The NF should contact the other Federal agency to determine if or when it plans to study the river as part of its land management planning process. The NF may invite the agency or State to participate in a joint study for the river."
2. "The FS and other Federal or State agencies should prepare a joint river study report, either as part of the Forest Plan/EIS or as a separate study report."
3. "If the responsible agency or State declines to study the river or if its study schedule does not coincide with forest planning, develop prescriptions in the forest plan that provide protection for the river and adjacent lands of the river segment(s) on NFS lands."
4. "Where the river segment that extends into the NF would make a viable addition to the NWSR System without the remainder of the river, the NF should proceed to assess the segments' suitability on its own merits."

Regarding the potential for possible future designation of Wild and Scenic Rivers on or adjacent to the NFGT, twenty-eight creek and river segments were considered for further evaluation on the four National Forest and two National Grassland Units. Of these, eleven segments exhibited enough potential for further evaluation. Stephen F. Austin State University, under a Challenge Cost Share Project with the USDA Forest Service, evaluated the eleven river segments in or near National Forests in Texas during the summer of 1993 for potential eligibility for inclusion in the Wild and Scenic Rivers System. Where possible each segment was canoed, however due to low flow conditions several segments were monitored from the stream bank. The determination that a river segment passed an eligibility evaluation in this study did not necessarily mean that the segment would meet suitability standards and be admitted to the Wild and Scenic Rivers System (see EIS Appendix E).

To be eligible for a Wild and Scenic designation, a river must be free flowing and possess one or more outstandingly remarkable value. The categories in which the values are separated are: Scenic, Recreational, Geologic, Botanic, Wildlife, Historic and Cultural. Of the eleven segments evaluated, the Neches River (on the Davy Crockett and Angelina National Forests), Henry Lake Branch and Winters Bayou (Sam Houston National Forest) and the Attoyac River appears to

Appendix E Table 3).

Environmental Consequences of the Alternatives

(Wild and Scenic Rivers)

The current situation provides for a 1/4 mile corridor along the Neches River that requires special management until Texas Parks and Wildlife Department initiates a study to determine the potential of the river for formal designation. The current situation affects the Davy Crockett and Angelina National Forests. Alternatives 2 and 3 would be no change from the present. Alternatives 4, 4a, 4b and 8 increase NFGT wild and scenic designation by adding the Winters Bayou segment as a candidate stream. Alternatives 5, 6 and 7 would be the same as Alternative 4, but would also include as a Wild and Scenic River candidates the Attoyac River in Alternatives 6 and 7 on the Angelina National Forest and Henry Lake Branch in Alternatives 5, 6 and 7 on the Sam Houston National Forest.

The following chart provides information about the alternatives in regard to total channel length (in miles) and what portion of the total channel length is managed by the Forest Service (by streambank):

Table 2

Alternative	**Channel Length**	**FS Management One Bank**	**Other Bank**
Alternative 1	143	24.6	0
Alternative 2	143	24.6	0
Alternative 3	143	24.6	0
Alts. 4,4a,4b	169	26.6	3
Alternative 5	186	29.6	11.5
Alternative 6	186	29.6	11.5
Alternative 7	186	29.6	11.5
Alternative 8	169	26.6	3

The following also describes the potential Wild and Scenic River segments by indicating the alternative in which they occur.

POTENTIAL WILD AND SCENIC RIVER SEGMENTS

Alternative	**Henry Lake Neches**	**Winters Branch**	**Attoyac Bayou**	**River**
Alternative 1	Y	N	N	N
Alternative 2	Y	N	N	N

Alternatives 4, 4a, and 4b	Y	N	Y	N
Alternative 5	Y	Y	Y	N
Alternative 6	Y	Y	Y	Y
Alternative 7	Y	Y	Y	Y
Alternative 8	Y	N	Y	N

The potential for impact to private landowners and increases in litter and resource damage increase directly by alternative (with Alternative 1 being least and Alternative 7 being most), due to the designation and assumed increases in recreational use. These impacts are based on the assumption that use levels would be similar between areas. The alternatives of greatest potential are all limited to Federal ownership on only one side of the stream or river courses. In the cases of the Angelina and Neches Rivers, the rivers form the proclamation boundaries of the Forests.

In general, corridors for these potential Wild and Scenic Rivers are managed for the protection of their special attributes in all alternatives. All river and stream corridors occur within Management Area 4 (MA-4) in all alternatives, unless that alternative proposes Wild and Scenic consideration. The Attoyac River corridor is within a special riparian area in all alternatives except 1 and 2. The significant portions of Henry Lake Branch and Winters Bayou already exist within Scenic Areas and would be provided special status in all alternatives.

As special area designations, the Wild and Scenic River candidates do not have a substantial affect on any commodity output for any alternative.

Research Natural Areas

Affected Environment - Forests and Grasslands

Research Natural Areas (RNA) are part of a national network of ecological areas designated in perpetuity for research and to maintain biological diversity on National Forest System lands (FSM 4063). The USFS designed the RNA system to provide examples of ecological areas for long term research investigations and base-line information on a diverse array of North American ecosystems. Strict guidance is provided for the evaluation, selection and establishment of RNA's. This process is detailed in Appendix G.

Mill Creek Cove on the Sabine National Forest was proposed for inclusion as a Research Natural Area in the 1987 Forest Plan. The area was evaluated and not recommended for designation into the system; however, it was identified to be managed as a scenic area. The Cross Timbers RNA was established in 1977 and is currently managed according to that original establishment order and as clarified in the 1987 Forest Plan.

During the Forest Plan Revision process, seven areas were proposed for RNA establishment: Mill Creek Cove; Boykin Springs; Trout Creek; Neches River Banks; McGee Bend; Upper Colorow Creek; and Catahoula Barrens. The Cross Timbers RNA was also evaluated to assess if management and protection was appropriate for the continuation of this designation. A full evaluation of each area is summarized in Appendix G of this document.

Environmental Consequences of the Alternatives

All RNA candidates are considered for special area designation in one or more alternatives. Of the 7 candidate areas, only 3 were specifically proposed for RNA status in any alternative. These areas were Boykin Springs, Mill Creek Cove, and Upper Colorow Creek. These three areas were evaluated by the RNA committee to have the best potential as RNA's, and had the least impacts from previous management or human disturbance. The other candidate RNA's, however were considered appropriate for special area management in one or more alternatives. (Table 3, page 124).

Treatment of the RNA candidate areas by alternative is shown in Table 3 on page 124 and is summarized below. (See Appendix E for a complete write-up concerning the Wild and Scenic River situation).

	Alternative								
Area Name	1	2	3	4	4a	4b	5	6	7
Mill Creek Cove	SA	RNA	RNA	RNA	RNA	RNA	RNA		
Boykin Springs	NA	NA	SA	SA	SA	SA	SA		
Trout Creek	NA	NA	NA	NA	NA	NA	NA		
Neches River Bank	NA	NA	NA	NA	NA	NA	SA		
McGee Bend	NA	NA	NA	NA	NA	NA	SA		
Upper Colorow Creek	SA	SA	SA	SA	SA	SA	SA		
Catahoula Barrons	NA	NA	SA	SA	SA	SA	SA		
Cross Timbers	RNA	RNA	RNA	RNA	RNA	RNA	RNA		

SA - Special Area designation
RNA - Proposed and existing.
NA - No special designation
** - Microsite within Longleaf Ridge Special Area

RNA designations would not permit standard timber, range, or mineral related production. These designations reduce the amount of suitable land for these commodity related activities. Cross Timbers RNA is 380 acres, Boykin Springs is 350 acres, Upper Colorow Creek is 230 acres and Mill Creek Cove is 225 acres. The maximum RNA designation occurs in Alternatives 6 and 7 with 1185 acres; Alternative 1 is least with the existing 380 acre Cross Timbers RNA. Alternatives 2 through 5, and 8 add Mill Creek Cove, for approximately 730 acres of proposed RNA. These designation alone do not appreciably affect commodity outputs. The development of Longleaf Ridge as a special area in Alternative 8, with many of these sites classed as microsites within it, provides protection and landscape level value to these sites.

In general, RNA establishment will have no adverse effects on the physical or biological environment. One specific impact, however, involves management to protect T&E (RCW)

species and adjoining landowners in the case of SPB infestations. Establishment of Boykin Springs as an RNA would not provide adequate management capability to ensure maintenance of the existing RCW cluster. RNA's would provide valuable benchmarks for natural processes to evolve. Specific communities that would contribute to the RNA information base with these

White Oak at Mill Creek Cove; Loblolly - Oak, Beech - Magnolia, and White Oak - Black Oak - Northern Red Oak at Upper Colorow Creek; and the Little Bluestem - Indiangrass and Post Oak - Blackjack Oak communities on the Cross Timbers RNA.

Other Special Areas

Affected Environment - Forests and Grasslands

Scenic, Cultural **& Natural Heritage, Bottomland, and Historic Areas**

The NFGT provides significant natural habitat for native plant species, many of which are rare or declining. The recognition of these values through the designation of special areas is consistent with a growing recognition for future reference sites by the public and within the USFS. There is growing recognition of the aesthetic, educational and interpretive values of these sites. A report prepared by the TNHP, which is available to the general public, specifically recommended the establishment of 29 special areas; these recommendations were primarily due to the recognition of the outstanding natural or botanical characteristics.

Not all of the 29 special areas identified by the TNHP have been proposed in alternatives 1-7 for special designation. Alternative 8 identifies any TNHP site not in a recommended special area allocation for inclusion into MA-8d. Many of these areas fall within previously designated special areas, wilderness areas, RNA's, Wild and Scenic River corridors, and streamside or riparian management zones (MA-4). Some of the TNHP sites are rather small, and managed as a part of a larger landscape managed with a specific desired future condition that would promote the character of that site. The following environmental consequences section discloses the allocation of Botanical, Historic, or other special area designations as a group within each alternative, and the impacts they may have on the other resources, goods, and services that could be provided by the NFGT.

Environmental Consequences of the Alternatives

(Other)

Alternative 1 is the same as the 1987 Forest Plan with the exception of Beech Ravines and Upper Colorow Creek designations changing to Botanical Areas. Total special area in this alternative is 5,067 acres.

In Alternative 2 the Old Aldridge Mill Site is designated as a Historic Area. Mill Creek Cove changes from scenic to a RNA candidate. Total special area in this alternative is 7,704 acres.

Alternative 3 identifies eight new areas on the Angelina National Forest; these areas are generally larger riparian hardwood bottomlands and TNHP sites. Similar special area designations add sites on the other Forests. Total special area assigned in this alternative is 13,040 acres.

Alternatives 4 through 4b would recognize similar areas as in Alternative 3 with the exception of Nebletts Creek and Big Woods on the Sam Houston National Forest. Total area in special designation is 12,153 acres.

respectively. Alternative 6 only has 9,183 acres designated as special due to a major emphasis on proposed wilderness which incorporates many of the special areas and TNHP sites.

Alternative 8 establishes Longleaf Ridge as a special area, a macrosite of the West Gulf Coastal Plain longleaf pine-little bluestem ecosystem. Many TNHP microsites are identified in MA-6. This alternative clearly defines and directs protection and management for these sites. The 32,300 acre Longleaf Ridge and other TNHP sites on the Forests and Grasslands, exceed the special area acreage in alternative 7.

Botanical area significance for both Boykin Springs and Catahoula Barrens is recognized nationally. Both sites are located on the Angelina National Forest and each provides opportunities for interpretation.

The following matrix describes the alternatives and the mix of special areas proposed. These special areas have adverse impacts on commodity production; which is generally proportional to the amount of acreage that is removed from the suitable base for timber, range and mineral exploration (with surface occupancy).

TABLE 3 - FOREST ALTERNATIVES - SPECIAL AREAS - WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

Part II (a)

The Physical Environment

Soil Productivity

Affected Environment - Forests and Grasslands

There are approximately 100 soil series on the National Forests and Grasslands in Texas (NFGT). Most of these soils were developed from a complex and diverse variety of sedimentary material deposited during the Cenozoic (recent) and Mesozoic eras (2.5 to 135 million years ago when shallow seas covered the East and North Central Texas Regions). Many of the soils found on the floodplains and terraces were formed from alluvial deposits of Recent or Late Pleistocene Epochs.

Soils on the NFGT vary greatly in physical and chemical composition, ranging from clays that are at or near the surface to deep sands, with reactions ranging from very strongly acid to alkaline. Soils on the National Forests are acid with pH ranging from 4.5 to 6.0; however, in blackland fields and those soils with clay near the surface, the pH can range from 5.6 to 7.3 (soils transect data on file in the Supervisor's Office). Soils on the Grasslands are generally acid with a pH ranging from 5.1 to 7.3, except on some eroded soils with limestone parent material and prairie soils on the Caddo unit of the Grasslands, where the pH can range up to 8.4.

All soils on the NFGT are relatively low in available nutrients, especially phosphorus and potassium; therefore, soil moisture, texture, and structure play a major role in site productivity. Soils developed on bottomlands are highly productive with site index ranging from 90 to 110. Upland soils have site index which ranges from 60 to 90 and are not as productive.

are few problems with soil instability. However, there are some soils that are considered to be critical to certain management practices. These soils are those that have 60 percent or more of

high expansion clays (Vertisols or Vertic Subgroups). Physical properties and characteristics of these soils limit activities such as the use of mechanical tree planters and site preparation burns. These soils have been inventoried and interpretive data provided to all land managers on the NFGT. These soils occur throughout the NFGT and are handled on a site-specific basis.

Environmental Consequences of the Alternatives

(Soil Productivity)

Analyses, provided by Stephen F. Austin's State University and Texas A&M University, of soil samples collected on the National Forests in Texas indicate low nutrient content which has a direct effect on soil productivity. Management practices implemented are not causing long-term degradation to current soil productivity. Alternatives 2, 8 and 3 will have the greatest impact to soil productivity due to compaction and on-site erosion that will occur when mixed forest acres are converted to longleaf. Alternative 6 will have the least impact to soil productivity due to the majority of forest acres being managed uneven-aged or with longer rotations, and no seed-trees removal in the regeneration areas. Alternatives 4a through 7 will have moderate impact on soil productivity, similar to the Current Alternative (Alternative 1), due to moderate rotations, fewer clearcut acres, and more seed trees left on the stands. Although there are soils on the National Forests in Texas with severe compaction ratings, none of the alternatives will result in long term reduction in soil productivity. According to studies conducted in east Texas by Texas A&M University, on forested lands where a variety of silvicultural and grazing practices had occurred, surface soil bulk density did not increase excessively.

Erosion is critical on all soils, but especially on those soils with thick sandy or silty surfaces that are on gradients that exceed 15 percent. Less than 1 percent of the soils on the National Forests in Texas are deep sands on greater than 15 percent slopes. The current average geologic erosion rate is 22 lbs./acre or 6.994 tons/year. Activities such as logging, grazing, and road reconstruction will cause an accelerated erosion rate. Alternatives 2, 8 and 3 will cause the erosion rate to be higher than the Current Alternative. Alternatives 6 and 7 will cause the lowest erosion rate due to the majority of forests acres being managed uneven-aged. Alternative 4a, 4, and 5 will produce about the same as the Current Alternative due to longer rotations, fewer clearcut acres, and more seed trees left on the stands.

Only a small percentage of erosion occurring in an alternative will become sediment due to the establishment of streamside zones. Research by Texas A&M University on National Forest and private lands indicate that sediment production from grazing and silvicultural activities on these lands produced sediment yields within the range of undisturbed forest.

TONS OF SEDIMENT RESULTING FROM
MANAGEMENT ACTIVITIES

Alternative	**Period 1**	**Period 5**
Alternative 1	543,676	602,599
Alternative 2	599,486	528,459
Alternative 3	590,676	541,894
Alternative 4	563,986	539,839

Alternative 4b	581,586	578,539
Alternative 5	575,636	535,879
Alternative 6	440,956	416,589
Alternative 7	449,316	421,999
Alternative 8	591,116	583,659

Analysis of soil samples on the National Grasslands indicates that nutrient levels are low. All alternatives except the Current Alternative will have a greater impact to soil productivity due to the increase in soil disturbing activities.

Water Quality and Groundwater

Affected Environment - **Forests and Grasslands**

The overall hydrologic condition of the NFGT is good. The majority of the NFGT has hydrologic conditions which do not create adverse effects on water quality or soil productivity under undisturbed conditions. Approximately 1,600 acre-feet do not meet water quality objectives due to watershed improvement needs. All other water yields meet the goals of the Clean Water Act. Runoff (yield) varies from 2 percent of average rainfall in dry years to 28 percent in wet years. This amounts to some 552,042 acre-feet of annual runoff from the National Forests, and the average annual rainfall for the forests is approximately 47 inches. The average annual water yield from the National Grasslands is 31,630 acre-feet. This is 9.7 percent of the total average rainfall, which is approximately 30 inches per year.

Demand for surface and ground water is steadily increasing in east Texas. There are 21 wells presently in use on the NFGT. Yearly consumption from these wells is approximately 32 million gallons of water. On the Caddo National Grasslands, a shift from ground water to surface water for domestic use has been accomplished. To the south of the National Forests, the City of Houston creates a high demand for surface water as the city continues to grow, and ground water supplies diminish.

Environmental Consequences of the Alternatives - Forests

Water Quality

Baseline water quality monitoring on the National Forests in Texas indicates that current management activities are not violating State Water Quality Standards. Alternatives 2 and 3 will produce more sediment than the Current Alternative, due to the conversion of mixed forest acres to longleaf. Alternative 6 will produce the least amount of sediment due to the majority of forest acres being managed uneven-aged. Alternatives 4, 4a, 4b, 5 and 8 will produce sediment and have similar impacts to water quality as the Current Alternative; these alternatives have longer rotations, fewer clearcut acres, more seed trees left on the stands, and fewer roads being used while other soil disturbing activities are at a minimal level. Alternatives 6 and 7 will have the least impact to watershed conditions due to a minimal need of site preparation for stand regeneration; however, Alternatives 6 and 7 will have the highest impact to water quality by producing more sediment from fewer roads being closed for extended periods and extensive use of the roads to enter stands more frequently. Increased recreational shoreline use on major reservoirs will cause increased siltation. The forest ORV direction (Plan Appendix E) describes management and mitigation for soil and water protection needed due to trail and cross-country ORV use.

Water Quantity

All alternatives will have an effect on the average annual water yield. Alternatives 2 and 3 will yield the greatest amount of water due to the conversion of mixed forest acres to longleaf during the first period. Alternatives 4 and 4b through 8 will yield less water, because fewer acres will be clearcut and rotations are longer.

Groundwater

The quality of groundwater in the National Forests in Texas is highly variable, but is generally good and suitable for most purposes. Groundwater in oil fields may become contaminated by leaking wells, pipelines, unlined reserve pits, and separation tanks.

All alternatives have the potential to impact groundwater when activities are implemented. Alternatives 2 and 3 have the greatest potential to impact groundwater due to the conversion of mixed forest to longleaf. Some of the conversion acres will be within groundwater recharge areas. Removal of vegetation will cause an increase in infiltration, which could result in contamination of groundwater. The potential for contamination to groundwater is not as great with other alternatives.

Environmental Consequences of the Alternatives - Grasslands

Water Quality

Baseline water quality monitoring has not occurred on the National Grasslands primarily due to the fact that there are very few perennial streams on the Grasslands with watersheds that are 100 percent National Grasslands. Observations during storm events indicate that current management is maintaining water quality at a high level on the National Grasslands. Alternatives 4 through 8 will cause a slight degradation of water quality due to shorter burning cycles, an increase in road reconstruction, an additional 25 miles or more of horseback trails, and an increase in the number of acres that are grazed. Alternatives 2 and 3 will have the greatest impact to water quality due to a shorter burning cycle than the Current Alternative and Alternatives 4 through 8. Additionally, there will be an increase in road construction, 15 miles of horseback trails, narrower streamside zones, and 88 percent of the total area will be heavily grazed. Increased shoreline recreational use along major reservoirs will cause increased siltation.

Water Quantity

All alternatives will have an effect on the average annual water yield. Alternatives 4 through 8 will cause a slight increase in water yield due to the shortest burning cycle, the increase in road construction, and the greater number of acres being grazed.

Groundwater

The groundwater on the National Grasslands is generally good and suitable for most purposes. All alternatives have the potential to produce effects, especially when management activities are within groundwater recharge areas. Alternatives 2 and 3 have the greatest potential to impair groundwater.

The following table describes water yield in acre/feet by alternatives.

INCREASED WATER YIELD

Alternative	**Period 1**	**Period 5**
Alternative 1	104,966	130,120
Alternative 2	150,009	140,159
Alternative 3	155,936	146,726
Alternative 4	129,830	143,605
Alternative 4a	138,604	156,834
Alternative 4b	136,988	151,386
Alternative 5	132,545	134,566
Alternative 6	106,875	113,461
Alternative 7	103,787	119,291
Alternative 8	130,516	146,416

Air Quality

Affected Environment - Forests and Grasslands

Monitoring by the former Texas Air Control Board (TACB); now the Texas Natural resources Conservation Commission (TNRCC) has demonstrated that the air quality on the NFGT meets the National Ambient Air Quality Standards (NAAQS), as set by Environmental Protection Agency (EPA), everywhere except for the National Forest lands in Montgomery County. Monitoring conducted by the TACB in 1988 demonstrated that Montgomery County would be considered non-attainment for ozone. Ozone is the most widespread air pollutant in the United States, causing more plant damage than any other. Five ozone damage plots were established outside, but close to the Little Lake Creek Wilderness. Plots were established and evaluations were made in cooperation with Forest Health personnel. Very little ozone damage symptoms were noted.

Ambient ozone monitoring (June, 1988 to January, 1991), done in conjunction with fumigation chamber research at the Stephen F. Austin Experimental Forest at Nacogdoches, Texas indicates that ambient ozone concentrations are sufficient to affect vegetation, but below NAAQS.

Considerable monitoring has been done by TACB to evaluate the effects of acidic deposition (acid rain) in Texas. The consensus is that while east Texas forests may be susceptible to acidic deposition, no environmental effects have been identified.

The air quality over the NFGT meet the NAAQS for Class II, as defined by the amended Clean Air Act. The Forest, except for Montgomery County, is considered to be in attainment by the Federal EPA and the TNRCC.

Environmental Consequences of the Alternatives

(Air Quality)

The effects of fire on air quality is documented in the Final EIS and Record of Decision for Vegetation Management in the Coastal Plains/Piedmont dated February 27, 1989 and is

Texas, except for those lands in Montgomery County, meets the NAAQS. Current management activities will not cause degradation below those standards. Alternatives 2 through 4b and 8 will have the same impact on air quality as the Current Alternative. Alternatives 5 through 7 will have less impact than the Current Alternative due to the addition of wilderness areas, and removing those acres from an aggressive burning schedule. Less burning will reduce the amount of particulate matter in the air.

Monitoring indicates that air quality over the National Grasslands in Texas meet the NAAQS. Current management activities will not cause degradation below these standards. Alternatives 4 through 8 will have a greater impact to air than the Current Alternative. These alternatives will have shorter burning cycles (5 year and 3 to 5 year, respectively) and will burn more per year than the Current Alternative. Alternatives 2 and 3 will have the greatest impact on air quality.

Burning will be reduced to a 3 year cycle, with 88 percent of the acres burned yearly. More burning will increase the amount of particulate matter in the air.

ACRES BURNED PER 10 YEAR PERIOD

Alternative	**Period 1**	**Period 5**
Alternative 1	354,734	375,383
Alternative 2	876,588	915,745
Alternative 3	893,347	934,317
Alternative 4	828,279	847,264
Alternative 4a	996,481	1,031,305
Alternative 4b	997,159	1,068,852
Alternative 5	909,060	960,830
Alternative 6	109,497	112,135
Alternative 7	942,982	975,564
Alternative 8	992,623	1,069,636

Fire

Affected Environment - Forests and Grasslands

Fire is divided into two topics: wildfire control (or suppression), and prescribed fire. Wildfire control is discussed below, while a discussion of prescribed fire can be found in Part I(a) - Vegetation, an earlier section to this chapter.

Historically, lightning-caused fires were a major force in shaping the vegetation of north and east Texas. Depending on the frequency of such fires, certain forest types may have been more open than they are now. The pine-dominated uplands burned more frequently and more intensely than the bottomland hardwoods and riparian areas.

Human-caused fire (caused by Native Americans) was also a factor in the Grasslands and Forests. Burns occurred primarily in the fall and winter, different from the more intense late spring and summer lightning burns. The fires improved habitat for deer and buffalo, and made the gathering of nuts easier.

became part of the system, a significant reduction in the number of fires was evident.

Environmental Consequences of the Alternatives
(Fire)

There is no difference in the environmental consequences of wildfire suppression between all alternatives. Fuel loading may increase in Alternatives 5 and 7 with additional wilderness areas, thereby increasing the risk of catastrophic wildfire.

Lands and Land Uses

Affected Environment - Forests and Grasslands

Lands

Public land ownership pattern in Texas is highly fragmented with many private tracts adjacent to or surrounded by National Forest land. The U.S. owns only 37 percent of the land inside the proclaimed boundaries of the Forests and Grasslands. This intermingled ownership results in numerous problems concerning boundaries, title claims and encroachments, and hinders reaching much of the desired resource management potential. Even where U.S. ownership is concentrated, many large and small blocks of private land remain. Access is sometimes hindered by intervening private land.

Land Uses

The fragmentation mentioned above, combined with a growing rural population, creates a heavy demand for land uses. As of September 30, 1990 about 11,500 acres of the NFGT were under permanent Special Use authorizations to individuals, corporations, and other governmental agencies. The acreage set aside under permanent Special Use authorizations impacts the potential use of these lands for any other purposes. The predominant use is for linear rights-of-way and water developments. Additional relatively non-impacting uses as of September 30, 1990, include military training, recreation events, and experimental areas.

Land uses for personal use are a minor land commitment, with about 217 acres devoted to private uses such as private roads, fences, cultivation, etc.

Linear-uses, such as pipelines, power lines, and public roads are the major uses in terms of acreage affected. Many of these are in corridors with two or more linear uses running parallel in the same clearing. New linear uses are placed in existing corridors when feasible. Lake Conroe covers over 5,100 acres of U.S. land under the terms of a Special Use Permit.

Environmental Consequences of the Alternatives

All alternatives plan on consolidating ownership and improving access through exchange and acquisition. A Landownership Adjustment map, which defines broad objectives for acquisition and exchange, is available at the Forest Supervisor's office in Lufkin and in each District Ranger's office. Alternatives 1 through 4b plan 800 acres of purchase each year, and Alternatives 5 through 8 increase the rate of purchase to 1,000 acres per year. For exchange, Alternative 1 is the current 1,600-acre annual objective and all other alternatives have a 1,000-acre annual objective. All alternatives anticipate acquisition of five rights-of-way per year.

Additions to the public land base benefits and affects use and management of the National Forests. Exchanges, through disposal of existing lands, can have some adverse effects (which are offset by the new acquisitions). All acquisitions, with the exception of rights-of-way, are from willing owners. Taking land off county tax rolls could adversely affect tax receipts, although returns from National Forests receipts would normally more than offset this loss.

Land Uses

All alternatives anticipate maintaining and issuing the same number of Land Use Authorizations during the first period. RCW habitat management areas (HMAs) will cause some reductions in future periods. New uses must not significantly conflict with the objectives of the affected management area, except that valid existing rights may override management objectives. Utility corridors will continue to be used as feasible. Standards and guidelines for Management Area 10b found in the Forest Plan, provide criteria for issuing and managing Land Use Authorizations.

Every Special Use Application is evaluated against the issuance criteria. Those which are not rejected because of an obvious conflict with the criteria, are subjected to the appropriate level of environmental review to decide if a permit should be issued and what special mitigation measures should be required. Common effects are loss or change in vegetation, soil disturbance, and commitment of resource land to private or limited public use.

Boundary Management

Affected Environment - Forests and Grasslands

There are about 2,800 miles of property boundary encompassing U.S. lands, most with private owners. Boundary lines must be located and maintained to assure ownership rights are not violated by the U.S. or its neighbor. Management includes resolution of claims of ownership by private entities and removing unauthorized improvements placed on U.S. lands.

Environmental Consequences of the Alternatives
(Boundary Management)

All alternatives anticipate the same level of line location, maintenance and claims/encroachments resolution. Environmental effects are negligible.

Road Development

Inventory work on the transportation system (as described in Plan Appendix E) is substantially complete; however, field verification of map locations continues as resource needs require entry into specific areas. With State, County, and Forest Service routes, a transportation system now exists that meets the need for access into most areas. The transportation system varies in its ability to meet expected needs and demands depending on the current condition of each facility and its intended use. The current inventory contains all arterial and collector roads needed for administration of the NFGT. However, some of these roads exist at a standard lower than needed to meet safety requirements and access needs of the NFGT and rural and urban neighbors. The local road system is still being developed in response to various resource needs including timber harvest, minerals management, and recreation development.

These local roads exist in a variety of conditions ranging from recently reconstructed routes to primitive roads, and often just wheel tracks in the forest. This group includes routes present on the land prior to Forest Service acquisition and those developed over the years to various standards, depending on the location and traffic levels. Most are now passable and open to some type of vehicular traffic during at least part of the year. Some of these routes are evaluated and can be included for use by off highway vehicles. Many roads, however, exist at a standard that is not appropriate for the intended uses. Most of the reconstruction identified in the Forest Plan

will occur on these local routes. It is also recognized that with few exceptions, the work previously identified as construction actually consists of utilization and reconstruction of these existing routes. Those identified as not needed in site specific resource examinations will be obliterated and revegetated as these areas are entered for resource work.

The reconstruction work will fall into two broad categories: (1) Major reconstruction; and (2) minor reconstruction. The majority of the work will be classified as minor reconstruction.

Major reconstruction will involve upgrading some primitive roads to Traffic Service Level C classification (as defined in Plan Appendix E). This is necessary to provide for heavier vehicles and larger traffic volumes. This work will employ techniques generally associated with road construction, clearing, grubbing, excavation, drainage structures, and where necessary aggregate surfacing. To the casual observer, this work may appear to be new construction; however, the routes will coincide with existing transportation facilities and will involve reconstruction or relocation only where necessary. Also included in this category will be reconstruction and major work items on existing Traffic Service Level A, B, and C roads.

Minor reconstruction will involve work on routes expected to transport low traffic volumes either on a continuous or intermittent basis. This work will utilize the existing route and result in minor clearing, earthwork, erosion control, drainage, and relocation of some Traffic Service Level (TSL) C and Traffic Service Level D roads. The majority of all reconstruction work falls into this category.

Operation and Maintenance of Roads

Transportation System Operation and Maintenance involves the analysis of user needs, management requirements, and direction within an area. The Operation and Maintenance Management System process currently in use on the NFGT provides the methods and procedures to plan needed maintenance activities on Forest development roads, and allows for the determination of the operational status for those individual transportation facilities. Maintenance

Accomplishment, however, depends on available funding levels.

The Forest Plan recognizes the desires of the public for unrestricted motorized access to and through the NFGT. This must be balanced against conflicting goals of providing for certain types of wildlife habitat and non-motorized recreation use.

Road use restrictions are considered on most local routes where access may not be necessary for extended periods of time, and may be applied to protect other resource values. Restrictions may be implemented in response to resource programs such as wildlife, recreation, minerals, and fire, or for other reasons such as reduction of road maintenance cost, or soil and water impacts. With use restrictions and closures, the open road density can be effectively reduced to meet management and resource needs and objectives. All restrictions are applied in accordance with 36 CFR 261.

Environmental Consequences of the Alternatives

(Road Development)

In Alternatives 1, 2, 3, 4 and 8 the majority of road reconstruction occurs in the first period when initial entry into most areas takes place. By the end of the second period, little road reconstruction in response to timber harvest activities is planned except in Alternatives 5, 6, and 7. Some reconstruction, primarily on TSL A, B, and C routes, will occur in response to specific resource needs such as mineral exploration and development and reconstruction within developed recreation areas.

Reconstruction levels in the first period will be highest in Alternatives 1, 2, 3, 4, and 8 with the initial entry for thinning in mature stands. The limited additional clearing and grubbing necessary to improve these routes will result in some short term increase in/on site erosion. These transient effects will be mitigated by employing temporary erosion control measures such as the use of silt fences and temporary seeding, followed by the establishment of a permanent vegetative cover immediately following completion of the soil disturbing activities . In Alternatives 1, 2, and 3 no road reconstruction in response to timber harvest activities is planned after period 2. Road construction and reconstruction will effect the scenic resources. Road design and location will indicate the effects. Forest-wide Standard and Guides (FW-185) should be utilized to mitigate negative impacts on the Forests Scenic Resources. Since no new road construction is planned, road densities do not vary between alternatives.

The uneven-aged management in Alternatives 5, 6, and 7 will delay initial entry into areas with younger stands until the third and fourth period resulting in road reconstruction in those periods. However, the total road reconstruction mileage will not vary significantly between alternatives except for variations in suitable acres due to the placement of lands in wilderness, special management areas or streamside zone (which restrict entry for other resource activities).

The estimates for miles of road to be reconstructed on any given area is based on a uniform set of coefficients which are applied to all alternatives; these do not significantly vary within an area. The timing of this activity will, however, vary based on the acres accessed and the time frame each area is first entered and in response to specific resource activities. The total miles of road reconstructed will vary only because of the differences in acres available for resource activities in each alternative. Road reconstruction will cause an increase in erosion, sedimentation, and water yield. Road reconstruction will include relocating portions of the road bed, surfacing with gravel, constructing dips, and installing culverts; all of which will reduce the sediment yield once in place. New mitigation and management standards implemented in various alternatives will maintain a road system after 50 years that is not expected to require major reconstruction.

ROAD RECONSTRUCTION (MILES)

Alternative	**Period 1**	**Period 1-5**
Alternative 1	671	1088
Alternative 2	624	1134
Alternative 3	654	1144
Alternative 4	932	1407
Alternative 4a	933	1423
Alternative 4b	870	1338
Alternative 5	677	1208
Alternative 6	639	1109
Alternative 7	505	960

Operation and Maintenance of Roads

In all alternatives, a majority of the transportation system, including all arterial and collector routes and many local roads, will remain open on a year round basis.

Alternatives 1, 2, and 3 offer the most opportunity to utilize lower maintenance levels 1 and 2, as larger areas of the forest will not be entered as frequently for resource activities. Management in maintenance level 2 allows less soil disturbing activities; it also includes mowing as a more frequent maintenance activity resulting in these routes functioning as linear wildlife openings. As more areas are placed in Special Management Areas and HMAs are expanded in Alternatives 4, 4a, 4b and 8, more roads may be eligible for road use restrictions to meet requirements for these areas. In Alternatives 5, 6, and 7 opportunities to provide road use restrictions will be reduced as larger areas experience more activities on a more frequent basis. Also, with a larger percentage of the local road system in use at any given time, roads in maintenance levels 1 and 2 will be shifted into higher categories to provide the proper operation and maintenance necessary with the more frequent use activities. Some of the increases may be offset by the inclusion of larger tracts in Special Management Areas that preclude any road activity.

Administrative Facilities

Affected Environment - Forests and Grasslands

All administrative facilities and structures are inspected annually and noted maintenance, health, and safety items are corrected as funding is available. As these facilities reach the end of their design life or opportunities to replace remote leased facilities with co-located Forest Service owned space become available, replacement work is scheduled as funds become available.

All dams on the NFGT are low hazard dams and are inspected by qualified engineering personnel, as required. Maintenance and safety items are corrected when funding is available.

Environmental Consequences of the Alternatives
(Administrative Facilities)

The inspection, maintenance, repair, and replacement schedule for administrative facilities and dams on the NFGT does not vary significantly with the alternatives. However, the types of replacement structures planned at the work centers will vary with the emphasis present in each alternative.

Management decisions affecting the restructuring or consolidation of forest operations may also alter facility replacement schedules.

Developed Recreation

Affected Environment - Forests and Grasslands

Forest developed recreation facilities have a combined capacity of 10,305 people-at-one-time (PAOT). All developed recreation sites offer at least a minimum of constructed facilities. These

and electrical hook-ups. The NFGT are within a four hour drive of approximately 12,000,000 people and within a day's drive of 18,000,000 people. For more detail on recreation demand in the future, see the Dispersed Recreation part of this chapter.

There are eighteen developed recreation areas on the National Forests that provide facilities for camping and/or picnicking, swimming, and boating. Individual areas are discussed below.

Angelina Ranger District

Bouton Lake, a primitive camping and picnicking area with 10 tables, on the beautiful Bouton Lake which is an oxbow of the Neches River, and Boykin Springs Recreation Area with 36 camping units, 8 picnic units, group picnic shelter, and swimming beach on the shores of Boykin Lake are in the southern part of the districts. These areas serve as trailheads for the Sawmill Hiking Trail and provide excellent fishing.

Caney Creek with 128 camping units, Harvey Creek with 42 camping units, and Sandy Creek with 27 camping units are on the shoreline of Sam Rayburn Reservoir. These sites are in attractive pine-hardwood settings with access to the popular, outstanding bass fishing lake. Along with the camping units, these sites also provide picnicking, boat ramps, swimming beaches, group picnic shelters, and some electrical hookups. These areas are impacted by serious shoreline erosion with considerable loss to facilities over the years since their construction.

Neches District

Ratcliff Lake Recreation Area, on the shores of a 45 acre historic log pond for the 4C's sawmill, has 70 camping units, 17 picnic units, 2 group picnic shelters, swimming beach and bathhouse. Fishing, rental canoes and paddle boats, concession store, and electrical hookups in 27 campsites are other services available. The ruins of the 4C's sawmill, listed as a historic site, can be found throughout the area. This area and the Neches Bluff Overlook, which has a panoramic view of pine-hardwood forests on a bluff above the Neches River bottomlands, are trailheads for the 4C's National Recreation Trail.

Trinity District

The Kickapoo picnic area, a short interpretive trails with 10 picnic units and flush toilets, is located on U.S. Highway 287, east of Groveton.

Tenaha District

The Ragtown Recreation Area, on the shores of Toledo Bend Reservoir, a nationally known bass fishing lake, has 36 camping units, a 2 lane boat ramp, parking, and flush toilets with showers. It is the only recreation site on this district except for the East Hamilton boat ramps.

Yellowpine District

Red Hills Lake, with 30 camping units and 3 picnic sites; Lakeview with 10 primitive camp units; Indian Mounds with 44 camp units; and Willow Oak, with 12 camp units, are the major

swimming beaches, electrical hookups, and trails. Lakeview, Indian Mounds, and Willow Oak are on the shores of Toledo Bend Reservoir, an outstanding fishing lake.

Raven District

Stubblefield Recreation Area, on the north shores of Lake Conroe among a moss-hung cypress and pine-hardwood forest, has 28 camping units, a group picnic shelter, and flush toilets. The Lone Star Hiking Trail passes through the area.

Kelley Pond, with eight primitive camping units, is heavily used by off-road vehicle (ORV) enthusiasts. Cagle and Scotts Ridge provide boat launching access to Lake Conroe, and are proposed for additional future development.

San Jacinto District

Double Lake Recreation Area, with 52 camping units, 17 picnic units, a group picnic shelter, 6 group camping sites, and swimming beach with bathhouse surrounds a 25 acre lake, about 60 miles from Houston. There is also an enclosed group pavilion available by reservation. This area is being renovated and will have an additional 15 campsites, electrical hookups, playground equipment and new restrooms with showers.

Caddo/LBJ National Grasslands

Three developed recreation sites on the Caddo/LBJ National Grasslands; Black Creek Lake (LBJ), East Coffee Mill (Caddo), and Lake Davy Crockett (Caddo) were developed by the Soil Conservation Service in the early 30's as day use picnic sites. The Forest Service took over administration of the Grasslands in the late 60's. Since that time the three recreation areas have been utilized for camping as well as picnicking. Some improvements have been made to the units at West Lake Davy Crockett area to make them more useable for camping. Rehabilitation work is needed at all three areas to bring them up to standard for developed campgrounds and make them accessible to persons with disabilities.

All three recreation areas need complete rehabilitation or reconstruction to provide updated camping, boating, water, and sanitation systems.

Other Sites

Two primitive trail camps, one on the Lone Star Hiking Trail between Double Lake Recreation Area and Big Creek Scenic Area and another on the 4C's hiking trail at Hickory Creek provide camping for hikers. A 30 unit primitive horse camp on the Piney Creek Horse Trail, five miles south of Kennard on the Davy Crockett National Forest provides camping for horseback riders.

Facilities for Disabled

Most developed recreation facilities are not fully accessible by people with disabilities, but the process of rehabilitating some of the more heavily used areas and making them accessible has begun. Work at Double Lake, Ratcliff Lake, Caney Creek and Boykin Springs Recreation Areas is making facilities accessible. Accessible fishing piers have been constructed in several recreation areas. Rehabilitation work and planning for new facilities will provide for accessibility. All developed recreation areas were constructed before 1965, and most of the facilities are outdated and in need of major rehabilitation or replacement.

other facilities are expected to increase on portions of the Forests adjacent to the Houston metropolitan area, and the Grasslands adjacent to the Dallas-Fort Worth metroplex.

Areas of Concentrated Public Use

Many other areas receive concentrated heavy use for one reason or another. Designated hunter camps, during gun deer hunting season, receive heavy use. The most heavily used and most difficult to maintain sites are the shoreline areas along Lake Conroe and Sam Rayburn Reservoir. Some of these areas are accessible by road and some only by water. These areas present serious problems in solid and human waste management.

Environmental Consequences of the Alternatives

(Developed Recreation)

The profusion of RCW on the Sam Houston has put limits on certain types of dispersed use (i.e. ORV use and developed sites). Added wilderness on the Sam Houston National Forest would also further limit the amount of area available for dispersed use.

Alternative 1 provides for the existing 21 developed sites plus the development of 3 additional areas (Cagle, Scott's Ridge and Tarkington Bayou) on the Sam Houston National Forest. Alternatives 2 and 3, would remain the same for the Grasslands, but would add one developed site to the Forests. Alternatives 4, 4a, 4b, and 8 would be the same as 1 with the addition of Haley's Ferry and Boles Field on the Tenaha District, Sabine National Forest, and four sites on the Grasslands. Alternatives 5 and 6 for the Forests would be the same as Alternatives 2 and 3 by adding an additional site to Alternative 1 development. Alternative 7 would put added emphasis for dispersed recreation on the Sam Houston and Angelina, but not developed recreation.

On the Grasslands, Alternatives 5 through 7 would include the existing sites and add the construction of seven new sites. Three of the new sites, East Coffeemill, Cottonwood, and Ladonia, would be Level III developments for camping, picnicking, trails and necessary support facilities. The other sites would be minimum development sites for two fishing access, and two horse trailhead/camping sites. All new facilities would provide for persons with disabilities through universal design of facilities.

There is an estimated backlog of recreation rehabilitation work of $16,000,000. This does not include the cost that will be incurred in making existing facilities accessible. Rehabilitation of existing facilities will be the same for all alternatives.

Accessibility to all recreation activities and facilities will not change across the alternatives. Very few, if any of the present facilities are accessible. It will take considerable planning and money to meet the standards for accessibility in existing recreation areas. In some cases, existing toilet facilities cannot be made accessible, which means at least a certain percentage of the toilets will have to be replaced. All new facilities will be designed and constructed following universal design criteria. Some of the existing structures may be made accessible through modification.

Shooting Ranges

There are no shooting ranges on the Forests or Caddo/LBJ National Grasslands. Shooting, especially target shooting, is a serious problem on the LBJ Grasslands, which is within 45 minutes drive of Ft. Worth and Dallas. Heavy use by shooters with firearms such as handguns to rifles, automatic weapons, to small cannons occur. Other users and adjacent property owners

have complained about the noise of shooting and bullets flying through the air. Unregulated shooting on the LBJ has resulted in near misses, wounded livestock, and damage to private property and resources from stray bullets.

In 1991, a public scoping process solicited comments and concerns regarding shooting on the LBJ National Grasslands and the development of shooting ranges. The Forest Service received overwhelming support from respondents for the construction of shooting ranges. While the Forest Service realizes shooting and hunting are legitimate recreational pursuits, responsibility for providing a safe environment for public uses is most important. As a result of the complaints, scoping and evaluation of the situation, the Forest Service on August 16, 1993, closed all of the LBJ, except 500 acres, to all rifle and pistol shooting. Recreational target shooting is now confined to two areas on the LBJ. Five-hundred acres will remain open to rifle, pistol and shotgun target shooting, and closed to all forms of hunting. Another 180 acres will be open to clay pigeon shooting with shotguns. Automatic weapons are prohibited!

All hunting on the LBJ is limited to shotgun and black powder firearms and bows and arrows. This action has greatly increased safety on the LBJ. This action also opens 800 acres of land to hunting with shotgun, black powder rifle or bow and arrow, that have been closed to hunting in the past because of safety.

Environmental Consequences of the Alternatives
(Shooting Ranges)

Alternatives 2 and 3 would provide for the development of one shooting range and maintain the existing open shooting areas. Hunting would remain restricted to shotgun, black powder rifles or bows and arrows only. Cooperative agreement with the National Rifle Association could be utilized in the development of any shooting ranges.

Alternatives 5, 6, and 7 would be the same as Alternatives 2 and 3, except they would allow for developing two more ranges, possibly one for bow and arrow target shooting.

Alternatives 4, 4a, 4b and 8 would propose two to five ranges with some development on the Caddo and the development of an archery range. These alternatives would also add two more areas for open shooting and keep the Grasslands hunting restricted to shotgun, black powder rifle or bow and arrow.

Safety of the public will remain a primary objective of shooting and hunting on the Grasslands.

Part II (b)
The Physical Environment

Minerals and Geology

Background

The National Forests and Grasslands in Texas includes approximately 480,000 acres of Federally-owned minerals. All except those under wilderness areas are available for various mineral development activities as described below. The Federal mineral estate is under acquired lands status and as such is subject to Federal leasing laws and regulations. No public domain land, which allows for staking and patenting of mining claims, occurs within the plan area.

Mineral rights are privately-owned on approximately 196,000 acres or 29 percent of the plan area. Of this total, 28 percent are mineral rights outstanding in third parties and 72 percent are mineral rights that were reserved by the grantor at the time of acquisition by the U.S. Government. Areas of reserved and outstanding rights are scattered throughout the plan area and are displayed on the land status atlas. An atlas is available at each Ranger District and in the Supervisor's Office.

Currently, there are oil and gas wells in place on every National Forest and on the LBJ National Grassland. Two permits are in effect for removal of sand and gravel. There has been no strip mining for coal or lignite, but there have been several small strip pits for gravel and sand.

The reader is referred to the AMS and EIS, Appendix C, for additional background, potential and leasing stipulations for minerals activities.

Leasable Non-Energy Minerals

Because there are no known economic occurrences of these minerals, which include metallic ores, on U.S. lands, the planning process does not address their exploration or mining. Should developmental interest occur, a proposal will be considered through appropriate NEPA analysis. Thus, while some of the alternatives allow such activities, it is not anticipated that there will be any.

Saleable (Common Variety) Minerals

These minerals include common clays, sand, gravel, and rock for crushing, including limestone. "Iron-ore gravel" and sand are the most common resources of this nature on the National Forests. There are very few known deposits of alluvial gravel. Limestone is common on the National Grasslands.

Extraction over the past 15 years has been principally "iron-ore gravel" with a few permits issued for sand and one for alluvial gravel. Current policy is to severely limit such uses, and allow no commercial sales. This limitation is due to the long-term nature of soil impacts at pit sites. There have been no quarrying operations for rocks to be crushed and none are anticipated where the U.S. is the mineral owner. There is a rock-crushing operation at a sandstone quarry on private land adjacent to U.S. land on the Angelina National Forest. This sandstone formation is thought to extend under adjacent U.S. surface. Therefore extension of the quarrying operation onto U.S. land is possible as the mineral rights are privately owned.

No new "iron-ore gravel" sites will be authorized under any of the alternatives. Sites for removal of sand and alluvial gravel may be authorized. An average of no more than one new site per year is anticipated, with new activities impacting about two acres for each site. Uses are limited to public agencies. No quarrying operations for U.S.-owned stone are to be permitted.

Current Oil & Gas Situation

The National Forests in Texas and the Caddo National Grasslands lie in what is known geologically as the East Texas Basin. The LBJ Grasslands lie in the Fort Worth Basin. There are 283,806 acres leased for oil and gas on both the Forests and Grasslands in Texas and there was a backlog of lease requests. Even during times of low oil and gas demand and poor industry economics there remains a relatively steady level of leasing. Exploration on both U.S. and private rights also continues to be a routine activity. Levels of exploration interest fluctuate with economic conditions within the industry. Development of new plays or prospects (theories of occurrence) and drilling technologies also create renewed interest in the area.

As of October 1993, there were 274 oil/gas wells located on Federal surface. About 27 percent of those wells are drilled into private minerals. Not all wells are currently producing, being in varying stages of development, production, or plugging and abandonment.

With the exception of wilderness areas, leasing of U.S. mineral rights and their exploration and production will continue with an average of 40-60 new leases issued annually. The exercise of reserved and outstanding mineral rights under Federal surface will continue.

Table 2. Acres Available for Leasable Energy (Oil and Gas) Minerals[1]

Alterna-tives	Leasing with Unavailable Standard Lease Terms & Conditions	Leasing with Stipulations Notices, Congressional Limitations	Leasing with No surface Occupancy	Due to Action[2]
1	None	381,477	40,036	25,642
2	None	366,339	55,074	25,642
3	None	363,550	57,863	25,642
4	None	364,053	57,640	25,642
4a	None	363,989	57,524	25,642
4b	None	363,252	58,261	25,642
5	None	358,349	63,164	25,642
6	None	None	None	None
7	None	317,053	104,460	25,642
8	None	363,252	58,261	25,642

[1] Excludes private rights under U.S. surface, about 194,000 acres. Due to scattered pattern of mineral ownership the figures shown here are estimated based on percentage of U.S. rights in the plan area.

[2] Additional lands would be added to this classification if areas recommended for wilderness study in Alternatives 5 and 7 were designated as wilderness through legislation.

Table 3. Acres of National Grasslands Available for Leasable Energy

Alternatives	Leasing with Standard Lease Terms & Conditions	Leasing with Stipulations Notices, Limitations	Leasing with No surface Occupancy
1	None	35,489	263
2 & 3	None	35,292	460
4, 4a, 4b & 8	None	35,142	610
5, 6 & 7	None	None	None

[1]Excludes private rights under U.S. surface, about 1,622 acres. Due to scattered pattern of mineral ownership the figures shown here are estimated based on percentage of U.S. rights in the plan area.

Reasonably Foreseeable Development (RFD) Scenario

Since oil and natural gas are subsurface natural resources, their exact location is never entirely certain until successful drilling has occurred. In light of this, the Secretary of Agriculture's Rules and Regulations for Oil and Gas Leasing (36 CFR 228 Subpart B) require that Forest Plan environmental impact statements "...project the type/amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program consistent with that described in the proposal and for each alternative" (36 CFR 228.102(c)(3).

The Reasonably Foreseeable Development Scenario is discussed in Appendix C of this EIS. Using the last four years activity (during which the petroleum prices and operational constraints are expected to remain fairly constant), the Reasonably Foreseeable Development Scenario for the National Forests and Grasslands forecasts some exploration and development trends for the National Grasslands and Forests of Texas over the next 10 years. It includes an estimation of the number of producing wells and dry holes both on portions of the National Forests and National Grasslands with Federal ownership of oil and natural gas resources ("Federal") and on portions with outstanding or reserved mineral rights ("private"). Both types of activity are presented to account for the cumulative effects of development. It is important to note, however, that the identification of land open to leasing and the subsequent decision to lease such lands would only affect drilling on those portions of the National Forests and National Grasslands with Federal ownership of oil and natural gas resources.

The Reasonably Foreseeable Development Scenario predicts the anticipated activity by alternative on existing oil and natural gas fields and on new wildcat fields. The discussion under each alternative first details the total development by alternative and then presents a discussion of what is anticipated in each field where further development is anticipated. Maps of each oil and gas field may be reviewed for each Forest or Grassland unit in the accompanying map package.

ALTERNATIVE 1

wells drilled nor their impact on the surface resources from the description of the "Unconstrained Reasonably Foreseeable Development (RFD) Scenario" in Appendix C of this EIS. During a typical year over the next decade, 16 wells would be drilled:

Table 4. Reasonably Foreseeable Development Scenario for
Alternative 1

Oil or Natural Gas Field	National Forest or National Grassland	Ranger District	Producing Wells	Dry H
Boonsville	LBJ National		10 Federal	0 Fed
Conglomerate	Grasslands		0 Federal	0 Fed
Brookeland	Angelina	Angelina	10 Federal	0 Fed
			10 private	
			0 private	
Brookeland	Sabine	Yellowpine	20 Federal	10 Fe
			0 private	0 priv
Center	Sabine	Tenaha	0 Federal	10 Fe
			0 private	0 priv
Coldsprings/	Sam Houston	San Jacinto	0 Federal	0 Fed
Coline/Mercy			10 private	0 priv
East Bridges	Sabine	Tenaha	10 Federal	0 Fed
			0 private	0 priv
Glen Rose/Petit	Davy Crockett	Neches	10 Federal	0 Fed
Formations			0 private	0 priv
Laura Lavelle	Davy Crockett	Trinity	20 Federal	0 Fed
			0 private	0 priv
Saratoga	Sabine	Yellowpine	0 Federal	0 Fed
Annona			10 private	10 pri
Thornberry	Sam Houston	Raven	0 Federal	0 Fed
			0 Private	0 Priv
New Wildcat	(location		20 Federal	0 Fed
Fields	uncertain)		0 private	0 priv
TOTAL			100 Federal	
20 Federal				
			30 private	10 pri

The composite amount of new disturbance for unreclaimed roads and drill pads per year will be about 1.84 acres/site. However, the total net surface disturbance associated with oil/gas development will show a new decrease as the formerly producing wells cease economic production, are plugged and abandoned, and the sites rehabilitated. As of 1993 the forest had 139 producing wells and many of these are marginally profitable. A large number of them will be plugged and abandoned as the petroleum bearing trap/structure is depleted or the costs of operating the well becomes too great. Also, while initial disturbance occurs from new sites being created the overall disturbance will be minimal with the mitigating measures and stipulations that are required of the operators.

Affected Fields

The Boonsville Conglomerate Field would have a total of 10 Federal producing wells over the next decade. The target formation for drilling is the Fan Delata Sandstone Conglomerate which lies 6,700 feet below the surface. It can be reached by vertically drilling from well pads ranging from 1.0 acre to 4.0 acres with the average in the past being 1.8 acres. The average length of new access road is 0.11 miles involving 0.43 acres of clearing. Over the next 10 years, approximately 22.3 acres will initially be disturbed. After the production is established and the unneeded portion (9.0 acres) of the drill site is reclaimed, 13.3 acres will be left for production.

Brookeland Field

The portion of the Brookeland Field on the Angelina National Forest would have a total of 20 producing wells over the next decade. The target formation for drilling is the Austin-Buda Fractured Chalk Play which lies approximately 9,800 feet below the surface. It can be reached by horizontally drilling from well pads ranging from 3.5 acres to 7.5 acres with the average size in the past being 4.13 acres. The average length of new access road is 0.06 miles involving 0.23 acres of clearing. After the production is established and the unneeded portion of the drill site is reclaimed, the area of unreclaimed disturbance ranges from 2.0 acres for the smaller sites and up to 4.0 acres for the larger sites with the average in the past being 2.30 acres/year. Over the next 10 years, approximately 87.2 acres will initially be disturbed. After the production is established and the unneeded portion (41.2 acres) of the drill site is reclaimed, 46.0 acres will be left for production over the life of the well (approximately 20 years).

The portion of the Brookeland Field on the Sabine National Forest would have a total of 20 Federal producing wells and 10 Federal dry holes over the next decade. The target formation for drilling is again the Austin-Buda Fractured Chalk Play which lies approximately 8,770 feet below the surface. It is normally reached by horizontally drilling from dual well pads averaging 8.2 acres in size. The average length of new access road is 0.06 miles involving 0.23 acres of clearing. Over the next 10 years, approximately 252.9 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed, 166.3 acres will have been reclaimed leaving about 86.6 acres for production.

Center Field

The Center Field would have a total of 10 Federal dry holes over the next decade. The target formation is at an average depth of 2,627 feet and is normally reached by vertically drilling from a drill pad of approximately 1.26 acres. The access road would be about 0.06 miles involving 0.23 acres of clearing. Over the next 10 years, approximately 14.9 acres will initially be disturbed. Since all wells are anticipated to be dry holes under this scenario, the sites will be plugged, abandoned, and totally reclaimed.

Coldsprings/Coline/Mercy Fields

The Coldsprings/Coline/Mercy Fields would have a total of 10 private producing wells over the next decade. These formations are normally reached by vertical drilling to a depth of 12,500 feet from drill pads ranging from 2.0 acres to 4.5 acres with the average in the past being 2.4 acres which tends to be larger on private surface than on Federal lands. With production established, the surface area of the drill pad shrinks to approximately 2.02 acres which becomes the average

Over the next 10 years, approximately 32.0 acres will initially be disturbed. After the production is established and the unneeded portion (12.0 acres) of the drill site is reclaimed, 20.0 acres will be left for production.

East Bridges Field

The East Bridges Field would have a total of 10 Federal producing wells over the next decade. The target formation is at an average depth of 8,450 feet and is normally reached by horizontal drilling from a drill pad of approximately 4.88 acres. The access road would be about 0.05 miles involving 0.2 acres of clearing. Over the next 10 years, approximately 50.7 acres will initially be disturbed. After the production is established and the unneeded portion (24.4 acres) of the drill site is reclaimed, 26.3 acres will be left for production.

Glen Rose/Petit Formations

The Glen Rose and Petit Formations would have a total of 10 Federal producing wells over the next decade. The target formation ranges between 1,600 and 1,700 feet and is reached vertically by development within the Carrizo and Wilcox sands. The average length of new access road is 0.09 miles or 0.35 acres. The well pad needed for this size rig ranges from 3.0 acres to about 6.5 acres with the average in the past being 3.7 acres. Over the next 10 years, approximately 40.5 acres will initially be disturbed. After the production is established and the unneeded portion (18.5 acres) of the drill site is reclaimed, 22.0 acres will be left for production.

Laura Lavelle Field

The Laura Lavelle Field would have a total of 20 Federal producing wells holes over the next decade. The average depth to the target formation is 1,800 feet and is normally reached by vertically drilling from pads averaging 0.55 acres in size. The access road length would be about 0.33 miles involving 1.28 acres of clearing. Over the next 10 years, approximately 36.6 acres will initially be disturbed. After the production is established and the unneeded portion (5.4 acres) of the drill site is reclaimed, 31.2 acres will be left for production.

Saratoga Annona Field

The Saratoga Annona Field would have a total of 10 private producing wells and 10 private dry holes over the next decade. These wells would be in the Sabine Uplift Oil Play and Sabine Uplift Gas Play which have an average depth of 8,770 feet. These formations are normally reached by vertical drilling from sites averaging 5.3 acres in size. The access road length would be about 0.02 miles or 0.08 acres. Over the next 10 years, approximately 107.6 acres will initially be disturbed. After the dry holes plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed, 80.3 acres will have been reclaimed leaving about 27.3 acres for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

In the next 10 years, it is likely that new geophysical techniques will be perfected that will allow better interpretation and delineation of petroleum bearing structures. Also, new geological theories on where oil/gas traps may be found could emerge to indicate new areas for exploratory drilling outside of currently producing fields. Some of the assumptions used in constructing this development scenario are: there will be two fields containing one well each/year; one field will be drilled using horizontal drilling technology; the other will involve vertical drilling; and sixteen of the twenty wells will produce economic quantities of oil and gas (8 of the 10 wells in each field). Consequently, this scenario envisions an average of two wells (one horizontal and one vertical) drilled per year during the next 10 years.

The combined surface disturbance associated with horizontally drilled locations average about 7.5 acres of area cleared and graded. For vertically drilled wells, the pad and reserve pit area is approximately 1.5 acres. Access roads to the drill pad locations are approximately 30 feet wide The average length of access road expected to be constructed is about 0.3 miles.

Over the 10-year life of the Revised Forest Plan, an initial surface disturbance from drilling oil/gas wells outside of the currently producing areas would total some 90 acres or 9.0 acres per year. Assuming that two horizontal and two vertical wells will be non-producers and their associated road and drill pad is re-claimed, the total unreclaimed disturbance is reduced to 72 acres. Additionally, once production is established, the size of the drill pad needed for production operations is less than that required for drilling the well. This will reduce the unreclaimed surface disturbance by another 34 to 36 acres overall. The average disturbance would then become 36 to 38 acres over the next ten years.

ALTERNATIVE 2

Under this alternative, there should be no discernable affect on the anticipated number of wells drilled described for Alternative 1. Management Area 2, which emphasizes Standards and Guidelines for the recovery of the Federally endangered species red-cockaded woodpecker (RCW), will have slightly fewer acres (sites) available in the leasable area (all areas in MA-2 will be available for lease). This could affect activity during nesting season and some well sites may need to be relocated to southern pine beetle (SPB) spots or storm damage areas to avoid creating additional openings.

Table 5. Reasonably Foreseeable Development Scenario for
Alternative 2

Oil or Natural Gas Field	National Forest or National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		10 Federal 0 Federal	0 Fed 0 fFd
Brookeland	Angelina	Angelina	10 Federal 10 private	0 Fed

			0 private	
Brookeland	Sabine	Yellowpine	20 Federal 0 private	10 Fe 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
`				
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 10 private	0 Fed 0 priv
East Bridges	Sabine	Tenaha	10 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 fede 0 priv
Laura Lavelle	Davy Crockett	Trinity	20 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 10 private	0 Fed 10 pr
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		20 Federal 0 private	0 Fed 0 priv
TOTAL 20 Federal			100 Federal 30 private	10 pr

Affected Fields

Boonsville Conglomerate Field

There is one Federal well predicted to be vertically drilled in the Boonesville Oil Field per year. Under this alternative, drilling will mostly be affected by grazing. A few of the future wells may be affected by wildlife emphasis areas and the special area. All wells are expected to be drilled under this alternative. The amount of surface disturbance would be the same described under Alternative 1.

Brookeland Field

The portion of the Brookeland Field on the Angelina National Forest would still have an estimated two Federal wells/year. In this portion of the Brookeland field, the Austin-Chalk formation is drilled horizontally and the sites can be relocated if found to be within an RCW

described under Alternative 1.

The portion of the Brookeland Field on the Sabine National Forest would still have an estimated three Federal wells per year drilled into the Brookeland Field Austin-chalk formation. Because the wells in this field are horizontally drilled the affected wells may be relocated if needed. All three wells/year should be drilled under this alternative. The amount of surface disturbance would be the same described under Alternative 1.

Center Field

The one Federal well drilled/year should not be affected under this alternative. The wells drilled in this field are vertical. The amount of surface disturbance would be the same described under Alternative 1.

Coldsprings/Coline/Mercy Fields

It is estimated that one private well per year would normally be drilled vertically into either the Coldsprings, Coline, or Mercy fields per year. The wells should not be affected under this alternative. The amount of surface disturbance would be the same described under Alternative 1.

East Bridges Field

The one Federal well drilled/year should not be affected under this alternative. The wells drilled in this field are horizontal and could be relocated if needed. The amount of surface disturbance would be the same described under Alternative 1.

Glen Rose/Petit Formation

The one Federal well/year drilled into either the Petit formation or the Glen Rose formation will not be affected under this Alternative. The amount of surface disturbance would be the same described under Alternative 1.

Laura Lavelle Field

Under Alternative 2, the two estimated Federal wells/year will not be affected by the RCW HMA. The wells are drilled vertically into the Laura Lavelle Field. Over the next ten years, all

twenty of the expected wells would be drilled under this alternative. The amount of surface disturbance would be the same described under Alternative 1.

Saratoga Annona Field

Under this alternative, two private vertical wells (one producer - one dry hole per year or 20 per decade) would continue to be drilled per year. The amount of surface disturbance would be the same described under Alternative 1.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

Since the locations of the new wildcat fields cannot be predicted with any reasonable certainty, it is assumed that there would be no change in the development scenario described under Alternative 1, and the amount of surface disturbance would be the same.

ALTERNATIVE 3

Under this alternative, there are twelve special areas, four riparian/wild- life areas, five wilderness areas, and one wild and scenic river. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available within the lease (areas within MA-2 will have stipulations protecting surface occupancy at clusters and recruitment-replacement stands). This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings. Oil and Gas production is emphasized.

Table 6. Reasonably Foreseeable Development Scenario for
Alternative 3

Oil or Natural Gas Field	National Forest or National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		10 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	10 Federal 10 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	20 Federal 0 private 0 private	10 Fe
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 7 private	0 Fed 0 priv
East Bridges	Sabine	Tenaha	10 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	20 Federal 0 private	0 Fed 0 priv

Annona			9 private	9 priv
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		20 Federal 0 private	0 Fed 0 priv
TOTAL 20 Federal			100 Federal 26 private	9 priv

Affected Fields

Boonsville Conglomerate Field

The amount of surface disturbance would be the same described under Alternatives 1 and 2.

Brookeland Field

Under Alternative 3, neither the anticipated two Federal wells/year on the portion of the Brookeland Field under the Angelina National Forest nor the anticipated three Federal wells/year on the portion of the Brookeland Field under the Sabine National Forest would be affected. The Brookeland field Austin-Chalk formation is drilled horizontally and the sites may be relocated if found to be within an RCW HMA, a special area like Boykin Springs or Angelina River Corridor, or Upland Island Wilderness Area. This alternative will impact the development of new wells and may delay future operations, but all anticipated wells should still be drilled. The amount of surface disturbance would be the same described under Alternatives 1 and 2.

Center Field

The amount of surface disturbance would be the same described under Alternatives 1 and 2.

Coldsprings/Coline/Mercy Fields

Under Alternative 3, the Coldsprings/Coline/Mercy Fields would have a total of seven private producing wells over the next decade. Over the next 10 years, approximately 22.4 acres will initially be disturbed. After the production is established and the unneeded portion (8.4 acres) of the drill site is reclaimed, 14.0 acres will be left for production. This is slightly fewer than Alternatives 1 and 2 due to special areas and management for RCW.

East Bridges Field

The amount of surface disturbance would be the same described under Alternatives 1 and 2.

Glen Rose/Petit Formation

The amount of surface disturbance would be the same described under Alternatives 1 and 2.

Laura Lavelle Field

The amount of surface disturbance would be the same described under Alternatives 1 and 2.

Saratoga Annona Field

It is anticipated that, under this alternative, some of the private wells will be affected by RCW or special area designation. In most cases the well sites can be moved. Over the next ten years, only 18 out of 20 (9 will be dry holes) private wells will be drilled. Over the next 10 years, approximately 96.8 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded

for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1 and 2.

ALTERNATIVE 4

Alternative 4 emphasizes most of the forest areas managed for the RCW, several special areas, and urban forests. Under this alternative most of the National Forests are in MA-2 except for five existing wilderness areas, eleven special areas, four riparian/wildlife areas, two wild and scenic river corridors, and approximately 13,500 acres on the Sabine National Forest. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available within the lease (areas with no surface occupancy).

Table 7. Reasonably Foreseeable Development Scenario for
Alternative 4

Oil or Natural Gas Field	National Forest or National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		8 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	6 Federal 6 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	16 Federal 0 private	8 Fed 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	7 Fed 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 6 private	0 Fed 0 priv
East Bridges	Sabine	Tenaha	8 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	8 Federal 0 private	0 Fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	17 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 8 private	0 Fed 8 priv

New Wildcat Fields	(location uncertain)	20 Federal 0 private	0 Fed 0 priv
TOTAL 15 Federal		83 Federal 20 private	8 priv

Affected Fields

Boonsville Conglomerate Field

Under this alternative, drilling will be affected by grazing, the wildlife emphasis area, and a Research Natural Area. Over the next ten years, the Boonsville Conglomerate Field would have a total of eight Federal producing wells. Over the next 10 years, approximately 17.8 acres will initially be disturbed. After the production is established and the unneeded portion (7.2 acres) of the drill site is reclaimed, 10.6 acres will be left for production.

Brookeland Field

Under this alternative, the portion of the Brookeland Field under the Angelina National Forest would be affected by MA-2 and by Special Areas like Boykin Springs Scenic Area and Angelina River Corridor. On this district the Brookeland Field Austin-Chalk formation is drilled horizontally and the sites could be relocated if a suitable area was found. Of the 20 wells that are anticipated over the next 10 years, only 12 would be drilled under this alternative. Over the next 10 years, approximately 52.3 acres will initially be disturbed. After the production is established and the unneeded portion (24.7 acres) of the drill site is reclaimed, 27.6 acres will be left for production.

The portion of the Brookeland Field on the Sabine National Forest would have a total of 16 Federal producing wells and 8 Federal dry holes over the next decade. Over the next 10 years, approximately 198.2 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells; and with the unneeded 131.7 acres portion of the drill site reclaimed; about 66.5 acres will remain for production.

Center Field

Under Alternative 4, drilling in the Center Field would be affected by the RCW HMAs, riparian areas, and possibly a special area. The Center Field would have a total of seven Federal dry holes over the next decade. Over the next 10 years, approximately 10.4 acres will initially be disturbed. Since all wells are anticipated to be dry holes under this scenario, the sites will be plugged, abandoned, and totally reclaimed.

Coldsprings/Coline/Mercy Fields

Under Alternative 4, well drilling into the Coldsprings/Coline/Mercy Fields will be affected by MA-2, Big Creek Scenic Area, and Winters Bayou. Since the wells are vertical drills relocation is difficult. The Coldsprings/Coline/Mercy Fields would have a total of six private producing wells over the next decade. Over the next 10 years, approximately 19.2 acres will initially be

site is reclaimed, 12.0 acres will be left for production.

East Bridges Field

Under Alternative 4, drilling in the East Bridges Field would be affected by the MA-2, riparian areas, and possibly a special area. The East Bridges Field would have a total of eight Federal producing wells over the next decade. Over the next 10 years, approximately 40.5 acres will initially be disturbed. After the production is established and the unneeded portion (19.5 acres) of the drill site is reclaimed, 21.0 acres will be left for production.

Glen Rose/Petit Formations

The one Federal well per year drilled into either the Petit formation or the Glen Rose formation will be affected by the MA-2. The wells are vertical and nonrelocatable. The Glen Rose and Petit Formations would have a total of eight Federal producing wells over the next decade. Over the next 10 years, approximately 32.4 acres will initially be disturbed. After the production is established and the unneeded portion (14.6 acres) of the drill site is reclaimed, 17.6 acres will be left for production.

Laura Lavelle Field

Under Alternative 4, the two estimated Federal wells/year will be affected by the MA-2. The wells are drilled vertically into the Laura Lavelle Field and would not be drilled. The Laura Lavelle Field would have a total of 17 Federal producing wells over the next decade. Over the next 10 years, approximately 31.1 acres will initially be disturbed. After the production is established and the unneeded portion (4.6 acres) of the drill site is reclaimed, 26.5 acres will be left for production.

Saratoga Annona Field

Under Alternative 4, some of the private wells would be affected by the RCW HMA. The Saratoga Annona Field would have a total of eight private producing wells over the next decade. Over the next 10 years, approximately 107.6 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells; the unneeded 80.3 acres of the drill site is reclaimed, leaving about 27.3 acres for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1, 2 and 3 (or about 38 acres).

ALTERNATIVE 4a

This alternative sets aside one third of the forests for the RCW. There is moderate to high emphasis on commodity production, some emphasis on recreation and wildlife. There are also special areas set aside as urban forests. Under this alternative, there should be little affect on the anticipated number of wells drilled. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available for surface occupancy. This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings.

Table 8. Reasonably Foreseeable Development Scenario for
Alternative 4a

Oil or Natural Gas Field	National Forest or National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		8 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	10 Federal 10 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	20 Federal 0 private	10 Fe 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 7 private	0 Fed 0 priv
East Bridges	Sabine	Tenaha	10 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 Fed 0 priv

Table 8. Reasonably Foreseeable Development Scenario for
Alternative 4a

Oil or Natural Gas Field	National Forest or National Grassland	Ranger District	Producing Wells	Dry H
Laura Lavelle	Davy Crockett	Trinity	20 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 9 private	0 Fed 9 priv
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		20 Federal 0 private	0 Fed 0 priv

TOTAL 98 Federal
20 Federal

26 private 9 priv

Affected Fields

Boonsville Conglomerate Field

The amount of surface disturbance would be the same described under Alternative 4.

Brookeland Field

The amount of surface disturbance would be the same described under Alternatives 1, 2 and 3.

Center Field

The amount of surface disturbance would be the same described under Alternatives 1, 2 and 3.

Coldsprings/Coline/Mercy Fields

The amount of surface disturbance would be the same described under Alternative 3.

East Bridges Field

The amount of surface disturbance would be the same described under Alternatives 1, 2 and 3.

Glen Rose/Petit Formation

The amount of surface disturbance would be the same described under Alternatives 1, 2 and 3.

Laura Lavelle Field

The amount of surface disturbance would be the same described under Alternatives 1, 2 and 3.

Saratoga Annona Field

The amount of surface disturbance would be the same described under Alternative 3.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4 (or about 38 acres).

This alternative sets aside two-thirds of the forests for the RCW. There is moderate to high commodity production, some emphasis on recreation and wildlife. There are special areas and urban forests. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available for surface occupancy. This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings.

Table 9. Reasonably Foreseeable Development Scenario for
Alternative 4b

Oil or Natural Gas Field	National Forest OR National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		08 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	08 Federal 08 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	18 Federal 0 private	9 Fed 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 6 private	0 Fed 0 priv
East Bridges	Sabine	Tenaha	10 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 Fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	17 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 7 private	0 Fed 7 priv
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		20 Federal 0 private	0 Fed 0 priv
TOTAL 19 Federal			91 Federal 21 private	7 priv

Affected Fields

Boonsville Conglomerate Field

The amount of surface disturbance would be the same described under Alternatives 4 and 4a.

Brookeland Field

Under this alternative, the portion of the Brookeland Field under the Angelina National Forest would be affected by the RCW HMA. Of the 20 wells that are anticipated over the next ten years, only 16 would be drilled under this alternative. Over the next 10 years, approximately 69.8 acres will initially be disturbed. After the production is established and the unneeded portion (33.0 acres) of the drill site is reclaimed, 36.8 acres will be left for production.

The portion of the Brookeland Field on the Sabine National Forest would have a total of 18 Federal producing wells and 9 Federal dry holes over the next decade. Over the next 10 years, approximately 223.0 acres will initially be disturbed. After the dry holes plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed 148.1 acres will have been reclaimed leaving about 74.9 acres for production.

Center Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

Coldsprings/Coline/Mercy Fields

The amount of surface disturbance would be the same described under Alternative 4.

East Bridges Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

Glen Rose/Petit Formation

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

Laura Lavelle Field

The amount of surface disturbance would be the same described under Alternative 4.

Saratoga Annona Field

Under Alternative 4b, some of the private wells would be affected by the RCW HMA. The Saratoga Annona Field would have a total of 7 private producing wells and 7 private dry holes

disturbed. After the dry holes plugged, abandoned, and totally reclaimed, and production is

established on the producing wells and the unneeded portion of the drill site is reclaimed, 28.1 acres will have been reclaimed leaving about 9.6 acres for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4 and 4a (or about 38 acres).

ALTERNATIVE 5

Under this alternative there is less commodity production, the emphasis is on special areas, uneven-aged management, RCW, and primary recreation and wildlife. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available for surface occupancy. This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings.

Table 10. Reasonably Foreseeable Development Scenario for
Alternative 5

Oil or Natural Gas Field	National Forest OR National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		4 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	10 Federal 10 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	16 Federal 0 private	8 Fed 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 7 private	0 Fed 0 priv

			0 private	0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 Fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	20 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 9 private	0 Fed 9 priv
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		20 Federal 0 private	0 Fed 0 priv
TOTAL 18 Federal			90 Federal 26 private	9 priv

Affected Fields

Boonsville Conglomerate Field

Under this alternative, there would be no new leasing on the Lydon B. Johnson National Grasslands. Over the next ten years, the Boonsville Conglomerate Field would have a total of 4 Federal producing wells. Over the next 10 years, approximately 8.9 acres will initially be disturbed. After the production is established and the unneeded portion (3.6 acres) of the drill site is reclaimed, 5.3 acres will be left for production.

Brookeland Field

For the portion of the Brookefield Field under the Angelina National Forest, the amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

For the portion of the Brookefield Field under the Sabine National Forest, the amount of surface disturbance would be the same described under Alternative 4.

Center Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4a and 4b.

Coldsprings/Coline/Mercy Fields

The amount of surface disturbance would be the same described under Alternatives 3 and 4a.

East Bridges Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4a and 4b.

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4a and 4b.

Laura Lavelle Field

The amount of surface disturbance would be the same described under Alternative 1, 2, 3 and 4a.

Saratoga Annona Field

The amount of surface disturbance would be the same described under Alternatives 3 and 4a.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4, 4a and 4b (or about 38 acres).

ALTERNATIVE 6

Alternative 6 focuses on no leasing. Drilling would still occur on lands that are already leased but would taper off as the active leases expire.

Table 11. Reasonably Foreseeable Development Scenario for
Alternative 6

Oil or Natural Gas Field	National Forest OR National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		4 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	3 Federal 3 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	8 Federal 0 private	4 Fed 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	3 Fed 0 priv
Coldsprings/	Sam Houston	San Jacinto	0 Federal	0 Fed

East Bridges	Sabine	Tenaha	4 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	4 Federal 0 private	0 Fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	7 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 3 private	0 Fed 1 priv
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		0 Federal 0 private	0 Fed 0 priv
TOTAL 7 Federal			30 Federal 8 private	1 priv

Affected Fields

Boonsville Conglomerate Field

Under this alternative, the amount of surface disturbance would be the same described under Alternative 5.

Brookeland Field

Of the 20 wells that would normally be anticipated in the portion of the Brookeland Field under the Angelina National Forest over the next ten years, only 6 would be drilled under this alternative. Over the next 10 years, approximately 26.2 acres will initially be disturbed. After the production is established and the unneeded portion (12.4 acres) of the drill site is reclaimed, 13.8 acres will be left for production.

The portion of the Brookeland Field on the Sabine National Forest would have a total of 8 Federal producing wells and 4 Federal dry holes over the next decade. Over the next 10 years, approximately 99.1 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed 65.8 acres will have been reclaimed leaving about 33.3 acres for production.

Center Field

Under this alternative, the Center Field would have a total of 3 Federal dry holes over the next decade. Over the next 10 years, approximately 4.47 acres will initially be disturbed. Since all

and totally reclaimed.

Coldsprings/Coline/Mercy Fields

Under this alternative, the Coldsprings/Coline/Mercy Fields would have a total of 2 private producing wells over the next decade. Over the next 10 years, approximately 6.4 acres will initially be disturbed. After the production is established and the unneeded portion (2.4 acres) of the drill site is reclaimed, 4.0 acres will be left for production.

East Bridges Field

Under this alternative, the East Bridges Field would have a total of 4 Federal producing wells over the next decade. Over the next 10 years, approximately 20.3 acres will initially be disturbed. After the production is established and the unneeded portion (9.8 acres) of the drill site is reclaimed, 10.5 acres will be left for production.

Glen Rose/Petit Formations

Under this alternative, the Glen Rose and Petit Formations would have a total of 4 Federal producing wells over the next decade. Over the next 10 years, approximately 16.2 acres will initially be disturbed. After the production is established and the unneeded portion (7.4 acres) of the drill site is reclaimed, 8.8 acres will be left for production.

Laura Lavelle Field

Under this alternative, the Laura Lavelle Field would have a total of 7 Federal producing wells over the next decade. Over the next 10 years, approximately 12.8 acres will initially be disturbed. After the production is established and the unneeded portion (1.9 acres) of the drill site is reclaimed, 10.9 acres will be left for production.

Saratoga Annona Field

Under this alternative, the Saratoga Annona Field would have a total of 3 private producing wells and 1 private dry hole over the next decade. Over the next 10 years, approximately 21.5 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed, 13.3 acres will have been reclaimed leaving about 8.2 acres for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

Under this alternative, there would be no development of wildcat fields.

ALTERNATIVE 7

Alternative 7 focuses on low impact. One third of the forests would focus on wilderness, botanical research and natural areas. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available for surface occupancy. This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings.

Table 12. Reasonably Foreseeable Development Scenario for
Alternative 7

Oil or Natural Gas Field	National Forest OR National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		4 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	1 Federal 1 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	11 Federal 0 private	5 Fed 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 7 private	0 Fed 0 priv
East Bridges	Sabine	Tenaha	10 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 Fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	20 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 5 private	0 Fed 1 priv
Thornberry	Sam Houston	Raven	0	0
New Wildcat Fields	(location uncertain)		20 Federal 0 private	0 Fed 0 priv
TOTAL 15 Federal			76 Federal 13 private	1 priv

Affected Fields

Boonsville Conglomerate Field

Under this alternative, the amount of surface disturbance would be the same described under Alternatives 5 and 6.

Brookeland Field

Of the 20 wells that would normally be anticipated in the portion of the Brookeland Field under the Angelina National Forest over the next ten years, only 2 would be drilled under this alternative. Over the next 10 years, approximately 8.7 acres will initially be disturbed. After the production is established and the unneeded portion (4.1 acres) of the drill site is reclaimed, 4.6 acres will be left for production.

The portion of the Brookeland Field on the Sabine National Forest would have a total of 11 Federal producing wells and 5 Federal dry holes over the next decade. Over the next 10 years, approximately 132.2 acres will initially be disturbed. After the dry holes are plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed 86.4 acres will have been reclaimed leaving about 45.76 acres for production.

Center Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4a, 4b and 5.

Coldsprings/Coline/Mercy Fields

The amount of surface disturbance would be the same described under Alternatives 3, 4a and 5.

East Bridges Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4a, 4b and 5.

Glen Rose/Petit Formation

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4a, 4b and 5.

Laura Lavelle Field

The amount of surface disturbance would be the same described under Alternative 1, 2, 3, 4a and 5.

Saratoga Annona Field

and 1 dry hole over the next decade. Over the next 10 years, approximately 32.3 acres will initially be disturbed. After the dry holes plugged, abandoned, and totally reclaimed, and

production is established on the producing wells and the unneeded portion of the drill site is reclaimed, 21.4 acres will have been reclaimed leaving about 10.9 acres for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4, 4a, 4b and 5 (or about 38 acres).

ALTERNATIVE 8

This alternative sets identifies 40 percent of the forests for MA-2. There is moderate to high commodity production, some emphasis on recreation and wildlife. There are special areas and urban forests. Management Area 2, which focuses on Standards and Guidelines for the recovery of the Federally endangered species RCW, will have fewer acres available for surface occupancy. This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings.

Table 9. Reasonably Foreseeable Development Scenario for
Alternative 8

Oil or Natural Gas Field	National Forest OR National Grassland	Ranger District	Producing Wells	Dry H
Boonsville Conglomerate	LBJ National Grasslands		08 Federal 0 Federal	0 Fed 0 Fed
Brookeland	Angelina	Angelina	08 Federal 08 private	0 Fed 0 priv
Brookeland	Sabine	Yellowpine	18 Federal 0 private	9 Fed 0 priv
Center	Sabine	Tenaha	0 Federal 0 private	10 Fe 0 priv
Coldsprings/ Coline/Mercy	Sam Houston	San Jacinto	0 Federal 6 private	0 Fed 0 priv

East Bridges	Sabine	Tenaha	10 Federal 0 private	0 Fed 0 priv
Glen Rose/Petit Formations	Davy Crockett	Neches	10 Federal 0 private	0 Fed 0 priv
Laura Lavelle	Davy Crockett	Trinity	17 Federal 0 private	0 Fed 0 priv
Saratoga Annona	Sabine	Yellowpine	0 Federal 7 private	0 Fed 7 priv
Thornberry New Wildcat Fields TOTAL 19 Federal	Sam Houston (location uncertain)	Raven	0 20 Federal 0 private 91 Federal 21 private	0 0 Fed 0 priv 7 priv

Affected Fields

Boonsville Conglomerate Field

The amount of surface disturbance would be the same described under Alternatives 4 and 4a.

Brookeland Field

Under this alternative, the portion of the Brookeland Field under the Angelina National Forest would be affected by the RCW HMA. Of the 20 wells that are anticipated over the next ten years, only 16 would be drilled under this alternative. Over the next 10 years, approximately 69.8 acres will initially be disturbed. After the production is established and the unneeded portion (33.0 acres) of the drill site is reclaimed, 36.8 acres will be left for production.

The portion of the Brookeland Field on the Sabine National Forest would have a total of 18 Federal producing wells and 9 Federal dry holes over the next decade. Over the next 10 years,

approximately 223.0 acres will initially be disturbed. After the dry holes plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed 148.1 acres will have been reclaimed leaving about 74.9 acres for production.

Center Field

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

Coldsprings/Coline/Mercy Fields

The amount of surface disturbance would be the same described under Alternative 4.

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

Glen Rose/Petit Formation

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3 and 4a.

Laura Lavelle Field

The amount of surface disturbance would be the same described under Alternative 4.

Saratoga Annona Field

Under Alternative 4b, some of the private wells would be affected by the RCW HMA. The Saratoga Annona Field would have a total of 7 private producing wells and 7 private dry holes over the next decade. Over the next 10 years, approximately 37.7 acres will initially be disturbed. After the dry holes plugged, abandoned, and totally reclaimed, and production is established on the producing wells and the unneeded portion of the drill site is reclaimed, 28.1 acres will have been reclaimed leaving about 9.6 acres for production.

Thornberry Field

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative.

New Wildcat Fields

The amount of surface disturbance would be the same described under Alternatives 1, 2, 3, 4 and 4a (or about 38 acres).

Environmental Consequences of the Alternatives (Oil & Gas Development)

Physical Environment -- Soil, Water and Air

AIR QUALITY

In general, the air resource impacts are proportional to the amount of oil and gas activity identified within each alternative. The greater the acres, well sites and access roads in an alternative, the greater the potential for impacts to air quality. It should be pointed out that all permitted mineral activity on National Forest Lands will be conducted in accordance with State and Federal air quality laws and regulations. Mineral activity impacts air quality through increases in; fugitive dust (PM10) from site development and equipment movement on site and

oxides (NOx) from gasoline and diesel engine exhaust. Flaring of natural gas also produces VOC, NOx and Sulfur Oxides (SOx). The more mineral activity the greater the impact on the air resource; however using standard stipulations described in EIS Appendix C, these impacts are expected to be well within state and federal limitations.

The Alternatives 1 (current) and 2 will have the greatest impact to air quality due to the greatest number of oil and gas sites. Alternative 6 will cause the least impact to air quality due the fewest number of oil and gas sites. Alternatives 3 through 5, and 7 will have less impact to air quality than the Current and Alternative 2 due to a fewer number of oil and gas sites; and greater than Alternative 6 due to a greater number of sites. However, no measurable impacts to air quality are anticipated from any proposed oil and gas activity on the National Forests and Grasslands in Texas (NFGT).

SOIL PRODUCTIVITY

Soils on the National Forests and Grasslands in Texas have relatively low productivity levels. The majority of the available nutrients are in the A horizon. Removal of the surface material on any site, will have a drastic affect on soil productivity. Site specific mitigations such as stockpiling topsoil and the use of surface water control structures, will allow restoration of soil productivity to most sites that are not used in production of oil and gas products. However, those sites that are used for oil and gas production, will have long term adverse affects on soil productivity; these affects will last until production ceases and restoration is completed.

Alternative 3 will have the greatest potential to adversely affect soil productivity due to having more area remaining in production of oil and gas products. Alternative 6 will cause the least impact to soil productivity due to having the fewest acres in the production of oil and gas products. The Current and Alternatives 2, 4 through 5, 7 and 8, will have a greater impact on soil productivity than Alternative 6 because of more acres in oil and gas production; and less impact to soil productivity than Alternative 3 due to less acres being in oil and gas production.

TONS OF SEDIMENT RESULTING FROM
OIL AND GAS
MANAGEMENT ACTIVITIES

Alternative Nos.	**Period 1**	**Period 5**	
Alternative 1		231,880	226,066
Alternative 2		589,505	518,523
Alternative 3		579,597	531,954
Alternative 4		556,642	537,004
Alternative 4a		560,752	563,135
Alternative 4b		570,930	559,656
Alternative 5		566,087	529,048
Alternative 6		436,006	410,901
Alternative 7		444,366	416,311
Alternative 8		580,460	564,776

WATER

State and Federal water quality laws and regulations. Virtually all surface water leaving the Forest has been designated as public water supply somewhere downstream. Waters designated by the State of Texas as domestic water supply include: Neches River (Davy Crockett National Forest), Upper Angelina River and Sam Rayburn Reservoir (Angelina National Forest), Sabine River and Toledo Bend Reservoir (Sabine National Forest), West Fork Trinity River (Big Sandy Creek) and Denton Creeks (LBJ National Grassland). Groundwater protection strategy dictates that aquifer recharge areas be protected from potential contamination sources. The Carrizo-Wilcox aquifer outcrop is located on the Tenaha Ranger District of the Sabine National Forest; this is classified as a high recharge potential for this major aquifer.

Oil and gas activities have the potential for erosion, sedimentation, and surface and groundwater contamination. However mitigating measures and oil and gas leasing stipulations will protect resources under all alternatives. Surface water contamination can occur as brine, oil, or sedimentation from well sites which enter streams. No measurable impacts to water quality That exceed current standards are anticipated from any proposed oil and gas activity on the National Forests and Grasslands in Texas (NFGT).

GENERAL ALTERNATIVE DISCUSSION

Alternative 6 will cause the least impact to soil, water and air values due to the fewest acres of surface disturbance. Alternatives 2 through 5 and Alternative 7 will have greater impact to soil, water and air values than Alternative 6 but less than current. Water quality will be maintained through activity timing and controlled surface use stipulations, which establish control activities within certain distances from the well site to water bodies (intermittent and perennial streams and lakes), and eroded areas on the Grasslands. Site specific environmental analyses will provide for application of mitigating measures; utilization of erosion control plans (including access roads) will mitigate erosion effects. Construction of reserve pits or collection bins, subject to inspection by Forest Service specialists, will ensure that brine and other contaminants will not leave the site. Sites located on the Carrizo-Wilcox outcrop (Tenaha Ranger District, Sabine National Forest), and/or adjacent to lakeshores and alluvial stream terraces, will require additional mitigating measures such as requiring a sealed reserve system.

ALTERNATIVE 1

This alternative will result in the greatest impact to soil, water and air values, mainly due to the greatest number acres disturbed. This alternative also has the potential for groundwater contamination.

Under Alternative 1 on the Angelina Ranger District, the Brookeland Field has the potential to produce 31 tons per acre per year (T/A/Y) of sediment; the Laura Lavelle Field on the Trinity Ranger District has the potential to produce 13 T/A/Y of sediment; the Glen Rose/Petit Field on the Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Annona

Field on the Yellowpine Ranger District has the potential to produce 39 T/A/Y of sediment; the Coldspring/Coline/Mercy Field on the San Jacinto Ranger District has the potential to produce 12 T/A/Y of sediment; the Boonesville Field on the LBJ National Grasslands unit has the potential to produce 8 T/A/Y of sediment; and the Sabine Uplift on the Yellowpine Ranger District has the potential to produce 152 T/A/Y of sediment. For a total of 270 tons of sediment per acre annually.

The Brookeland Field on the Angelina Ranger District has the potential to produce 31 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 89 T/A/Y of sediment; the Laura Lavelle Field on the Trinity Ranger District has the potential to produce 26 T/A/Y of sediment; the Glen Rose/Petit Field on Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Annona Field on the Yellowpine Ranger District has the potential to produce 39 T/A/Y of sediment; the East Bridges Field on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 5 T/A/Y of sediment; the Coldspring/Coline/Mercy Field on the San Jacinto Ranger District has the potential to produce 12 T/A/Y of sediment; and the Boonesville Field on the LBJ National Grasslands Unit has the potential to produce 8 T/A/Y of sediment. For a total of 262 tons of sediment per acre annually.

ALTERNATIVE 3

The Brookeland Field on the Angelina Ranger District has the potential to produce 31 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 89 T/A/Y of sediment; the Laura Lavelle Field on the Trinity Ranger District has the potential to produce 13 T/A/Y of sediment; the Glen Rose/Petit Field on the Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Anonna Field on the Yellowpine Ranger District has the potential to produce 35 T/A/Y of sediment; the East Bridges Field on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 5 T/A/Y of sediment; the Coldspring' Coline/Mercy Field on the San Jacinto Ranger District has the potential to produce 8 T/A/Y of sediment; and the Boonesville Field on the LBJ National Grasslands Unit has the potential to produce 8 T/A/Y of sediment. For a total of 241 tons of sediment per acre annually.

ALTERNATIVE 4

The Brookeland Field on the Angelina Ranger District has the potential to produce 19 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 72 T/A/Y of sediment; the Laura Lavelle Field on the Trinity Ranger District has the potential to produce 11 T/A/Y of sediment; the Glen Rose/Petit Field on the Neches Ranger District has the potential to produce 12 T/A/Y of sediment; the Sara Annona Field on the Yellowpine Ranger District has the potential to produce 31 T/A/Y of sediment; the East Bridges Field on the Tenaha Ranger District has the potential to produce 15 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 4 T/A/Y of sediment; the Coldspring/Coline/Mercy Field on the San Jacinto Ranger District has the potential to produce 7 T/A/Y of sediment; and the Boonesville Field on the LBJ National Grasslands Unit has the potential to produce 6 T/A/Y of sediment. For a total of 177 tons of sediment per acre annually.

ALTERNATIVE 4a

The Brookeland field on the Angelina Ranger District has the potential to produce 31 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 90 T/A/Y of sediment; the Laura Lavelle on the Trinity Ranger District has the potential to

potential to produce 15 T/A/Y of sediment; the Sara Annona on the Yellowpine Ranger District has the potential to produce 17 T/A/Y of sediment; the East Bridges on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 5 T/A/Y of sediment; the Coldspring/Coline/Mercy on the San Jacinto Ranger District District has the potential to produce 8 T/A/Y of sediment; and the Boonesville Field on the LBJ National Grasslands Unit has the potential to produce 6 T/A/Y of sediment. For a total of 222 tons of sediment per acre annually.

ALTERNATIVE 4b

The Brookeland field on the Angelina Ranger District has the potential to produce 25 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 80 T/A/Y of sediment; the Laura Lavelle on the Trinity Ranger District has the potential to produce 11 T/A/Y of sediment; the Glen Rose/Petit on the Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Annona on the Yellowpine Ranger District has the potential to produce 14 T/A/Y of sediment; the East Bridges on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 5 T/A/Y of sediment; the Coldspring/Coline/Mercy on the San Jacinto Ranger District has the potential to produce 8 T/A/Y of sediment; and the Boonesville Field on the LBJ National Grasslands Unit has the potential to produce 6 T/A/Y of sediment. For a total of 201 tons of sediment per acre annually.

ALTERNATIVE 5

The Brookeland field on the Angelina Ranger District has the potential to produce 31 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 72 T/A/Y of sediment; the Laura Lavelle on the Trinity Ranger District has the potential to produce 13 T/A/Y of sediment; the Glen Rose/Petit on the Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Annona on the Yellowpine Ranger District has the potential to produce 17 T/A/Y of sediment; the East Bridges on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 5 T/A/Y of sediment; and the Coldspring/Coline/Mercy on the San Jacinto Ranger District has the potential to produce 8 T/A/Y of sediment. For a total of 198 tons of sediment per acre annually.

ALTERNATIVE 6

The Brookeland field on the Angelina Ranger District has the potential to produce 9 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 36 T/A/Y of sediment; the Laura Lavelle on the Trinity Ranger District has the potential to produce 5 T/A/Y of sediment; the Glen Rose/Petit on the Neches Ranger District has the potential to produce 6 T/A/Y of sediment; the Sara Annona on the Yellowpine Ranger District has the potential to produce 6 T/A/Y of sediment; the East Bridges on the Tenaha Ranger District has the potential to produce 7 T/A/Y of sediment; the Center Field on the Tenaha has the potential to produce 2 T/A/Y of sediment; and the Coldspring/Coline/Mercy on the San Jacinto

Ranger District has the potential to produce 2 T/A/Y of sediment. For a total of 73 tons of sediment per acre annually.

The Brookeland field on the Angelina Ranger District has the potential to produce 3 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 51 T/A/Y of sediment; the Laura Lavelle on the Trinity Ranger District has the potential to produce 13 T/A/Y of sediment; the Glen Rose/Petit on the Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Annona on the Yellowpine Ranger District has the potential to produce 12 T/A/Y of sediment; the East Bridges on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 11 T/A/Y of sediment; and the Coldspring/Coline/Mercy on the San Jacinto Ranger District has the potential to produce 8 T/A/Y of sediment. For a total of 150 tons of sediment per acre annually.

ALTERNATIVE 8

The Brookeland field on the Angelina Ranger District has the potential to produce 25 T/A/Y of sediment; the Brookeland Field on the Yellowpine Ranger District has the potential to produce 80 T/A/Y of sediment; the Laura Lavelle on the Trinity Ranger District has the potential to produce 11 T/A/Y of sediment; the Glen Rose/Petit on the Neches Ranger District has the potential to produce 15 T/A/Y of sediment; the Sara Annona on the Yellowpine Ranger District has the potential to produce 14 T/A/Y of sediment; the East Bridges on the Tenaha Ranger District has the potential to produce 37 T/A/Y of sediment; the Center Field on the Tenaha Ranger District has the potential to produce 5 T/A/Y of sediment; the Coldspring/Coline/Mercy on the San Jacinto Ranger District has the potential to produce 8 T/A/Y of sediment; and the Boonesville Field on the LBJ National Grasslands Unit has the potential to produce 6 T/A/Y of sediment. For a total of 201 tons of sediment per acre annually.

<u>Environmental Consequences</u> of the Alternatives (Oil & Gas Development)

Biological Environment -- Wildlife and Vegetation

Specific considerations directly affecting oil and gas development are management related activities for threatened and endangered species. In all alternatives site development within 1/4 mile of RCW nest sites and 1/2 mile of bald eagle nest sites may require controlled surface stipulations due to noise, fragmentation, and potential nesting failure to T&E species like the eagle and RCW. This control would have to be on a site-specific basis and rely on current biological information to address disturbance factors, vegetation and habitat loss. These stipulations are discussed in the Environmental Impact Statement (EIS) Appendix C and may apply for other species (such as for Navasota Ladies' Tress) as well as those not yet identified.

As well sites increase in number, size and longevity; the possibility of habitat fragmentation will increase. The increasing fragmentation of species habitats will need to be evaluated. Generally fragmentation is not considered a problem in forested areas unless the sites exceed 5-10 acres in size. Most well sites do not exceed the 10 acre maximum that could occur. Fragmentation should be addressed in the site specific analysis as it relates to any threatened or endangered species, or if the area is critical to interior forest species that may be emphasized in that area.

For each two acres of well site there is an equal two acre loss of habitat until that site is totally revegetated and restored. Drilling, pumping, road traffic, pipeline installation will all create a

some will leave that area, and some will be attracted to the new opening. These effects from the loss of habitat and disturbance will have to be evaluated on a case-by-case basis.

Vegetation by itself is not a major concern on forests as the acres of potential well site will not have a significant impact on timber harvest capabilities or forage use by cattle. In Grassland units the potential development is even less in any alternative. The best way to evaluate potential impacts on the biological element is to identify the approximate amount of openings and soil disturbance for Forest and Grassland units by alternative. These areas of disturbance will affect the seral stage and weed production that benefit some game species, yet may cause some negative impacts in interior forest species.

ALTERNATIVES 1, 2, 3, and 4a

Brookeland Field (Angelina National Forest) - Under these alternatives, the most exploration and production of federal wells would occur. Some areas of concern (though not affecting overall production) would be RCW emphasis areas, the Neches River corridor, and special areas. The initial disturbance of the wells anticipated over the next ten years would be about 87.2 acres and after portions are reclaimed the area would be reduced to 46 acres.

Brookeland and Saratoga/Annona (Sabine National Forest) - Under these alternatives, the most area is initially disturbed for oil and gas exploration. Some 355 acres would be disturbed and reclaimation would reduce that area to about 70 acres. The initial disturbance of 37 wells being drilled over the next ten years could impact some of vegetation and wildlife components of this longleaf pine dominated area, however surface disturbance may have some beneficial effects on game or recreational species.

East Bridges and Center Fields (Sabine National Forest) - Even though some area is added for RCW and special areas, oil and gas should not be greatly affected. Disturbance would be approximately 65.6 acres over the first 10 years, but reclaimation efforts would reduce the area left for production to about 26 acres.

Laura Lavelle and Glen Rose Fields (Davy Crockett National Forest) - The estimated Federal wells will not be affected by the RCW emphasis area. The proposed wells as indicated would be drilled. Over the next ten years, approximately 36 acres and 40 acres respectively will be disturbed for a total of 76 acres. After reclaimation only 54 acres is expected to be disturbed over the next ten years.

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - There are no wells expected to be drilled on Federal or private minerals in any alternative. This field will not have any appreciable impact on the biological resources in this area.

Coline, Coldsprings, and Mercy Fields (Sam Houston National Forest, San Jacinto Ranger District) - Same 32 acres are estimated to be disturbed during the first 10 years of the Plan. Twelve acres will be reclaimed leaving 20 acres of mineral openings on this area.

Boonsville Conglomerate Field (LBJ National Grasslands) - About 10 wells are anticipated to be drilled during the first 10 years of this plan. The eventual area used for this production would be about 13 acres. This level of disturbance is not anticipated to have any significant impact on wildlife or vegetation.

No known oil and gas fields exists on the Caddo National Grassland. No impact from minerals activities is anticipated on the biological resources of this area in any alternative.

ALTERNATIVE 4

Brookeland Field (Angelina National Forest) - Larger RCW emphasis areas, the Neches River corridor, and special areas will decrease oil and gas production. The initial disturbance of the wells anticipated over the next ten years would be about 52 acres and after portions are reclaimed the area would be reduced to 27 acres.

Brookeland and Saratoga/Annona (Sabine National Forest/Yellowpine Ranger District) - This alternative would reduce the area initially disturbed for oil and gas exploration. Some 155 acres would be disturbed and reclaimation would reduce that area to about 66 acres. The initial disturbance of 37 wells being drilled over the next ten years could impact vegetation and wildlife components of this longleaf pine dominated area, however due to lease stipulations (EIS Appendix C) this is expected to be of minimal consequences.

East Bridges and Center Fields (Sabine National Forest/Tenaha Ranger District) - Whole Forest areas are added for RCW, along with special areas and other concerns, reducing oil and gas disturbance. Total disturbance would be approximately 51 acres over the first 10 years, but reclaimation efforts would reduce the area left for production to about 21 acres.

Laura Lavelle and Glen Rose Fields (Davy Crockett National Forest) - The estimated Federal wells will be affected by the RCW emphasis area. Fewer wells in the Laura Lavelle and Glen Rose Fields would be drilled. Over the next ten years, approximately 31 acres and 32 acres respectively will be disturbed for a total of 63 acres. After reclaimation only 44 acres is expected to be disturbed over the next ten years.

Thornberry Field (Sam Houston National Forest, Raven Ranger District) - Same as 4a.

Coline, Coldsprings, and Mercy Fields (Sam Houston National Forest, San Jacinto Ranger District) - Same 19 acres are estimated to be disturbed during the first 10 years of the Plan. Twelve acres will be left in production after reclaimation.

ALTERNATIVE 4b and 8

Brookeland Field (Angelina National Forest) - The initial disturbance of the wells anticipated over the next ten years would be about 69 acres and after portions are reclaimed the area would be reduced to 36 acres.

Laura Lavelle and Glen Rose Fields (Davy Crockett National Forest), Coline, Coldsprings, and Mercy Fields (Sam Houston) and Boonsville (Grasslands)Fields- Same as 4.

East Bridges and Center Fields (Sabine National Forest/Tenaha Ranger District) - Same as 4a.

Brookeland and Saratoga Fields (Sabine National Forest/Yellowpine Ranger District) - The initial disturbance of wells being drilled over the next ten year would be about 270 acres that would be reduce to about 85 acres in production after reclaimation.

ALTERNATIVE 5

Brookeland Field (Angelina National Forest); Laura Lavelle and Glen Rose Fields (Davy Crockett National Forest); Coline, Coldsprings, and Mercy Fields (Sam Houston) - Same as 4a.

Brookeland and Saratoga (Yellowpine Ranger District) - Same as 4.

East Bridges and Center Fields (Sabine National Forest/Tenaha Ranger District) - Same as 4a.

Boonsville Conglomerate - National Grasslands - No leasing occurs in Alternatives 5, 6, and 7. Existing leases and development may approximate up to 9 acres of development over the first 10 years, with about 5 acres dedicated to production.

ALTERNATIVE 6

Maximum Special Area and Wilderness: Alternative 6 focuses on no leasing. Drilling would still occur on lands that are already leased but would taper off as the active leases expire. Area allowed for production in this alternative would be about 14 acres/decade on the Brookeland Field (Angelina National Forest), 18 acres/decade on the Laura Lavelle and Glen Rose Fields (Davy Crockett National Forest); 48 acres/decade on the Sabine, and 4 acres on the Coline, Coldsprings, and Mercy (Sam Houston) Fields.

ALTERNATIVE 7

Brookeland Field (Angelina National Forest) - Under Alternative 7, Federal wells would be greatly affected by wilderness and special area designations. The Brookeland field Austin-Chalk formation is drilled horizontally but the sites would be hard to get outside of the wilderness area. Under this alternative no wells would be drilled with about 4-5 acres left in production.

Brookeland, Saratoga, East Bridges and Center Fields (Sabine National Forest) - Approximately 32 acres left in production.

Laura Lavelle and Glen Rose Fields (Davy Crockett National Forest);Thornberry, Coline, Coldsprings, and Mercy Fields/Sam Houston National Forest - Same as Alternative 4a.

Social Environment -- Recreation

Some of the major affects from oil and gas activity involve more roaded access to currently primitive or semi-primitive non-motorized areas. This access will create increased sounds when activity is to close to trails, roads and other recreational areas. Roads and pipelines may cross use areas such as trails. These occurrences would have negative visual impacts if within view of the trail or camping area. Restrictions to recreational use, or less primitive settings may result.

Sam Houston National Forest and Caddo/LBJ Grasslands are managed as Forests with a special urban emphasis, and have more exposure and sensitivity to visual impacts and conflicts with recreational uses. The ROS (Recreational Opportunity Spectrum) and VQO would be changed in the general vicinity of well sites and their access roads.

special management areas than the north side. Oil and gas activities in this Brookeland Field (Angelina National Forest) area will create more impacts on the south.

Socioeconomic Considerations

Oil and Gas activities on the NFGT have not been as great an impact on County returns as has timber production; however, oil and gas activity does produce between $250,000-$300,000 annually for counties within NFGT. Total returns to the U.S Government from NFGT activities were approximately 8 million dollars in 1993. The NFGT is credited with 12 1/2 percent or just over 1 million dollars in 1993 from oil and gas activities. Based on the one million dollar NFGT credit 25 percent was returned to counties ($272,000) in 1993. The returns from oil and gas have a more significant impact on Grasslands Counties. Other benefits from oil and gas production are secondary jobs initiated from production efforts on active leases. These jobs are directly correlated to mineral production (or about 20 jobs created for every million dollars in exploration) and to mineral refinement (or 3 jobs for every million dollars of oil/gas refined).

In an attempt to model the impacts of the reasonably forseeable oil and gas development by alternative, specific information relative to the scenario as discussed RFD was applied to FORPLAN II and IMPLAN (see Appendix B for details). In all alternatives the estimated returns to the counties are considered optimistic due to the way in which FORPLAN calculations were developed. Models generally consider a "perfect case" scenario where no restrictions exist from budgets, man-power, and legal or administrative activities which impact or reduce the ability to produce. As in the estimated timber volume, the outputs are considered "perfect case" scenario (without impacts from budgets, personnel, legal, and environmental concerns which have not been entered into the equations.) Appendix E discusses the development of these estimated outputs in detail.

ALTERNATIVES 1, 2, 3, and 4a

It is anticipated that these alternatives would be closest to existing returns to the treasury and subsequent county benefits. The production activities would have similar secondary employment impacts locally as currently exists. Exploration and leasing would be similar. Alternative 1 is estimated at $438,000 total returns from oil and gas activities after the first decade, Alternatives 2 through 4a are $435,000. These alternatives are projected to display a slight (10 percent) reduction in oil and gas proceeds over the 50 year horizon.

ALTERNATIVE 4

Reduction in oil and gas leasing related to production would be approximately 5 percent within this alternative the first decade. Total returns to the counties would be approximately $418,000 during this period, but the trend would be a general reduction of about 20 percent through the first 50 years.

ALTERNATIVE 8 and 4b

If the wells were drilled as predicted in this alternative, counties would receive about $424,000. This is about only a 3 percent reduction from what the current or no action alternative would

however, fully about 30 percent below the current alternative.

ALTERNATIVE 5

In Alternatives 5, 6, and 7 leasing does not occur on the Grasslands. Under Alternative 5 there is less commodity production, the emphasis is on special areas, uneven-aged management, RCW, and primary recreation and wildlife. The returns to the treasury would be very similar to 4b with

about $424,000 returned to the counties. This situation in as in Alternative 4b would slowly decline in future decades due to the lease stipulations.

ALTERNATIVE 6

With maximum Special Area and Wilderness, Alternative 6 focuses on no leasing. Drilling would still occur on lands that are already leased but would taper off as the active leases expire. The money from royalties and business in the local communities will not be generated. There may be less additional jobs and salaries that are typically associated with oil and gas industry. Industry will move from Federal surface and drill on private land and drain the Federal interests with more surface disturbance on private.

This alternative would return just less to the treasury as 4b and 5 through the first decade, but as leases expire and new exploration is curtailed these returns will gradually shrink. County returns would drop substantially by the the fifth decade to about 60 percent ($354,000) of the predicted levels in Alternative 1, period one. The production may initially compare with what is in Alternative 7 near the end of the first period, but drilling would continue to taper off.

ALTERNATIVE 7

With many Special Areas and Wilderness, Alternative 7 focuses on low impact. One third of the forests would focus on wilderness, botanical research and natural areas. Management Area 2, which focuses on Standards and Guidelines for the RCW, will have fewer acres available to lease. This could affect activity during nesting season and some well sites may need to be relocated to SPB spots or storm damage areas to avoid creating additional openings.

There would be less drilling on Federal surface under this alternative compared to all alternatives except 6. There will be fewer additional jobs and salaries that are typically associated with oil and gas industry. Returns to the treasury and subsequent county returns would be just over $390,000 annually through the first decade. These proceeds would continue a downward trend, and by the fifth period production would yield less than 45 percent of what could be expected in the no-action or current alternative.

Part III (a)
The Socioeconomic **Environment**

Social and Economic Setting

Affected Environment - Forests and Grasslands

The forests of East Texas and the grasslands of North Central Texas play a significant role in the economic, social, cultural, and political environment of the state. The U.S. Forest Service

that are collectively called the National Forests and Grasslands in Texas (NFGT). Many local communities rely on the employment and income generated from the use of Forest and Grassland resources. A measure of stability is derived from a continuous supply of timber being available for harvest from the forests, even though supply is not the only determinant of stable markets. Income and employment are also derived from people traveling through communities on their way to use the Forests or Grasslands for recreation and other purposes. An awareness of tourism's importance as a source of future economic and social activity for communities in East Texas is growing.

In addition to economic activity, the quality of people's lives is greatly enhanced by the physical environment associated with the Forests and Grasslands. A diversity of vegetation, wildlife, and other resource opportunities provide for a variety of quality recreation experiences; and the many scenic and other attractions provide an attractive place to live and work.

All of these goods, services, and uses have value to the people who live in the area. Changes in the quantity or quality of these attributes affect their lives. With a limited resource base and increasing demands from a growing population, conflicts or issues related to the relative values of different goods, services, and uses are bound to arise.

A socioeconomic study was initiated in 1990 to look at social and economic indicators in order to understand the environment within which decisions concerning practices and policies on the NFGT are made. This summary highlights some of the major points discussed in that report. More information can be found in the NFGT Socio-Economic Overview (Albers 1990) which is available for review in the planning records at the Supervisor's Office in Lufkin, Texas.

Geographical Scope

Texas covers 266,807 square miles and contains 23 million acres of forested land. East Texas, which is 55 percent timbered, includes 95 percent of the 12 million acres of productive timberland in the state. The NFGT cover 673,926 acres including about 5 percent of the productive timberland in the State.

The Angelina, Davy Crockett, and Sabine National Forests lie within eight counties of rural east Texas, where the economy is based on natural resources. Yet, these forests are within a few hours of Houston, the fourth largest city in the United States.

The Sam Houston National Forest lies within 55 miles of downtown Houston. This forest covers roughly 60,000 acres in rural San Jacinto County, nearly 48,000 acres in fast-growing Montgomery County, and about 54,000 acres in relatively urban Walker County. Population levels in the counties which encompass the Sam Houston National Forest are high, and fast growing, due to the proximity of the city of Houston.

The Lyndon Baines Johnson (LBJ) and Caddo National Grasslands are located in three rural counties in north central Texas, where the population density averages 30 persons per square mile. The economy of these counties is based primarily on livestock production and oil and gas exploration. Both the LBJ and Caddo are within a two-hour drive of Dallas and Fort Worth, where 22 percent of all Texans reside.

The population of Texas is predominantly young and ethnically diverse. Among the 10 most populous states, Texas has the largest share of residents under-age 25 and the smallest share of residents over age 45. Texas is ethnically diverse: 63 percent Anglo; 12 percent African-American; and 23 percent Hispanic. Yet, demographic characteristics vary markedly from rural to urban areas. Population growth rates also vary and are highest in the urban areas.

The population in the area encompassing the Angelina, Davy Crockett, and Sabine National Forests is older and less ethnically diverse than the State as a whole. In Sabine, San Augustine and Trinity Counties, more than 20 percent of the residents are over 65, compared to only 10 percent statewide. The population in this area is 77 percent Anglo, 19 percent Black, and 3 percent Hispanic. However, ethnic diversity is projected to increase; by the year 2025 Angelina

County, the most ethnically diverse county in the area, is projected to be 61 percent Anglo, 14 percent African-American, and 24 percent Hispanic.

The Sam Houston National Forest is located in a more urban setting than the other National Forests. Montgomery, Walker, and San Jacinto Counties mirror statewide demographic trends typical of urban areas; Montgomery and Walker Counties have a young population while Walker County has high ethnic diversity. Population growth rates are high in these counties; from 1980 to 1988 population growth rates exceeded 30 percent. Montgomery County is projected to add close to 400,000 additional residents from 1990 to the year 2025, a 215 percent increase in population. Walker County is projected to add more than 34,000 residents and San Jacinto will add close to 18,000 residents by the year 2025. Residents of Montgomery and Walker Counties are predominantly young; less than 8 percent of the population is over age 65, compared to 10 percent statewide. Walker County, the most diverse of the three counties, is 69 percent Anglo, 21 percent Black and 8 percent Hispanic.

The Houston Metropolitan Area, as defined by the State, includes one-third of the Sam Houston National Forest (Montgomery County). Houston is one of the 30 most ethnically diverse cities in the United States. Over 3.5 million people currently reside in the Houston Metropolitan Area and the population is projected to increase to 7 million by the year 2025.

Residents of the counties encompassing the LBJ and Caddo Grasslands are older and less ethnically diverse than more urban areas. In Montague and Fannin Counties, over 20 percent of the population is over age 65. Wise County, the most ethnically diverse of these counties, is 7 percent Hispanic and is projected to be 22 percent Hispanic by the year 2025. From 1980 to 1988 Wise County experienced population growth rates of 30 percent while growth in Montague and Fannin Counties was less than 4 percent. From 1990 to 2025 population growth is projected to be highest in Wise County (91 percent).

The Dallas and Fort Worth Metropolitan Areas, both within two hours of the Grasslands, are characterized by a young, ethnically diverse population. In Collin and Denton Counties, less than 6 percent of the population is over age 65.

Employment/Economy

In 1980, services (16 percent), manufacturing (15 percent) retail trade (15 percent) and State and local government (11 percent) were the largest employers in Texas. By 1989, the four major sectors of employment were services (24 percent), retail trade (19 percent), manufacturing (14

source of employment, has continued to grow. Three-quarters of the new jobs created in Texas during the next decade will be in the service industries; yet, the importance of various sectors of the economy varies tremendously from region to region.

Manufacturing, which includes the forest products industry, is the largest sector of the economy in terms of employment and wages in Angelina, Jasper, Polk, Shelby, Newton and Sabine Counties. The manufacturing of timber is a vital part of the Texas economy as well as the regional and national economy. Texas wood-based industry is the ninth largest in the nation, and the fourth largest in the south. Texas is third in plywood production, seventh in pulpwood, and twelfth in lumber production. In 1981, the Texas wood-based industry had sales of $5.6 billion and indirectly contributed another $2.3 billion to the Texas economy.

Timber, considered by many to be the most valuable agricultural crop in the south, is one of the top four cash crops in Texas. In 1984, almost 60,000 Texans were employed in the wood-based

industry. An additional 228,000 Texans transport, sell, or use wood in other activities. In 17 of the 43 East Texas counties, wood-based manufacturing is the largest of all manufacturing industries.

In 1989 and 1990, unemployment rates in counties which encompass the Angelina, Sabine, and Davy Crockett National Forests ranged from 5.5 to 10.5 percent. Unemployment rates were slightly lower in the counties which encompass the Sam Houston National Forest and the LBJ and Caddo Grasslands. Unemployment rates in San Jacinto, Montgomery, and Walker Counties ranged from 3.8 to 5.9 percent; while unemployment rates in the Grassland counties ranged from 4.9 to 6.7 percent.

Income

Poverty rates are generally higher, and per capita income is lower in rural areas due to lower levels of education and lack of employment opportunities. Poverty rates in counties which encompass the four National Forests range from 18 to 35 percent. The exception is urban Montgomery County, where the poverty rate is less than 9 percent. Poverty rates in the Grassland counties range from 15 to 19 percent. In contrast, poverty rates in the urban metropolitan areas range from 3 to 18 percent.

Per capita income in the Forest and Grassland counties are well below the State average with the exception of Montgomery County. In 1988, San Jacinto ($8,832) had the lowest per capita income of the Forest/Grassland counties while Montgomery County ($13,811) had the highest per capita income and was close to the State average of $13,888. Per capita incomes in the counties which encompass the LBJ and Caddo Grasslands were below the State average. In contrast to the Forest and Grassland Counties, the per capita income in the metropolitan areas ranges from $11,193 to $19,155.

Lifestyles

Outdoor recreation opportunities are abundant in Deep East Texas (1.919 acres per person) and developed recreation land (0.024 acres per person) is plentiful compared to other regions. Roughly 15 percent of the total land area is available for recreation. With over 440,000 surface acres of water contained in 30 large reservoirs, it is not surprising that 53 percent of residents

a recent study indicates hunting is the primary activity in wilderness areas.

The National Forests, particularly the Sam Houston National Forest, are increasingly seen as an outdoor recreation destination by urban residents. Lack of recreation land is a major concern to residents of Houston. Both outdoor recreation opportunities (0.083 acres per person) and developed recreation (0.005 acres per person) are in great demand. Consequently, areas such as Lake Conroe experience high visitor rates. These and other high use recreation areas have already created positive economic benefits. Increased access to Lake Conroe and increased opportunities for other recreational activities could enhance tourism in the area. Opportunities for off-road vehicle use are particularly limited, since the National Forests are the only public lands in the general area providing opportunities for this form of recreation.

In the Dallas and Fort Worth area, outdoor recreation opportunities are limited (0.032 acres per person) and developed recreation (0.009 acres per person) is in great demand. The high population density (336.6 persons per square mile) makes overcrowding a problem at many recreation areas. Forty-seven percent of resource based recreation by residents occurs outside the region. No other region has as large a percentage of residents leaving the home region to

engage in outdoor recreation. By the year 2025, the Dallas-Fort Worth and Arlington metropolitan area will have close to 6 million residents, further stressing recreation resources. The LBJ National Grasslands could provide quality recreation experiences to residents of Dallas, Fort Worth, and surrounding counties. Hunting opportunities, in particular, are few and costly.

In counties surrounding the Caddo Grasslands, recreationists from outside the region already outnumber local participants more than two to one. Outdoor recreation land is comparable to other regions in the state (0.289 acres per person) and the region's supply of developed recreation ranks highest in the State (0.044 acres per person). Demand for leisure activities suited to older individuals will increase as the number of senior citizens retiring to the Lake Texoma area increases.

The educational level of rural residents is generally lower than that of urban residents. Sixty-two percent of the population in Texas has 12 years or more of schooling. Of the forest counties, only Montgomery County (66 percent) exceeds the statewide average education level: in Jasper, Wise, Angelina, Nacogdoches, and Walker Counties 52 to 61 percent have 12 or more years of schooling; and in the remaining counties, less than half of the residents have 12 or more years of schooling. In contrast, at least half the residents in all nearby metropolitan counties have 12 or more years of schooling.

Crime in rural areas is still less violent and less prevalent than in more urbanized areas, but this discrepancy is narrowing. The highest per capita crime rates are found in Dallas and Tarrant Counties with over 11,000 serious crimes per 100,000 residents. Harris County also had a high crime rate with close to 7,000 serious crimes per 100,000 residents. In Deep East Texas, crime rates are relatively low; serious crimes per 100,000 ranged from 5,000 in Angelina and Nacogdoches Counties to 1,500 in Sabine County. The Grassland counties also have low crime rates: in Wise County, there were 2,268 serious crimes per 100,000; while Montague and Fannin County had crime rates just over 3,000 crimes per 100,000 residents.

Of the 12 counties which include National Forests, road usage is highest in Angelina and Montgomery Counties. Plans are currently underway for major reconstruction of Interstate 45 in Montgomery County. The proximity of this major artery to the Sam Houston National Forest

success of any recreation area. Recent interest has developed for construction of a completely new Interstate Highway 69 through East Texas, near Highway 59.

Receipts to Counties

Twenty-five percent of receipts from timber sales, recreation user-fees, and other revenue sources on the Forests and Grasslands are given to counties as grants and are to be used for education (50 percent) and roads (50 percent). During the last decade, the average annual payment to the 12 National Forest counties was $1,948,865. During this period, payments ranged from $1,519,025 in 1982, to a high of $4,194,180 in 1983. In 1987 payments totalled $3,753,309 and, on a per acre basis, were greater than the average per acre current-use tax paid by private timberland owners. Payments going to schools represented less than one percent of the 1988-89 school budget in all counties except Houston, Sabine, San Augustine and Trinity, where payments comprised as much as 4 percent of the school budget. The proportion of payments going to county roads in 1990 was less than 4 percent in all counties except Houston, Sabine, San Augustine, Shelby and Trinity, where payments accounted for as much as 35 percent of the road and bridge budget.

Summary

Significant demographic differences are found between urban and rural residents which could influence demands from the National Forests and Grasslands. Urban residents are young and ethnically diverse while rural areas have populations which are significantly older and show less ethnic diversity. The population of counties which encompass the Angelina, Sabine, and Davy Crockett National Forests and the LBJ and Caddo Grasslands are older and less ethnically diverse than the population of Texas as a whole. Residents of Montgomery and Walker counties, by the Sam Houston National Forest, show demographic characteristics typical of urban areas and are younger and more ethnically diverse than the other Forest and Grassland Counties. Montgomery and Walker Counties, as well as Wise County which encompasses the LBJ National Grasslands, have experienced and are projected to continue to see high rates of growth and change in their ethnic diversity and age characteristics.

Differences in income and employment are found between urban and rural areas. In general the Forest and Grassland counties have lower per capita incomes and higher poverty rates than more urban counties. Many of the Forest Counties depend heavily on wood based manufacturing, while the service industry, already the largest employer in Texas, is expected to grow considerably in the next decade.

The availability of outdoor recreation opportunities varies from region to region. Outdoor recreation opportunities are abundant in Deep East Texas. In contrast, outdoor recreation opportunities and developed recreation opportunities, in the Gulf Coast region (includes the city of Houston and Walker and Montgomery Counties) and the North Central region (includes Dallas/Ft. Worth and Wise County) are less than in the Deep East Texas region. Outdoor recreation opportunities in the Texoma region (includes Caddo National Grassland) are comparable to levels found statewide and per capita developed recreation opportunities are among the highest in the state.

County, are below the statewide average and below educational levels found in most metropolitan counties. Crime rates in the rural Forest and Grasslands counties are low, roughly 1/3 to 2/3 of the crime rate found in the metropolitan areas. Receipts to the counties from forest revenues comprise up to 4 percent of the school budgets in Houston, Sabine, San Augustine and Trinity Counties. These receipts constitute a more significant portion of the county road and bridge budget, comprising up to 35 percent of the budgets in Houston, Sabine, San Augustine, Shelby and Trinity Counties during the years examined.

The rural Forest and Grassland counties are significantly different than nearby metropolitan areas and the state as a whole. These counties have more abundant outdoor recreation opportunities, lower crime rates, less ethnic diversity, more poverty, an older and less educated population, and a lower per capita income. The manufacturing sector, which includes the forest products industry, is the major economic base in many rural counties while statewide the services sector is most important. Montgomery County, and to a lesser extent Walker and Wise Counties, straddle this urban/rural interface and consequently, are intermediate in most of these aspects. Counties which encompass the Sam Houston National Forest show many demographic characteristics typical of urban counties.

Environmental Consequences of the Alternatives

(Social and Economic)

The social and economic environment that surrounds the Forests and Grasslands will be affected as a consequence of implementing any of the proposed alternatives. Change will occur through various direct and indirect effects on the communities, industries, and people that rely on them for employment, recreation, and other goods and services.

The intent of the Forest Service management was stated shortly after the turn of the century as "the greatest good for the greatest number in the long run." It essentially means that the National Forests were established not for any single group, industry, or individual, but rather for the present and future benefit of the people of the United States. This sort of utilitarian philosophy has been the guiding principle of National Forests and Grasslands management ever since. Thus, both local and national issues and concerns are considered in Forest Service policies and decision-making.

Management of resources affects many of the people and communities and around the counties which make up the Forests and Grasslands primary area of influence. The alternatives, which show different combinations of management options, will have certain impacts or effects on people who are employed by the Forest Service, those who work under contract for the agency, and businesses that use or renew the many resources. The counties receive monies equivalent to 25 percent of the gross timber receipts in lieu of taxes that could be generated from National Forests or Grasslands lands. The counties also receive 25 percent of the total revenues derived from other resource uses on the public lands, including campground receipts and grazing fees. There is also a direct effect on recreation users, including individuals, families, and organized groups. These people use the Forests and Grasslands for a wide variety of recreation

participating in these leisure activities vary by alternative.

The socioeconomic environment is affected by changes which are subtle and quite often difficult to measure. These are indirect impacts which include expected changes in secondary employment due to changes in direct employment. Thus, the car dealer or grocery store may be affected by changes in the number of sawmill or Forest Service workers that are employed. Likewise, the employment and projects partially supported by the county monies will have indirect impacts that are real, but difficult to quantify. Feelings of satisfaction with the local area influences citizen's beliefs, attitudes, leisure activities, and enjoyment of their work. These are considered to be indirect because of the many other factors that may influence the people in an area more directly. These include home mortgage interest rates, availability of work, hourly wages or salaries, family ties, savings, and amount of leisure time.

The range of alternatives shows considerable variation in the resource outputs that can have an impact on the socioeconomic environment. For example, in one alternative the amount of timber to be sold could be 50 percent less than current volumes, while available recreation opportunities increase. Effects may include a reduction in available jobs associated with timber harvesting, and county revenues and potential increases in recreation use if the alternative were implemented. The secondary impacts would also be estimated in terms of the types of businesses that rely on income from timber processing employees, as well as aspects of the community that would benefit through an increase in recreation visits to the area.

There are several basic factors that vary by alternative, with respect to their impact on the socioeconomic environment. They are: (1) jobs, which are heavily influenced by the amount of timber sold and subsequently harvested; (2) income, which is affected by dollar flows throughout

the country; (3) payments to the counties which affect county funding, especially for schools and roads; (4) lifestyles, reflected in the amount of recreation opportunities; and (5) community cohesion, which reflects the amount or type of natural resources or management issues which pull together or split the communities.

The Forest Service has the potential to affect the total number of jobs in its area of influence as a result of the mix and level of goods and services provided in each alternative. The assumption in estimates of job impacts is that other supply and demand factors affecting the "markets" for forest products and uses are constant. This assumption becomes more tenuous the further out in time projections of effects are made. For example, the amount of timber offered for sale by the forest is not, and will not be, the only factor to affect the number of jobs in the timber industry. The timber industry is in a time of transition and the amount of workforce required per unit of output has decreased in some areas due to modernization of mills. Additional factors include union and non-union wage and benefit agreements, interest rates for home mortgages and business loans, closing of mills that cannot make a profit, import and export levels, production and shipping costs, regional competition, private and public land harvest levels and policies, volatility of the lumber, plywood, and chip markets, and estimating what the availability and price of raw materials and finished products will bring.

The number of jobs associated with each alternative was estimated using an input-output model called IMPLAN. The data base in IMPLAN represents 1990 county information for 528 economic sectors. In this model, job estimates are a function of changes in final demand resulting from changes in output levels. Changes in output or activity levels initiate expenditures in various sectors of the local economy which trigger the change in jobs and income. Job and

expected to be harvested; recreation use; payments to counties; and Federal government expenditures.

Two impact areas exist for the National Forests and Grasslands in Texas. They are those counties containing portions of the National Forests and those counties containing portions of the National Grasslands.

National Forest Counties		**National Grassland Counties**
Angelina	Sabine	Fannin
Houston	San Augustine	Wise
Jasper	San Jacinto	Montague
Montgomery	Shelby	
Nacogdoches	Trinity	
Newton	Walker	

While these counties receive revenues from the National Forests and Grasslands in Texas as well as visitors to these areas, other metropolitan areas are also impacted. The cities of Beaumont, Dallas, Ft. Worth, Houston, and Tyler also benefit from their proximity to the National Forests and Grasslands in Texas.

The socioeconomic consequences of the alternatives presented here need to be viewed as relative indicators of change rather than assessments of absolute changes that would occur in the social impact area. These predicted changes would have validity as absolute indicators only if no other factors were acting upon this economy. The analysis techniques are discussed in Appendix B where additional economic data may be found.

The following table displays the changes in employment and income that could occur as a result of the management practices and policies contained in the alternatives. Changes in employment and income are in comparison to current management as reflected in Alternative 1.

Change in Employment and Income by Alternative

Alternative	**Employment**	**Income (MM$)**
1	0	0
2	+596	+21.211
3	+469	+17.483
4	-277	-12.758
4a	+110	+1.574
4b	-84	-7.230
5	-493	-16.891
6	-1144	-37.747
7	-948	-35.787
8	+201	+ 4.271

$15,874,000 of total income is generated annually in the forest impact area.

Twenty-five percent of receipts collected for the use of the forest land is distributed to counties that contain forest land. The funds are ear-marked for roads and schools.

From 1986 through 1993, the 15 counties in Texas containing Forests and Grasslands have received the payments shown in the following table.

Payments to Counties from 1986-1993.

Year	**25 Percent**
1986	$3.6 million
1987	$3.7 million
1988	$2.7 million
1989	$2.0 million
1990	$2.4 million
1991	$2.5 million
1992	$3.5 million
1993	$3.6 million

The following table displays the estimated 25 percent fund as a result of the management practices and policies contained in the alternatives.

Estimated Annual 25 Percent Fund
by Alternative for 1st Period.

Alternative	Millions of Dollars*
1 (Current)	$5.581**
2	$6.626
3	$6.295
4	$5.042
4a	$5.728
4b	$5.538
5	$4.537
6	$3.079
7	$3.862
8	$5.889

*Includes all dollars, minerals/recreation/timber/and range

**Based on 1987 Plan Allowable Sale Quanity (ASQ) with adjustment for court ordered 1,200-meter RCW guidelines.

TRADEOFFS BY ALTERNATIVE TABLES WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

Part III. (b)
The Socioeconomic **Environment**

Dispersed Recreation Uses

This section of the Socioeconomic Environment provides a discussion of the various uses and values that attract users to the National Forests and Grasslands in Texas (NFGT). Recreational settings occur throughout the NFGT providing a range of recreation or leisure opportunities through numerous dispersed recreation facilities, or just natural undeveloped landscapes. Settings range from dense thicket type forests to open prairie grasslands on about 675,570 acres.

Users are attracted to the NFGT by areas established as wilderness, scenic, and wildlife management areas along with the general national forest environment incorporating trails for hiking, horseback, and motorbikes, or all terrain vehicles. Forests and Grasslands scenery, heritage values, and unique ecosystems provide enjoyable open spaces for people's leisure activities. These open spaces provide therapeutic relief to persons working in highly developed urban areas.

The Forests accommodate a variety of dispersed recreation activities including hunting, camping, picnicking, fishing, swimming, hiking, horseback riding, off-road vehicle (ORV) use, mountain biking, shooting, driving for pleasure, firewood gathering, wildlife viewing, viewing scenery, boating, canoeing and gathering of forest products.

Accessibility by all users regardless of physical capability is an important aspect of providing dispersed recreation facilities and activities as well as at the more developed facilities. As a public agency, the Forest Service is required by law to provide facilities that are accessible by people with disabilities.

In order to meet the June 26, 1990 Americans with Disabilities Act (ADA) standards, all recreation sites will require some type of modification or replacement of facilities, over time. Not all facilities and/or activities will require the same type of modification. There are four levels of accessibility, ranging from easy to most difficult. These levels of difficulty will be tied to the Recreation Opportunity System (ROS). The levels of difficulty will normally relate to ROS as follows: Rural - easy; Roaded-Natural - moderate; Semi-Primitive - difficult; and Primitive - most difficult.

Increased public use of the National Forest System has created conflicts between users who compete for the limited resources. Before the 1970's, the foremost law problem of the NFGT was arson. Today, many serious crimes are being committed against Forest users. Crimes formerly considered urban type offenses now occur on the NFGT.

Law enforcement officers are assigned to Ranger Districts and criminal investigators are available to the Forest Supervisor. Each field officer completes a minimum of 240 hours of law enforcement training to serve as a fully qualified technician. In addition, cooperative agreements with local law enforcement offices provide additional enforcement assistance. This provides a minimal protection level; however, additional law enforcement presence would assure better user safety.

Interpretive services activities and programs are designed to enhance a visitor's interest, enjoyment, appreciation, and understanding of the natural environment of the NFGT. Interpretive

will increase as the number of recreation facilities increase.

Recreation Supply and Demand

Recreational use on USFS lands and particularly the NFGT continues to grow in importance and visibility. Accurate planning for future recreational development and management should be based on a thorough review of the full recreational supply and demand situation from a national, regional, state and local level. The following discussion summarizes the recreational supply and demand situation on the NFGT and is based on extensive documentation from the AMS, the Socio-Economic Report (Albers 1991), and the RPA.

Supply Summary

Recreation supply can be defined as the amount of recreational trips available at a certain time and place to an individual. The supply of recreational trips is a function of many factors including: the availability of recreational facilities and resources available to potential visitors such as transportation, equipment, technology and personal skills, knowledges and abilities.

Approximately 2,010,400 acres of parkland (developed and undeveloped) were provided by federal agencies in Texas. The NFGT comprises just over 675,000 acres or about 1/3 of Federal "parklands" open for public recreation. In general, the U.S. Fish and Wildlife Service and the National Park Service offer more primitive recreation activities prohibiting activities which require motorization or development, with the U.S. Forest Service slightly more developed, and the Corps of Engineers having the most developed facilities. The state of Texas provides an additional 30 percent of the recreational land in the state with 1,120,434 acres of land. The remaining 1/3 is comprised of a number of counties, cities, and other local entities or the private sector.

The NFGT provides a substantial variety and amount of recreational opportunities on Texas's 1/3 federal parklands. These recreational activities are best summarized in terms of identifiable activities. Recreational trips are defined on NFGT in 12 hour "recreational visitor days" (RVD's); or specifically for hunting and fishing as "wildife and fish user days" (WFUDS). NFGT survey data indicates that fishing was the most popular activity in fiscal year (FY) 1990, as 805,200 RVD's occurred. The next most common activity on the NFGT was camping, at 448,600 RVD's. The third most frequently occurring activity on the NFGT was hunting at 248,800 RVD's. Motorcycle and scooter travel accounted for 129,600 RVD's. Power boating and viewing scenery each resulted in 67,000 RVD's. Accounting for 56,100 and 49,600 RVD's were picnicking and automobile travel, respectively.

Demand Summary

The estimated expenditures of Texans for recreation equipment in 1987 was $1,045,953,000. The typical American family may be smaller, with more discretionary income, but less free time. The result will be shorter, but more frequent, planned vacations. With the aging population, lifetime activities will gain in popularity such as walking for pleasure and nature study. More people in Texas participate in walking for pleasure than any other outdoor recreational activity. Although only a predicted 19 percent occurs on trails. Some other popular activities are picnicking, swimming, fishing, camping, boating, hunting, nature viewing, off-road vehicle riding and horseback riding.

The Texas Outdoor Recreation Plan (TORP) ranks projected participation in many outdoor recreation activities. The projections are driven primarily by population growth. Life-time activities, such as walking for pleasure and nature study, will make slight gains in participation (15 percent each from 1990 to 2000) as they attract participants from all ages. Activities

projected to increase at 13 percent include freshwater fishing, camping and hiking. The activities projected to increase at 12 percent are hunting and horseback riding. Picnicking and ORV riding are projected to increase by 11 percent each, and freshwater swimming will only increase 10 percent if the projections are correct (AMS 1992).

The RPA Assessment depicts the national projection of recreation consumption by activity to the year 2040 if recent past trends of recreational opportunities are continued.

The growth of **land-based trips** is projected to accumulate across activities to about 15 percent by the year 2000. The expected consumption by the year 2000 of land activities which occur on the NFGT includes backpacking (+24 percent), day hiking (+23 percent), developed camping (+20 percent), walking for pleasure (+16 percent), photography (+15 percent), horseback riding and sightseeing (+14 percent), pleasure driving and picnicking at 10 percent each, primitive camping (+8 percent), wildlife observation (+7 percent) and nature study (-l percent).

The expected consumption of **water-based activities** which are projected to grow most rapidly includes canoeing (+13 percent), lake swimming (4 percent) and motor boating (+7 percent).

Considering the forecasted number of trips, the most popular recreational activities by the year 2000 will be day hiking, warm water fishing, developed camping, walking for pleasure and sightseeing.

Conclusions

Most pressures will be on supply of areas and facilities for physically active pursuits, particularly warm weather activities on roaded, partially developed lands near population centers. Other pressures will be for nonconsumptive uses such as walking for pleasure, day hiking, wildlife observation and nature study. The continual discussion and difficulty during this and any planning decision is evaluation of trade-offs; commodity versus amenity; timber production versus aesthetics. These issues are all the real key to ecosystem management and NFGT ability to assure long term sustainability and enjoyment of our resources.

National Forests near urban areas represent one of the most important opportunities to meet the increasing demand for outdoor recreation closer to people's homes. Urban forests will also be able to reach an ethnically diverse audience. Better information about outdoor recreation opportunities, partnerships with local government and private entrepreneurs, education of the visitor, facility upgrades, and intensified management can improve the accessibility of these opportunities. Overcrowding and user conflicts such as conflicting uses between hunters, hikers and ORV riders will intensify in the future. Educating users and managers, redistribution of use concentration, and greater use of volunteers is needed. The alternatives address various levels of these demands and and trade-offs. Some alternatives emphasize recreation and aesthetics at the expense of production; these concerns are the heart of any decision making process.

Affected Environment - Forests and Grasslands

Driving for pleasure has long been recognized as one of the most popular dispersed recreation activities on National Forest land. Whether users tour on paved roads and highways or are four-wheeling on rough roads, the NFGT offer a variety of experiences to the visitor.

Licensed drivers of off-road vehicles (ORV) are allowed on NFGT roads that are open for public

travel, provided the vehicle and the operator are in compliance with state motor vehicle laws. A number of NFGT level "D" roads provide a challenging off-road experience. These roads are typically narrow, curving, and/or infrequently maintained, and some may be seasonally opened for hunting.

ORV use off designed roads is currently prohibited on the Caddo and Lyndon Baines Johnson (LBJ) National Grasslands to stop the excessive erosion from occurring. No designated ORV trails exist on the Grasslands. The most serious erosion occurred on the LBJ unit of the Grasslands on the fragile limestone based soils. Much of the damage done prior to 1976 is still visible today.

The Grasslands are relatively small in comparison to Forest acreage (LBJ 20,313 acres, Caddo 17,785 acres) and has very fragmented ownership. If ORV use was allowed, it would become very concentrated, and potential conflicts with other users, private land owners, and resource damage (i.e., soil and water, wildlife and vegetation) would be high.

Most ORV use occurs on the west side of the Sam Houston and southern Angelina National Forests. Approximately 55 miles of designated ORV trails are located on the western part of the Sam Houston NF; these are designated for motorcycles and all-terrain vehicles including four-wheelers less than 50 inches in total width. Also, an open area of approximately 14,000 acres is designated for the same type of ORV's. The open area and the 55 miles of designated trails were officially recognized in 1976; but prior to that date and since that time, many other trails have evolved creating what is now a maze of trails crisscrossing the western part of the district. These are not officially recognized and are estimated to be in excess of 250 miles.

The Angelina National Forest is managed as "open cross-country" and with substantial ORV activity; this has created an estimated 300 miles or more of trails in the Longleaf Ridge or Boykin Springs area. These existing trails include some level "D" roads, but primarily they are comprised of old logging trams, firelines and woods trails. Concerns over increasing ORV use of these trails and soil erosion have been identified.

The Davy Crockett and Sabine National Forests are managed as "open cross-country", except for special areas closed to ORV use. Closed areas include wilderness, scenic areas, developed recreation areas, administrative sites, utility corridors, special management areas, sensitive soils areas, and other areas that may be administratively closed by the Forest Supervisor for resource protection.

The management problem caused by "open cross-country" use is the basic lack of control. This lack of control causes conflicts in uses, soil and water degradation, wildlife conflicts, safety and protection, and law enforcement. Statistics indicate Texas has approximately 61 motorcycles per 1,000 public acres, which is a relatively high number compared to such states as California with 8.7 motorcycles per 1,000 public acres. This is created by the relatively low 2.1 percent of land in the state being in public ownership of which 20 percent is National Forest. The impact of less

ORV recreational needs which accentuate the demand on the National Forests in Texas.

Many trails on the Angelina and Sam Houston National Forest are very close or possibly encroach upon sensitive, threatened, and endangered species such as the red-cockaded woodpecker (RCW). Management of the RCW, adds further resource concerns that limit ORV access, as the court decision (Sierra Club v. United States, case No. L85-69-CA, dated October 20, 1988), where ORV's were either limited or prohibited from RCW sites. The Endangered Species Act of 1973, protecting endangered species, takes precedence over recreation uses.

Some stream bank crossings show signs of soil movement creating gullies two and three feet deep leading to the stream. Trails in other areas have trenches one to two feet deep where water running down the trail erodes exposed soils. Few rock or gravel stone are found in the soils that could help reduce ORV impact. Through a Challenge Cost-Share Agreement with the Trail Riders of Houston, stream crossings on the permanently marked trail system are being reinforced with concrete blocks.

The Angelina National Forest is the second most used area by ORV's, but it has no designated trail system. All use on the Angelina is open cross-country, utilizing a maze of existing trails. Although motorcyclists and some four-wheel drive enthusiasts (OHV) have created a large network of trails concentrated in the Boykin Springs Area, none of these trails have been formally designated.

Four-wheel drive vehicles, as off-road vehicles, have been limited mostly to hunters using Level D roads constructed for timber sales and other system roads in all areas except the southern Angelina National Forest.

Non-Motorized Uses

Approximately 240 miles of trails designed for hiking, horseback riding, mountain biking, backpacking, and canoeing are located throughout the four Forests and two Grasslands. Most of the NFGT trails were not built to regional standards, but they are usable and safe for their intended use. Trail maintenance levels are below that prescribed at the current level and also below the level that is needed to fully maintain the trail system to regional standards. Consequently, the condition of some of the trails on the NFGT system are slowly declining. The maintenance shortfalls have not resulted in the closure of any trails because volunteers from various groups have kept resource damage to a minimum.

The trail systems were originally planned and designed to provide a representative cross section of a managed forest environment. It was designed to work in harmony with other resource management activities, while neither dominating nor being subordinate to them. It was recognized that this would involve compromise between trail management and other resource management and activities.

The greatest apparent demand for non-motorized use trails is for horses and mountain bicycles. The existing designated non-motorized trail system provides 188 miles of hiking trails and 52 miles of horse trails. The only mountain bicycle trails are within the Double Lake Recreation Area and are considered part of the developed facilities.

Trail (Sam Houston National Forest); the 28 mile Trail-Between-The-Lakes (Sabine National Forest); the 20 mile 4-C's Hiking Trail (Davy Crockett National Forest); the 5 mile Sawmill Trail (Angelina National Forest); a 4 mile trail between Black Creek Recreation Area and Cottonwood Lake (LBJ National Grasslands); and 19 miles of undesignated trails, interpretative trails, and scenic area trails.

Horseback riding is a popular use of National Forests and Grasslands, occurring singly, in small groups, or as permitted event rides. At present, few problems with excessive wear on vegetation, soil, and water resources, or conflicts with other users. The 52 miles of designated horse trails on the Davy Crockett National Forest presents few problems with excessive wear on vegetation, soil, water resources, or conflicts with other users.

A twelve mile canoe trail in the Big Slough Wilderness and along the Neches River on the Davy Crockett National Forest, is a loop trail which begins at Scourloch's Camp trailhead. This trail has been difficult to maintain because of limited access through the wilderness and downed trees from the Neches River waterway.

Mountain bike use and demand is on the increase. There are approximately 15 miles of mountain bike trails inside the Double Lake Recreation Area.

Hunting for squirrel and deer is a very popular use of the NFGT. Although the use is limited to about three and one-half months during the fall and winter months, it creates a very heavy impact on weekends during that time. Designated hunter camps have been used on the Sam Houston and Davy Crockett National Forests in order to provide more safety, reduce conflicts, control litter, and minimize indiscriminate shooting. With more and more private land being restricted from hunting, additional pressures are being put on public lands for hunting.

Dispersed area camping is popular during the fishing and hunting seasons. Some camping occurs along with hiking and horseback riding activities. Some problems associated with this camping include excessive use of popular areas, site deterioration, littering, and vegetation damage. Camping along the shorelines of Lake Conroe and Sam Rayburn Reservoirs have caused site deterioration, litter, and accumulations of human waste in these areas.

Indiscriminate target shooting incidents are increasing and there are frequent complaints of stray bullets. Portions of the Sam Houston National Forest have several large sub-divisions butting-up against Forest Service land and have been the source of several complaints about stray bullets. The LBJ Grassland shooting incidents increased until restrictions were placed on firearm use and areas were closed to target shooting.

There are currently five recreation areas with interpretive trails. The NFGT Master Interpretive Plan, which is on file in the Supervisor's Office, proposed further development of interpretive trails.

Environmental Consequences of the Alternatives

(Dispersed Recreation)

Non-Motorized **Uses**

alternatives. The needs for accessibility are dictated by the Americans and Disabilities Act, and any new construction will provide for accessibility through universal design of the facility. An inventory of facilities that do not meet ADA standards is completed and a transition plan developed in order to program rehabilitation of existing facilities to provide the proper accessibility.

The need and application for law enforcement activities on NFGT will be equal to the current situation or will increase across most alternatives. Enforcement activities will be especially in demand to provide regulation compliance for recreation sites, protect resources, and special areas. Specific law enforcement needs will be for arson, recreation related needs, resource protection to include endangered species, management of ORV trails and shooting ranges.

Alternatives 3, 4, 4a, 4b, 5 and 8 have an increasing number of special area designations, developed recreation sites, and trails. The law enforcement effort will have to increase accordingly across these alternatives to protect more designated areas. Alternatives 6 and 7 will

have large allocations of wilderness, which will also demand greater enforcement efforts to secure the integrity of wilderness.

The interpretive needs will remain the same through the alternatives, except that the opportunities for providing these services will increase from Alternative 1 through 4 and 8.

Alternatives 2, 3, 4, 8, 4a and 4b add 15 miles of hiking trail to the Forests' existing mileage. Alternatives 1, 5, 6 and 7 would maintain the same number of trail miles as currently exists. On the Grasslands Alternative 8 indicates the most increase in hiking trail (and multi-use trail) with 29 miles. Alternative 2 and 4-7 adds 6 miles of trail, and Alternative 3 adds 10 miles to the Grasslands.

Most existing hiking trails have concentrated use only on selected areas. The highest priority for hiking trail development would be to create loop trails on existing trail segments. Alternative 6 would provide up to a 300 foot trailside zone on either side of the trail that would not receive any type of timber management. Proposed management along the trails would meet the adopted Visual Quality Objective (VQO) of Retention. The VQO for trailside zones would be consistent with the other alternative themes.

Alternatives 2, 3, 4, 4a, and 4b add approximately 10 miles of canoe trails in Winters Bayou of the Sam Houston National Forest to the existing 12 miles. Fifty miles are added in Alternative 8.

Mountain bike use is increasing on the National Forests and is a somewhat recent demonstrated need. Alternatives 2 and 3 add 20 miles, while Alternatives 4, 4a, 4b and 8 add 50 miles to the existing system. For the Grasslands, Alternatives 2 and 3 add 20 miles and Alternatives 4, 4a, and 4b would add 10 miles of mountain bike trails. The most trail miles on the Grasslands occurs in Alternative 8, where approximately 18 miles of mountain bike and another 25 miles of multi-use lake traverse trail miles are proposed.

Several areas are being used by horseback riders, but only the Davy Crockett has a designated. Alternatives 2, 3, 5, and 7 add 26 miles on the Angelina National Forest already being used for competitive events. Alternatives 4, 4a, 4b, 6, and 8 add 90 miles which includes the 26 miles on the Angelina, plus another 64 miles on the Sam Houston National Forest. The establishment of multi-use trails would provide considerably more miles of use for each user. Alternative 2 would

miles of horse trails on the Grasslands.

Motorized Uses

Currently, the Forests are basically open for ORV cross country use, plus the 55 miles of designated ORV trails on the Raven District of the Sam Houston National Forest. Alternative 2 would still allow the Forests to be open for cross country use and have 55 to 100 miles of designated trails on the Sam Houston and Angelina National Forests. Alternative 3 would limit the open areas to the Sabine and Davy Crockett National Forests, but would increase the designated ORV trail miles on the Sam Houston and Angelina by 200 miles. Alternatives 4, 4a, and 4b would all leave the open areas to the Sabine and Davy Crockett National Forests, but would increase the designated trail miles on the Angelina and Sam Houston by 250 miles on the Forests. Alternative 5 would allow open cross country use only on the Sabine and Davy Crockett and not add any miles to the designated trail system. Alternative 6 would close the Forests completely to ORV use. Alternative 7 would not allow any cross country use but would add 250 miles of designated trails to the system with some mileage being on each forest. Alternative 8 would all leave the open areas to the Sabine, northern Angelina and Davy Crockett National

Forests, but would increase the designated trail miles on the southern Angelina and Sam Houston by 250-300 miles or 355 miles total on the Forests. This alternative also allows a transition period for trail inventory, evaluation and designation.

Alternatives 1, 2, 3 and 8 prohibit ORV use on the Caddo and LBJ National Grasslands. All motorized use would be restricted to system roads that are open for vehicular traffic.

Alternatives 4 through 7 provide both open areas for ORV use and designated trails for ORV's on both Grassland units. Alternative 4, 4a, and 4b call for 10 to 50 miles of designated trails while Alternatives 5, 6, and 7 call for 20 to 40 miles of designated trails. Alternative 8 on the Grasslands prohibits ORV use. Any ORV trails located on the LBJ would probably have to have a reinforced trail tread, similar to a roadway. Trail location would be critical to minimize conflicts and resource damage. Costs would be high compared to other trail construction costs of $2,000 per mile. Trails on the Caddo would be similar in problems, but would probably not be so costly as on the LBJ.

Off-Road Vehicle Trail Miles

Alternative	**Number Miles**	**Number Miles**
	Forest	Grasslands
Alternative 1	* 55	0
Alternative 2	*100	0
Alternative 3	*255	0
Alternative 4, 4a, & 4b	*305	10-50
Alternative 5	* 55	20-40
Alternative 6	0	20-40
Alternative 7	*305	20-40
Alternative 8	*355	0

Uncontrolled ORV use may have an adverse impact to vegetation, soil, and water values. Areas of concentrated use will have a decrease in soil productivity caused by compaction and soil loss. Water quality may also be affected by sedimentation on stream channels which could lead to a violation of the 319 section of the Clean Water Act. Animals may be disturbed and even displaced from their home range by the noise. When ORV use is intense, reproductive success for some species can be lower.

In all alternatives (except Alternative 6), soils and water run-off will be the main concerns for trail location and mitigation needs. As new trails are planned and designated, they will have to avoid RCW clusters. This will be quite restrictive in locating additional mileage.

Scenery/Visual Quality

Affected Environment - Forests and Grasslands

This East Texas area is heavily oriented to agricultural and forest industry, most of it being covered by forest of shortleaf, loblolly and some longleaf pine. These are interspersed with hardwood stands and flowering species such as dogwood, redbud and magnolia. Stands of old residual pine provide habitat for the RCW (an endangered species). The old trees having "red

heart" provide nesting sites (holes). The vegetation of the National Forests is predominately shortleaf and loblolly pine with red oak, white oak and sweetgum. Longleaf stands usually have an open understory whereas the loblolly and shortleaf have a more heavily vegetated understory.

The river bottoms and sloughs are predominately willow, cherrybark, water and overcup oaks, sweetgum and a variety of other bottomland hardwood species. The ridges terraces and slopes have a dense understory while the river bottoms and sloughs have a sparse understory. The general character of the forests is a continuous vegetative cover with little variety except at river bottoms and sloughs.

The LBJ National Grasslands are located in the central lowland landscape character type. This area is characterized by rather level and some gently sloping surfaces lying at different levels with a relatively steep and straight, cliff-like face or slope of considerable linear extent. Main streams are entrenched. Vegetation is a mixture of tall and pasture grasses, live oaks, black jack oak, post oaks and mesquite.

The LBJ National Grasslands is also quite open on the ridges and on top of the mesas, and the drainages and bottomlands are covered with oaks. A considerable amount of variety exists, primarily through landforms. Long distance views, unlike the forests, are often available. The Caddo National Grasslands have in most areas a heavy cover of post oak, blackjack oak and Eastern red cedar.

The landform within the National Forests varies from flat to gently rolling uplands to low hardwood bottoms and is very weak. The Sam Houston National Forest has the least amount of landform followed by the Davy Crockett, Angelina, and the Sabine National Forests which has the most amount of landform. Long distance views across the forest are very limited. All long distance views have a line of site of less than 10 percent slope making most management practices in middle ground or background unseen.

the primary mapping unit on the VQO inventory.

Timber management activities are the most common activity affecting landscape management. There has been a shift in timber management philosophy on the National Forests in Texas from clearcutting to seed tree and shelterwood cutting. There has also been recent policy change to favor more hardwood in pine stands, especially in clumps. There is also an emphasis on leaving flowering trees and shrubs wherever possible, even in red-cockaded woodpecker areas. One of the reasons for these changes is concern for visual quality.

Current management (Alternative 1) for each of the four VQO's are:

Forest Data

Visual Quality Objective	**Acres**
Preservation	39,546
Retention	40,369
Partial Retention	104,805
Modification	488,301
Total	673,021

Caddo/LBJ Grasslands Data

Visual Quality Objective	**Acres**
Preservation	380
Retention	0
Partial Retention	3,366
Modification	21,009
Total	24,755

Environmental Consequences of the Alternatives (Scenery/Visual Quality)

The percentage of each VQO is an approximation of emphasis within management area which can be directly applied to acres in each alternative. This was derived through assessment of current VQO maps.

Forest VQO by Management Areas (MA)

	Preservation	**Retention**	**Partial Retention**	**Modi**
MA-1			15%	85%
MA-2*		10%	25%	65%
MA-4		80%	20%	
MA-5		33%	66%	
MA-7	100%			

MA-9		100%		
MA-10			50%	50%
MA-11		10%	50%	40%

* Includes MA-6

Grasslands VQO by Management Areas (MA)

	Preservation	Retention	Partial Retention	Modi
MA-3			15%	85%
MA-4		90%	10%	
MA-5		100%		
MA-8	100%			

In all alternatives, utility corridors present a marked contrast in line, form and texture to the natural landscape. These contrasts are mitigated to the extent practical.

Developed recreation areas, administrative sites, oil well sites and communications sites also contrast with the surrounding landscape. These are rehabilitated, designed and constructed under all alternatives to the extent feasible in a manner that minimizes impact or harmonizes with the natural environment.

All alternatives allow for the application of the enhancement and rehabilitation VQO's. These short term VQO's are applied when necessary and appropriate in order to meet a long term VQO. They will not be applied where a preservation VQO has been adopted. An example of this is the application of a rehabilitation VQO in a retention zone that has extensive mortality from SPB killed timber. The removal of dead snags and other efforts to clean up the area are necessary in order to meet the long term retention VQO. Enhancement is applied when visual resources are of primary importance in order to open vistas or otherwise enhance the scenic resources of the Forest.

Standards have been developed to guide vegetation management, road construction, and other management activities relative to visual resources. Contrast reducing techniques appropriate for each management practice and VQO are given and are applicable under all alternatives.

Approximately 90 percent of the forests would be managed under the uneven-aged management system in Alternatives 6 and 7. This would present a mostly closed canopy scene with few openings. The views from the roadways would be restricted to the immediate foreground areas. All the other Alternatives would have a mix of even-aged and uneven-aged management ranging from 20 to 50 percent of each. These alternatives would present more variety and provide longer views into the forest. The use of prescribed burning, especially in longleaf pine stands, will provide even longer views into the forested areas.

In all Alternatives, a large portion of the Forests will be guided by the management necessary to provide for the RCW, a threatened and endangered species. This special management will limit the options available for scenic resource management.

Most of the Grasslands scenic resource is pastural, and provides long distance viewing. All alternatives would remain basically the same. Alternatives 2 and 3 would provide for the least emphasis on scenic resources (with the most area occurring in MA-1), and Alternatives 4 through 8 (with the least occurring in MA-1) would concentrate more effort on the visual aspects of management.

Recreation Opportunity Spectrum (ROS)

Affected Environment - Forests and Grasslands

The Recreation Opportunity Spectrum (ROS) offers a framework for understanding the relationships between different physical settings and recreation experiences. The Spectrum has been divided into six major classes: Rural (R); Urban (U); Roaded-Natural (RN); Semi-Primitive Motorized (SPM); Semi-Primitive Nonmotorized (SPNM); and Primitive (P). From a dispersed recreation standpoint, the following discussion is concerned with the Roaded-Natural, Semi-Primitive Motorized, Semi-Primitive Nonmotorized and Primitive classes. The Rural and Urban ROS classes apply to developed recreation.

In order to address several key issues raised during the planning process, the NFGT has further

subdivided the Roaded-Natural class. Under the Roaded-Natural class, the two subclasses are Roaded-Natural (RN) and Roaded Modified (RM). RN areas are managed under a VQO of partial retention, retention or preservation. RM areas are assigned a VQO of modification and are open to a full spectrum of management activities.

Demands for both motorized and non-motorized recreation experiences are high. People come from the Houston metropolitan area and the Dallas-Ft. Worth Metroplex to backpack, horseback and mountain-bike ride, to participate in ORV activities, and to day-hike on the Forest's developed trail system or in the general forest areas. The recreation opportunity spectrum provides a method to assess the capacity of lands on the Forest to provide recreation opportunities in different settings compared to the anticipated demand for these opportunities.

Planning and managing recreation is an inherently difficult task. It is made even more complex by unpredictable changes. The typically low accuracy and reliability of recreation use projection is indicative of the difficulty of anticipating these changes. This makes the task of planning into the future extremely difficult. Despite the complexity of the issue, recreation will remain one of the principal services provided by forests.

The basic assumption of the ROS is that quality in outdoor recreation is best assured by providing a diverse set of opportunities. Providing a wide range of settings varying in level of development, access and other factors, insures the broadest segment of the public will find quality recreational experiences, both now and in the future. Although the notion of quality is relative--a value judgement--the concept of quality can be stated for management decision purposes in this way: Quality depends on what experiences the individual is looking for, how much of it is realized, and the degree of satisfaction.

The ROS is a helpful concept for determining the types of recreation opportunities to be provided. After a basic decision has been made about the opportunity desirable in an area, the ROS provides guidance about appropriate planning approaches and standards by which each factor should be managed.

Environmental Consequences of the Alternatives

(ROS)

The percentage of each ROS class is an approximation of emphasis within management areas which can be directly applied to acres in each alternative. This was derived through assessment of current ROS maps.

Forest ROS by Management Area (MA)

	Rural	RN	SPM	SPNI
MA-1		75%	25%	
MA-2		75%	25%	
MA-4		10%		90%
MA-5			100%	
MA-7				100%
MA-8		10%		90%
MA-9	90%	10%		
MA-10		100%		
MA-11	10%	70%	20%	

Grasslands ROS by Management Area (MA)

	Rural	RN	SPM	SPNI
MA-3		80%	20%	
MA-4				100%
MA-5	100%			
MA-8				100%

From Alternative 1 through 4b and Alternative 8 there is a decrease in the amount of Roaded-Natural and Semi-Primitive Motorized areas and less opportunities for Semi-Primitive Non-Motorized experiences. These Alternatives provide a relatively large number of acres in Roaded-Natural. In these areas, social interaction with other forest visitors is likely. Both Motorized and Non-Motorized uses might be occurring in the same area. Experiences of solitude and remoteness would occur primarily in wilderness and special management areas.

Alternative 5 would be close to Alternative 1 except there would be more special management areas and wilderness, which would provide more Semi-Primitive Non-Motorized and Primitive recreation experiences. In Alternative 5, there would be more opportunities to experience remoteness and solitude within the special management and wilderness areas.

Alternative 6 would provide the greatest number of acres in the Semi-Primitive Non-Motorized and Primitive recreation experiences. There would be little or no Semi-Primitive Motorized areas. There would be no ORV trails or any ORV use allowed. Many of the existing roads would be closed to public use. Alternative 6 would provide the largest acreage in wilderness and special management areas. This Alternative would provide the least amount of Roaded-Natural area.

use. The amount of Semi-Primitive Non-Motorized and Primitive acres would be somewhere between Alternative 5 and Alternative 6.

On the Caddo/LBJ National Grasslands, the ROS experience will be the same for Alternatives 1 through 3 and 8. Alternatives 5 through 7, with the increase in special management ares, would provide more Semi-Primitive Non-Motorized areas. Also, with the development of more recreation areas, the rural ROS would increase. The increase in trails will require the construction of more parking and access; and increase the roaded-natural ROS. Alternatives 4, 4a, and 4b would be quite similar to Alternatives 5 through 7. The overall affect from Alternative 1 to 7 is: Even though the special management areas would be classified as Semi-Primitive Non-Motorized experience, the addition of recreation areas, trails, roads, and parking create an overall situation with less Semi-Primitive Non-Motorized and more rural and roaded-natural ROS experiences.

Cultural Resources

Affected Environment - Forests and Grasslands

Cultural History Synopsis

The NFGT, which occupy a significant portion of area known as the East Texas Pineywoods and the North Texas Tall Grass Prairie are unique as several distinct, yet contemporary, cultural groups are represented. Information derived from surveys of major river basins prior to inundation indicates a broad spectrum of variability in cultural resources from the northeast to southwest limits of the National Forests. Due to the concentration of survey efforts within the river systems, a sampling bias is evident, a bias which excludes the greater portion of the upland environment. Despite this, however, some knowledge of the aboriginal inhabitants of east and north Texas, including a rather complete chronological framework, has been established (Keller 1977; Jurney et al 1989). A broad simplification of the north and east Texas chronologies follow. Although somewhat generic and simplified, it provides an insight to the diversity of cultural materials to be found within the NFGT:

1. Paleo-Indian (ca. 15,000 - 6,000 B.C.)

Finds representative of this stage of cultural development are rare in eastern Texas, but they do occur. In north Texas, such finds are somewhat more common. Included are sites and complexes associated with early style fluted points, such as Clovis and Folsom, as well as more regionally distinctive styles such as Dalton, San Patrice, and Scottsbluff. Although regional variances are distinct, certain attributes are shared by these artifact types: 1) a more or less lanceolate outline, 2) ground basal and lateral margins, 3) a base often thinned by fluting or long, multiple flakes, 4) preference for high quality raw material, and 5) evidence of careful curation, the refurbishing or recycling of the point into other tools such as scrapers, drills and knives (Story et al 1990).

2. Archaic (ca. 6,000 - 1,500 B.C.)

mobile population with effective extractive subsistence strategies. Despite the relative abundance of Archaic materials, little more is known about this stage in eastern Texas than with the Paleo Indian era. Present understanding would indicate that a majority of sites, and especially the larger and more long term occupations, are concentrated in areas of seasonally abundant subsistence resources. For this reason, the modern floodplain is expected to have somewhat higher site densities, although the great depth of the floodplain sediments (sometimes in excess of 20 meters) hampers site discovery and excavation. Chipped stone tools of the Archaic are generally less carefully fashioned, and are made from less exotic materials, than those of the preceding period. At various times in the Archaic, several new technologies are introduced, most notably stone-lined hearths and baking pits and the use of milling implements (Story et al 1990).

3. Woodland (ca. 1,500 B.C. - 700 A.D.)

Although the differences between this and the preceding period are unclear (Shafer, 1975), it would seem plain that the basic settlement pattern of the Archaic continued with some structural and perhaps religious alterations. Sites are normally found in a similar scattered arrangement, although larger sites and such structural associations as mounds are apparently concentrated in the lowlands adjacent to major streams drainages.

It is evident the Woodland development in Texas owes much to influences from the Mississippi and even the Ohio Valleys. The connective cultural fabric is incompletely understood, but drastic alterations in the Archaic lifeway, with the exception of the introduction of new technologies such as pottery, arrow points and an increasing emphasis on the use of cultigens, do not appear to have taken place. This basic cultural conservatism appears to be somewhat characteristic of southeastern Texas where the Woodland expression survives until Historic times.

4. Mississippian - Caddoan (ca. 700 - 1600 A.D.)

In Northeast Texas and adjacent areas generally centered on the Red River, a new and vigorous cultural development succeeds the Woodland tradition. This Caddoan expression is not well defined in the Angelina area where it tends to merge with indigenous Woodland developments; and the settlement pattern, as known, does not differ markedly from that of the preceding period. However, the agricultural nature of the Caddoan subsistence system, and presumably that of later Woodland development (Davis, 1970), would imply sites are largely confined to the fertile bottomlands where horticulture was most practicable. Decorated pottery, large habitation and ceremonial centers, and extensive use of cultigens characterize these occupations.

5. Historic (1500 A.D. - Present)

The general history of the area after European contact and settlement is well known. Indeed a number of historic towns, (Nacogdoches, San Augustine, Zavalla, etc.), are located in close proximity to forest boundaries and examples of smaller but related developments may be present on National Forest lands. Thus, while general chronological data and settlement information is more accessible, there is still relatively little archeological knowledge of this period. Among the kinds of sites which could further contribute to our understanding of this period are Spanish

structures and sites associated with historic Native American groups indigenous to this area.

Over 300 cultural resource properties are known to be present within the proclaimed boundaries of the NFGT. Approximately 50 of these, within current ownership, have been subjected to some level of evaluation, either to determine National Register eligibility or to facilitate a management decision. Determinations of eligibility have been solicited on eight (8) properties (one of which is a multi-structure district), and positive determinations of eligibility have been received on six: Lake Fannin; Ratcliff Lake Picnic Shelter; Ratcliff Lake Bathhouse; 4-C's Mill; Double Lake Bathhouse; and Aldridge Mill. Archeological excavations at a number of archeological sites (41TN26, 41TN14, 41HO22, AND 41SY46) has provided enough information to determine either further study necessary or the site (41TN13, 41TN73, 41THO61, 41HO72, 41HO74 AND 41TN20) is determined not eligible for listing and no further work is necessary. Analytical data from these excavations has not as yet been synthesized and published. Numerous other sites have been evaluated by less intensive methods designed to provide enough data to make management decisions concerning project redesign or movement.

A comprehensive archeological and historical overview of the National Grasslands in Fannin, Wise and Montague Counties was conducted by Southern Methodist University from September 1988 to June 1989 (Jurney et al 1989). A cultural-historical overview of the history, ethnology and prehistory of the three units of the Caddo Grasslands and the LBJ Grasslands highlight some of the differences in human ecology and natural environments found on these units. Major trends in population and depopulation of the historic and prehistoric inhabitants of the areas are summarized. An inventory of known prehistoric and historic resources in each Grassland area is presented. Based on these data and data from adjacent areas, each Grassland has been stratified

into resource zones useful for evaluating the general potential for the presence of previously unidentified properties. These zones are mapped for each National Grassland and are discussed in the overview. Specific recommendations for evaluating cultural resource data gaps, identification strategies, National Register evaluation historic context and property type eligibility and resource needs, enhancement options, and interpretive potentials for the Grasslands are reviewed in the document.

In recent years, a shift in emphasis has occurred which will carry Heritage Resource Management (HRM) to a new level of involvement. The change in terminology from "Cultural Resource Management" to "Heritage Resource Management" is only an outward manifestation of much greater change in the approach to inventory, evaluation, protection and nomination of significant cultural resources. Early in 1993, the Regional Forester and the Executive Director of the Advisory Council on Historic Preservation signed a Programmatic Agreement concerning the management of Historic Properties on National Forest Lands in the Southern Region. This agreement directs the Forests to develop, in partnership with their State Historic Preservation Officer (SHPO), an implementing Memorandum of Understanding (MOU) which would incorporate elements of Heritage Management into the already established compliance process.

The MOU between NFGT and the Texas SHPO is currently under development. However, the basic framework and philosophies which will guide its implementation have been agreed upon:

1. Traditional compliance surveys will be conducted only on selected compartments where the forest research design will be tested. Approximately half of the remaining forest acreage will be categorically excluded from the normal compliance process. Criteria for the

Forest Heritage Team and SHPO staff.

2. More emphasis will be placed on site evaluations and interpretation instead of on "by-the-book" compliance. More scholarly reports, public education and involvement in site studies, and an active contribution to the bank of knowledge of east Texas prehistory and history represent the anticipated benefits from the change in the compliance program.

3. Personnel and funding levels must remain at current levels in order for the heritage program to continue its development. Key to the MOU will be a stipulation that failure to maintain these levels will result in the return to project specific consultation and compliance on all actions.

4. The Forest and SHPO agree to work together in all facets of the heritage management program. A visible symbol of this cooperation will be the integration of GIS and GPS equipment and knowledge into a shared data base and network connecting the two offices.

The proposed Heritage Management program would incorporate five components into the stewardship of the Forest's heritage resources: inventory, evaluation, curation, monitoring, and program management. The program will shift away from a supporting role to other resources, to a more independent status stressing the importance of heritage resources on their own merits. Budgeting will/should be shifted to a single budget code to more accurately reflect the program management identity rather than the support role of the program.

Environmental Consequences of the Alternatives

(Cultural Resources)

Heritage (Cultural) Resources are protected under all alternatives. All surveys will be conducted in accordance with the terms of the Southern Region Programmatic Agreement, the Forest/State Memorandum of Understanding and the Forest Heritage Management Plan. Consultation with SHPO under Section 106 of NHPA will be completed prior to the signing of decision documents which authorize implementation of activities not excluded from consultation by prior agreement. Eligible sites will be nominated to the National Register of Historic Places.

The possibility of site disturbance due to fire fighting activities exists under all alternatives. To the extent practical, an archeologist will be called to assist in locating fire lines to avoid sites in areas having the highest probabilities of heritage resource sites.

In all alternatives, significant sites will be interpreted for the public as funding allows and demand dictates.

In Alternatives 2, 3, 4, 4a, 4b, 5, 6, 7 and 8 the Old Aldridge Sawmill and Town site on the Angelina National Forest are given special interest area designation. Under Alternatives 3, 4, 4a, 4b, 5, 6, 7 and 8 this designation is also extended to areas along the Attoyac River and Ayish Bayou on the the Angelina National Forest and the segment of Cochino Bayou within Compartment 54 of the Neches Ranger District. Special use area (Historical) designation will

sites within those areas. Other areas of historical significance which may fall under this category are included in protective riparian zones under all alternatives.

Under all alternatives, site evaluations will be conducted as directed in the Forest Heritage Resource Management Plan, and tiered to answering pertinent research questions identified in the Statewide Preservation Plan.

Under Alternatives 4 through 8, the Lake Fannin Organizational Camp on the LBJ Grassland will be afforded designation as a Special Interest Area. Special interest area designation will allow only those management activities which enhance the interpretation and preservation of sites and structures within that area.

Chapter IV

List of Preparers

Introduction

The following is a listing of those participating in preparing the Environmental Impact Statement (EIS) and Revised Forest Plan for the National Forests and Grasslands in Texas (NFGT). Beginning with Interdisciplinary (ID) Team members, biographical sketches follow for current members of the Core Team and other primary participants. Information regarding qualifications (education and experience) and involvement in the preparation of the Forest planning documents is found within this chapter.

In addition, others involved in this Revision process are shown as members of working groups, technical assistants, management team members, and other contributors.

Interdisciplinary (ID) Team

Core Group

DENNIS ROBERTSON (Staff Officer) B.S. in Agriculture with 28 years experience. Provided leadership among planning activities, management team, and USFS Regional Office.

BILL BARTUSH (Planning Team Leader) B.S. and M.S. in Wildlife and Ecology with 16 years experience. Provided coordination in the development and preparation of the Forest Plan and EIS documents.

JOE METZMEIER (Operations Research Analyst) B.S. in Engineering with 24 years experience. Provided economic analysis and budgets for EIS and Forest Plan. Responsible for overall coordination of FORPLAN and IMPLAN input into planning process.

BETTE MINER (Resource Specialist) B.S. in Forestry with 20 years experience. Provided silvicultural and natural resource management technical assistance.

CATHERINE ALBERS (Economics and Recreation Specialist 1990-1992) B.S. in Geography, B.S. in Forest Management and M.S. in Economics with five years of experience.

REESE POPE (Planning Team Leader 1990-1992) B.S. Forest Management and M.S. Agronomy with 16 years of experience.

In addition to the Core Group shown above, the following personnel participated on the ID Team:

Specialists

experience.

BILL FLOYD Lands and Minerals B.B.A. in Business Administration and M.F. in Forestry with 20 years experience.

RON HAUGEN Silviculturist B.S. in Forestry with 20 years experience.

JOHN IPPOLITO Archaeologist B.S. in Polital Science and B.A. in Anthropology with 19 years of experience.

AL MATECKO Public Affairs Specialist B.A. and M.A. in Communication with 18 years of experience.

RODNEY PETERS Soil Scientist B.S. in Agronomy with 22 years experience.

WARREN STARNES Range Conservationist/Wildlife Biologist B.S. in Wildlife Management with 20 years experience.

DUANE STROCK Landscape Architect/Recreation Specialist B.S. in Landscape Architecture with 29 years of experience.

Working Groups

Silvicultural Working Group - Keith Baker, Ron Haugen, Bette Miner, Bob Smiley, and Bobi Stiles.

Ecological Classification System Working Group - Rob Evans, Larry Ford, Sten Olsen, Rodney Peters, Bruce Silvey, Duane Strock, and George Weick.

Old Growth Working Group - Steve Clarke, Ron Haugen, Bette Miner, Don Phillips, and Warren Starnes.

Management Indicators Working Group - Dawn Carrie, Rob Evans, Dave Peterson, Craig Rudolph, and Warren Starnes.

Minerals Working Group - Holly Erimias, Beverly Giza, Kenn Frye, and Harry Switzer.

Other Technical Assistance

Contributions were also made by many District Foresters, Range Conservationists, Technicians, and Budget and Finance Personnel.

Timber Management Specialist - Don Benner
Graphics - Melvin Bell and Dale Bounds
Pest Management Specialist - Steve Clarke
Botanist - Rob Evans
Fire and Fuel Specialist - Larry Ford
Editing - Gay Ippolito
Fisheries Specialist - Dave Peterson

Map Preparation - Bruce Silvey
Silviculture - Karl Stoneking
Planning Assistants - Sheila Sprague/Vicki Howard
ORA Assistant - Carmen Wanner

NEPA/Appeals Specialist - George Weick
Recreation - Greg Cohrs

Document Preparation and Format

Clerical and editorial assistance provided by the following personnel:

Lawanda Forsythe
Donna Griffith
Barbara Harris
Vicki Howard
Sid Jackson
Saundra Law
Lue Nell Miller
Tonya Ritnour
Marie Short
Sheila Sprague
Terry Terry

Leadership Team Members

Executive **Members**

Forest Supervisor - Alan Newman
Deputy Forest Supervisor - Ron Bertsch
Secretary/Stenographer - Betty Jones

Team Leaders

Land Management Planning and Public Affairs - Dennis Robertson
Forest Management and Protection - Don Phillips
Resources - Larry Bonner
Law Enforcement - Doug Hobbs
Lands and Recreation - Harry Switzer
Engineering - Ruben Natera
Administration - Phil Ingram

District Rangers

Angelina National Forest (Angelina Ranger District) - Glenn Donnahoe
Sam Houston National Forest (Raven & San Jacinto Ranger Districts) - Tim Bigler
Davy Crockett National Forest (Neches & Trinity Ranger Districts) - Sten Olsen
Sabine National Forest (Tenaha & Yellowpine Ranger Districts) - Larry Potts
Caddo & LBJ National Grasslands - Ben Harbour

Diversity Team Members

Catherine Albers
Lynn McDonald

Former Management Team Members

Law Enforcement - Billy Ball
District Ranger, San Jacinto - Joe Carmical
Diversity Team Member - Verma Coleman
District Ranger, Tenaha - Milt Evans
Public Affairs Staff Officer - Carl Gidlund
District Ranger, Yellowpine - Ike Hawkins
Forest Supervisor - Mike Lannan
District Ranger, Trinity - Dick Lukes
Fire, Recreation, Communication and Law Enforcement Staff Officer - Jim Morphew
Timber Staff Officer - Dave Oates
Diversity Team Member - Barbara Stiles
Lands and Minerals Staff Officers - Harry Switzer

Other Contributors

Richard Conner - Southern Forest Experiment Station
David Diamond - Texas Parks & Wildlife Department
Jim Dickson - Southern Forest Experiment Station
Mike Krueger - Texas Parks & Wildlife Department
Mike Fountain - Stephen F. Austin State University
Rick Larkin - Texas Parks & Wildlife Department
Mike Legg - Stephen F. Austin State University
Jack McCullough - Stephen F. Austin State University
Ike McWhorter - The Nature Conservancy
Elray Nixon - Stephen F. Austin State University
Melissa Parker - Texas Parks & Wildlife Department
Micah Poteet - Texas Parks & Wildlife Department
Jeff Reid - U.S. Fish & Wildlife Service
Mary Jo Stegman - U.S. Fish & Wildlife Service
Ron Thill - Southern Forest Experiment Station
Fred Werner - U.S. Fish & Wildlife Service
Monty Whiting - Stephen F. Austin State University

NOTE: Not all persons who were consulted are mentioned above.

Chapter V

Agencies, Organizations, and Others **on the Revised Plan and EIS Mailing List**

FEDERAL

Agricultural Stabilization & Conservation Service
Animal & Plant Health Inspection Service
Big Thicket National Preserve
Caribbean National Forest
Chattahoochee & Oconee NF
Cherokee National Forest
Congress of the U.S. House of Representatives, Washington, D.C.*
Daniel Boone National Forest
Environmental Protection Agency
Farmers Home Administration
Federal Aviation Administration
Federal Energy Regulatory Commission (FERC)
Federal Highway Administration
Federal Railroad Administration
Food & Nutrition Service (FNS)
Francis Marion & Sumter NF
General Services Administration
George Washington Nat'l Forest
Interstate Commerce Commission (ICC)
Jefferson National Forest
Kisatchie National Forest
Office of Equal Opportunity (OEO)
Office of Environmental Compliance
Office of General Counsel
Office of Program Review and Education
National Agri. Statistics Service
National Forests in Alabama
National Forests in Florida
National Forests in Mississippi
National Forests in N. Carolina
National Marine Fisheries Service
National Park Service
National Resource Conservation Service
NOAA Ecology and Conservation Office
Ouachita National Forest
Ozark-St Francis Nat'l Forest
Rocky Mountain Experimental Station
Rural Electrification Administration (REA)
Southern Forest Experiment Station

U.S. Army, Engineering Division Southwestern, CESWD

U.S. Department of Housing and Urban Development (HUD)
U.S. Department of the Interior (USDI)
U.S. Department of Transportation (DOT)
U.S. Fish and Wildlife Service
U.S. Geological Survey
USDA, National Agricultural Library
USDA OPA Publications Stockroom

*Mailings were made to those senators and representatives having NFGT lands within their appropriate districts.

STATE

Governor's Office Budget/Planning
Historical Commission
Martin Dies Jr. State Park
Railroad Commission of Texas
Rural Electrification Administration
State Conservationist
Texas Agricultural Extension Service
Texas A&M Campus
Texas Department of Agrigulture
Texas Department of Health
Texas Farm Bureau
Texas Forestry Association
Texas Forest Service
Texas Land Commissioner
Texas Parks & Wildlife Dept.
Texas State Department of Highways
Texas Natural Resource Conservation Commission
Trust for Public Lands

*Mailings were made to those County Judges, City, and County Commissioners having NFGT lands within their appropriate districts.

LOCAL/TRIBAL

Ala-Coushatta Tribal HQ
Angelina County Farm Bureau
Caddo Tribal Center
Centerville ISD
Deep East TX Development Assoc.
Huntington ISD
Kurth Memorial Library
Montague County Courthouse
Prairie View A&M University
Pineywoods RC&D

SFA School of Forestry
Texoma Council of Governments
Tunica-Biloxi Indians of LA

SPECIAL INTEREST

American Fisheries Society
American Fishing Tackle Assoc.
American Motorcycle Assoc.
American Rivers
Angelina Forest Trail Riders
Atlantic States Marine Fish
Baylor University
Center for Marine Conservation
Central Distance Riders
Concerned Citizens Nacogdoches
Down to Earth Researching
EZ Riders
Golden Triangle Group
Houston Orienteering Club
Houston Sierra-Trail Maintainence
International Association Fish and Wildlife Agencies
Izaak Walton League of America
Lone Star Chapter, Sierra Club
Montgomery County Adult Horse Committee
Montogomery County Landowners
National Audubon Society
National Campground Owners Assoc.
National Off-Highway Vehicle Conserv.
National Wildlife Federation
Outdoor Nature Club of Houston
Prairie & Timber Audubon
San Jacinto County Wilderness Club
Southeast Texas Off-Road Riders Club
Sierra Club
Sierra Club Legal Defense Fund
Sport Fishing Insitute
Sportsmen Conservationists Texas
Southwest Paso Fino Horse Assoc.
TERA
Texas ATV Association
Texas Endurance Riders
Texas Environmental Center
Texas Nature Conservancy
Texas Recreation & Park Society
The Irland Group
Trail Riders Associations
Trails Riders of Houston
Trout Unlimited
Texas Committee on Natural Resources

Texas Environmental Action Coalition
Texas Organization Endangered Species
Texas Society American Foresters
United 4WD Association
Wilderness Society

fWildlife Management Institute
Woodlands Hiking Club

COMMODITY INTEREST

American Assoc. Petroleum
Anderson County Timber Growers
Champion International Corp.
Conroe Creosoting Co.
Duke City Lumber Company
EXXON
Georgia Pacific Resins, Inc.
Gregg Robinson Logging
Houston County Forest Landowners
Jasper-Newton Landowners Association
Justin Seed Co.
Kirby Forest Industries
Koch Hydrocarbon, Pipeline Div.
Lost Pines Timbergrowers Assoc.
Louisiana-Pacific Corp.
Louisiana-Pacific/Kirby
Maersk Energy Inc.
McMoran Oil & Gas Co.
Mitchell Energy Corp.
Montgomery County Landowners
Moran Corp.
Nacogdoches County Forest Timber
National Forest Products Association
NFPA/Timber Purchasers Council
Phillips Petro Co.
Sabine-San Augustine Timber Growers
San Jacinto County Landowners
Shell Pipeline Corp.
Temple-Inland
Texas Eastern Transmission
Texas Forestry Association
Thornberry Oilfield Services
Trinity County Forest Landowners
Texas Indep. Producers & Royalty
Trinity County Forest Resources Assoc.
Walker Bros. Lumber

and Grasslands in Texas Planning Mailing List.

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Glossary

Many of these definitions are referenced to the following numbered sources. Some definitions are referenced to Forest Service Manuals (FSM), Forest Service Handbooks (FSH), or other sources that are too numerous to list. Other definitions are not referenced but are those in general use on the National Forests and Grasslands in Texas.

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A

ACCESS CLASS - Classification of land where classification is based on distance from an existing road. (11)

Class 1 land - Land within 1/4 mile of an existing road and not separated from the road by a physical barrier such as a major stream or private land. (11)

Class 2 land - Land within 3/4 mile of an existing road and not separated from the road by a physical barrier such as a major stream or private land. (11)

ACID RAIN - Precipitation with a high concentration of acid. (11)

ACTIVITY - A measure, course of action, or treatment that is undertaken to directly or indirectly produce, increase, or maintain forest and rangeland outputs or achieve administrative or environmental quality objectives. FSH 1309.11, The Management Information Handbook, sets forth definitions, codes, and units of measure for Forest Service activities. (12)

ACTIVITY OUTPUTS - The quantifiable goods or services resulting from any management actions taken on a Forest. (11)

ACTIVITY TYPE - The further description of the measure, course of action, or treatment within an activity. See FSH 1309.11 for definitions of activity types. (12)

ADMINISTRATIVE UNIT (Forest) - A geographic area containing at least one proclaimed National Forest where a single line officer is responsible for the management of resources and activities. (2)

ADVANCE REGENERATION (Reproduction) - Seedlings or saplings that develop or are present in the understory. (22)

ADVISORY COUNCIL ON HISTORIC PRESERVATION - Created by the National Historic Preservation Act (1966) to advise agencies of proper procedures for protecting, preserving, and enhancing historic and prehistoric cultural resources (Wildersen 1977). (11)

AGE CLASS - A distinct aggregation of trees originating from a single natural disturbance or regeneration cutting. (22)

AIR QUALITY - The composition of air with respect to the quantities of pollutants. Most frequently used in connection with standards of maximum acceptable pollutant concentrations. (2)

ALL-AGED STAND - A stand that contains trees of all or almost all age classes. Tree crowns are at various levels and the canopy very uneven or irregular. (11)

ALLOTMENT - An area designated for use by a prescribed number and kind of livestock under one plan of management. (11)

ALLOWABLE SALE QUANTITY (ASQ) - The quantity of timber that may be sold from the area of suitable land covered by the Forest Plan for a time period specified by the Plan. This quantity is usually expressed as the "average annual allowable sale quantity." (36 CFR 219.3) (12)

ALLOWABLE USE - (1) The degree of use estimated to be proper until proper use is known. A rule of thumb on ranges in good or excellent condition is 30 to 50 percent of the annual growth by weight. (2) The amount of forage planned to be used in order to accelerate range improvement. (11)

ALTERNATIVE - One of several policies, plans, or projects proposed for decisionmaking. (12)

ANALYSIS AREA - A specified area of land where responses to proposed management practices may be analyzed. Responses may be in the production, improvement, or maintenance of forest and rangeland outputs, and in environmental quality objectives and economic and social impacts. (12)

planning area to supply goods and services in response to society's demand for those goods and services. (2)

ANIMAL-MONTH - A month's tenure on range by one animal. Not synonymous with animal-unit month. (11)

ANIMAL UNIT - Considered to be one mature (1,000 lb.) cow or the equivalent based on an average daily forage consumption of 26 lbs. of dry matter per day. (2)

ANIMAL UNIT MONTH (AUM) - The amount of forage required by an animal unit for 1 month. (2)

AREA REGULATION - A method of controlling the amount of suitable forest land to be harvested annually or periodically on the basis of stocked area. (11)

ARTERIAL ROADS - Roads that provide access to large land areas and usually connect with public highways or other Forest Service arterial roads to form a network of primary travel routes. (2)

ARTIFICIAL REGENERATION/(REFORESTATION) - Creation of a new age class by renewal of a tree crop by direct seeding, or by planting seedlings or cuttings. (22)

ASSESSMENT - The Renewable Resource Assessment required by the Forest and Rangeland Renewable Resources Planning Act. (11)

B

BACKGROUND - In visual management terminology, the visible terrain beyond the foreground and middleground. Individual trees in the background are not visible, but are blended into the total fabric of the stand. Also, a portion of a view beyond 3 to 5 miles from the observer and as far as the eye can detect objects. (6)

BASAL AREA - The area of the cross-section of a tree stem near the base, generally at breast height (4.5 feet above the ground). (3)

BASE SALE SCHEDULE (BSS) - A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than that for the preceding decade. The planned sale and harvest for any decade is not greater than the long-term sustained yield capacity. This definition expresses the principle of nondeclining flow. (1,12)

BENCHMARK - The physically or biologically determined maximum of a resource output that can be obtained from Forest lands when minimum legal requirements for production of other resources and maintenance of soil and water productivity are met. Benchmarks define the range within which alternatives can be formulated. (11)

BENCHMARK ECOLOGICAL TYPES - Reference sites on representative ecological types. These sites reflect the results of management actions in the shortest timeframes. Sites which contain sensitive plants or critical habitat for threatened and endangered species should be considered. (12)

in monetary or quantitative nonmonetary terms. (12)

BENEFIT/COST RATIO - The total discounted benefits of an activity divided by the total discounted costs. (10)

BEST MANAGEMENT PRACTICES (BMP) - A technique that is determined to be the most effective, practical means of preventing or reducing pollutants from nonpoint sources in order to achieve water quality goals. (2)

BIOLOGICAL ASSESSMENT - A biological evaluation conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under section 7 of the Endangered Species Act (16 U.S.C. 1536(c). The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species. (10)

BIOLOGICAL EVALUATION - A documented Forest Service review of Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, or sensitive species or species proposed for such classification. (10)

BIOLOGICAL GROWTH POTENTIAL - The average net growth attainable in a fully stocked natural forest stand. (36 CFR 219.3) (12)

BOARD FOOT (BF) - The amount of wood equivalent to a piece of wood measuring 1 foot by 1 foot by 1 inch. (3)

BOARD FOOT/CUBIC FOOT CONVERSION RATIO - The number of board feet per cubic foot of volume varies with tree species, diameter, height, and form factor. For the NFGT, the Forest-wide average conversion ratio is 5.54 board feet per cubic foot. This factor is applied to the cubic-foot FORPLAN outputs to give board-foot estimates. (11)

BURNING, PRESCRIBED - The application of fire, usually under existing stands and under specific conditions of weather and fuel moisture, in order to control vegetation to meet goals of silviculture or hazard reduction. (22)

C

CFR - Code of Federal Regulations.

CANOPY - The cover of branches and foliage formed by the crowns of adjacent trees and other woody growth. (2)

CAPABILITY - The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at given levels of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils, and geology, and on the application of management practices such as silviculture or protection from fire, insects, and disease. (36 CFR 219.3) (1,12)

integrated forest planning. Capability areas may be identical with ecological land units, ecosystems, or land response units. (12)

CAPITAL INVESTMENT - An input that increases the stock of natural or manmade resources (assets) needed to maintain or increase the flow of outputs in the future. Benefits resulting from capital investments are normally recouped over periods longer than 1 year. (12)

CHARGEABLE VOLUME - All volume that is included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity, based on Regional utilization standards. Planned production of fuelwood is not included in the allowable sale quantity and therefore is

generally nonchargeable. However, unforeseen conditions may make it appropriate to sell as fuelwood some volume that was included in the allowable sale quantity--for example, when timber is severely damaged by fire or insects. In such cases, fuelwood volume is chargeable. (11)

CIVILIAN CONSERVATION CORPS - A public employment program of the 1930's and 1940's. It accomplished various conservation tasks on public land. (11)

CLAIM - Challenge to U.S. ownership of a tract or portion of a tract. (11) Can include a claim of an easement interest or other partial right.

CLIMAX - The culminating stage in plant succession for a given site. Climax vegetation has reached a highly stable condition. (6)

CLIMAX FOREST - Plant community dominated by trees representing the culminating stage of natural succession for the specific locality and environment. (20)

CLIMAX SPECIES - Plant species that will remain essentially unchanged in terms of species composition for as long as the site remains undisturbed. (20)

CODOMINANT - See crown class.

COLLECTOR ROADS - Roads that serve small land areas, are usually connected to public highways or Forest Service arterials, and collect traffic from local roads or terminal facilities. (2)

COMMERCIAL FOREST LAND (CFL) - Forest land that is producing or is capable of producing crops of industrial wood and (1) that has not been withdrawn from production of such crops by Congress, the Secretary, or the Chief; (2) that can produce timber without irreversible damage to soils, productivity, or watershed conditions with existing technology and knowledge; and (3) for which existing technology and knowledge provide reasonable assurance that adequate restocking can be attained within 5 years after final harvesting. (2)

COMMERCIAL THINNING - Cutting by means of sales for products (poles, posts, pulpwood, etc.) in immature stands to improve the quality, growth, and vigor of the remaining stands. (11)

COMMERCIAL TIMBER SALES - The selling of timber from National Forest lands. (11)

COMPARTMENT - The basic operating and record-keeping unit of the Forest, having permanently defined boundaries and containing 1,000 to 2,000 acres of commercial forest land. (11)

present on a site. Competition can cause reduced tree growth. (20)

COMPLEX PLANNING ACTION - A planning action in which individual components of the alternatives require separate decisions. (see FSM 1970.62) (12)

CONFINE FIRE - To restrict the fire within determined boundaries established prior to the fire, during the fire, or in an analysis of an escaped fire situation. (11)

CONSUMABLE SPECIES - Game and fur-bearing wildlife species harvested for sport, food, study, or commerce. (11)

CONTAIN FIRE - To surround a fire and any spot fires with control line, as needed, that can reasonably be expected to check the fire's spread under prevailing and predicted conditions. (11)

CONTINUOUS FOREST INVENTORY (CFI) - A procedure for determining forest growth, mortality, and standing volume by periodic remeasurement at permanent sample locations. (11)

CONTINUOUS INVENTORY OF STAND CONDITIONS (CISC) - A computerized system that maintains a continuous inventory of stand conditions on Forest land. (11)

CONTROL FIRE - To complete the control line around a fire, any spot fires, and any interior islands to be saved; to burn out any unburned area adjacent to the fireside of the control line; and to cool down all hot spots that are immediate threats to the control line until the line can reasonably be expected to hold under foreseeable conditions. (11)

CORDUROY - A road formed by logs or other material laid side-by-side crosswise. (7)

CORRIDOR - A strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. (1,12)

COST, CAPITAL INVESTMENT - The cost of manmade structures, facilities, or improvements in natural resources used as inputs in production processes to produce outputs over one or more planning periods. (12)

COST COEFFICIENTS - Values that relate to a particular dollar cost in a specified period of time. (11)

COST-EFFECTIVE - Achieving specified outputs or objectives under given conditions for the least cost. (6,12)

COST EFFICIENCY - The usefulness of specified inputs (costs) in producing specified outputs (benefits). Some outputs including environmental, economic, or social impacts, are not assigned monetary values but are to be achieved at specified levels at the least cost. Cost efficiency is usually determined by comparing present net values, although use of benefit-cost ratios and rates of return may be appropriate. (12) (36 CFR 219.3)

COVER TYPE - Vegetation currently occurring on a given site. (11)

CROP TREE - Any tree that is selected to become a component of a future final harvest. (22)

CROWN - The part of a tree or woody plant bearing live branches and foliage. (22)

CROWN CLASS - A class of tree based on crown position relative to the crowns of adjacent trees. (22)

Codominant - Trees with crowns forming the general level of the main canopy in even-aged groups of trees, receiving full light from above and comparatively little from the sides. (22)

Dominant - Trees with crowns extending above the general level of the main canopy of even-aged groups of trees, and receiving full light from above and partly from the sides. (22)

Intermediate - Trees with crowns forming the general level of the main canopy in even-aged groups of trees, receiving full light from above and comparatively little from the sides. (22)

Overtopped (Suppressed) - Trees of varying levels of vigor that have their crowns completely covered by the crowns of one or more neighboring trees. (22)

CROWN CLOSURE (CANOPY CLOSURE) - In a crop or stand, the progressive reduction of space between crowns as they spread laterally, increasing the canopy density. (2)

CROWN COVER - The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area (syn. Canopy Cover). (22)

CROWN DENSITY - The amount, compactness, or depth of foliage of the crowns of trees and/or shrubs. (22)

CUBIC FOOT (CF) - The amount of timber equivalent to a piece of wood measuring 1 foot by 1 foot by 1 foot. (3)

CULMINATION OF MEAN ANNUAL INCREMENT (CMAI) - The age at which the average annual growth of a stand of trees is greatest. Mean annual increment is expressed in cubic feet and is based on expected growth according to management intensities and utilization standards assumed in accordance with 36 CFR 219.16(a)(2)(i) and (ii). Culmination of mean annual increment includes regeneration harvest yields and any additional yields from planned intermediate harvests. (10)

CULTURAL ECOLOGY - The study of the relationship between humans and their environment or between organism and habitat. (11)

CULTURAL RESOURCE - Potential knowledge about human cultural systems, in the form of historical and prehistorical products and by-products of man. Physical remains (such as artifacts, ruins, burial mounds, petroglyphs, etc.) and their cultural meanings that are useful or important when land-use planning decisions are being made. (2)

CUNIT - 100 cubic feet. (11)

CURRENT MANAGEMENT - Management of NFGT under existing standards and guidelines with annual outputs and costs based on the outputs and costs for FY 1989. (11)

D

D.B.H. - Diameter at breast height. The diameter of a tree measured 4.5 feet from the ground. (2)

DECISION CRITERIA - Guidelines or rules used to evaluate alternatives and to select a preferred alternative. (11)

DECISION VARIABLE - A component of an alternative in which activities and their costs, outputs, and benefits are identified and this information used in analysis and decisionmaking. All activities and costs necessary to obtain the outputs and benefits are included. See FSH 1309.11 for decision variable definitions and codes. (12)

DEMAND - The amount of an output that users are willing to take at a specified price, time period, and condition of sale. (10,12)

DEMAND ANALYSIS - A study of the factors affecting the schedule of demand for an output, including the price/quantity relationship, if applicable. (10)(12)

DEMAND SCHEDULE (CURVE) - A schedule of quantities of an output that users are willing to take at a range of prices, at a given time and under given conditions of sale (see Price/Quantity Relationship). (12)

DEPARTURE - A schedule that deviates from the principle of nondeclining flow by exhibiting a planned decrease in the timber sale and harvest schedule at any time in the future. (12)

DESIRED FUTURE CONDITION - A portrayal of the land or resource conditions that are expected to result if goals and objectives are achieved fully.

DEVELOPED RECREATION - Recreation that requires facilities that in turn result in concentrated use of an area. Examples might include roads, parking lots, picnic tables,
toilets, drinking water, ski lifts, and buildings. (2)

DEVELOPED RECREATION AREA - An area that will accommodate up to 1,000 persons at one time with a full range of facilities provided facilities include picnic tables, potable water, vehicular access, and sanitary facilities. (11)

DIOECIOUS - Having staminate (male) flowers and pistillate (female) flowers on different plants of the same species. (19)

DIRECT HABITAT IMPROVEMENT - Land treatments done or structures built to improve wildlife habitat. These are habitat improvements not accomplished through coordination with other resource activities. (11)

DISCOUNTING - An adjustment, using a discount rate for the values of money over time so that costs and benefits occurring in the future are reduced to a common point in time, usually the present, for comparison. (FSM 1905) (6,12)

DISCOUNT RATE - An interest rate that represents the cost or time value of money in determination of present values of future costs and benefits. (6,10,12)

DISPERSED RECREATION - Dispersed Recreation outside a developed recreation site; this includes activities such as driving, for the purpose of viewing scenery, recreation in primitive environments. (2)

the area covered by a land and resource management plan. See also edge, horizontal diversity, and vertical diversity. (2,12)

DOMINANT - See crown class.

DUFF - Organic matter in various stages of decomposition on the floor of the forest. (4)

E

EARLY FOREST SUCCESSION - The early developmental stage or condition of a plant community. (6)

ECONOMIC EFFICIENCY - See cost efficiency.

ECONOMIC EFFICIENCY ANALYSIS - An analytical method in which incremental market and nonmarket benefits are compared with incremental economic costs. (2)

ECONOMIC INPUT-OUTPUT MODEL - A linear programming system used to assess social and economic impacts of management strategies being considered. (11)

ECOSYSTEM - An interacting system of organisms considered together with their environment; for example, the vegetation and animals within marsh, watershed, or lake ecosystems. (2)

ECOSYSTEM MANAGEMENT - Managing the forest ecological units for their uses and values using knowledge about patterns of relationships between organisms and their environment in ways that sustain the diversity and productivity of the ecosystems for the future.

EDGE - Where plant communities meet or where successional stages or vegetative conditions within plant communities come together. See also edge contrast and horizontal diversity. (2)

EDGE CONTRAST - A qualitative measure of the difference between the structure of two adjacent vegetated areas; for example, "low," "medium," or "high" edge contrast. (2)

EDGE EFFECT - The influence of one adjoining plant community the composition and density of populations at or near the margin of another. (11)

EFFECT (IMPACT), ECONOMIC - The positive or negative change, in economic conditions, including the distribution and stability of employment and income in affected local, regional, and national economies, that directly or indirectly results from an activity, project, or program. (12)

EFFECT (IMPACT), PHYSICAL, BIOLOGICAL - The positive or negative change in the physical or biological conditions that directly or indirectly results from an activity, project, or program. (12)

EFFECT (IMPACT), SOCIAL - The positive or negative change in social and cultural conditions that directly or indirectly results from an activity, project, or program. (12)

ENDANGERED SPECIES - Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. (2)

ENDING INVENTORY CONSTRAINTS - A FORPLAN model timber constraint ensures that the total inventory volume left at the conclusion of the planning horizon will equal or exceed the volume that would occur in a regulated Forest managed in accordance with the prescriptions selected for regeneration of timber stands. This prevents liquidation of the timber growing stock at the end of the planning period. (2)

ENVIRONMENTAL ANALYSIS - An analysis of alternative actions and their predictable short-term and long-term environmental effects, which include physical, biological, economic, social, and environmental design effects and their interactions. (11)

ENVIRONMENTAL ASSESSMENT - Documentation of the Environmental Analysis. (11)

ENVIRONMENTAL IMPACT STATEMENT (EIS) - A formal document that must meet the requirements of NEPA and follow Council of Environmental Quality (CEQ) guidelines and directives of the agency responsible for the project proposal. (11)

EPHEMERAL STREAM - One that flows briefly and only in direct response to precipitation in the immediate locality and that receives little or no water from springs or other sources. The channel of the stream is above the water table at all times. (11)

EVEN-AGED MANAGEMENT - A combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by stands of varying ages (and therefore tree sizes) distributed throughout the forest area. The difference between the ages

of trees forming the main canopy level of an even-aged stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in individual stands is obtained during a short period at or near the time when each stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed-tree cutting methods produce even-aged stands. (12) (36 CFR 219.3)

EVEN-AGED STAND - A stand of trees containing a single age class in which the range of tree ages is usually less than 20 percent of rotation. (22)

EVEN-AGED SYSTEM - A planned sequence of treatments designed to maintain and regenerate a stand with one age class. The range of tree ages is usually less than 20 percent of the rotation. (see Clearcutting, Seed Tree, Shelterwood, Coppice). (22)

EXCHANGE - A discretionary, voluntary transaction involving mutual transfers of land or interests in land between the Secretary of Agriculture acting by and through the Forest Service and a non-Federal entity. (1)

EXTIRPATED SPECIES - A species that no longer occurs in all or significant portions of its former range but occurs as small populations or individuals in isolated portions of its range or is maintained in captivity or cultivation. (11)

F

FEATURED SPECIES - Selected wildlife species managed to occur in relatively large numbers in particular places for particular purposes. (2)

FILTER STRIP - An area of varying width of relatively undisturbed vegetation retained to intercept overland water flow, decrease its velocity, and collect sediment. (11)

to meet land management goals and objectives. (2,6)

FLOODPLAIN - The lowland and relatively flat areas adjoining inland and coastal waters (including debris cones and floodprone areas of offshore islands) including, at a minimum, those areas subject to a 1-percent or greater chance of flooding in any given year (100-year recurrence). (2)

FORAGE - All browse and nonwoody plants that are available to livestock or game animals and used for grazing or harvested for feeding. (6)

FOREGROUND - A term used in visual management to describe the portions of a view between the observer and up to 1/4 to 1/2 mile distant. (6)

FOREST - A plant community composed predominantly of trees and other woody vegetation growing more or less closely together. A common shortened form of the term "National Forest." Also the area within the administrative boundaries of a National Forest, irrespective of ground conditions or cover. (2)

FOREST AND RANGELAND RENEWABLE RESOURCES PLANNING ACT OF 1974 - (RPA) - An Act of Congress requiring the preparation of a program for the management of the National Forests' renewable resources and the preparation of land and resource management plans for units of the National Forest System. It also requires a continuing inventory of all National Forest System lands and renewable resources. (6)

FOREST DEVELOPMENT ROAD - An access road wholly or partly within or adjacent to and serving a National Forest and that has been included in the Forest Development Transportation Plan. (11)

FOREST HIGHWAY - A Forest road under the jurisdiction of and maintained by a public authority and open to public travel. (11)

FOREST LAND - Land at least 10 percent occupied by forest trees of any size or that formerly had such tree cover and is not currently developed for nonforest use. Lands developed for nonforest use include areas for nonforest crops, improved pasture, residential or administrative areas, improved (constructed) roads of any width and adjoining road clearings and powerline clearings of any width. (36 CFR 219.3) The term "occupancy," when used to define forest land, shall refer to measured canopy cover of live forest trees at maturity. The minimum area to be classified as forest land is one acre or greater, consistent with Regional mapping standards. Unimproved roads, trails, streams, and clearings in forest areas are classified as forest if they are less than 120 feet in width. (1,10,12)

FOREST PROGRAM - The summary or aggregation of project or activity information that makes up an integrated (multifunctional) course of action for a given level of funding on a National Forest and is consistent with the Forest Plan. (12)

FOREST REGULATION - The organization and control of the growing stock for a sustained yield of forest products from a specific forest area. Forest regulation performs the vital task of balancing the yield (production) from the specific forest area with growth or productive capacity. (2)

FOREST SERVICE HANDBOOK (FSH) - A handbook of directives that provide detailed instructions for proceeding with specialized phases of programs or activities for Forest Service use. (10)

FOREST SERVICE MANUAL (FSM) - A system of manuals that provide direction for Forest Service activities.

FOREST SYSTEM ROADS - Roads that are part of the Forest development transportation system, which includes all existing and planned roads as well as other special and terminal facilities designated as Forest development transportation facilities. (See arterial roads, collector roads, and local roads.)

FOREST TREE IMPROVEMENT - All practices designed to produce genetically more desirable forest trees; for example, forest tree breeding, the selection and protection of superior seed trees, and some provenance studies. (2)

FOREST TYPE - A classification of forest land based upon the tree species presently forming a plurality of stocking in live trees. For trees of poletimber size and larger, stocking is expressed as basal area per unit land area. For trees with d.b.h. less than 5.0 inches, stocking is expressed as number of trees per unit land area. (2)

FORPLAN - A linear programming system used for developing and analyzing Forest planning activities. (10)

FRAGMENTATION - The process of reducing the size and connectedness of stands that make up a forest. (16)

FUEL MANAGEMENT - The practice of planning and executing the treatment or control of living or dead vegetative material in accordance with fire management direction. (10)

FUELS - Combustible wildland vegetative materials. The term is usually applied to aboveground living and dead surface vegetation, but also applies to roots and organic soils such as peat. (10)

FULL-SERVICE MANAGEMENT - Management of developed recreational facilities to provide optimum maintenance. (11)

G

GAME SPECIES - Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fishermen under state or Federal laws, codes, and regulations. (6)

GOAL STATEMENT - A concise statement that describes a desired condition to be achieved at some time in the future. It is normally expressed in broad, general terms and does not specify a date by which the goal is to be achieved. Goal statements form the principal basis from which objective statements are developed. (12)

GOODS AND SERVICES - The various outputs, including on-site uses, produced from forest and rangeland resources. (12)
(36 CFR 219.3)

GRASS-FORB - A stage in the succession of coniferous forests that is dominated by grasses and forbs. Not the same as grassland. (2)

GRASSLAND - Plant communities whose potential natural and dominant vegetation is grasses or grasslike plants. Also, and administrative unit of the U.S. Forest Service (more frequently "National Grassland"). (2)

GRAZING ALLOTMENT - An area designated for use by a prescribed number and kind of livestock under a plan of management. (2)

GROSS NATIONAL PRODUCT (GNP) - The market value of goods and services produced by the Nation's economy. (2)

GROUP SELECTION - See regeneration.

H

HABITAT - The place where a plant or animal naturally or normally lives and grows. (2)

HABITAT CAPABILITY - The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish, or plant population. It is stated in terms of potential population numbers. (12)

HABITAT CAPABILITY MODEL - A model of the relationship between species population size and a variety of habitat factors such models can be used to predict changes in (animal numbers) as responses to habitat change. (12)

HABITAT TYPE - The aggregate of all areas that support or can support the same primary vegetation at climax. (2)

HARVESTING METHOD - A cutting method by which a stand is harvested. Emphasis is on meeting logging requirements rather than silvicultural objectives. (see Regeneration Methods). (22)

HERBICIDE - A chemical used to control, suppress, or kill plants or to severely interrupt their normal growth processes. (14)

HISTORIC ARCHEOLOGY - Archeology dealing with historic sites (i.e. those of post-European contact). These might include Spanish, British, early American, and Civil War Period sites. (11)

HORIZONTAL DIVERSITY - The distribution and abundance of plant and animal communities or

successional stages across an area of land; the greater the number of communities, the higher the degree of horizontal diversity. See also vertical diversity. (2)

HYDROLOGIC CONDITION - The characteristics of a watershed that influence its ability to absorb and release precipitation through surface and subsurface water flow and through evaporation and transpiration of vegetation. (2)

HYDROLOGY - The scientific study of the properties, distribution, and effects of water in the atmosphere, on the Earth's surface, and in soil and rocks.

I

ID TEAM - See interdisciplinary team.

IMPLAN - A computer-based system used by the Forest Service for constructing nonsurvey input-output models to measure economic input. The system includes a data base for all counties in the United States and a set of computer programs to retrieve data and perform the computational tasks for input-output analysis. (10)

INCLUSION - A community of trees with all the attributes of a stand, but not meeting minimum criteria for stand size or shape. (11)

INDICATOR SPECIES - (1) Species that indicate the presence of certain environmental conditions, seral stages, or previous treatment. (2) One or more plant species selected to indicate a certain level of grazing use. (11)

INDIRECT IMPACT - Effects on the environment that are not immediate or direct results of an action but that are less likely to occur without it. Indirect effect is the extent to which a project or action exposes resources, within or adjacent to the development to such adverse effect as accelerated erosion, construction of private homes or commercial buildings, road building, increased vandalism, or other disturbance attendant on the action. An indirect impact can be beneficial, as when a project results in development that helps protect a site from vandalism. (11)

INDIVIDUAL TREE (SINGLE TREE) SELECTION - See regeneration.

INFRASTRUCTURE - Includes all facilities, roads, buildings, etc. and associated structural components.

INPUT - Land, labor, or capital required for production processes. (12)

INPUT-OUTPUT ANALYSIS - A technique for analyzing the interdependence of producing and consuming sectors in an economy. (12)

INTEGRATED PEST MANAGEMENT - A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resource values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of combinations of tactics (for examples, timber stand improvement ands selective use of pesticides). A basic principle in the choice of strategy is that it must be ecologically acceptable. (12) (36 CFR 219.3)

INTEGRATED RESOURCE MANAGEMENT - A management strategy that emphasizes no resource element to the exclusion of others or in violation of the minimum legal standards for others. (12)

INTERCHANGE - A land transfer in which the Secretary and another person exchange lands or interests in lands of approximately equal value without a formal appraisal. (1)

INTERDISCIPLINARY TEAM (ID TEAM) - A group of individuals with different training assembled to solve a problem or perform a task. Such a team is assembled because no one scientific discipline is sufficiently broad so that its practitioners can to adequately solve the problem (6)

INTERMEDIATE - See crown class.

INTERMEDIATE TREATMENTS (Tending) - A collective term for any treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment of regeneration and prior to final harvest. (22)

INTERMITTENT STREAM - A stream that flows cyclically in response to water table levels. During normal years, flow of an intermittent stream ceases during dry periods and resumes when water table levels rise during wet periods. The channel of an intermittent stream is dry for a large part of the year, ordinarily for more than three months. (11)

INTERPRETIVE SITE - A developed site at which a broad range of natural or cultural history is interpreted or described for the enjoyment of the public. (11)

INTRODUCED SPECIES - A species not a part of the original fauna or flora of the area in question. (11)

INVADER - Plant species that were absent or present only in very small numbers in undisturbed portions of a specific range site and will invade following disturbance or continued overuse. (11)

IRON-ORE GRAVEL - See plinthite.

IRRETRIEVABLE - Incapable of being recovered; applied to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible. (11)

IRREVERSIBLE - Incapable of being undone; applied primarily to the use of or damage to resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible decisions cannot be repealed and eliminate future options. (11)

ISSUE - A point, matter, or question of public discussion or interest to be addressed or decided through the planning process.

K

KEY AREA - Unit of land managed primarily for wildlife food, water, or cover. Key areas supplement the nearby forest management types and enable them to meet the habitat requirements of the featured game species at the population size objective within a unit area. They can be stand-sized or smaller and be managed through timber sales, cultural treatments, or wildlife stand improvements. (11)

KV - The Knutson-Vandenberg (KV) Act of June 9, 1930, as amended by the National Forest Management Act of October 22, 1976, is the authority for requiring purchasers of National Forest timber to make deposits to finance sale area improvement activities needed to protect and improve the future productivity of the renewable resources of forest lands on timber sale areas. Activities include sale area improvement operations

and maintenance and construction for reforestation, timber stand improvement, range, wildlife, and fish habitat, soil and watershed protection, and recreation. (10)

L

LAND AND WATER CONSERVATION FUND (L&WCF) - Funds collected from sales of surplus Government real property, motorboat fuels taxes, recreation use fees, etc. and available to purchase and develop certain qualifying lands for recreational purposes.

LAND CAPABILITY - The suitability of land for use without permanent damage. "Land capability," as the term is ordinarily used in the United States, expresses the effect of physical land conditions, including climate, on the suitability of land for use without damage for production of crops that require regular tillage, for grazing, for timber management, and for wildlife management. Land capability involves consideration of (1) the risks of land damage from erosion and other causes and (2) the difficulties in land use that result from physical land characteristics, including climate. (11)

LAND MANAGEMENT - The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions. (6)

LANDSCAPE MANAGEMENT - The art and science of planning and administering the use of forest lands in such ways that the visual effects achieved maintain or upgrade man's psychological welfare. It is the planning and design of the visual aspects of multiple-use land management. (2)

LAND SUITABLE FOR GRAZING OR BROWSING - Land with vegetation that can be used by domestic and wild grazing animals, without damage to soil and water resources. (12)

LEASE - A special use authorization that conveys a right of occupancy and use of National Forest System land or facilities for a specified period and purpose and is both revocable and compensable according to its terms. (1)

LEVEL IV LAW ENFORCEMENT OFFICER - A Forest Service employee who has graduated from the Federal Law Enforcement Academy and holds a law enforcement commission signed by the Regional Forester. District Level IV officers generally perform other duties as well as law enforcement.

LIBERATION - A release treatment made in a stand not past the sapling stage in order to free the favored trees from competition of older, overtopping trees. (22)

LITHIC SCATTER - An archeological site consisting of lithic (stone) material, often containing cast-off flakes from the manufacture of stone tools. Usually considered to represent a prehistoric hunt camp. (11)

LOCAL ROADS - These roads connect terminal facilities with Forest Service collector or arterial roads or with public highways and normally serve single resources. (2)

LONG-TERM SUSTAINED-YIELD TIMBER CAPACITY (LTSY) - The highest uniform wood yield from land being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives. (1) (12)

M

M - Thousand

MBF - Thousand board feet.

MM - Million

MMBF - Million board feet

MAINTENANCE BURNING - The use of prescribed burning to maintain vegetation in a desired condition. (11)

MANAGED SEASON - That period of time when developed recreational sites are open for public use, with routine maintenance, cleanup, and operation on a scheduled basis. (11)

MANAGEMENT AREA - An area whose parts are managed for similar objectives and under a common management prescription. (1,10,12)

MANAGEMENT CONCERN - An issue, problem, or condition that constrains the range of management practices identified as suitable by the Forest Service in the planning process. (1,12)(36 CFR 219.3)

MANAGEMENT DIRECTION - A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them. (1,12)
(36 CFR 219.3)

MANAGEMENT EMPHASIS - The values to be featured or enhanced. (11)

MANAGEMENT INDICATOR SPECIES - A species whose welfare is presumed to indicate the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area. (8)

MANAGEMENT INFORMATION HANDBOOK (MIH) - A part of the Forest Service Directives System; it contains standard definitions for types of work and units of measure. (11)

MANAGEMENT INTENSITY - The management practices or combinations of management practices and associated costs designed to produce different levels of goods and services. (1,12) (36 CFR 219.3)

MANAGEMENT PRACTICE - A specific activity, measure, course of action, or treatment. (12) (36 CFR 219.3)

MANAGEMENT PRESCRIPTION - Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives. (1,12)
(36 CFR 219.3)

MANAGEMENT TEAM - Decisionmaking group consisting of the Forest Supervisor, Staff Officers, and District Rangers. (11)

MANAGEMENT TYPE - The species or species group that is best suited to the site for commercial timber production or to meet other resource needs. Site productivity is typically a primary determinant of management type, but the overriding necessity to provide for one or more nontimber forest uses may influence or determine management type. (11)

MAST - The fruit of trees such as oak, beech, and sweet chestnut, and also the seeds of certain pines (such as longleaf and pinnon pines), particularly where considered as food for livestock and certain kinds of wildlife. (2)

MATURE TIMBER - Trees that have attained full development, particularly in height, and are in full seed production. (3)

MAXIMIZE - To find the maximum value of a specific resource without regard to other resources or constraints. (11)

MAXIMUM MODIFICATION - See visual quality objectives.

divided by that age. Culmination of mean annual increment is the stand age at which the mean annual increment of growth is greatest or reaches its highest point. (2)

MIDDLEGROUND - A term used in visual resource management to describe the visible terrain beyond the foreground; in the middleground, individual trees are still visible but do not stand out distinctly from the stand, usually up to 3 to 5 miles from the observer. (See foreground and background.) (1)

MINERAL LEASE - An agreement permitting use of land for exploration, and then, if mineral is discovered, giving right to take mineral either for definite term or so long as it can be produced in paying quantities upon reserved royalty. (18)

MINIMUM LEVEL MANAGEMENT - The management strategy that would meet only the basic statutory requirements of administering unavoidable, nondiscretionary land uses; preventing damage to adjoining lands of other ownerships; and protecting the life, health, and safety of incidental users. (11)

MINIMUM MANAGEMENT REQUIREMENTS - Constraints or activities necessary to maintain viable wildlife populations and to prevent permanent impairment of the productivity of the land. (11)

MINIMUM VIABLE POPULATION - The minimum number of individuals required to maintain a stable, self-sustaining gene pool. (11)

MISSION - A major, continuing national area of concern or responsibility of the Forest Service that is directed by legislation, order, or regulation. The Forest Service mission is the basic reason for the existence of the Forest Service as a Federal agency and characterizes the Agency's role in solving broad, national problems. (12)

MITIGATION MEASURES - Actions to avoid, minimize, reduce, eliminate, or rectify adverse impacts of management practices.

MODIFICATION - See visual quality objective.

MONITORING - A process for collecting significant data from defined sources to identify departures or deviations from expected plan outputs. (2)

MONITORING AND EVALUATION - The periodic evaluation of Forest Plan management practices on a sample basis to determine how well objectives have been met.

MONOECIOUS - Having staminate and pistillate flowers on the same plant. (19)

MORTALITY - In wildlife management, the loss in a population from any cause, including hunter kill, poaching, predation, accident, and disease. In forestry, trees in a stand that die of natural causes. (8)

MULTIPLE-MANAGEMENT USE - The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people. Making the most judicious use for production of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions (some lands will be used to produce less than all of the resources). Harmonious and coordinated management of the various resources, each with the other, without impairment of

not necessarily management for the combination of uses that will give the greatest dollar return or the greatest unit output. (1,12) (36 CFR 219.3)

N

NATIONAL DIRECTION - Statements of missions, goals, and objectives that guide Forest Service planning. (12)

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969 - An act to declare a National policy that will encourage productive and enjoyable harmony between man and his environment; to promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality. (11)

NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN - A Plan that "...shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner." (1)

NATIONAL FOREST MANAGEMENT ACT (NFMA) - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that work.

NATIONAL FOREST SYSTEM BOUNDARY - A legal boundary of a National Forest, Grassland, or other administrative unit and that encloses a unit of the National Forest System as defined in section 11 of the RPA. These lines have been established by Presidential Proclamation, Executive Order, Public Land Order, Secretarial Order, or Act of Congress. (2)

NATIONAL FOREST SYSTEM (NFS) LAND - A Federal reservation, generally forest, range, or other wild land, that is administered by the Forest Service of the U.S. Department of Agriculture under a program of multiple use and sustained yield for timber, and for range, catchment, wildlife, and outdoor recreational purposes. (2)

NATIONAL FOREST SYSTEMS - All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein that are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608) (12)

NATIONAL RECREATION TRAILS (NRT) - Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the National system of trails authorized by the National Trails System Act. National Recreation Trails provide a variety of outdoor recreation uses. (6)

NATIONAL REGISTER OF HISTORIC PLACES - A listing (maintained by the National Park Service) of areas that have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation. (6)

subsequent wilderness designations, irrespective of the department or agency having jurisdiction. (11)

NATURAL FOREST - A forest environment, including its associated plant and animal communities, that has been produced essentially through the process of natural succession. This process would include the effects of natural catastrophic occurrences. (11,12)

NATURAL REGENERATION - An age class created from natural seeding, sprouting, suckering, or layering. (22)

NET PUBLIC BENEFITS - An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield. (12) (36 CFR 219.3)

NO-ACTION ALTERNATIVE - The 1987 Forest Plan alternative representing the condition expected to exist in the future if current management direction continued unchanged. Also referred to as the Current Program. (11)

NONCHARGEABLE VOLUME - All volume that is not included in the growth and yield projections for the selected management prescriptions used as a basis for calculating the allowable sale quantity. (10)

NONCOMMERCIAL THINNING - A cutting made in a stand past the sapling stage for the purpose of improving its composition and character, by removing trees of less desirable species, form, and condition in the main crown canopy. (11)

NONCONSUMPTIVE SPECIES - Wildlife species that are not taken (harvested) for personal consumption. (11)

NONDECLINING YIELD - A timber flow constraint that ensures that harvests in each period after the first will be greater than or equal to the harvest in the preceding period. (11)

NONFOREST LAND - Land never having or land incapable of having more than 10 percent of its area occupied by forest trees and land formerly and currently developed for nonforest use. (6)

NONGAME SPECIES - Species of animals not managed for sport hunting. (2)

NONPOINT SOURCE POLLUTION - Pollution whose source is general rather than specific in location. (6)

NONPRICED OUTPUTS - Those outputs for which there is no available transaction evidence and no reasonable basis for estimating a market value commensurate with market values associated with price outputs. (11)

O

a time schedule for attainment of the planned results. An objective forms the basis for further planning that defines precisely the steps to be taken and the resources to be used in achieving identified goals. (1,12)

OBJECTIVE FUNCTION - The item to be maximized (or minimized) in a problem's solution. (11)

OFF-ROAD VEHICLES (ORV'S) - Vehicles such as motorcycles, all-terrain vehicles, four-wheel-drive (to include off-road vehicles and trucks) vehicles, and snowmobiles. (2)

OLD-GROWTH FOREST - Ecosystems characterized by old trees and related structural attributes. "Old growth" refers to the later stages of stand development which typically differ from earlier stages in a variety of characteristics such as tree size, accumulation of large dead woody material, number of canopy layers, species composition, and ecosystem function. (15)

OLD-GROWTH HABITAT - Wildlife habitat that is characterized by overmature coniferous and deciduous forest stands with large snags and decaying logs.

OPPORTUNITY - A proposal that is considered in developing alternative activities, projects, or programs where there is a chance to invest profitably to improve or maintain a present condition. (12)

OUTPUT - A good, service, or on-site use that is produced from forest and rangeland resources. See FSH 1309.11 for forest and rangeland outputs codes and units of measure. (12)

OUTPUT, INDUCED - A good, service, or on-site use that is produced incidentally and not as a primary objective. For example, an increase in wildlife habitat acreage can be an induced output of timber harvest administration activity that produces timber as a primary output. (12)

OUTPUT, MARKET - A good, service, or on-site use that can be purchased at a price. (12)

OUTPUT, NONMARKET - A good, service, or on-site use not normally exchanged in a market. (12)

OUTPUT, PRIMARY - A good, service, or on-site use that results from the completion of an activity, project, or program specifically designed to produce the good, service, or on-site use. Examples are board feet of timber and recreation visitor day. (12)

OVERGRAZING - Continued overuse (year after year) creating a deteriorated range.

OVERMATURE TREES - Trees allowed to grow beyond optimum age or size, for purpose of timber production, with resulting declines in growth and vigor (because of decay). In certain species, mortality and loss in volume due to insects and disease may result when trees are retained to overmaturity. (13)

OVERSTORY - Those trees that form the upper or uppermost canopy in a forest or stand having more than one story. (3,19)

OVERTOPPED (Suppressed) - See crown class.

PARTIAL RETENTION - See visual quality objectives.

PERENNIAL STREAM - Stream that flows throughout the year. (11)

PERMIT - A special use authorization that provides permission, without conveying an interest in land, to occupy and use National Forest System land or facilities for specified purposes, and which is both revocable and terminable. (1)

PERSONS-AT-ONE-TIME (PAOT) - A recreation capacity measurement term for the number of people that can use a facility or area at one time. (11)

PLANNING AREA - The area of the National Forest System covered by a Regional Guide or a Forest Plan. (1,12)

PLANNING HORIZON - The overall time period considered in the planning process. It spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions that would influence the planning decisions. (1,12)

PLANNING PERIOD - One decade. Within the planning horizon, for which incremental changes in yields, costs, effects, and benefits are shown. (1,12)

PLINTHITE - An iron-rich, humus-poor mixture of clay with quartz and other diluents. (21)

POLICY - A guiding principle upon which a specific decision or set of decisions is bases. (12)

POLICY ISSUE - An action or set of circumstances that has bearing on current or future policy. (12)

PRECOMMERCIAL THINNING - A thinning that does not yield trees of commercial value, usually designed to improve crop spacing. (22)

PREFERRED ALTERNATIVE - The alternative recommended for adoption as the Forest Plan. (11)

PRESCRIPTION - A written direction for harvest activities and regeneration methods.

PRESENT NET VALUE - The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. (1,12) (36 CFR 219.3)

PRESERVATION - See visual quality objectives.

PRICE-QUANTITY RELATIONSHIP - A schedule of prices that would prevail in a market for various quantities of the output exchanged. (See demand schedule and supply schedule.) (12)

PRIMITIVE CAMPGROUND - A campground that has no flush toilets, tent pads, or fireplace grates, and is located in a setting that allows use by 4 to 8 people per acre at one time. (11)

PRIMITIVE RECREATION - Those recreational activities associated with unroaded land; e.g., hiking, backpacking, cross-country travel. (6)

PRIVATE MINERAL RIGHTS - Mineral rights owned by other than the United States. May be either reserved or outstanding. (11)

PROGRAM - Sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishments. (12)

PROGRAM BUDGET - A plan that allocates annual funds, work force ceilings, and targets among agency management units. (12)

PROGRAM BUDGET LEVEL - A single, comprehensive integrated program responsive to the Chief's direction that specifies a level of production attainable from a given investment of dollars and other resources. Each budget level represents a complete, full, and independent package. (12)

PROGRAM ELEMENT - An individual Forest Service area of responsibility, which in combination with other elements, comprises the statutory or Executive-directed mission of the Forest Service. Specific Forest Service program elements are defined in the Management Information Handbook (FSH 1309.11). (12)

PROGRAM PROPOSAL - A multiyear course of action proposed under a given set of assumptions and constraints. (12)

PROJECT - An organized effort to achieve an objective identified by location, activities, outputs, effects, and by time periods and responsibilities for execution. (12)

PROJECT DESIGN - The process of developing specific information necessary to describe the location, timing, activities, outputs, effects, accountability, and control of a project. (12)

PUBLIC INVOLVEMENT - A Forest Service process designed to broaden the information base upon which agency decisions are made by (1) informing the public about Forest Service activities, plans, and decisions and (2) encouraging public understanding of and participation in the planning processes that lead to final decisionmaking. (10,12)

PUBLIC ISSUE - A subject or question of widespread public interest relating to management of the National Forest System. (1) (12)

PUBLIC PARTICIPATION - Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities and contributions conducted or solicited to obtain comments from the public about Forest Service planning. (12)

PULPWOOD - Softwood trees that contain at least 15 feet of continuous merchantable length or three 5-foot pieces and hardwood trees that contain at least 10 feet of continuous merchantable length or two 5-foot pieces. Softwood trees must be at least 5.0 inches in diameter at breast height, and hardwood trees must be at least 6.0 inches in diameter at breast height.

R

RANGE CONDITION CLASS - One of a series of nonquantitative categories used to classify range condition, usually excellent, good, fair, or poor. (11)

communities of successively lower ecological order occupy an area. (11)

RANGE IMPROVEMENT - (1) Any structure or excavation built or dug to facilitate management of range or livestock. (2) Any practice designed to improve range condition or facilitate more efficient utilization of the range. (3) An increase in the grazing capacity of range, i.e., improvement in range condition. (11)

RANGELAND (RANGE) - Land on which the native vegetation is predominately grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing use. Forested sites and nonforested sites providing forage and habitat for domestic and wild herbivores are included. (12)

RANGELAND VEGETATION - Vegetation on all land with rangeland resource values or for which rangeland resource objectives have been established, including riparian areas. Generally, the focus is on grass or grasslike plants, forbs, or shrubs. (12)

RANGE MANAGEMENT - The art and science of planning and directing range utilization so as to secure sustained maximum production of livestock, milk, or cut forage or combinations of these outputs consistent with other uses and while conserving natural resources. (3)

RARE II (Roadless Area Review and Evaluation II) - A comprehensive process directed by the Secretary of Agriculture to identify roadless and undeveloped land areas in the National Forest System and to determine their uses for either wilderness or other resource management and development and to determine areas for which such decisions would require further planning. (2)

REAL DOLLAR VALUE - A monetary value that compensates for the effects of inflation. (12) (36 CFR 219.3)

RECEIPT SHARES - The portions of receipts derived from Forest Service resource management that are distributed to State and county governments (for example, Forest Service 25-percent fund payments). (12) (36 CFR 219.3)

RECORD OF DECISION - A document separate from but associated with an Environmental Impact Statement and stating the decision, identifying all alternatives, specifying which alternatives were environmentally preferable, and stating whether all practicable means to avoid environmental harm resulting from the alternative have been adopted, and if not, why not. (40 CFR 1505.2)

RECREATION EXPERIENCE LEVEL - A classification (using a 1 to 5 scale) of the level of development in camp and picnic sites and expressing the types of recreational opportunities and modifications to the environment that can be expected. (11)

RECREATION INFORMATION MANAGEMENT SYSTEM (RIM) - A Forest Service system that compiles recreational visitor use information by type and intensity of use. (11)

RECREATION OPPORTUNITY SPECTRUM (ROS) - Land delineations that identify a variety of recreation experience opportunities categorized into six classes on a continuum from primitive to urban. Each land class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the outdoor skills needed to enjoy the area, and the relative density of recreation use. The six classes are primitive, semi-primitive nonmotorized, semi-primitive motorized, roaded natural, rural, and urban. (2)

1. Primitive - Essentially unmodified natural environment where evidence of other users is low, usually 3 miles or more from roads. Visitors enjoy hiking, horseback riding, nature study, and other nonmotorized uses. Visitors experience isolation, independence, closeness to nature, and self-reliance in an environment offering a high degree of challenge and risk.

2. Semi-primitive nonmotorized - The area is predominantly a natural environment generally over 1/2 mile from roads, but no further than 3 miles from all roads and visitors encounter evidences of other users. Visitors enjoy nonmotorized uses, and there is a high probability that they will experience isolation, independence, and closeness to nature. Challenge and risk are generally high. Resource management activities may be conducted; however, natural appearance is still maintained.

3. Semi-primitive motorized - Settings, activities, and opportunities are within 1/2 mile of primitive roads and trails that generally provide much the same conditions as semi-primitive nonmotorized, primitive roads may be present and motorized use is permitted. Settings, activities, and opportunities are affected accordingly, but there is still a moderate probability of experiencing isolation from sights and sounds of humans; and generally no closer than 1/2 mile from improved roads.

4. Roaded natural - The appearance of natural environment Predominates, but there is moderate evidence (sights and sounds) of humans. Concentration of users is moderate to low. Roads of better than primitive class are usually within 1/2 mile. A broad range of motorized and nonmotorized activity opportunities are available. Management activities including timber harvest are present but harmonize with the natural environment.

5. Rural - These areas are substantially modified. Other persons are readily seen and heard. Interaction between users is moderate to high. Numerous facilities are usually present. Challenge and risks are unimportant. Motorized use and facilities are common. Resource management activities may be common and obvious.

6. Urban - The environment is usually highly modified and contains numerous improvements. Large concentrations of humans can be expected. Experiencing the natural environment is unimportant.

RECREATION VISITOR DAY (RVD) - Twelve visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more persons. (11)

RECREATIONAL OPPORTUNITY - Availability of a real choice for a user to participate in a preferred activity within a preferred setting in order to realize the satisfying experiences that are desired. (11)

RED-COCKADED WOODPECKER COLONY - A group of live pine trees containing cavities excavated, maintained, and used by a clan of red-cockaded woodpeckers for nesting and roosting. A buffer at least 200 feet deep must furround each colony. (11)

REDUCED-SERVICE MANAGEMENT - Management of developed recreation facilities below optimum maintenance standards. (11)

REFORESTATION - The natural or artificial restocking of an area with forest trees. (2)

REGENERATION - A cutting method by which a new age class is created. The major methods are Clearcutting, Seed Tree, Shelterwood, Selection, and Coppice (see Harvesting Method). (22)

Even-Aged Method Methods

1. **Clearcutting** - A method of regenerating an even-aged stand in which a new age class develops in a fully-exposed microclimate after removal, in a single cutting, of all trees in the previous stand. Regeneration is from natural seeding, direct seeding, planted seedlings, and/or advance reproduction. Harvesting may be done in groups or patches (Group or Patch Clearcutting), or in strips (Strip Clearcutting). In the Clearcutting System, the management unit or stand in which regeneration, growth, and yield are regulated consists of the individual clearcut stand (see Group Selection).

2. Clearcutting with Reserves - A clearcutting method in which varying numbers of reserve trees are not harvested to attain goals other than regeneration.

3. Seed Tree - An even-aged regeneration method in which a new age class develops from seedlings that germinate fully-exposed micro-environments after removal of all the previous stand except a small number of trees left to provide seed. Seed trees are removed after regeneration is established.

4. Seed Tree with Reserves - A seed tree method in which some or all of the seed trees are retained after regeneration has become established to attain goals other than regeneration.

5. Shelterwood - A method of regenerating an even-aged stands in which a new age class develops beneath the partially-shaded micro-environment provided by the residual trees. The sequence of treatments can include three distinct types of cuttings: 1) an optional preparatory harvest to enhance conditions for seed production; 2) an establishment harvest to prepare the seed bed and to create a new age class; and 3) a removal harvest to release established regeneration from competition with the overwood. Harvesting may be done uniformly throughout the stand (Uniform Shelterwood), in groups or patches (Group Shelterwood), or in strips (Strip Shelterwood).

6. Shelterwood with Reserves - A variant of the Shelterwood Method in which some or all of the shelter trees are retained, well beyond the normal period of retention, to attain goals other than regeneration. The resulting stand may be two-aged or tend towards an uneven-aged condition as a consequence of both an extended period of regeneration establishment and the retention of reserve trees that may represent one or more age classes.

7. Two-Aged Methods - Methods designed to maintain and regenerate a stand with two age classes. See Shelterwood with Reserves and Coppice with Reserves.

8. Uneven-Aged (Selection) Methods - Methods of regenerating a forest stand, and maintaining an uneven-aged structure, by removing some trees in all size classes either singly, in small groups. or in strips.

9. Group Selection - A method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. The maximum width of groups is approximately twice the height of the mature trees, with small openings providing micro-environments suitable for tolerant regeneration and the larger openings providing conditions suitable for more intolerant regeneration. In the Group Selection system, the management unit or stand in which regeneration, growth, and yield are regulated consists of a landscape containing an aggregation of groups (see Clearcutting).

10. Single Tree Selection - A method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more-or-less uniformly throughout the stand to achieve desired stand structural characteristics.

11. Coppice Methods - Methods of regenerating a stand in which the majority of regeneration is from stump sprouts or root suckers.

12. Coppice - A method of regenerating a stand in which all trees in the previous stand are harvested and the majority of regeneration is from sprouts or root suckers.

13. Coppice with Reserves - A coppice method in which reserve trees are retained to attain goals other than regeneration. The method normally creates a two-aged stand.

REGENERATION CUTTING - Any removal of trees intended to assist regeneration already present or make regeneration possible. (2)

REGENERATION CUTTING METHODS - Any cutting methods intended to promote or facilitate regeneration of a new stand or make regeneration of a new stand possible. (11)

REGENERATION (Reproduction) PERIOD - The time between the initial regeneration cutting and the successful re-establishment of a new age class by natural means, planting, or direct seeding. (22)

REGION - An area managed under the provisions of a Regional guide. See FSM 1221.3 for organizational definitions. (12)

REGULAR UNEVEN-AGED (Balance) STAND - A stand in which three or more distinct age classes occupy approximately equal areas and provide a balanced distribution of diameter classes. (22)

RELEASE - A treatment designed to free young trees from undesirable, usually overtopping, competing vegetation. Treatments include cleaning, liberation, and weeding (see Stand Improvement). (22)

RENEWABLE RESOURCES ASSESSMENT - An appraisal of the Nation's renewable resources made in recognition of their vital importance and the necessity for long-term planning and associated program development. The Assessment must meet the requirements of Section 3 of the Resources Planning Act and includes analyses of present and anticipated uses, demands, and supplies of the renewable resources; a description of Forest Service programs and responsibilities; and a discussion of policy considerations, laws, and regulations. (12)

RENEWABLE RESOURCES PROGRAM - The program for management and administration of the National Forest System, for Research, for Cooperative State and Private Forest Service programs, and for conduct of other Forest Service activities. This program is developed in accordance with the Forest and Rangeland Renewable Resources Planning Act. (12)

RESEARCH NATURAL AREA (RNA) - Designated area of land, usually larger than 300 acres and having ecological characteristics that are of scientific or educational interest. These areas are valuable as locations for observing and researching plant and animal succession, habitat requirements of species, insect and fungus depredations, soil microbiology, phenology, and other related subjects. (2)

RESERVE TREES - Trees, pole-sized or larger, retained after the regeneration period under the Clearcutting, Seed Tree, Shelterwood, or Coppice Methods. syn. Standards. (22)

RESOURCE - Anything beneficial or useful -- animal, vegetable, or mineral; a location; a labor force; a view; an experience; and so on. Resources, in the context of land use planning, thus vary from such

opportunities. (6)

RESPONSIBLE LINE OFFICER - For land management planning purposes, the Forest Service employee who has been delegated the authority to carry out a specific planning action. (12)

RETENTION - See visual quality objectives.

RETURNS TO COUNTIES - The portion of receipts derived from Forest Service resource management that is distributed to State and county governments (for example, Forest Service 25-percent funt payments.

RIGHT-OF-WAY (ROW) - Land authorized to be used or occupied for the construction, operation, and maintenance of a project or facility passing over, upon, under, or through such land. (17)

RIPARIAN - Pertaining to areas of land directly influenced by water or influencing water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, and marshes are typical riparian areas. (3)

RIPARIAN ECOSYSTEM - A transitional ecosystem between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics and distinctive vegetation communities that require free or unbound water. (11)

ROAD CONSTRUCTION INVESTMENT - Investment in construction of a road to provide access where the construction adds new miles of road to the transportation system. (11)

ROAD RECONSTRUCTION INVESTMENT - The investment in construction activity that results in betterment, restoration, or realignment of a road. Realignment is construction activity that results in the new location of an existing road or portions thereof. Betterment is construction activity that raises the traffic service level of a road or improves the road's safety or operating efficiency. Restoration is construction activity required to rebuild a road to its approved traffic service level. (11)

ROADED NATURAL - See Recreation Opportunity Spectrum.

ROADLESS AREA - Area studied during the Roadless Area Review and Evaluation process (RARE II) and that is roadless and at least 5,000 acres in size.

ROADLESS AREA REVIEW AND EVALUATION - See RARE II.

ROS - See Recreation opportunity spectrum.

ROTATION - The planned number of years between the formation or regeneration of a crop or stand and its final cutting at a specified stage of maturity. The rotation includes a period for harvesting and reestablishment, normally about 5 years. (2)

RPA (RESOURCES PLANNING ACT) - The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the National Assessment and Recommended Program developed to fulfill the requirements of the act.

National Forest System lands.

RPA RECOMMENDED PROGRAM - The 1980 updated program prepared in response to the Forest and Rangeland Renewable Resources Planning Act of 1974. (2)

RURAL - See Recreation Opportunity Spectrum.

S

SALE SCHEDULE - Statement of the quantity of timber planned for sale, by time period, from an area of suitable land covered by a Forest Plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Sales in periods are described establish that long-term sustained yield capacity will be achieved and maintained. For timber resource planning purposes, the sale schedule quantity and allowable sale quantity shall be considered synonymous for all periods or decades within the planning horizon. (2,12) (36 CFR 219.3)

SALVAGE CUTTINGS - The removal of dead trees or trees being damaged or killed by injurious agents than competition, to recover value that would otherwise be lost. (22)

SANITATION CUTTINGS - The removal of trees to improve stand health and to reduce actual or anticipated spread of insects and disease (see Stand Improvement). (22)

SAPLING - A tree, usually young, that is larger than a seedling but smaller than a pole. Size varies by region. (22)

SAWTIMBER - Trees containing at least one 12-foot sawlog or two noncontiguous 8-foot logs and meeting regional specifications for freedom from defect. Softwood trees must be at least 9.6 inches 37 d.b.h. and hardwood trees 12 inches in d.b.h.

SAWTIMBER STANDS - Forest stands at least 10-percent stocked with growing stock trees 5 inches d.b.h. and larger, and in which the stocking of trees 9 inches in d.b.h. and larger is at least equal to the stocking of trees 5 to 8.9 inches in d.b.h. (11)

SCENIC AREAS - Places of outstanding or matchless beauty that require special management to preserve these qualities. Such areas may be designated under 36 CFR 294.1 (6)

SCOPING PROCESS - An early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. (2)

SEDIMENT - Earth material transported, suspended, or deposited by water. (6)

SEDIMENT YIELD - Amount of sediment delivered into a water course. (11)

SEED-TREE CUTTING - See cutting methods.

SEEDLINGS AND SAPLINGS - Live trees less than 5 inches in diameter at breast height. (3)

of National Forest System land for the purpose of gathering geological information, related to possible gas and oil deposits by seismic methods.

SEMI-PRIMITIVE MOTORIZED (SPM) - See recreation opportunity spectrum.

SEMI-PRIMITIVE NONMOTORIZED (SPNM) - See recreation opportunity spectrum.

SENSITIVE SPECIES - Plant or animal species susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the Regional Forester as needing special management to prevent placement on Federal or State lists. (2)

SENSITIVITY ANALYSIS - A determination of the consequences of varying the level of one or several factors while holding other factors constant. (12)

SERAL COMMUNITY - A biotic community that is a developmental, transitory stage in an ecologic succession. (6)

SHADE-INTOLERANT PLANTS - Plant species that do not germinate or grow well in shade. (2)

SHADE-TOLERANT PLANTS - Plants that grow well in shade. (2)

SHELTERWOOD - See regeneration.

SILVICULTURE - The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands. Silviculture entails the manipulation of forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis. (22)

SILVICULTURAL SYSTEM - A planned process whereby a stand is tended, harvested,a nd re-established. The system name is based on the number of age classes (see Even-aged, Two-aged, uneven-aged), and/or the regeneration method used (see Clearcutting, Seed Tree, Shelterwood, Selection, Coppice, Coppice with Standards). (22)

SINGLE-TREE SELECTION - See regeneration.

SITE - An area considered as a physical environment, a biological environment, e.g., riparian zone, a homogeneous stand of vegetation, a campground, archaeological site, etc.

SITE CLASS - A classification of site quality, usually expressed in terms of ranges of dominant tree height at a given age or potential mean annual increment at culmination. (22)

SITE INDEX - A measure of site class based on the height of the dominant trees in a stand at an arbitrarily chosen age. (11)

SITE PREPARATION - A hand or mechanized manipulation of site designed to enhance the success of regeneration. Treatments may include chopping, discing, bedding, raking, burning, and scarifying. All treatments are designed to modify the soil, litter, vegetation and to create miroclimate conditions conducive to the establishment and growth of desired species. (22)

SIZE CLASS - For the purposes of Forest planning, size class refers to the intervals of tree stem diameter used for classification of timber in the Forest Plan data base.

seedling-sapling = less than 5-inch diameter
pole-sapling or poletimber = 5- to 9-inch diameter
sawtimber = greater than 9-inch diameter

SKIDDING - A general term for hauling loads by sliding, not on wheels, as developed originally from stump to roadside, deck, skidway, or other landing. (3)

SLASH - The residue left on the ground after tree felling and tending, or accumulating there as a result of storm, fire, girdling, or poisoning, or both. It includes unutilized logs, uprooted stumps, broken or uprooted stems, the heavier branchwood, etc. (3)

SMALL GAME - Birds and small mammals commonly hunted or trapped. (2)

SNAG - A standing dead tree. (14)

SOCIAL IMPACT ASSESSMENT - An assessment of potential change in the social state, where such change may directly or indirectly result from one or more activities or activity types, or from the production of one or ore outputs. (2)

SOCIOECONOMIC STATUS - The comparative position of a person or group in terms of, employment, income, and other conditions that reflect interactions of social and economic factors. (2)

SOIL LOSS COEFFICIENT - A numerical factor that indicates the rate of soil movement. (11)

SOIL MOISTURE - The amount of water a soil is capable of retaining. (11)

SOIL SURVEYS - Systematic examinations of soils in the field and in laboratories; the description and classification of soils; the mapping of kinds of soil; the evaluation of soils according to their adaptability for production of various crops, grasses, and trees; the behavior of soils under use or treatment for plant production or for other purposes; and evaluation of the productivity of soils under different management systems. (6)

SPECIAL ACRES - The component of the commercial forest land that needs specially designed timber treatments to protect or enhance resources other than timber. (11)

SPECIAL INTEREST AREAS - Areas managed to make recreation opportunities available for the understanding of the earth and its geological, historical, archeological, botanical, and memorial features. (6)

SPECIAL USE AUTHORIZATION - A permit, term permit, temporary permit, lease, easement, or other written instrument that grants rights or privileges of occupancy and use on National Forest System land subject to specified terms and conditions. (17)

SPECIAL USE PERMIT - Authorization for use and occupancy of National Forest System land issued by the Forest Service. (11)

structure, and growing on a site of sufficiently uniform quality, to be distinguishable unit (see Mixed, Pure, Even-Aged,and Uneven-Aged Stands). (22)

STANDARDS AND GUIDELINES - Statements specifying conditions or levels of environmental quality to be achieved.

STOCKING - An indication of growing-space occupancy relative to a pre-established standard. Common indices of stocking are based on percent occupancy, basal area, Relative Density, and Crown Competition Factor. (22)

STUMPAGE (STUMPAGE VALUE) - The value of timber as it stands uncut, in terms of an amount of money per unit of volume. (6)

SUCCESSION - In plant ecology, the gradual supplanting of one community of plants by another, the sequence of communities being termed a sere and each intermediate state, seral, as opposed to the final climax state. (2)

SUITABILITY - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices. (12)
(36 CFR 219.3)

SUITABLE FOREST LAND - Land that is to be managed for timber production on a regulated basis. (11)

SUPPLY - The amount of an output that producers are willing to provide at the specified price, time period, and condition of sale. (12)

SUPPLY SCHEDULE (CURVE) - A schedule of amounts of an output that producers are willing to provide at a range of prices, at a given time and condition of sale. (See price-quantity relationship). (12)

SUPPRESSION - The process of extinguishing or confining fire.

SUSTAINED YIELD OF PRODUCTS AND SERVICES - The achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land. (1,6,12) (36 CFR 219.3)

T

TEMPORARY ROAD - Any short-lived road not intended to be a part of the forest development transportation system and not necessary for future resource management. (11)

TENTATIVELY SUITABLE FOREST LAND - Forest land that is producing or is capable of producing crops of industrial wood and: (1) that has not been withdrawn by Congress, the Secretary, or Chief; (2) for which existing technology and knowledge is available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions; (3) for which there is reasonable assurance that application of existing technology and knowledge that result in adequate restocking within 5 years after final

activities. (2)

TERM PERMIT - An authorization that is issued for a specified period and that is both revocable and compensable according to its terms. (17)

TERRITORY - The area that an animal defends, usually during breeding season, against intruders of its own species.

THINNING - A cutting made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality. (22)

THREATENED SPECIES - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and that has been designated in the Federal Register by the Secretary of the Interior as a threatened species. (11)

TIERING - Incorporating information contained in an EIS (Environmental Impact Statement), such as the Forest Plan EIS, by reference in subsequent environmental documents. (11)

TIMBER CLASSIFICATION - Forest land classifications based on management of the timber resource under each land management alternative. (2) The following classifications are (2)

1. Nonforest land - Land never having or that is incapable of having more than 10 percent of its area occupied by forest trees, and land formerly and currently developed for nonforest use.

2. Forest land - Land that is at least 10 percent occupied by forest trees of any size or that formerly had such tree cover that is and not currently developed for nonforest use.

3. Suitable land - Land managed for timber production on a regulated basis.

4. Unsuitable land - Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness) or identified as not appropriate for timber production in the Forest planning process.

TIMBER PRODUCTION - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood. (12) (36 CFR 219.3)

TIMBER SALE PROGRAM QUANTITY - The volume of timber that the Plan calls for selling during the first decade of the planning horizon. It includes the allowable sale quantity (chargeable volume) and any additional material (non-chargeable volume) planned for sale. The timber sale program quantity is usually expressed as an annual average for the first decade. (11)

TIMBER STAND IMPROVEMENT (TSI) - Measures such as thinning, pruning, release cutting, prescribed burning, girdling, weeding, or poisoning of unwanted trees aimed at improving growing conditions for the remaining trees. (2)

TOLERANCE, SHADE - The relative capacity of a plant to become established and grow in the shade. (22)

natural and human-created features. (6)

TRAFFIC SERVICE LEVEL - A road classification based on traffic and user characteristics. (11)

TWO-AGED STAND - A stand composed of two distinct age classes that are separated in age by more than 20 percent of rotation. (22)

U

UNDERSTORY - The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth. (6)

UNDEVELOPED AREA - An essentially unroaded portion of a National Forest.

UNEVEN-AGED MANAGEMENT - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the numbers or proportions of trees of particular sizes to retain within each area, so that a planned distribution of size classes is maintained. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (1,12) (36 CFR 219.3)

UNEVEN-AGED STAND - A stand of trees of three or more distinct age classes, either intimately mixed or in small groups. (22)

UNEVEN-AGED SYSTEM - A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes (see Single Tree Selection, Group Selection). (22)

UNSUITABLE FOREST (LAND NOT SUITED) - Forest land that is not managed for timber production because: (a) the land has been withdrawn by Congress, the Secretary, or the Chief; (b) the land is not producing or capable of producing crops of industrial wood; (c) technology is not available to prevent irreversible damage to soils, productivity, or watershed conditions if timber is produced; (d) there is no reasonable assurance that the lands can be adequately restocked within 5 years after final harvest, based on

existing technology and knowledge as reflected in current research and experience; (e) there is at present a lack of adequate information about responses to timber management activities; or (f) timber management is inconsistent with or not cost efficient in meeting the management requirements and multiple-use objectives specified in the Forest Plan. (11)

UTILITY AND TRANSPORTATION CORRIDOR - A strip of land designated for the transportation of energy, commodities, and communications by railroad, State highway, electrical power transmission, oil and gas and coal slurry pipelines, and telecommunication cable and electronic sites, all for interstate use. (2)

UTILIZATION STANDARDS - Measurements that describe the smallest trees that will be designated for sale for various products such as sawtimber or small roundwood.

V

VARIETY CLASS - In the National Visual Management System a classification of visual landscapes on the basis of degree with the most variety or diversity of visual features.(11)

cover for multiple-use purposes.

VERTICAL DIVERSITY - The diversity in a stand that results from the complexity of the aboveground structure of the vegetation; the more tiers of vegetation or the more diverse the species makeup, or both, the higher the degree of vertical diversity. See also horizontal diversity. (2)

VIABLE POPULATION - A population that has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area. (FSM 1905) (10,12)

VIBRA TILLING - A method of subsoiling with a subsoiler which moves rapidly from side to side. (11)

VISUAL QUALITY OBJECTIVE (VQO'S) - Category of acceptable landscape alteration where classification is based on degree of deviation from the natural-looking landscape.

1. **Preservation** - Only ecological changes occur.

2. **Retention** - Human management activity or change should not be evident to the casual Forest visitor.

3. **Partial Retention** - Human management activity or change may be evident but must remain subordinate to the characteristic landscape.

4. **Modification** - Human management activity or change may dominate the characteristic landscape but must, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

5. **Maximum Modification** - Human management activity or change may dominate the characteristic landscape but should appear to be a natural occurrence when viewed as background. (2)

VISUAL RESOURCE - The composite of basic terrain, geologic features, water features, vegetation patterns, and land-use effects that typify a land unit and influence the visual or scenic appeal the unit may have for visitors. (2)

W

WATERSHED - The entire area that contributes water to a drainage system or stream. (2)

WATER YIELD - The runoff from a watershed, including groundwater outflow. (2)

WETLAND - Land where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in or on the soil. (2)

WETSITE - Inundated by surface or ground water with a sufficient frequency so that vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction are prevalent or would be prevalent under normal circumstances. (11)

WILD AND SCENIC RIVERS- Those rivers or sections of rivers designated as wild and scenic rivers by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those

through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

1. Wild River Areas - Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

2. Scenic River Areas - Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

3. Recreational River Areas - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past. (6)

WILDERNESS - In area designated by congressional action under the 1964, 1975, 1980, and 1983 Wilderness Acts. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence and without permanent improvements or human habitation. Wildernesses are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable provide outstanding opportunities for solitude or a primitive and unconfined type of recreation include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest. (2)

WILDFIRE - Any wildland fire not designated and managed as a prescribed fire within an approved prescription. (11)

WILDLIFE AND FISH USER DAY (WFUD) - Any portion of a day spent participating in an activity involving wildlife or fish. (2)

WILDLIFE STRUCTURE - A site specific improvement of a wildlife or fish habitat. (11)

WINTER RANGE - Habitat used by wildlife species for food and shelter during the winter months. (2)

Y

YARDING - The moving of logs from the stumps where they are cut to a central concentration area or landing. (2)

YIELD TABLE - A tabular statement of outputs expected to be produced under a specified set of conditions. (11)

YOUTH CONSERVATION CORPS - A human resource program that utilizes youth ages 15 to 18 to perform various Forest projects. Environmental education is tied into the projects undertaken. (11)

Appendix A

Scoping Process and Issue Identification

Introduction

Summary

This appendix describes the scoping process used in the Land Management Plan Revision for the National Forests and Grasslands in Texas (NFGT). Key events that occurred during scoping are included. Direction for scoping is found in 40 Code of Federal Regulations (CFR) Part 1501.7. More specific public participation direction is found in 36 CFR 219.6 planning regulations.

Step 1 - Initial Scoping

A public involvement plan was developed to guide the scoping process. This plan was included in the final work plan developed to guide the Revision effort. The final work plan, including the public involvement plan, were reviewed and approved by the Forest Management Team and then submitted to the Regional Forester for his review.

Revision of the Forest Plan was announced by means of a Notice of Intent (NOI) in the October 23, 1990 issue of the Federal Register. In this NOI, the public was asked to comment on the scope of the analysis associated with the Revision.

Three thousand seven hundred and twenty copies of a newsletter inviting public comment were distributed. More than 2,840 letters and 2,500 comment cards were distributed through various groups and organizations. Newsletters were sent to 121 newspapers, 94 radio and television stations, and 24 other news organizations. Approximately 90 other groups and key individuals contacted personally and were invited to comment on the Revision.

The comment period on the scope of the analysis ended on November 30, 1990, as the NOI in the Federal Register stated that it would. The Forest Supervisor received 345 letters about the Plan revision before the NOI announcement was made. Two thousand seven hundred eighty three letters were received between October 23, 1990 and November 30, 1990, and approximately 1,100 more letters were received after November 30, 1990. By April 1, the Forest had received approximately 4,300 letters. In keeping with the spirit of 40 CFR 1501.7 (Scoping) which states that, "There shall be an early and open process for determining the scope of issues to be addressed," all comments were accepted and documented.

Three interested parties asked the Forest Service to extend the comment period. These requests were denied for two reasons. Firstly, it was doubtful whether any new substantive issues would be raised. Secondly, any new substantive issues raised after the official scoping period would have to be considered as directed within the National Forest Management Act (NFMA) regulation. One interested individual requested that the Forest Service consider only the comments received prior to and during the scoping period and not to consider any comments received after November 30, 1990. The Forest Service's obligation to the public is to accept and consider all comment letters received at any time.

Step 2 - Issue Identification

Forest Interdisciplinary (ID) and Management Teams then screened the comments to identify those that could and should be addressed in the Forest Plan Revision. Fifteen such issues and 53 such subissues were identified.

A scoping document that summarizes all aspects of the scoping and identification process was prepared. It contains a detailed index to the scoping records filed with the planning records. This index also lists scoping information received through mid-1991. However, the index does not list comment letters received after 1991. Nevertheless, all scoping letters received after 1991 are maintained in the planning records, as are the letters received prior to the official scoping period.

Step 3 - Continued Public Involvement

Forest officials met with individuals and groups throughout the scoping process to provide information and explanations of the Revision. Newsletters and other planning news mailings were sent to more than 850 individuals, organizations, and agencies and were used to keep the public informed and involved in the Revision process.

Decisions Within the Scope of This Revision

The Federal Register NOI of October 23, 1990 identified the following items as not being within the scope of the Revision:

1. Allocations of existing wilderness areas (Texas Wilderness Act decisions).
2. Allocations of Special Management Areas and the Research Natural Area (decisions made for the 1987 Forest Plan).
3. Actions to control southern pine beetle (SPB) [decisions made for SPB Environmental Impact Statement (EIS)].
4. Management of red-cockaded woodpeckers (RCW). (Current management is as directed by the court). If responsibility for RCW management is returned to the Forest Service, regional direction would probably be applied following appropriate public participation and NEPA compliance.

A new NOI was published in the Federal Register on July 23, 1992. This notice expanded the scope of the Revision, and revised the availability dates for the draft and final EIS. This NOI was needed because of findings during monitoring and evaluation for the Analysis of the Management Situation (AMS) and because it was time for the required 5-Year Review of the current Forest Plan. Scoping had also identified the need to reconsider existing allocations of Scenic Areas, protective corridors, and Research Natural Areas. The NOI of October 23, 1990 had not identified these subjects as within the scope of the Revision.

Identification of Planning Issues

Goal

The goal of scoping and public involvement is to enable the Forest Supervisor to identify major public issues, management concerns, and resource use and development opportunities that should be addressed in the planning process. This is achieved through public participation and coordination with other Federal agencies, State and local governments, and Indian tribes.

1987 (Current Plan) Issues

There was much public participation in the preparation of the 1987 Forest Plan (see the Final EIS for this Forest Plan for more details). This public participation identified many issues, concerns, and opportunities, which ID Team review condensed into the following nine planning issues:

1. How much soil and water maintenance and improvement is necessary to provide desirable resource outputs?
2. What is the appropriate level and method for timber resource production to meet local and national economic and commodity needs consistent with other resource outputs and diversity?
3. What is the appropriate level of the Grasslands range resource production to meet local and national economic and commodity needs consistent with other resource outputs and diversity?
4. What should be done to maintain or improve the diversity and quality of fish and wildlife habitats?
5. What allocation should be recommended for RARE II Further Planning Areas?
6. To what standards should Forest roads be constructed and maintained?
7. How should the increasing demand and use of public land for a variety of recreation experiences be met? What should be the mix between developed and dispersed recreation?
8. What steps can be taken to integrate the development and use of mineral resources with the use and conservation of all other forest resources to the extent possible under the laws governing mineral disposal?
9. How much and what types of land should the U.S. Forest Service acquire or exchange in land ownership adjustments?

Although citizen participation played a major role in the development of the 1987 Forest Plan, not all of the public was satisfied and the Forest Plan was appealed. The appellants raised issues related to the level and method of timber production, biodiversity, wildlife, recreation, wilderness, forest pest management, and use of prescribed fire.

Management Concerns

In April of 1989, more than 30 employees from the Forests and Grasslands met to discuss revision of the Forest Plan. For the most part, issues identified at this meeting were those identified in the last round of planning and those raised by appellants of the 1987 Forest Plan.

The Forest Supervisor then reviewed public input and management concerns to identify new issues and concerns to determine how they should be addressed in the Forest Plan Revision. The document, A Summary of Scoping Process Records, lists the issues that the Forest Plan will address. It also describes the public participation activities completed and lists all of the issues and concerns raised and opportunities identified.

Personal Contacts

relationship regarding the Plan. The following persons and groups have been contacted during revision of the Plan.

U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
Texas Parks and Wildlife Department
Texas Forest Service

Texas Department of Agriculture
Texas Attorney General's Office
Texas State Historic Preservation Officer
County judges (15)
Local governments
Texas Forestry Association
Texas Committee on Natural Resources
Golden Triangle Group Sierra Club
Houston Group Sierra Club
Dallas Group Sierra Club
National Audubon Society
West Central Texas Chapter Audubon Society
Texas Environmental Action Coalition (TEAC)
Sierra Club Forest Watch, Houston
Regional Office, U.S. Forest Service, Atlanta, Georgia
Indian Governments
National Park Service
Stephen F. Austin State University faculty members
Texas A&M University Forestry Department
Bureau of Land Management
Chamber's of Commerce
Landowners' associations
Texas Railroad Commission
Civic clubs
Grazing permittees
Timber Purchasers Council
State and U.S. Congressmen
State and U.S. Senators
Texas Water Commission
Society of American Foresters

Maintaining Contact

The NFGT maintains a mailing list of all individuals who indicate an interest in participating in the planning process. These individuals and all other known interested parties, were notified by mail and were sent Planning News notices about the Revision. Approximately 3,000 newsletters were mailed. NFGT personnel also visited State agencies and special-interest groups from Lufkin to Austin to discuss the Forest Plan Revision. As a result of these meetings, news releases, and mailings, an additional 4,000 newsletters were requested and delivered to interested parties.

Analyzing the Comments

"Public comments shall be considered individually and by type of group and organization to determine common areas of concern and geographic distribution. The result of this analysis should be evaluated to determine the variety and intensity of viewpoints about ongoing and proposed planning and management standards and guidelines."

The Forest Service records substantive comments instead of counting "votes" for and against particular policies. Forest Service regulations make no provision for settling questions of policy by counting votes.

Scoping Process Records - Identifying Issues

Step 1. Identify Substantive Comments

The planning core team read the comment letters received in response to the NOI, Newsletter Number 1, and other scoping efforts. Letters about the Revision but received before and after the official scoping period were considered also. The CEQ regulations require that scoping continue throughout the analysis. All of these comments are listed in the scoping process records at the Supervisor's Office in Lufkin.

Step 2. Incorporate Substantive Comments from Previous Scoping Efforts

The ID Team leader reviewed letters commenting on the original draft EIS for the Forest Plan and the appeals to the Forest Plan. Comments contained in these letters but not obtained in scoping were noted in the list of comments.

Step 3. Identify Issue Topics

Comments were then grouped by underlying issue (e.g. roads, biodiversity). Sixty-two issue topics were identified in this way. All comments from Step 1 and 2 above that were grouped into issue topics can be found in the scoping process records.

Step 4. Screen Substantive Comments

The Planning Team identified three rules for screening substantive comments. The purpose of screening was to eliminate substantive comments that could not be addressed effectively in the Revision or were not pertinent to land and resource management planning. The screens were:

1. The NFGT has the capability and authority to resolve or participate in the resolution of the issue and it is within the context and intent of the National Forest Management Act, the Multiple-Use Sustained Yield Act, and the mission of the Forest Service.

2. It is within the NFGT authority but not a decision germane to NEPA or forest planning (e.g. personnel or other administrative decisions).

3. It is within the authority of the NFGT to resolve and subject to NEPA, but not a decision made in Forest Plans (e.g. project-level decisions) or is excluded from the scope of the revision.

reviewed and screened the comments received during the official scoping period. Additional work was necessary, so a task force composed of two Rangers, two Staff Officers, one Interdisciplinary Team member, and one Planning Team member met to complete this process. The Planning Core Team then reviewed all the comments to insure that comments that could be addressed effectively were not screened from consideration. The ID Team then reviewed the list again in April, 1991 and then submitted it to the Forest Management Team for final review and approval in May, 1991. Items that were addressed internally and did not appear on the final list were screened by the ID Team using the previously described criteria. All issues that were raised internally and could be addressed were then blended into the final list of scoping comments. The results of these screenings are presented in Chapter 2 of "A Summary of Scoping Process Records," which is a part of the process records.

Step 5. Formulate Issues

The Core Planning Team reviewed the issue topics and substantive comments and identified 15 issues. Associated with each issue are numerous subissues and substantive comments. The Core Team tried to retain the original wording of comments to the extent practicable. Similar comments were consolidated.

The tentative list of issues, subissues, and comments was then reviewed and edited by the ID Team and Planning Team.

This list of issues included seven issues tentatively identified in the NOI published on October 23, 1990. These issues are:

1.How much, where, and how timber management is to be practiced.
2.How the natural diversity of plants and animals is to be maintained.
3.How the Longleaf Ridge area is to be managed.
4.What balance of commodity and noncommodity goods and services is to be provided.
5.Where and how mineral exploration and development are to be conducted.
6.Where and how much off-highway vehicle use is to be allowed.
7.What level of transportation system is to be implemented.

Step 6. Incorporation of Management Concerns

Comments received from the Forest Management Team, the Forest ID Team, the Regional ID Team, and other Forest Service officers were analyzed to identify substantive comments. The comments analyzed included those made during monitoring and evaluation of the existing Forest Plan. All substantive comments were screened using the criteria described in discussion of Step 3. Those comments passing the screens were incorporated into the appropriate issues and subissues.

Step 7. Review of the Issues

The Planning Team prepared drafts of a Scoping Process Record that included the list of comments, and proposed issues and subissues for review by the Forest Management Team and Regional ID Team. The issues and subissues listed were:

Subissue 1: Natural values of NFGT
Subissue 2: Old growth
Subissue 3: Special ecosystems
Subissue 4: Management indicators

Issue 2 - VEGETATION MANIPULATION
Subissue 1: Harvest methods and silvicultural systems
Subissue 2: Reforestation and intermediate stand management
Subissue 3: Prescribed fire
Subissue 4: Use of chemicals
Subissue 5: Pine-hardwood mixtures

Issue 3 - SPECIAL MANAGEMENT AREAS
Subissue 1: Protection of Special Management Areas
Subissue 2: Wilderness allocations
Subissue 3: Wilderness management
Subissue 4: Wild and Scenic Rivers

Issue 4 - OFF-ROAD VEHICLES (ORV'S)
Subissue 1: ORV use
Subissue 2: ORV management
Subissue 3: ORV trails in the Forest

Issue 5 - RCW MANAGEMENT
Subissue 1: Addressing RCW management in the Forest Plan Revision
Subissue 2: Management of RCW

Issue 6 - INTEGRATED PEST MANAGEMENT
Subissue 1: Addressing SPB in the Forest Plan Revision
Subissue 2: SPB control measures

Issue 7 - ROADS AND TRAILS
Subissue 1: Road access in the Forest
Subissue 2: Road and trail maintenance
Subissue 3: Nonmotorized trail access in the Forest
Subissue 4: Road and trail closures
Subissue 5: Roadside and trailside management

Issue 8 - COMMUNITY STABILITY
Subissue 1: Local economy and jobs
Subissue 2: County revenues

Issue 9 - WILDLIFE AND FISHERIES
Subissue 1: Extirpated or introduced species
Subissue 2: Fish and aquatic resource management
Subissue 3: Threatened, endangered, rare, or sensitive species (PETS) excluding RCW
Subissue 4: Wildlife management

Issue 10 - RECREATION
Subissue 1: General recreation
Subissue 2: Management of developed recreation sites
Subissue 3: Dispersed recreation management
Subissue 4: Hunting
Subissue 5: Law enforcement
Subissue 6: Cultural resources
Subissue 7: Visual quality

Issue 11 - RESOURCE SUSTAINABILITY
- Subissue 1: Clean air
- Subissue 2: Soil productivity and water quality
- Subissue 3: Timber harvest
- Subissue 4: Range management and Grazing
- Subissue 5: Wildfire

Issue 12 - MIX OF GOODS AND SERVICES
- Subissue 1: Balance of multiple uses
- Subissue 2: Implementation of the Forest Plan

Issue 13 - PLANNING
- Subissue 1: Adequacy of the Revision
- Subissue 2: Public involvement
- Subissue 3: Research needs and new ideas

Issue 14 - MINERALS
- Subissue 1: Leasing, exploration, and development

Issue 15 - LANDS
- Subissue 1: Landownership-acquisition and exchange
- Subissue 2: Land uses
- Subissue 3: Property boundary management

Step 8. Public Notification of Issues

During the last week of March and the first week of April, 1991, the NFGT mailed Newsletter Number 2 to all of the more than 4,300 parties who submitted scoping comments. The newsletter listed the comments (by topic) that had been received. Readers were invited to review the list to make sure that their substantive comments were included. The 10 steps for obtaining and analyzing comments and formulating issues and subissues were described.

In response to Newsletter number 2, some persons advised that their comments were not included in the list of comments. These additional comments were screened by the ID Team and the Forest Management Team and were included as appropriate.

Newsletter number 3 contained a list of the issues and subissues. It also contained a brief article on each issue. These articles were included to let the public know how each issue was analyzed and incorporated into the Forest Plan and EIS. The intent of this newsletter was to show how the Revision would be "issue driven."

Step 9. Revision of Issues

Since the public has the right to comment on the Revision throughout the planning process, all letters are analyzed for substantive comments and are screened as described in discussion of Step 3. Most of the substantive comments are reiterations of comments already received. All comment letters and new substantive comments are recorded in the process records on file in the Supervisor's Office.

Step 10. Disposition of Issues and Concerns

were needed. The ID Team and Regional Office formulated a strategy for developing a draft AMS. The draft AMS included discussion of the issues and a 5-Year Review of the 1987 Plan. This document was completed in March, 1992 and is available for review at the Supervisor's office.

Public Involvement

Five methods have been used to reach the public. These methods are public meetings, personal letters, newsletters, meetings with individuals, and media programs.

The approach has been one of listening first then explaining what has happened in the past and what alternatives may be available. The emphasis has been on identifying people's concerns and obtaining their suggestions.

Public Meetings

Between 1992 and 1994, 28 public involvement meetings were held. These ranged from meetings with the relatively small Forest Watch Group of the Sierra Club to a meeting with the entire Houston Sierra Club (more than 250 members). Meetings were also held with county judges, who supervise the day-to-day operations of governments in Texas. Other groups have included landowners; the Texas Farm Bureau; the Texas Department of Parks and Wildlife; the

U.S. Fish and Wildlife Service; various biology and forestry faculty and student groups at Texas A&M, Stephen F. Austin, and Rice Universities; and off-road vehicle user groups.

Members of more than 20 groups discussed trail management at a trails workshop held at Double Lake Campground. These included horseback riders, off-road vehicle users, wildflower enthusiasts, and others who wanted to know more about trails and about the Plan's effects on their interests. Attendees were given a mapping exercise that allowed them to explain how and where trails might be placed in the future.

Names and addresses of participants in meetings were taken so we could advise interested individuals of and send them future mailings and more information about the planning process.

Individual Meetings

Individuals sometimes meet with Forest Service officials at their homes or offices or at a district or Supervisor's Office to discuss concerns about the Revision. In all cases, a summary of the meeting is taken and key points are provided to those staff, districts, and ID Team members who have a working interest in the meeting.

Newsletters

The Forest has published six newsletters about the Revision during the period 1992 to 1994. Nine of these newsletters have been published since 1990. These newsletters have been used to give various individuals and groups the latest information about the planning process.

Service roads, and the Timber Sale Program Information Reporting System (TSPIRS) in the newsletters.

The newsletter is also used to respond to questions or concerns raised at meetings or posed by letter writers and to announce meetings and report on previous meetings.

Letters

We receive letters and telephone calls about the Revision and related matters from individuals who do not attend or request meetings. We note and respond to such letters and calls.

Media Visits

We have used radio and television talk shows to the public. Talk shows give us opportunities to discuss the Plan in greater detail than in 30-second soundbites on the evening news.

In 1993, three 60-minute radio interviews and two 30-minute television programs had the Plan Revision as their subject. These programs addressed such issues as the RCW, the importance of timber to local communities, wilderness, trails, and silvicultural practices.

Additional meetings with television, radio, and newspaper reporters are used to explain the Planning process and procedures. These sessions are used to lay the groundwork for news media contacts that will occur when the Plan and EIS become available for public comment.

Efforts Between Draft and Final

In September, 1994 upon the release of the Draft Environmental Impact Statement (DEIS) and Draft Revised Land & Resource Management Plan (hereafter referred to as "Draft Plan"), the NFGT created what could be termed a "rapid response team" to explain and answer concerns. This team was responsible for contacting and in many cases meeting with 103 different organizations/individuals. The 103 contacts include the Congressional delegations, state elected officials, state agencies, federal agencies, universities, river authorities, local/county organizations, professional societies, non-governmental organizations, environmental/recreational groups, the Alabama-Coushatta tribe and various internal and media groups.

These contacts included 22 meetings open to the public, one of which was the second annual "Trails Workshop" which addressed concerns of hikers, bikers, off-road vehicles and equestrians.

In addition to the meetings, more than 600 copies of the DEIS and Draft Plan, and 1400 copies of the DEIS Summary were sent out to libraries, agencies, news media, universities, groups and individuals.

Special newsletters and news releases announcing the DEIS and Draft Plan were mailed out to news media agencies throughout Texas. These newsletters and news releases explained where and how copies of the DEIS, Draft Plan and DEIS Summary could be obtained, how people

more.

A current theme running through all these actions was informing all groups, agencies and members of the public on how to comment on the DEIS, Draft Plan and DEIS Summary. Specific guidelines were provided to all NFGT employees, ensuring internal understanding of the DEIS and Plan release was obvious and consistent. Several letters/newsletters were mailed out informing the public on what should go into their comments; that each letter would be read separately and informing the public the value of personal letters compared to form letters and petitions. Form letters were received but since they all read the same, their comments were only included once. The public also was informed the comment period was not a vote, and the Forest Service would NOT tally comments for or against the DEIS/Draft Plan.

As a result of these activities, more than 1,800 letters were received. These letters when analyzed for specific concerns and issues, totaled 5,668 comments. Of the 5,668 total, 2,537 came from individuals, while 3,131 comments were attributed to organizations.

All the letters were read and discussed by an analysis team consisting of NFGT planning and subject matter experts. These letters were coded according to the issues and subjects they addressed. After coding each comment was sent to the Interdisciplinary Team for review, comparison to DEIS and Plan information, and response to the comment was drafted. These responses were reviewed by another team (the comment review team) to insure accuracy and uniformity. This process, the comments and responses can be reviewed in EIS Appendix K.

Appendix B

Description of the Analysis Process

I. Introduction

Appendix B presents a technical discussion of the analysis process and computer models used in the Revision planning effort. The appendix focuses on the quantitative methods used to perform the analysis and documents how the analysis was done.

The Forest's major planning goal is to provide enough information to help decision makers and the public determine which combination of goods, services, and land allocations will maximize Net Public Benefits (NPB). The regulations (36 CFR 219) developed under the National Forest Management Act (NFMA) provide the analytical framework within which these decisions are made.

The NFMA and its regulations also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in this analytic process. The NEPA regulations require that the environmental effects of a proposed action and alternatives to that proposed action must be disclosed in an Environmental Impact Statement (EIS).

Information presented in this chapter supplements the broader and less technical descriptions included in the body of the EIS. This discussion includes basic assumptions, modeling components and inputs, rules, methods, and constraints. Additional information and documents used in the analysis process are contained in the planning records. The planning record in its entirety is incorporated here by reference. The results from the modeling process are estimates of what can be expected if alternatives are implemented and facilitate comparison of alternatives.

1. Overview of the Forest Planning Problem

One of the primary responsibilities of the Forest Service is to determine how to manage the National Forest lands to produce goods and services in a mix that best meets the needs of the public. Not only must the needs of present generations be satisfied, but the needs of future generations must be considered. In some cases, the commitment of Forest Service lands and their associated resources will result in the exclusion of one or possibly several uses. In cases such as these, decisions have been based on sound analysis that considered the resource tradeoffs involved, the public that are to be effected and the economic consequences of the action.

National Forest lands provide a variety of goods and services that are valuable to a very diverse set of people and/or publics. Timber, minerals, water, forage, wildlife and recreation are the primary goods and services provided by the lands within the National Forests and Grasslands in Texas. Production of one good or service is often accomplished at the expense of another. For example, the production of timber precludes the production of wilderness recreation. Unfortunately, there is not a sufficient number of Forest Service acres to satisfy the needs or desires of all of the people and publics. In the scoping process the Forest Service received over 4400 letters suggesting items to be addressed in the Forest Plan revision. Comments were analyzed and grouped into 15 issues and 53 sub-issues. Therefore it was necessary to determine how to allocate the lands within the National Forests and Grasslands in Texas that will address

services they provide. This is the purpose of the Land Management Planning process.

In addition to identifying a strategy for management that maximizes net public benefits (overall long-term value to the nation inputs, outputs and effects - **see glossary**), the purpose of the FEIS is to (1) resolve public issues and concerns and (2) analyze the forest's contribution to RPA related goals. Decisions made in the Plan and FEIS become increasingly significant in terms of their economic and social consequences.

In reviewing the fifteen issues and concerns raised by the public and agency employees, it became evident to the IDT that the nature of the issues raised during the revision were similar to the issues defined during the initial 1987 planning effort. During the 1980's, planners defined issues primarily in terms of the goods and services which could be produced in an economically efficient manner. During the 1990's, the issues were the same but the emphasis shifted from the production of goods and services to concern over the management philosophy ('stewardship'). The forest had dealt with these concerns through initiatives such as new perspectives and ecosystem management on a project level basis; but this Plan and FEIS is an effort to develop a more programmatic strategy for these concerns.

During the entire revision process, and particularly during the formulation of alternatives, the IDT was sensitive to the fact that the concerns of some groups and individuals involve the quantities of goods and services produced while the concerns of others involve a more aesthetic and ecologically based land stewardship concern.

Due to magnitude (.7 million acres) and complexity (11 Land Use designations - i.e. Management Areas), several analytical models were used.

1. A Version II FORPLAN computer model was used to simulate land allocations and provide information on outputs and costs.

2. A PC computer Data Base and Spreadsheet also were used to simulate allocations and provide information on outputs and costs.

3. An IMPLAN model was used to analyze how those outputs and costs affected the local economy.

4. Maps were used to define management area prescription options based on the goals and objectives of the alternatives and resource inventories.

2. The Planning Process

Land and resource management planning requires that processes formerly used to make individual resource decisions be combined into integrated management decisions. It also requires that mathematical modeling techniques be used to identify the most economically efficient solution to meet the goals and objectives of any alternative.

The 10-step process defined in the NFMA regulations was followed. This appendix is concerned with describing the analysis phase of this process which are steps 3, 4, 5 and 6. Steps 1, 2, 7, and 8 are described in Chapters 1 and 2 and Appendix A of this EIS. Plan implementation and

discussion of this process follows.

Identification of purpose and need: Issues, Concerns, and Opportunities (Step 1) - The Forest IDT assessed changes in public issues, management concerns, and resource use and development opportunities since the Plan was initially developed and subsequently amended. Appendix A of

this EIS documents this step.

Planning Criteria (Step 2) - Criteria are designed to guide the collection and use of inventory data and information; the analysis of the management situation; and the design, formulation, and evaluation of alternatives. This step establishes guidelines for accomplishing the next five steps. The Work Plan, 5 year review/AMS, and other process records document and describe this step.

Inventory Data And Information Collection (Step 3) - The kind of data and information needed is determined in Step 2 based on the issues, concerns, and opportunities identified and the resulting assessment of the management situation and determination of what needs to change. Data collection is part of normal forest operations. Existing data is used whenever possible and supplemented with new data, when practicable, if new data will contribute to more responsive analysis. Data accuracy is continually evaluated. Much of this data and background documentation is on file in the Planning (or Process) Records on file in the Supervisor's Office.

Analysis of the Management Situation (Step 4) - This step consists of assessing the existing situation on the forest and determining opportunities for resolving issues and concerns. This information provides the basis for formulating an appropriate range of reasonable alternatives.

This analysis brings existing information together, puts it into a total forest perspective, and examines the range of possible situations to resource issues. It examines supply potentials and market assessments for goods and services, and determines suitability and feasibility for meeting needs.

Other objectives of the analysis of the management situation include:

-assessing current direction including an estimate of goods and services most likely to be provided if current direction is continued.

-assessing demand for goods and services from National Forest lands.

-determining if there is a need to change current management direction.

Formulation of Alternatives (Step 5) - A reasonable range of alternatives is formulated according to NEPA procedures. Alternatives are formulated to assist in identifying one that comes nearest to maximizing net public benefits (NPB). They provide for the resolution of significant issues and concerns identified in Step 1.

The alternatives reflect a range of resource management programs. Each identified major public issue and management concern is addressed in different ways in the alternatives. The programs and land allocations in each alternative represent the most cost-efficient way of attaining the goals and objectives for that alternative. Both priced and non-priced goods and services (outputs) are considered in formulating each alternative. This entire step is discussed in this appendix.

Estimated Effects of Alternatives (Step 6) - The physical, biological, economic and social effects of implementing each alternative are considered in detail to respond to the issues and need for change.

The FORPLAN model estimates many, but not all, of the economic and physical effects. Other effects examined outside the model include ecological and social considerations. Specifically, the analysis determines: 1) direct effects, 2) indirect effects, 3) conflict with other Federal, State,

and local land use plans, 4) other environmental effects, 5) socio-economic effects within the Planning Area, 6) tradeoffs associated with various resource production levels and land allocations, and 7) mitigation measures (standards) for resource protection. The effects of the alternatives are displayed in Chapters 2 and 3 of this FEIS.

Evaluation of Alternatives (Step 7) - Significant physical, biological, economic and social effects of implementing alternatives are used to evaluate each alternative and compare them with one another. Typically, each alternative can be judged on how it addresses the significant issues, and sub-issues identified in Chapter 1 and Appendix A of the FEIS. Also, the alternatives are evaluated for consistency with the recommended 1990 RPA philosophy. Chapter 2 of the FEIS summarizes the comparisons of the alternatives with the issues and sub-issues.

Preferred Alternative (Step 8) - The Forest Supervisor reviews the IDT evaluation of each alternative and the public issues and concerns. The Forest Supervisor then recommends a preferred alternative to the Regional Forester. The Regional Forester either selects the Forest Supervisor's recommendation, another alternative, or modifies the alternative recommended by the Forest Supervisor. This alternative was described as the Preferred Alternative in the DEIS and was displayed as the Proposed Draft Revised Forest Plan. Public comments were solicited and considered in the finalizing of the Revised Forest Plan and EIS.

Plan Approval and Implementation (Step 9) - The IDT reviewed public comments and incorporated any necessary changes into the DEIS and Revised Forest Plan. Selection of the Final "Selected" alternative occurred after public response on the Draft Revised Plan and DEIS were fully analyzed. This alternative was different than the "Preferred" alternative in the Draft Plan and EIS. The Forest Supervisor recommended the alternative for the FEIS, considering the criteria and public comments received. The Regional Forester then reviews and approves the Revised Forest Plan and Final Environmental Impact Statement, **A Record of Decision documents this step.**

Monitoring and Evaluation (Step 10) - The Revised Forest Plan establishes a system of measuring, on a sample basis, actual activities and their effects, and compares these results with projections contained in the Revised Forest Plan. Monitoring and evaluation comprises an essential feedback mechanism to ensure the Revised Forest Plan is dynamic and responsive to change. The Revised Forest Plan describes the Monitoring and Evaluation process in Chapter 5.

II. Inventory Data for Information Collection

1. Resource Data Concepts

The collection of resource data is the first step in the analysis phase of the planning process. The amount and level of detail of the data collected depended upon the public issues and management concerns to be addressed in the Forest Plan. The National Forests and Grasslands in Texas has existing data available from past planning efforts, studies and administrative

information gathered from secondary sources or from studies conducted through the Regional Office. The revised model information or data was entered into Region 8's CISC II data base and transferred to a "Paradox" data base. Some information was mapped to describe spatially how the various components of the model related to one another (soils, vegetation, ecological units etc).

Two basic types of information were needed to facilitate the analysis and development of alternatives. The first consisted of information (1) related to the classification of land into categories with unique properties. This data generally described physical, biological or social attributes, and was generally associated with readily identifiable areas and issues. The second

type of information (2) is not directly reflected in the base data, issues or attributes; but is generally an estimation of how land will respond to certain management activities. These data are generally in the form of coefficients that could change between alternatives. These estimates of "outputs or results" are sometimes referred to as the production coefficients.

A. Delineation of Capability Areas

Capability is defined in 36 CFR 219.3 as follows:

The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices.

Capability areas would then be recognizable units of land that are homogeneous with respect to their ability to respond to management as stated above. Capability areas on the National Forests and Grasslands in Texas were defined for individual resources.

Timber Capability Area - Existing data concerning timber type, condition class, age, site index and productivity class, and land class was used to identify timber capability areas. Data was obtained from the Continuous Inventory of Stand Conditions II (CISC II) data base.

Recreation Capability Areas - Visual quality objectives (VQO's) and recreation opportunity spectrum (ROS) classification defined recreation capability.

Wildlife Capability Area - Existing timber resource data and habitat capability index information was used to determine the capability of the land to best provide a diversity of wildlife habitats. Data was again obtained from CISC II data base.

Range Capability Area - Range capability areas were defined in the basis of cover type/management type and their associated understory species. Data was obtained from CISC II data base. On the Grasslands, capability is a function of the existing ground cover and the potential cover. Data was obtained from Resource Action Plans.

Wilderness Capability Area - Wilderness capability was based on existing areas as established by Congressional action as well as known or proposed roadless areas identified during the scoping process.

B. Analysis Area Stratification

Information from the issues and concerns process and from the definition of capability areas was used to stratify the Forests into analysis areas in the FORPLAN Version II model. Analysis areas are an aggregation of capability areas, not necessarily contiguous, which can be considered homogeneous with respect to responses to treatment in terms of yields, costs and values. Data used to define capability areas was also used to define analysis areas.

C. Determination of Production Coefficients

Production coefficients are needed in order to show the effects or results of alternative approaches to management. The coefficients in the FORPLAN Version II model were developed to reflect differences in site productivity, land class, including administrative designation and existing vegetation. The coefficients were also designed to reflect changes in

management intensity within a given management prescription and on a given analysis area. This type of information comes from many sources: Regional procedure handbooks; professional research studies; University and other Academic information. The most up-to-date and verifiable information was utilized for this revision.

D. Database Development

In 1991, a computerized data base was completed forest wide for the forest. Region 8's continuous inventory of Stand Conditions II (CISC II) data base was used adding the soils, visual quality objective and recreation opportunity spectrum data. This information was transferred to a Paradox data base.

E. Updating the Visual Quality Inventory and Recreation Opportunity Spectrum Inventory

The first Visual Quality Objective (VQO) and the Recreation Opportunity Spectrum Inventory were completed for the Forest Plan in 1984. In 1990 and 1991 the forest completed an extensive and detailed review of all factors involved in the derivation of these inventories. The inventories were completely updated to reflect the most current situation. This has been accurately translated into the CICS II data base for analysis and display.

F. Lands Tentatively Suitable for Timber Production

Land classifications from the CISC II data base were used to identify lands tentatively suitable for application of different timber management practices. The initial steps for defining tentative suitability are outlined in steps 1-7 of the suitability tables at the end of this document. These steps first remove lands that are not forest land (roads, water etc), those legally designated or established for other purposes (wilderness, recreation areas etc), and other lands that are not physically capable or that too little information is known to make a determination on timber suitability. Following these broad removals, the areas tentatively suitable for timber production can be clearly mapped and identified.

G. Development of Allocation and Scheduling Alternatives

The development of allocation and scheduling alternatives was based on information collected during the definition of analysis areas, production coefficients, and tentatively suitable lands. Land class identifiers were initially used to identify the allocation choices for analysis areas. For

allocation of that analysis area to timber production. If an area was not administratively or legally designated to a specific allocation, such as woodpecker colonies, capability information was used to identify allocation choices available to each area.

Within a given allocation, a variety of scheduling choices were analyzed. These scheduling choices consisted of management practices that could be applied to a given analysis area. Possible choices were based on biological, technical and economic considerations. For example, within a timber management allocation, potential scheduling alternatives were tested as to whether they were silviculturally sound, whether the technology existed or could reasonably be expected to exist within the near future, and whether they were economically efficient. Existing (current) scheduling choices were used as the initial starting point in all cases. From there, scheduling choices representing more intensive and less intensive management were considered for inclusion in the analysis process.

H. Implementation of Monitoring

Monitoring requirements were based on the goals and objectives defined for each alternative and quantified during the analytical phase. In the analytical phase, output levels for timber, forage, water and developed, dispersed recreation and other goals and objectives were all projected into the future. Consequently, output levels for these desired conditions and objectives will be monitored after Plan approval and implementation.

2. Sources of Data

The major data sources used in the planning process are the Geographical Information System (GIS) data base, CISC II data base and studies conducted to determine output values and cost coefficients. All coefficients and assumptions made in the modeling process have been developed from the following information sources.

A. General

1) Codes and definitions for many of the activities, outputs, and effects came directly from the National Activity Structure Handbook (FSH 1309.16).

2) The Department of Labor (state and federal) and the Forest Service IMPLAN Model were used to estimate future regional employment and income by resource.

B. Timber

1) The Continuous Inventory of Stand Conditions version two (CISC II) is the standard timber data base for the Southern Region. Forest Service Handbook (FSH) 2409.26d displays information and coding structure for CISC. CISC provided specific timber information for each land unit or stand on the forest. CISC was used in the analysis area (AA) identification process, and for determining land tentatively suited for timber production. CISC II will continue to be used during implementation and monitoring.

2) Historical timber sales data from the years 1987 to 1991 was taken from 2400-17 forms and from sales contracts and adjusted to current average sale values (1992-93). Data used in the

bidders, product sold, operable acres, site preparation method and cost, and reforestation costs. Sales contracts provided cruise data specifying volume per acre. Cruise data on yields was used in conjunction with documented research to formulate yield tables for use in the FORPLAN model. Economic data used in the model included average statistical high bid and per-acre costs for site preparation and reforestation.

3) Timber prices were determined using timber appraisal summaries for the forest. The mid-market timber values were calculated using the quarterly Cut and Sold Reports for the forest.

4) The costs attributed to harvesting timber have been calculated using actual cost expenditure reports averaged from several years.

5) Timber yields were based on the timber type and standing volume from continuous forest re-inventories.

6) Yields for regenerated timber stands were derived from permanent study plots and published research.

C. Road Construction and Reconstruction Activities

1) Road construction and reconstruction costs are based on actual road expenditures.

2) Inventory work on the transportation system indicates that (State, County, and Forest Service routes) a transportation system now exists that meets access into most areas. The current inventory contains all arterial and collector roads needed for administration of the National Forests and Grasslands in Texas. However, some of these roads exist at a standard lower than needed to meet safety requirements and access needs of the National Forest and our rural and urban neighbors. The local road system is still being developed in response to various resource needs including timber harvest, minerals management, and recreation development.

Estimate road reconstruction miles are based on a statistically significant sampling of forest transportation needs currently developed to respond to resource needs.

D. Soil and Water

1) Background water yields for the forest were calculated using records from USGS gauging stations on, or near, the forest, and from coefficients from data developed by the RO.

2) Increases in water yields were developed using procedures in the Region 8 Procedure for Preparing Soil Loss, Sediment Yield, and Water Yield Estimates for Forest Plans (1981).

3) Soil loss and sediment rates from both natural sources and management activities were developed according to procedures in the above Region 8 paper (1981), using coefficients from Predicted Erosion Rates for Forest Management Activities in Texas (Knight, R. W., J. W. Spillman, R. J. Caffey, H. A. Pearson, A. T. Weichert, W. H. Blackburn and J. C. Wood, 1992). Coefficients were applied to the Universal Soil Loss Equation, as outlined in An Approach to Water Resources Evaluation of Non-Point Silvicultural Sources (USDA Forest Service, 1980).

and Wendel, 1980), as adapted for forest conditions.

E. Recreation

1) Developed recreation data in the FORPLAN model are based on capacity. Capacity data were taken from information contained in the Forest Recreation Information Management (RIM) system. RIM data was also used to assess the use of developed and dispersed recreation capacity and the relationship of use to capacity estimated demand.

2) Recreation values were the same as 1990 Final RPA Values.

3) The cost of providing and maintaining recreation opportunities on the forest have been calculated using actual Forest Service cost information.

4) Recreation capacity figures were estimated using the procedures outlined in the Recreation Opportunity Spectrum Users Guide (ROS) (Forest Service Handbook (FSH) 2309.13)

5) Recreation use information and RPA indices were used to calculate future recreation demand by ROS.

F. Wildlife and Fish

1) National Forest Hunting and Fishing use was developed as described in the AMS (1992).

2) Hunting harvest figures for big game and small game as supplied by Texas Parks & Wildlife Department.

3) Wildlife capacity coefficients were calculated through the use of Habitat Capability Models (developed by interagency task forces) for some of the management indicator species.

4) Benefits derived from wildlife are the same as the 1990 RPA Values.

3. Summary of Data Sources Used in Data Collection

Data sources are listed by resource where appropriate:

A. Timber

1. Baldwin, V.C. and Feduccia, D.P. 1987. Loblolly Pine Growth & Yield Prediction for Managed West Gulf Plantations. USDA-FS-SOFES, Research Paper SO-236. 27 pp.

2. Belcher, D. and K. Stoneking. 1986. SINGLE: Single Tree Selection Growth and Yield Program. USDA Forest Service, Southern Region. 17 pp.

3. Cost Efficiency - TSPIRS Analysis, Region 8. May 6, 1992.

4. Dale, M.E. 1972. Growth and Yield Predictions for Upland Oak Stands. U.S. Department of Agriculture, U.S. Forest Service, Research Paper NE-241

5. Farrar, Robert M. 1985 Volume and Growth Predictions for Thinned Even-Aged Natural Longleaf Pine Stands in the East Gulf Area. USDA-FS-Sofes Research Paper SP-220. 172 pp.

6. Hepp, Todd E. 1981. A Users Manual for YIELD Timber Yield Forecasting and Planning Tool Version 2.1. Tennesee Valley Authority. 28 pp.

7. Historical timber sales data from sales on the National Forests in Texas including data on volume per acre, product sold, operable acres, site preparation method and cost and reforestation costs. This information was taken from 2400-17 forms and from sales contracts which included cruise data specifying volume per acre.

8. Murphy, P.A. and R.C. Beltz. 1981. Growth and Yield of Shortleaf Pine In the West Gulf Region. USDA Forest Service, Research Paper SO-169.

9. Murphy, Paul A. and Robert M. Farrar. 1982. Interim Models for Basal Area and Volume Projection of Uneven-aged Loblolly-Shortleaf Pine Stands. Southern Journal of Applied Forestry. Volume 6, No. 2. May 1982.

10. Schnur, G.L. 1937. Yield, Stand, and Volume Tables for Even-aged Upland Oak Forest. U.S. Department of Agriculture, Tech. Bul. No. 560.

11. Schumacher, F.X. and T.S.Coile. 1960. Growth and Yield of Natural Stands of the Southern Pines. T.S. Coile, Inc., Durham, NC.

12. USDA, Forest Service. 1929, revised 1976. Miscellaneous publication No.50. Volume, Yield, and Stand Tables for Second-Growth Southern Pines.

13. Williams, D.L. and William C. Hopkins. 1968. Converting Factors for Southern Pine Products. Louisiana State University in cooperation with Southern Forest Experiment Station. Bulletin No. 626.

B. Water and Sediment

1. Beasley, R.S. 1979. Intensive Site-preparation and Sediment Losses on Steep Watersheds in the Gulf Coastal Plains.

2. Blackburn, Wilbert H. and M.G. Dehaven. 1980. Assessment of Stormflow and Water Quality from an Undisturbed Watershed.

3. Dissmeyer, G.E. and G.R. Foster. 1984. A Guide for Predicting Sheet and Rill Erosion on Forest Land. Technical Publication R8-TP6. USFS Southern Region. Atlanta, GA 40 pp.

C. Recreation

1. Litton and McDonald. 1979. Silviculture and Visual Resources.

2. Texas Parks and Wildlife. 1990. Texas Outdoor Recreation Plan.

3. USDA Forest Service. 1977. Recreation Information Management (RIM).

4. USDA Forest Service. ROS Users Guide.

5. USDA Forest Service - Southern Region. Recreation Coefficients of Forest Land Management Plan. Chattahoochee National Forest, Georgia.

6. USDA Forest Service - Southern Region Visual Management System - FSM 2380.

7. USDA Forest Service, National Forests and Grasslands in Texas. 1992. Five Year Review/AMS.

D. Wildlife

1 . Texas Parks and Wildlife Department. July 1, 1983. Performance Report: Texas Big Game Investigations, Job No. 4: Big Game Harvest Regulations (White-tailed Deer Harvest Surveys). Federal Aid Project No. W-109-R6. Austin, Texas.

2. USDA Forest Service - Southern Region. FSH 2609.23R, Wildlife Habitat Management Handbook.

3. USDA Forest Service - Region 8. A Process for Obtaining Habitat Capability and WFUD'S.

E. Archeology

1. Ippolito, John E. 1983. Cultural Resource Overview of the National Forests in Texas. USDA Forest Service, Southern Region, Lufkin, Texas.

2. Jurney, David H., Frank Winchell, and Randall W. Moir 1989. Cultural Resources Overview of the National Grasslands in North Texas, Studies in Predictive Archaeological Modeling for the Caddo and LBJ Grasslands. Report subimtted to the USDA Forest Service by the Archaeology Research Program, Southern Methodist University, Dallas.

3. Keller, John E. 1974. Subsistence Paleoecology of the Middle Neches Region of Eastern Texas. Ph.D. Dissertation. University of Texas at Austin.

4. McClurkan, Burney B. et al. 1968. Livingston Reservoir, 1965-1966: Late Archaic and Neo-American Occupation. Texas Archeological Salvage Project Papers. Austin, Texas.

5. Newcomb, W.W. Jr. 1961. The Indians of Texas. University of Texas Press. Austin, Texas.

6. Shafer, Harry J. 1974. Archeology and Indians of Southeast Texas. The Big Thicket: Participants Handbook for the Contemporary Science Seminar. Spring, 1974. Houston Museum of Natural Science and the University of Houston.

7. Shafer, Harry S. 1975. Notes on the Woodlands Cultures of Eastern Texas. Bull of the Texas Archeology Society. Volume 46. Austin, Texas.

8. Sjorberg, Andree F. 1951. The Bidai Indians of Southeastern Texas. Southwestern Journal of Anthropology. Volume 7(4). pp. 391-400.

9. Fields, Ross. 1979a. Report on the 1977 University of Texas Field School Archeological Survey in Houston County, Texas. Report submitted to the U.S. Forest Service by the Department of Anthropology, University of Texas at Austin.

10. Fields, Ross. 1979b. Cultural Resources of the Davy Crockett, Sam Houston, Angelina, and Sabine National Forests of Texas. Report submitted to U.S. Forest Service by the Texas Archeological Research Laboratory, University of Texas at Austin.

11. Martin, W.A., T.Pertulla, and J.Bruseth. 1994. Cultural Management Planning for the National Forests and Grasslands in Texas. Department of Antiquities Protection; Tx. Historical Comm., Austin.

F. Other

1. An Assessment of the Forest and Rangeland Situation in the U.S. RPA. 1980.

2. USDA Forest Service - Southern Region. 1975. Final Environmental Impact Statement and Unit Plan for Caddo National Grassland in Texas.

3. USDA Forest Service - Southern Region. 1975. Final Environmental Impact Statement and Unit Plan for Lyndon B. Johnson National Grassland in Texas.

4. USDA Forest Service - Southern Region. 1977. Final Environmental Impact Statement and Land Management Plan for Sabine National Forest in Texas-.

5. USDA Forest Service - Southern Region. 1978. Final Environmental Impact Statement and Land Management Plan for Sam Houston National Forest in Texas.

6. USDA Forest Service - Southern Region. 1980. Final Environmental Impact Statement and Timber Management Plan for Davy Crockett National Forest in Texas.

7. USDA Forest Service - Southern Region. 1978. Final Environmental Impact Statement and Timber Management Plan for the Angelina National Forest in Texas.

III. The Forest Planning Model (FORPLAN Version II)

1. Overview of FORPLAN

A computerized model called FORPLAN Version II has been developed by the Forest Service to help each National Forest analyze the management situation, formulate management alternatives and estimate effects of management alternatives. The computer programs which comprise FORPLAN Version II are the same for all forests; however, each forest is responsible for defining the way FORPLAN Version II features will be used (i.e., the structure of the model) and for estimating the outputs or costs per acre which are stored in yield tables. These outputs/costs per acre are commonly referred to as production coefficients and have been developed and verified by the IDT. The basic elements of the FORPLAN Version II structure are: outputs and costs, analysis areas, prescriptions, time periods, constraints and objective functions. These elements are discussed in summary fashion in this introduction and are treated in more detail in the following pages.

Outputs (yields) are those goods and services which are produced either purposely or incidentally as a result of management of the Forest. Selection of outputs to be used in FORPLAN Version II has a major bearing on the structure of the model and on the results of the analysis. Outputs to be entered in the model are important factors in decisions regarding management of the Forest. Outputs represent those goods and services which are delivered to various users of the Forest who derive value from these goods and services. Such yields include thousands of board feet (MBF) of timber and visitor days (RVD's) of recreation. The model "tracked" 84 separate costs (activities) and 46 separate outputs as shown in Table B-2.

The different types and localities of land which are modeled in FORPLAN Version II are called analysis areas. In FORPLAN Version II, there are six hierarchical categories available to describe analysis areas: Level 1, Level 2, Level 3, Level 4, Level 5 and Level 6. Within these various levels, land areas are characterized in terms of those resource characteristics which are important either in responding to issues and concerns raised in the planning process, or in determining levels of cost or yields in the model. Selection of the resource characteristics used to define analysis areas follow closely with the selection of yields to be tracked in FORPLAN Version II as discussed above and with prescriptions to be modeled as discussed below. Because analysis areas (except for Level 6 identifier management area) are defined by homogeneity of resource characteristics rather than geographic locators, one analysis area may consist of many parcels of land scattered over the Forest. This is a key concept in understanding the allocation results from FORPLAN.

Prescriptions are another important element of the FORPLAN Version II structure. A narrative list of management prescriptions is contained in Section C4, of this chapter. Each prescription is a mix of integrated management activities which are intended to accomplish specific objectives. These prescriptions were developed by the IDT to address public issues and management concerns and are a major element of the Forest Plan.

A broad range of management prescriptions were considered from the minimum management prescription to intensive management prescriptions. The IDT constructed prescriptions to represent the most cost effective means of meeting the prescription's objectives while providing

a broad enough range to assure the meeting of multiple resource requirements. By utilizing the Maximize PNV objective function, the FORPLAN model selected prescriptions which represent to the extent practicable the most cost efficient combinations of management prescriptions that can meet the objectives established in each alternative and benchmark.

For the National Forests in Texas model, analysis areas had from one to as many as 40 prescriptions available for selection. There were 416 analysis areas delineated in this model. The characteristics of the hierarchical categories are given in Section C3 of this chapter.

A fifth component of the FORPLAN Version II structure is constraints. Constraints are the means by which prescriptions are further characterized in FORPLAN Version II and by which alternatives are represented to the model. It is through the use of constraints that legal and policy requirements, as well as management objectives, are represented in the model.

The last element of the model discussed here is the objective function. The objective function feature allows specification of an overall objective to be met in a given run of the model while all constraints otherwise specified are also met. For example, one run of FORPLAN Version II might be set up to obtain a specified number of cubic feet of timber per year and a specified

costs. The objective function in this case would be minimized government cost.

The model is based on the premise that any given parcel of land (analysis area) will respond (cost and yields) to management (prescriptions) in a predictable way (yield coefficients). Through the application of prescriptions to analysis areas, per-acre output/cost coefficients can be developed for possible prescription or analysis area combinations. Once these data are loaded into the computer in the FORPLAN Version II format, the total Forest-wide results (yields and costs) of the application of various prescriptions on various land areas can be calculated. Because the cause-effect relationship between prescriptions applied to analysis areas and yields/costs is symmetrical, the model can also calculate which prescriptions would need to be applied to specific analysis areas to produce desired levels (constraints) of yields.

Carrying this further, once all assumptions and yield coefficients are built into the FORPLAN Version II model and verified, a "what if" game can be played specifying different levels of yields to be attained under different management objectives. By this means, different strategies for managing the Forest (alternatives) can be portrayed and analyzed. Model results consist of predictions of levels of yields and costs of various alternatives as well as specific allocations of prescription acres to analysis areas. These allocations of prescriptions combine with direction contained in written management prescriptions to become, the primary basis of management alternatives. In turn, one of these management alternatives was selected to become the Forest Plan.

2. The Analysis Process and the Analytical Tools Used

A. Prior to FORPLAN Version II

Preliminary analysis prior to formulation of the forest's FORPLAN Version II model began with the analysis of identified issues and concerns. Issues influenced the identification of analysis areas, capability areas and prescriptions needed. Formulation of the cost and yield coefficients by resource specialists and the IDT required separate analysis to --

-match management practices within prescriptions,

-reflect opportunities for addressing issues and concerns, ascertain that coefficients used in the FORPLAN Version II model were indeed correct.

Because this was a Revised Plan only selected benchmarks were made using the FORPLAN Version II Model. One run was for the maximization of Timber in response to issues raised. Also a number of PNV runs were made, Maximum PNV, Maximum PNV Market Only, and a Minimum Level Management Benchmark PNV.

Also a Current No Action was run to check for errors in economic tables and yield files. Adjustments were made to reflect opportunities indicated by the management practices within prescriptions.

The IDT was also able to analyze the use of constraints in the model. As a result, additional constraints were placed on certain analysis areas to ensure "reasonableness" in potential on-the-ground application.

Other specific analyses accomplished prior to modeling were:

1.A socioeconomic overview of the forest.

2.An update of the Landownership Adjustment Plan maps.

3.Updating ROS inventory and mapping.

4.Updating Visual quality (VQO) objective inventory and mapping.

5.Minerals availability and mapping.

6.Recommendation for management indicators.

B. Using FORPLAN Version II

Alternatives are generated by applying constraints to produce or to allow a specified range of goods and services; or to only allow a specified set of management prescriptions to be assigned to specific analysis areas. Constraints are designed to reflect the goals and objectives of the alternatives. Conditions set by the constraints are satisfied before the objective function is optimized. The analysis of all alternatives had the same objective function: maximize present net value. In other words, after meeting all constraints, the FORPLAN Version II model allocated the remaining opportunities in a way that produced the most economically efficient solution.

C. Subsequent to FORPLAN Version II

Each of the alternatives was examined by the Forest IDT for reasonableness and practicality. This was accomplished, in part, by examining the prescription assignment to analysis areas. Professional judgment and experience were used extensively during this phase of the process.

Additional analysis conducted subsequent to the FORPLAN analysis included the use of IMPLAN to examine the effects of the various alternatives on population, employment and income. Adjustments to the FORPLAN Version II present net value calculations were also made in order to include additional fixed benefits from minerals and fixed costs not included in the management prescriptions in the model.

D. Cost Efficiency of Prescriptions

A broad range of management prescriptions were included in each alternative. By maximizing PNV, FORPLAN Version II selected the most efficient set of prescriptions subject to constraints and the objectives of the alternative. In order to assure that the most economically efficient set of prescriptions is considered in accordance with 36 CFR 219.14(b), each AA was offered a minimum level prescription. No forested lands were identified that "accepted" this minimum level prescription. If any land was identified as going to a MINLVL prescription, it would be established as not suitable for timber production in accordance with 36 CFR 219.14(c).

All economic tables were developed by resource managers and reviewed by the IDT. FORPLAN Version II runs for maximization and other benchmarks were analyzed and evaluated

managers analyzed the data to ensure cost effectiveness of the prescription and applicability to meeting alternative (benchmark) goals.

3. The FORPLAN Version II Model: Components and Rationale Behind Development

In the following sections, the individual components of the FORPLAN Version II model are discussed in general terms. A description of how these components were developed and structured in the Texas model is also included for analysis areas, management prescriptions and resource yield tables.

A. Objective Function

The objective function drives the allocation and scheduling process and defines the purpose of the run. It specifies output(s) to be maximized or minimized. For example, an objective function could specify the maximization of timber volume or present net value (PNV). Allocation and scheduling choices within the model are then made in accordance with the purpose stated in the objective function.

For the Texas model, the objective function of maximize PNV is used to evaluate all alternatives. Intermediate runs may have objective functions to maximize or minimize a particular output such as timber volume. These intermediate runs are used to explore and define resource capabilities under various assumptions. Once resource capabilities are defined, however, they are locked in via constraints, and the maximum PNV objective is assigned to determine the most economically efficient means of achieving the resource goals.

B. Constraints

As the term indicates, constraints are conditions or restrictions that determine which courses of action can and cannot be adopted. In a linear programming problem, conditions or restrictions defined by constraints are satisfied prior to optimization of the problem in the manner specified by the objective function. If a course of action that satisfies all of the constraints does not exist, the problem is infeasible. In this case, the constraints must either be relaxed or reformulated or the problem redefined to allow an optimal solution to be found.

In the FORPLAN Version II model, constraints are imposed for several reasons. Constraints were imposed to satisfy legal and policy related requirements. Examples of these are the nondeclining yield constraint (policy) and constraints to provide habitat for threatened and endangered species such as the red-cockaded woodpecker (legal). There can also be discretionary constraints imposed in order to achieve the objectives that define an overall management

philosophy or alternative. For example, in the CURRENT "No Action" alternative, there are timber harvest constraints imposed to reflect the current intensity of timber management. These constraints prevent the linear program from simulating timber harvest constraints greater than the amount current management will produce. This then is a discretionary constraint that is imposed in order to reflect an overall approach to management.

There are three types of constraints that can be used in the FORPLAN Version II model to control outputs and activities. They are: 1) absolute constraints, 2) timber harvest and flow constraints and 3) general relational constraints. Absolute, flow and general relational

all (15) periods.

Absolute constraints are used to specify minimum and/or maximum output levels or objectives for outputs such as numbers of pileated woodpeckers, tons of sediment and cubic feet of timber produced per period.

Flow constraints in the Texas model were used to limit periodic increases in timber harvested, to distribute the total harvest across the ranger districts and to put a ceiling on total timber volume produced.

The timber harvest and growth constraints include nondeclining yield, long-term sustained yield and ending inventory.

The general relational constraints were used to specify constraints as percentages or as a proportionate relationship. For example, a certain percentage of Management Area 2 (RCW Habitat Management Area) to be in the 0-10 age group.

C. Analysis Areas

Analysis areas are defined as parcels of land, not necessarily contiguous, which are for all practical purposes, homogeneous with respect to their response to the application of various management practices.

In FORPLAN Version II, analysis areas are defined by using combinations of six identifiers available to the user.

For the National Forests in Texas, the analysis area identifiers were defined in such a way as to take full advantage of existing resource and land based data. This included timber and wildlife data in the CISC data base, recreation data in the RIM data base and other sources. The data contained in these data bases, particularly the CISC data base was considered very reliable and also provided the information in detail that was sufficient to perform the analysis required.

The analysis areas were also defined in such a way as to allow the model to be used to address issues and concerns. Following is a listing of the analysis area identifiers as they are used in FORPLAN on the National Forests in Texas and the spreadsheet model for Caddo and LBJ National Grasslands:

I. National Forest (FORPLAN)

Level 1: Land Class and Fixed AA

1. Angelina NF Fixed AA
2. Davy Crockett NF Fixed AA
3. Sabine NF Fixed AA
4. Sam Houston NF Fixed AA
5. National Forest Fixed AA
6. Non Suited Fixed AA
7. Hardwood & Pine HDWD Fixed AA
8. National Grassland Fixed AA
9. Water Area

11. Transmission Lines
12. Road & Railroad R.O.W.
13. Wildlife Openings
14. Reserved
15. Wilderness
16. Deferred
17. General Forest
18. Special Land Timber Production Secondary
19. Restocking Cannot Be Assured
20. Irreversible Damage Likely to Occur
21. Rare and Endangered Plant Areas
22. Red Cockaded Woodpecker Area
23. Experimental Forest
24. Minimum Level Management
25. Developed Recreation Site
26. Undeveloped Recreation Site
27. Trails
28. Administrative Site
29. Unproductive Site
30. Not Applicable Land

Level 2: Forest Types

1. Bottomland and Upland Hardwoods
2. Loblolly Pine
3. Longleaf Pine
4. Slash Pine
5. Pine/Hardwood Mix
6. Shortleaf Pine
7. Non Applicable

Level 3: Visual Quality Objective and Recreation Opportunity Spectrum

1. Semi Primitive (ROS)
2. Roaded Natural (ROS)
3. Modification (VQO)
4. Retention (VQO)
5. Preservation (VQO)
6. Non Applicable

Level 4: Soils

1. Floodplains
2. Streams
3. Sandy/Loamy Soils <15% Slope
4. Clayey Soils
5. Vertisoils
6. Critical Soils/Wetlands
7. Deep Sandy Soils >15% Slope
8. Non Applicable

Level 5: Age

1. 0-4 Years old
2. 5-14 Years old
3. 15-24 Years old

5. 45-64 Years old
6. 65-84 Years old
7. 85-104 Years old
8. 105+ Years old
9. Non Applicable

Level 6: RCW Zone/Management Area

1. Mixed Forest MA
2. Longleaf MA
3. RCW HMA Mixed Forest MA
4. RCW HMA Longleaf Forest MA
5. Riparian/Streamside Zone MA
6. Wilderness/Roadless MA
7. Special Management Area
8. Developed Recreation
9. Administrative/Non Forest
10. Experimental Forest
11. Grasslands
12. Acquatic Ecosystems (water)

II. National Grasslands (SPREADSHEET)

Level 1: Geographic Area

1. Ladonia
2. LBJ
3. Bois D'Arc
4. Lake Fannin

Level 2: Land Class

1. Cross Timber RNA
2. Ball Knob Hill TXNH
3. Center Point Prairie TXNH
4. Gober Prairie TXNH
5. Lake Crockett Flatwoods TXNH
6. Lake Fannin Ravines TXNH
7. Pecan Creek Mesa TXNH
8. Post Oak Ridge TXNH
9. Pringle Creek TXNH
10. Spoonamore Prairie TXNH
11. Lake Crocket Recreation Area
12. Black Creek Recreation Area
13. Coffee Mill Lake Prairie TXNH
14. Coffee Mill Recreation Area
15. Water
16. Roads
17. Administration Sites
18. Well Sites
19. Fixed AA

Level 3: Soil Type

1. Fine
2. Medium Coarse
3. Floodplain

Level 4: Range Condition

1. Excellent Range
2. Good Imporving Range
3. Good Range
4. Fair Improving Range
5. Fair Range
6. Poor Improving Range
7. Poor Range
8. No range Condition

Level 5: Cover

1. Grass
2. Woodlands
3. Bottomland Hardwood

Level 6: ROS Class

1. Roaded Natural
2. Semi Primitive

Every acre on the National Forests and Grasslands in Texas is defined through some combination of these identifiers. Again, all lands within a given analysis area are homogeneous with respect to how they will respond to applied management. At the same time, the acres with an analysis area might not be contiguous. However, there are some management areas which are contiguous and non-homogenous, for example, 2 wilderness management areas.

Several factors were involved in the definition of the analysis areas in addition to those discussed earlier. Not only were the identifiers used to take advantage of existing data and to address issues, but they were also used to reflect significant differences in outputs and values. For example, the breakdown of pine type into loblolly, shortleaf and long- leaf was done to allow for differences in the yields and management characteristics associated with these management types. Each National Forest was identified as a separate unit for reporting of outputs by administrative unit and geographical area. This was especially important given the physical distance that separates the units. The six identifiers available in FORPLAN Version II were sufficient in defining the analysis areas in the National Forests in Texas.

4. Management Prescriptions

Allocation and scheduling choices for an analysis area are offered through management prescriptions which are composed of a management emphasis (allocation) and a management intensity (schedule of activities). The National Forest Management Act (NFMA) regulations define management prescriptions as "management practices selected and scheduled for application on a specific area to attain multiple use and other goals and objectives." One of the key components of this definition is the concept of multiple use. This concept was instrumental in the development of management prescriptions on the National Forests in Texas.

A broad range of management prescriptions was developed to provide a basis for meeting alternative resource objectives while providing for multiple resource management.

A. Management Emphases

The management emphases developed for use in the Texas model are as follows:

1.Minimum level
2.Timber
3.Dispersed Recreation
4.Wildlife
5.Range
6.Red-cockaded woodpecker clusters (colonies) and recruitment stands (thinning only harvest)
7.Wilderness
8.Current (Non-timber)
9.Developed Recreation

Each of these management emphases has a goal(s) associated with it. These goals are as follows:

Minimum Level: The level of costs, outputs and benefits from a forest or other unit, assuming no investments are made. This is a level that reflects the absolute minimum, unavoidable activities relating to public land management necessary to: (1) Protect life, health and safety of the incidental users, (2) Prevent environmental damage to lands in other ownership and (3) Administer fundamental land uses such as utility corridors, private land access, etc.

Timber: Timber management is emphasized. This includes the growing, tending, harvesting and regeneration of regulated crops of industrial wood.

Dispersed Recreation: Dispersed recreation is emphasized. Other resource management is modified to enhance dispersed recreation opportunities. This emphasis is applied to relatively large areas where concentration of use varies but is generally less than that under the developed recreation emphasis.

Wildlife: Management is directed toward enhancement of the wildlife resource at the expense of or in conjunction with other resource uses.

Range: Range Management of the range resource is emphasized. This emphasis is applied to designated areas of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan.

RCW Clusters - Recruitment: This emphasis is applied to red-cockaded woodpecker (clusters) colony sites and recruitment stands. A thinning only prescription was used in these areas.

Wilderness: Wilderness recreation is emphasized. Management is applied to areas where the earth and its community of life must be untrammeled by man, where man himself is a visitor who does not remain.

Current - Non-standard Acres (Other than Management Areas 1 and 2: This emphasis is applied to the non-standard acres in the current alternative to reflect current activity and budget levels. This includes developed recreation activities.

Developed Recreation: Management of the developed recreation resource is emphasized. The management of other resources is modified and, in some cases, prohibited to enhance the developed recreation experience. This emphasis is applied to relatively small, distinctly defined areas where facilities are often provided for concentrated public use.

Management Activities

The Management Information Handbook (MIH) output codes found in the 1986-1990 Management Information Handbook (FSH 1309.lla) were used to develop a preliminary list of management practices and outputs for each of the management emphases. This list was modified by the IDT members to include only those activities and outputs appropriate to the emphasis.

Once the list of outputs/activities for each emphasis was completed, a list of management intensities was defined. The initial intensities were designed to show differences in costs and levels of output and, in turn, to reflect different objectives.

B. Management Intensities (FORPLAN)

The end result of this process was a series of management intensities within each of the management emphases. Within the developed recreation emphasis, a total of five management intensities were developed:

1.Current
2.Current with Improved Quality
3.RPA
4.Maximum
5.Minimum Level

The dispersed recreation emphasis contained a total of four intensities.

1.Current
2.Current with Improved Quality
3.RPA
4.Maximum

There is a single management intensity within the wilderness emphasis. In this case, an area considered for a wilderness study designation is either allocated in total to wilderness or is allocated to some other emphasis.

The wildlife emphasis includes two intensities: a hardwood intensity with a 120-year rotation and a intensity (all types) with a 90-year rotation.

Timber - Longleaf, Shortleaf, and Loblolly Pine (FORPLAN)

The timber emphasis includes a total of seven intensities for all pine types, with an additional 4 intensities for longleaf pine. The intensities used in the 1987 Plan were fully evaluated for applicability in this Revision. These intensities with extended rotations were again used as described in the 1987 Plan and EIS. The longer rotations in this revision created a slightly different scenario than in the 1987 Plan and EIS analysis. The IDT determined this analysis to be appropriate with consideration for intensities as follows:

1.40-year rotation,High

3.60-year rotation
4.70-year rotation
5.80-year rotation

6.90-year rotation
7.100-year rotation
8.110-year rotation,longleaf pine only
9.120-year rotation,longleaf pine only
10.130-year rotation,longleaf pine only
11.140-year rotation,longleaf pine only, low

The thinning pattern associated with each rotation changes when the rotation age increases. The thinning patterns for shortleaf and loblolly pine (40-100) and longleaf pine (40-140) were established based on existing stand age. Thinnings were prescribed according to the following table:

Rotation	**Age of Thinnings**
40	20,30
50	20,30
60	20,40
70	20,30,50
80	20,30,40,60
90	20,30,50,70
100	20,30,40,60,80
110	20,30,50,70,90
120	20,30,40,60,80
130	20,30,50,70,90
140	20,30,40,60,80

Additional thins were included for all stands carried beyond rotation age up to age 90; no thinnings were calculated for stands over age 90 as IDT determined that mortality would approximately equal any potential growth.

Timber - Bottomland and Upland Hardwoods (FORPLAN)

The Bottomland and Upland hardwood types had 9 intensities. These forest groups were described as the hardwood type with the following timber emphasis or management intensities:

120-year rotation (high)
130-year rotation
140-year rotation
150-year rotation
160-year rotation
170-year rotation
180-year rotation
190-year rotation
200-year rotation (low)

hardwoods assumed no harvest prior to 110 years and assumed same thinning procedure as pine types; these thinnings were carried through age 100 rather than 90 as in pine types.

Hardwood types were evaluated outside the FORPLAN model using a personnel computer spreadsheet program with the results of cost and benefits included in the FORPLAN model as a fixed cost for financial evaluation between the alternatives. The analysis was performed within a

spreadsheet because there is a large supply in comparison to demand. Thus the model would try to convert to pine because of the PNV objective unless constraint. Thus with all the constraints set up by the ID team to insure very limited harvesting the decisions were actually made outside the FORPLAN model.

Range

Within the range emphasis, rotation lengths (intensities) are considered, (40 years to 120 years). This analysis was accomplished in FORPLAN for forested areas in order to provide increasing range forage; with maximum production at 0-10 age class.

The primary difference between the range and timber management prescriptions of equal rotations involves the basal area removed during thinnings. In general, more of the existing basal area is removed under a range prescription than under a timber prescription. This serves to maximize understory forage production while maintaining satisfactory timber stocking levels.

The range emphasis for the Grassland units was performed in the spreadsheet model. Range emphasis areas had greater production with frequent fire and cultural activities that were not emphasized in priority wildlife/recreation allocations.

The remaining emphases, minimum level, current (non-timber), and no harvest all include one intensity.

C. Prescription Standards and Guidelines

After defining the management intensities that were to be included in the FORPLAN Version II model, a list of prescription standards and guidelines was developed to further define the prescriptions. The standards and guidelines developed for each management emphasis/intensity combination are presented below in condensed form. In some cases, such as with the minimum level prescription, the standards and guidelines vary according to which management area it applies to. For this reason, the standards and guidelines are presented by management area.

After development of the alternatives and initial analysis, the IDT determined that developing different standards for Longleaf Forest Ecosystems, and Mixed Forest Ecosystems was impractical. In either Management Area or ecosystem allocation, the possibility existed for stands of either type [such as a longleaf stand(s) within the Mixed Forest Ecosystem Management Area] to occur. The prescriptions for each area emphasis was very similar (such as 1a=2a and 1b=2b etc). Subsequently the final management area descriptions grouped Longleaf and Mixed Forest Ecosystems into MA-1 (timber management emphasis), and moved Forested Ecosystems-RCW emphasis from MA-6 to MA-2. Description of the initial management areas and the emphasis prescriptions are as follows:

5. MANAGEMENT AREA DESCRIPTION & PRESCRIPTION EMPHASIS

Management Areas Considered in Alternatives

1. LONGLEAF DOMINATED ECOSYSTEMS

A.Longleaf Dominated Ecosystems, Current Direction

*even-age management (all methods) emphasis
*middle (75-90 year) rotation age for LLP
*ORVs allowed
*pesticides allowed

B.Longleaf Dominated Ecosystems, Commodity Emphasis With Even-Age Management

*even-age management (all methods) emphasis
*young (50-60 year) rotation age on LLP
*ORVs allowed
*pesticides allowed

C.Longleaf Dominated Ecosystems, Non-Motorized Recreation/Wildlife Emphasis

*shelterwood (group selection allowed) emphasis
*older (80-100 year) rotation age
*maintain high visual quality
*pesticides allowed
*develop large old trees
*no ORVs

D.Longleaf Dominated Ecosystems, Non-Commodity Emphasis

*uneven-age management emphasis
*no pesticides or prescribed fire allowed
*no ORVs

E.Longleaf Dominated Ecosystems, Non-Commodity Emphasis

*uneven-age management emphasis
*pesticides and herbicides allowed
*prescribed fire promoted
*no ORVs

2. MIXED FOREST ECOSYSTEMS

A.Mixed Forest Ecosystems, Current Direction

*even-age management (all methods) emphasis
*70 year rotation age on LBP, 80 years for SL, 120 years on hardwoods
*no pine-hardwood management types
*ORVs allowed
*pesticides allowed

B.Mixed Forest Ecosystems, Commodity Emphasis With Even-Age Management

*even-age management (most ST and SW, little CC) emphasis
*50 year rotation for pine, 120 years for hardwoods
*no pine-hardwood management types
*ORVs allowed
*pesticides allowed

C.Mixed Forest Ecosystems, Commodity Emphasis With Uneven-age Management

*uneven-age management emphasis (except type conversions)
*no ORVs
*pesticides allowed

D.Mixed Forest Ecosystems, Recreation/Wildlife Emphasis - No ORVs

*70 year rotation LBP, 80 year rotation SLP, 120 year rotation HW
*maintain high visual quality
*pesticides allowed
*no ORVs

E.Mixed Forest Ecosystems, Non-Commodity Emphasis
*uneven-age management emphasis
*no pesticides allowed
*no ORVs

3. GRASSLAND ECOSYSTEMS

A.Grassland Ecosystems, Current Direction With Commodity Emphasis
*keep existing non-natives, no new non-native pastures
*pesticides allowed

*no ORVs
*fair or Better Range Condition

B.Grassland Ecosystems, Current Direction With Recreation Emphasis
*allow non-natives to revert to native species
*pesticides allowed
*no ORVs
*good or better range condition
*retain semi-primitive ROS opportunities

C.Grassland Ecosystems, Motorized Recreation Emphasis
*allow non-natives to revert to native species
*pesticides allowed
*ORVs allowed
*good or better range condition
*provide semi-primitive motorized and roaded natural ROS opportunities

D.Grassland Ecosystems, Low-Impact Management
*eliminate non-natives pastures
*no pesticides
*no ORVs
*good or better range condition
*retain semi-primitive ROS opportunities

4. STREAMSIDE ZONE ECOSYSTEMS

A.Streamside Zone Ecosystems, Current Direction
*exceed State BMPs; minimum zone is 66 feet from intermittent and 100 feet from perennial
*unsuited for timber production
*timber harvest allowed for other resource management

B.Streamside Zone Ecosystems, Commodity Production Allowed
*meet State BMPs; minimum zone is 50 feet from intermittent and 100 feet from perennial water
*suited for timber production allowing selection management

C.Streamside Zone Ecosystems, Minimum Level Management
*greatly exceed State BMPs; minimum zone is 132 feet from ephemeral, 200 feet from intermittent, 300 feet from perennial water
*no touch zones except for SPB control using wilderness criteria

5. AQUATIC ECOSYSTEMS

*large reservoirs (Sam Rayburn, Toledo Bend and Lake Conroe)
*large Lakes not encompassed in 1 DFC (Coffee Mill, Lake Crockett, Black Creek, Cottonwood Creek, Lake Fannin)
*about 15,682 acres included
*separates requirements where authority is limiting on reservoirs

SPECIAL MANAGEMENT SITUATIONS

6. RED-COCKADED WOODPECKER MANAGEMENT
A.RCW, Interim Guides
*1200 meter, circular habitat strategy
*limited regeneration
B.RCW, Long Term Strategy
*area management concept
*provide for commodity production to maximum extent compatible
C.RCW, Long-Term Strategy - Recreation Emphasis

*area management concept
*provide for recreation to maximum extent compatible

7. WILDERNESS/ROADLESS AREA MANAGEMENT
A.Wilderness/Roadless Area, Current Direction
*no prescribed fire
B.Wilderness/Roadless Area, Semi-Primitive Emphasis
*prescribed fire used

8. SPECIAL AREA MANAGEMENT
A.Research Natural Areas
*essentially pristine, natural, unmodified condition
*baseline management, let nature take its course
B.Wild and Scenic Rivers
*Scenic Rivers - maintain in near natural condition
*not suited for timber or forage production
*limited recreation developments acceptable
*Neches plus consider any other eligible streams/rivers
C.Scenic Areas
*consider for 5 existing plus 2 new proposals
D.Botanical Areas
*certain TNHP proposals and RNA proposals
*low intensity management
E.Special Management Areas
*other TNHP, RNA or botanical proposals
*low intensity or minimum level management
F.Recreation, Historic and Conservation Area
*Lake Fannin Historic Area (about 60 acres)
*Longleaf Ridge as proposed during scoping
*very low or minimum level management
*other areas identified for special management

9. RECREATION AREA MANAGEMENT
A.Developed Recreation Sites
*campgrounds and picnic sites

*shooting ranges

B.Specialized Recreation Sites

*boat ramps, hunter camps, parking lots, trail heads, etc.

*no or few convenience facilities

10. ADMINISTRATIVE AND SPECIAL USE SITE MANAGEMENT

A.Administrative Sites

*Fire, Administrative and Other Sites (FAO)

*about 129 acres of sites

B.Special Use Areas

*special use sites

*right-of-ways

11. EXPERIMENTAL FOREST MANAGEMENT

A.Stephen F. Austin Experimental Forest

RELATIONSHIP BETWEEN MANAGEMENT AREAS IN THE 1987 FOREST PLAN AND THOSE DEVELOPED FOR THE REVISION TABLES WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

6. COST EFFICIENCY DISCUSSION

To provide for cost efficiency, management activities that were not considered essential to the goals and objectives of the prescription were not included. Also, activities that were included were funded at the level necessary to accomplish the objectives of the prescription. Additional criteria for the inclusion of activities in a prescription include: 1) the activity was necessary to protect the multiple use values of the land and 2) the activity was necessary to protect the productive potential of the land. By including only those activities necessary to produce the desired outputs and by funding them at the appropriate level, cost efficiency was assured.

7. RESOURCE YIELD TABLES

The resource yield tables in the FORPLAN model contain the yield coefficients for the outputs and effects used in the model. These yield tables are accessed by management prescriptions as they are allocated to analysis areas. The outputs tracked in the FORPLAN model include millions of cubic feet of timber, recreation visitor days, animal unit months, acre feet of water, tons of sediment, erosion rates, wildlife and fish user days, numbers of animals (by management indicator species), miles of road construction, reconstruction and maintenance, and minerals outputs. Following is a brief discussion of the processes used to develop the yield coefficients in FORPLAN Version II.

A. RECREATION

A(1) DEVELOPED RECREATION

All developed recreation sites are assumed to be in the rural (R) Recreation Opportunity Spectrum (ROS) class. Yields are based upon current use as taken from the Recreation Information Management (RIM) reports. The Recreation Visitor Day (RVD) outputs would vary over time based upon the particular management level selected, i.e. current, recreation emphasis, RPA, etc., with maximum use or capacity calculated at 40 percent theoretical design capacity.

The estimated costs to the Forest for recreation management were calculated based on current expenditures. The Resources Planning Act (RPA) has established the value per unit output (RVD) for the Forest.

A(2) DISPERSED RECREATION

Coefficients for calculating the carrying capacity (PAOT's) of the land in each analysis area are taken from the ROS users guide based on the following classification: Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Road Natural, Rural and Urban Areas.

There are only three classifications on the National Forests in Texas: semi-primitive non-motorized, semi-primitive motorized and roaded natural. Dispersed recreation in Texas is compatible, to some degree, with all timber management activities. As reflected in the yield tables, recreation use capacity is assumed to increase as the timber gets older. Yield capacity also varies according to the timber type (i.e. Pine, Bottomland Hardwood), and the ROS class of the particular area. The coefficient is in RVD/acre/year. The Resources Planning Act has established the value for all forms of dispersed recreation use, including hunting and fishing, per RVD output.

All costs and outputs for all alternatives were evaluated by comparing with current and past use and protected according to the R-8 Regional Guide, RPA and professional judgment.

B. WILDLIFE

B(1) BIG GAME HABITAT CAPABILITY

The U.S. Forest Service (USFS - Region 8) document entitled A Process for Obtaining Habitat Capability and WFUD's describes a process for obtaining wildlife habitat capability and wildlife and fish user days (WFUD's) based on the assumption that a management activity that alters a wildlife species habitat will have an effect, positive or negative, on the carrying capacity of that habitat. Coefficients can be developed that express the value of certain management activities to fish, waterfowl, white-tailed deer, turkey and small game habitats.

Management activities for which coefficients can be developed include timber harvest, such as regeneration and thinning, since timber operations probably have more effect on the forest habitat than any other activity. Other coefficients can be developed for direct habitat improvements such as wildlife stand improvement, prescribed burning and permanent opening development. These coefficients applied to the appropriate activities will estimate the effects of the activities to the total wildlife population. WFUD's are dependent upon the number of animals which can be harvested from the total population.

This document was used as a basis for developing the big game habitat capability and WFUD yield coefficients for the National Forests in Texas FORPLAN Version II model. Since white-tailed deer are the major big game species on the National Forests in Texas, the changes in their numbers were used to express changes in big game habitat capability due to various intensities of management activities. Yield coefficients were developed for timber regeneration and thinning, prescribed burning, wildlife stand improvement (WSI) and permanent opening development.

B(2) SMALL GAME HABITAT CAPABILITY

Squirrels, both fox and gray squirrels, are the major small game species of the National Forests in Texas. Changes in squirrel numbers due to changes in the carrying capacity of squirrel habitat were used to express the effects of management activities. Squirrels are dependent on hard mast. Up to a point, older age classes of timber produce relatively larger quantities of mast and, therefore, have a higher carrying capacity. Each age class of timber, by timber management type, was given a squirrel density coefficient, expressed as numbers of squirrels per acre. The density coefficients were based on the mast production potential of the various age classes. The number of acres in each age class multiplied by the density coefficients determines the small game habitat capability. The effects of management activities that affect the relative proportion of age classes by timber management type are expressed by changes in squirrel numbers.

Bobwhite quail is the major small game species of the National Grasslands. Quail density coefficients, based on the carrying capacity of the various vegetation types and range condition classes, were developed to determine the effects of management activities on the Grasslands. Quail habitat in association with management prescriptions for red-cockaded woodpecker (MA-2) was derived for forest areas.

The Process Record for Developing Wildlife Yield Coefficients for FORLAN Version II is on file in the Supervisor's Office in Lufkin.

C. RANGE

Forage and AUM/acre yield coefficients were developed by timber types, age classes and response to cultural treatments.

The basis for developing the coefficients is the allotment analysis on file. They reflect forage

production in various stand types and conditions as well as the effect that harvesting, thinning, prescribed burning etc. have had on forage production.

Based on current range environmental analysis, models and charts were developed to reflect projected forage production and AUM's/acre.

Activities were identified to estimate the cost required to obtain, develop, manage and administer the expected outputs.

D. TIMBER COEFFICIENTS

Timber yield coefficients developed for the 1987 Forest Plan were verified by the following growth and yield models:

Shortleaf - Murphy and Beltz (1981)
Loblolly - P-LOB
Longleaf - Farrar (1985)
Hardwood - Yield Plus
Uneven-aged Stands - Belcher and Stoneking (1986)

Estimated harvest yields were further verified with recent timber sale volumes.

E. SOIL AND WATER

E(1) INCREASED WATER YIELDS

Increased Water yields are based on the types of timber cuts and the number of acres harvested. The average annual water yield, which is the total yield of water based on undisturbed watershed condition, for the National Forests in Texas is 0.8 acre feet per acre. Coefficients for increased water yields were developed by adding the vegetative manipulation factor to the average annual yield. Regeneration cuts produced the greatest increase in water yield.

E(2) SEDIMENT

Sedimentation coefficients were developed by establishing sediment delivery rates from soil erosion rates which were developed through use of the universal soil loss equation. Sediment delivery rate is approximately 23 percent of the soil erosion rate except on the Grasslands where it varies according to management.

E(3) EROSION RATES

Erosion rates were developed through use of studies conducted by Texas A&M University on sediment and erosion outputs from silviculture and grazing practices in East Texas. Also, data from the National Forests in Texas, State and Private and Forest Service Research was used to develop erosion and sediment coefficients. Erosion rates for various types of management practices were developed and compared to each soil unit to assure practices did not exceed soil loss tolerance levels.

F. ROADS

process and criteria described in the white paper prepared as input for the AMS. Those areas falling into the inaccessible category were stratified based on age class and timber type. Using a statistically significant sample of each forest, road densities/1000 acres of Forest Service land were then developed and an average figure as described in the white paper was developed. This

average road density of 4.6 miles/1000 acres was then applied to the different forests and a road mileage needed for construction was developed by age class and timber type. These road mileages were then divided by the total acres by forest in those age classes and timber types to produce a set of coefficients for inclusion in the models to be applied to existing acres in the harvest schedules. As the model selects existing stands for harvest, the appropriate coefficients (construction/recreation costs of $11-60,000/miles depending on level of road) are applied on a per acre basis producing the road construction mileage needed to harvest that area. Mapping of existing woods roads has concluded that a transportation system exists with no construction required in all areas. Thus for all alternatives coefficients reflect reconstruction only in response to resource entries.

G. MINERALS

All estimates of activity levels are based on historical trends without regard to fluctuations due to short-term economic conditions. Economic outputs, BBTU's and dollars are estimated based on existing and predicted activity levels. British Thermal Units in Billions (BBTU's) result from average well production, and the dollar income estimates represent returns from sales of product or charge for leasing and exploration activities. An important consideration is that economic, legal and social factors beyond the control of the Forest manager will greatly influence accuracy, or lack of accuracy in estimates of this nature.

The figures representing activity levels and outputs are the result of estimations as described above. Activity costs are based on actual costs at the time the estimates were made.

H. LANDS

In conjunction with the planning team, various alternative levels of purchase and exchange were planned and distributed among the National Forests and Grasslands. The act of distribution is merely to indicate an approximation of what may happen on each area within a given alternative. For the Final Plan, only the total acres for Texas are significant. Actual distribution in operations will be on an as-needed or opportunity basis with priorities as provided by the selected alternative. The range of activities was considered for exchange and acquisition. All cost figures were derived from actual costs as summarized from historical records and represent averages for use in the model.

IV. ECONOMIC EFFICIENCY ANALYSIS

1. PRESENT NET VALUE

Net public benefits (NPB) is an expression used to specify the overall long-term value to the nation of all outputs and positive effects (benefits), less all associated outputs and negative effects (costs) whether they can be quantitatively valued or not. NPBs are measured by both quantitative and qualitative criteria rather than a single measure or index, such as present net value (PNV).

Conceptually, NPBs can be viewed as PNV, plus the value of non-priced outputs. Non-priced outputs include items such as threatened and endangered species maintenance or enhancement,

requirements and increased plant or animal diversity.

There are other benefits or effects which are related to NPBs and the concern for National Forest policy and management. These include local income, jobs, economic development, impacts on taxpayers, price effects on consumers of forest products and other producers of forest-related products, 25 percent returns to counties and distribution of benefits to specific users of National Forest outputs. All of these are distributive welfare effects of National Forest production. All

the foregoing distributive effects and impacts have been the object of national policy issues and discussion in both the Administration and the Congress. Since they are distributive effects, they are essentially questions of equity rather than efficiency. They involve questions of whom should get benefits and who pays the costs. They cannot be assessed in the context of the efficiency criteria associated with PNV.

PNV is the difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the area. (36 CFR 219.3). These outputs include all recreation visitor days including those for wildlife, fishing and wilderness experiences, the stumpage value of timber, the value of any increased waterflow quantities and the in-the-ground analyzed value of minerals as they are extracted.

PNV is one important component of NPBs because it provides a useful means of structuring a definition of the ways in which alternatives differ. Alternatives are designed to achieve their goals and objectives for priced outputs in a manner that maximizes the present net benefit (PNB) minus the present value of costs (PVC) while meeting all specific constraints and objectives from non-priced outputs.

Alternatives are designed to achieve priced outputs in an efficient manner and meet constraints to produce non-priced outputs at the least cost. Thus, the PNV of each alternative is a measure of the efficiency of the priced portion of present net benefits. The discounted return indicated by PNV will not be entirely in the form of cash. The major reason is that the dollar values used in calculating PNV are defined as the prices consumers would pay for forest outputs if a market existed. But, such prices are not actually collected by the National Forests. At present, it is national policy to provide most forest outputs either at no charge to consumers, as in the case of water, or for a fee which is less than the willingness-to-pay price, as in the case of recreation. The monetary values used for market and non-market outputs represent one measure of the positive effects or benefits associated with the production of a substantive part of the forest's benefits to society. See Table 3 Appendix B for comparison of PNV by benchmarks and alternatives.

2. MODEL PARAMETERS

The economic analysis is conducted using a 4.0 percent discount factor for the 150-year planning horizon.

The base year for costs and benefits is 1992. Real increases in major cost items were incremented at the rate of one-half of one percent per year. All budgets were adjusted to reflect 1992 values.

3. VALUES

calculated. Timber values were derived from data formulated using transaction appraisal. All other resource values are those assigned in the 1990 RPA Program, which also includes price value trends. The Regional targets in the RPA program correspond very closely with the demand trends established in the assessment for all resource element outputs in Region 8. The distribution of these targets in the Regional Guide was generally accepted as the best estimate of quantity demanded at the RPA values. A horizontal demand for this quantity was further assumed over the planning horizon.

Mineral values used in the model were based on recent oil and gas production income to the NFGT and historical information.

For some outputs, this Forest contributes only a small part of total production in the region and our influences on prices are minimal. These outputs include timber and range where a horizontal demand was assumed to apply over a plus or minus 50 percent range. For developed and dispersed recreation, wilderness, water, wildlife and fish outputs, our contribution is significant enough to influence prices with substantial changes in output flows. In these cases, a plus or minus 25 percent range was assumed to be appropriate. These limits were placed on the benchmark runs. These limits were not necessary for each alternative because the specific alternative constraints determined by the ID team were more constraining than the benchmark constraints.

4. VALUES & COSTS

Costs in FORPLAN Version II are termed "activities" and reflect the "cost of doing business." Generally, the ID Team chose FY 1992 to begin their cost preparation. This allowed for ease of calculation of per acre/per year cost coefficients by NIRP code. Where adequate cost data was not available, the IDT selected an average of several fiscal years or relied on their professional judgment.

Costs were calculated in FORPLAN Version II with minor adjustments made when necessary.

The majority of the cost coefficients are "trended" in the model at a real rate of increase of one-half of one percent per year to the midpoint of each decade of the RPA horizon.

Documentation of cost development is on file in the Supervisor's Office.

5. SUPPLY AND DEMAND

The management and harvest of timber is the major commodity related area of NFGT activity. Timber harvest has an impact on local economies in the east Texas area through timber industry related jobs and USFS harvest receipts which are returned to counties at a rate of 25 percent. Though NFGT comprise a relatively small part of the east Texas timber market (3-5 percent), the quality of NFGT market product (primarily sawtimber) accounts for a substantial 20-25 percent of the total Texas sawtimber production.

In general timberland acreage affects the supply of timber. Although acreage loss in east Texas since 1975 has been insignificant, changes in the species composition and economic value of forests have occurred. The more productive forest types have declined while the least productive forest types have expanded. The net change in timberland acreage is the result of forest land

to timberland.

Acreage in the productive pine and oak-pine forest types declined by 8 percent or 613,000 acres. Bottomland hardwood types, valuable for both high quality timber and wildlife habitat, declined by 210,000 acres; most of the loss of these stands is related to urbanization and development of water impoundments. Upland hardwood types, least productive of the forest types, expanded by 28 percent, primarily as a result of a shift in the species composition of timber stands. The loss of pine acreage was most dramatic on nonindustrial private timberlands due to selective cutting and lack of adequate regeneration.

Ownership affects supply because landowners have different objectives. The majority of east Texas timberland is owned by nonindustrial private forest owners who have diverse goals and

objectives. Nearly all timberland in east Texas (93 percent) is privately owned. Nonindustrial private timberland owners control the largest share of timberland (60 percent of the total, or 5.6 million acres). The size of the nonindustrial private timberland base has been essentially unchanged since 1977.

One-third of east Texas' timberland is owned by forest industries (3.8 million acres) which occupy the more productive sites found in the southeastern part of east Texas. There has been no significant change in the overall size of the industrial timber base since 1975 but, timberland exchanges and mergers have concentrated the ownership among a smaller number of owners.

Public ownership accounts for 7 percent (763.0 thousand acres) of the timberland in east Texas. Nearly all of the publicly owned acreage (80 percent) occurs on National Forests, which account for roughly 5 percent of the total timberland acreage in east Texas. The distribution of National Forest lands is higher in the southern portion of east Texas where National Forests make up 8 percent of the total timberland acreage. Total National Forest acreage is approximately 635,800 acres.

A. TIMBER SUPPLY SUMMARY

A review of the supply capabilities from all ownerships, within the market area of the National Forest and Grasslands in Texas, show growth-to-removal ratios of 1.0:1.0. When individual ownerships are examined, removals exceed growth only on forest industry land. While long term timber supplies will likely be supplied by industry owned lands (as ingrowth from extensive areas of young pine stands on industry land should cause growing stock levels to rise rapidly over the next 10 to 15 years), short term future supplies will be needed from nonindustrial or public lands.

Nonindustrial private timberland owners account for 60.58 percent of all timberland within the east Texas market area and growth currently exceeds removals on these lands (growth-to-removal ratio is currently 1.0:0.8). NFGT has historically supplied roughly 3 percent of the supply mix, a very small percentage of total supply from the east Texas market area; however the NFGT have accounted for a much larger percentage of all sawtimber produced in east Texas.

The limitation to timber supply and production on the NFGT over the past several years has been management for red cockaded woodpecker, an endangered species. The Threatened and Endangered Species Act of 1973 contains provisions for protection of habitat for species listed as threatened or endangered. According to the 1989 RPA Assessment, the number of plant and animal species listed is growing and this will have implications for timber harvest in areas that contain the species habitat.

Average production on NFGT since 1990 has been approximately 72 MMBF (green sales) and 20-30 MMBF (salvage sales), for a total of 90-100 MMBF per year from NFGT.

B. TIMBER DEMAND SUMMARY

Demand is defined as a relationship between price and quantity. The most important thing to recognize about demand is that it is not a set or fixed quantity but a relationship between price and quantity. If demand is greater than supply, at a certain price, then price will rise until an equilibrium state is reached.

Demand for stumpage is not direct, but derived from the sale or expected sale of lumber, plywood, paper and all the hundreds of items into which wood products are fabricated. Demand for stumpage is a derived demand and is heavily determined by demand for housing. Demand for housing is determined by another set of factors which includes population growth.

Nationwide projections for future timber supply and demand indicate an increasing role for nonindustrial timberlands while supplies from National Forest lands will decrease. The 1989 RPA Assessment stated, "Opportunities to increase productivity exist on all ownership, but the greatest potential is on private ownerships, Decisions on future management of private timberlands tend to be less constrained by institutional factors and freer to respond to economic opportunities than management choices for public lands." Demand for quality pine sawtimber is high and the National Forest could sell all high quality timber offered at competitive prices.

Projected demand for timber (Albers 1990 - NFGT Volume information projections and conversion estimates) from the NFGT is as follows:

Projections for National Forest in Texas Volumes Using Indexes of Projections of Softwood and Hardwood Lumber Production in the South Central Region 2000-2040

Year	Softwoods (MBF)	Hardwoods (MBF)	Total (MBF)	Total (MCF)
2000	140,075	3,769	143,844	18,699
2010	128,918	3,940	132,858	17,271
2020	168,585	3,940	172,525	22,428
2030	223,128	4,111	227,239	29,541
2040	271,472	4,283	275,755	35,848

6. Values and Cost Summary

A. Timber

Timber values used in the FORPLAN model are based on competitive bids actually received from current advertised sales. A linear regression analysis was done for each product sold. There was a clear linear relationship for pine sawtimber, pine small roundwood and hardwood small roundwood. Pine sawtimber "stumpage values" were $1085.90, pine roundwood "stumpage values" were $121.00, and hardwood roundwood "stumpage values" were $11.00 (all in Thousand Cubic Feet - MCF measure). No linear relationship existed for hardwood sawtimber ($261.88 per MCF). A weighted average of bid prices received adjusted for inflation, was used for this product.

1, 1.637 for period 2, 2.078 for period 3, 2.376 for period 4 and 2.540 for periods 5 through 10 was used to reflect actual values for east Texas. These real value increases were developed based on demand analysis process papers for the 1987 Plan. No real value increase was projected for hardwood products due to the large supply compared to demand. Sensitivity analysis was performed on the use of increasing price trends that were developed for Texas by IDT specialists using information obtained between 1985-1987. These were adjusted for applicability using 1992 estimates. Trending in the sensitivity analysis did not indicate a change to minimum level management or a below cost situation. Removing price trend increases did not change the timber harvest outputs significantly; adding approximately .5 mmbf for the first 2 periods (20 years) and a loss of .5 mmbf for the 3-5 periods (30-50 years). Therefore, it was

determined to use the price trends as described.

Timber costs or timber sale administrative costs used in FORPLAN were $41.55 per MCF multi-aged and $36.85 per MCF single-aged.

These stumpage prices were then weighted by species composition for stands in each analysis area. Details of these methods are available at the Forest Supervisor's Office.

B. Minerals

Mineral values used were calculated outside of FORPLAN in the spreadsheet model. Mineral (energy related) values were $1.40 per acre trending upwards to $2.00 per acre after 30 years.

Costs for mineral activities were $1200.00 per lease per year and $736.00 per year for each case

C. Recreation

Recreation values are based on the RPA assigned 1990 values for developed and dispersed recreation and wilderness use on the National Forests in Texas. These values were used in the economic analysis while the actual fees charged were used to develop projected returns to the treasury and the returns to counties (25 percent fund). Camping, picnicking and swimming values used $10.14; mechanized travel was $7.73; hiking, horseback, and water travel was $4.00; wilderness $23.60; and other recreation (dispersed) was $61.43, all per RVD.

D. Range

The grazing value of $4.09 on the National Forests and $7.26 on the National Grasslands per AUM is based on calculations by the USDA Agriculture Research Service and local data. Again, this is "on-site" value.

E. Wildlife

Wildlife values used are the RPA values for big game hunting (deer) and small game hunting (squirrel and quail). The value for both was $33.00 per WFUD. The RPA value for fish is $65.19 per WFUD. This value was considered to be high by the core team. So they looked at the values derived from the USFWS survey of hunting and fishing use in the U.S. (1985). These values indicated that fresh water fishing was approximately half the value of saltwater fishing (23.00/freshwater and $47.00/saltwater using 1985 estimates). The core team felt that half the $65.19 would be more appropriate. Therefore the $33.00 value for hunting (which was

activity) would be more reasonable. Therefore we used the hunting WFUD value $33.00 for fishing.

F. Water

RPA water value is $33.41 per acre-foot based on "100 miles off-Forest." All benefits were calculated in FORPLAN Version II.

7. DEMAND CUT-OFF

Horizontal demand cut-off assumptions were used for timber MCFs, grazing AUMs and water acre-foot, developed and dispersed recreation RVD'S, wilderness RVD's and wildlife WFUD'S.

Except for timber and grazing, any supply greater than 25 percent above the RPA demand levels was not valued. For timber or grazing supply demand cut-offs were not needed. For both timber and grazing (range) cut-offs would have been assigned if projected harvests exceeded 50 percent of demand. Only on one benchmark (maximum PNV) did timber slightly exceed demand, but only by 8-10 percent. Therefore, no demand limits were exercised for timber or grazing. Thus, any potential supply above these levels did not contribute to PNV. This constraint limits the effects of these resources on prescription allocation beyond their cut-offs by giving no value to those outputs that exceed the cut-offs.

V. SOCIAL IMPACT ANALYSIS

Social and economic impact analysis estimates the impact that National Forest activities may have on people. Of primary concern are the impacts within a 10-year span; however, consideration is given to longer term impacts in the area of influence.

1. OVERVIEW OF PROCESS

The determination of "Issues and Concerns" in the early stages of National Forest land and resource management planning identified potential situations where social and economic analysis can provide useful understanding. Chapter 1 and Appendix A of the Environmental Impact Statement (EIS) describe issues and sub-issues. Resource flows (i.e. timber, recreation, etc.) and especially a change in established output can have socioeconomic effects on people in the immediate areas of influence. These changes are best understood in the context of issues. Planning alternatives were constructed to be responsive to past issues as well as potential issues implied by socio-economic trends.

Management can directly impact employment, income and direct return of revenues to localities. These economic considerations are related to the social well-being of people in the areas of influence. Socio-cultural impacts related to forest management activities include population, beliefs, lifestyles, values, attitude and social organization.

In the early stages of Plan development, information was gathered on the existing socio-economic conditions in the area of influence and incorporated in a Socio-economic Overview (Albers 1991). Primary Areas of Influence generally include the counties containing National Forest and National Grasslands; secondary Areas of Influence generally include counties adjacent to primary counties.

2. ECONOMIC IMPACT MODEL

Social and economic impact analysis of Plan alternatives for managing the National Forests and Grasslands in Texas utilized the economic input-output model, IMPLAN. This computer-based system uses non-survey data to develop input-output models. The interdisciplinary models can then be applied to the evaluation of alternative management programs in economy (i.e., impact analysis area). Direct, indirect, induced and total impacts are calculated.

Input-output (I-O) analysis is a procedure for describing the interdependencies of production and consumption sectors within the impact area. Industries purchase inputs from primary (i.e., natural resource producers) sources and other industries for use in the production of outputs. Outputs, in turn, are sold either to other industries or to final consumers. The resulting I-O accounts or interdependencies can be thought of as a "picture" of an impact area's economic structure.

Flows of industrial inputs can be traced through the I-O accounts to illustrate linkages between

industries composing the impact area economy. Prediction of economic effects (employment, income, etc.) resulting from changes in Forest outputs and activities are available with account transformations.

A. DATA BASE FOR IMPLAN

The model data base consists of two major parts: (1) a national level technology matrix and (2) a county level file of estimated activity levels for total gross output, six components of final demand, three components of final payments and employment for 428 industrial/business sectors.

The national level technology matrix is based on a 1972 Commerce Department I-O model and corrected to an "industry by industry" configuration and updated to 1977, 1982,1985, and 1990 specific data, using the RAS procedure. (Stone and Brown, Behavioral and Technical Change in Economic Models. Papers of the Second Congress of the International Economic Association, Vienna).

B. NATIONAL DATA BASE REDUCTION TO LOCAL IMPACT AREA

The national level technology matrix and control totals for the multi-county impact area are used through a data reduction procedure to develop a regional I-O table.

IMPLAN consists of several computer programs designed to: access the data base; construct an I-O model for any county or group of counties that the user designates; and construct an analysis of the interface between land management planning alternatives and the projections of their economic impacts. Within these programs a number of concerns were considered and included to assess analytically the effects on these various social concerns. Some of the social concerns included Indian Tribes, special interest groups, local communities, and others considered with some dependency on NFGT resources.

3. SOCIAL VARIABLES

The National Forests and Grasslands in Texas provide a significant portion of these resources in the form of timber, recreation, wildlife, grazing and wilderness. In order to assess the social or

variables are being evaluated. The following are considered the most significant social variables:

A. LIFESTYLES AND JOB DEPENDENCE

Indicators of social organization are reflected in changing demand for forest related aspects of community life, such as municipal watersheds, recreation facilities, transmission corridors, energy sources, or scenic attractions. Direct National Forests and Grassland in Texas (NFGT) contributions to local communities (through the 25 percent fund returns) are also a major influence in forest related considerations. Other changes may also be noted by the degree of support or cooperativeness within the communities over forestry related issues. USFS and NFGT employee participation, cooperative agreements, and other services may also impact a communities social organization. Analysis of these variables will include both direct measures of change, as in the case of county returns and other more subjective measures, such as cooperative activities between NFGT and local groups.

B. ECONOMIC DIVERSITY AND DEPENDENCY ASSESSMENT

Economists in the Regional Program Development and Economic Analysis Group have prepared a paper "Economic Diversity and Dependency Assessment." The purpose of this paper was to describe the structure of the local economy and its relationship with the forest resource. They found the local economy to be relatively diverse with no particular industry dominating the economy. They reached the following conclusion in this paper:

Given the concentration of forest resource-related sectors found in the analysis, and the role of the National Forest System lands to the total forest resource base, changes in the National Forest resource outputs are not expected to cause heavy impacts on the local economy. The economy's relationship with the forest resource does suggest, however, some direct impacts would be expected.

4. SOCIAL AND ECONOMIC IMPACT ANALYSIS

IMPLAN was used to estimate income and employment effects on the economic impact area on the Forest. Calendar year 1990 data were used. This estimate was derived in the form of response coefficients for timber, recreation, wildlife, expenditures, and county returns. The response coefficients were multiplied by resource outputs by alternative to estimate the income and employment effects.

A. IMPLAN RESPONSE COEFFICIENTS

The following table describes the coefficients for jobs and income:

IMPLAN Response Coefficients

Activity	Units	Jobs	Income (MM$)
Timber			
Sawtimber	MMBF	20.23	0.58500

Timber Expend	MM$	22.08	0.73410
25% Fund			
Roads	MM$	40.61	1.22250
Education	MM$	68.17	1.53760
Recreation			
DEV Other	MRVD	1.03	0.02889
DEV Water	MRVD	0.76	0.02193
DSP Other	MRVD	0.74	0.02113
DSP Wilderness	MRVD	0.74	0.02113
DSP Hunt&Fish	MRVD	0.84	0.02464
Purchaser Credit	MM$	40.61	1.22250

The timber response coefficients include the effects of selling stumpage from the NFGT on income and employment within sectors 133, 134, 135, 139, 142, 145, 161, 162 and 163 in the IMPLAN model. These sectors are identified as follows:

133 - Logging Camps and Logging Contractors
134 - Sawmills and Planing Mills, General
135 - Hardwood Dimension and Flooring Mills
139 - Veneer and Plywood
142 - Wood Pallets and Skids
145 - Wood Preserving
161 - Sawmills and Planing Mills, General
162 - Hardwood Dimension and Flooring
163 - Special Product Sawmills, N.E.C.

Returns to the US Treasury were calculated for each decade. These returns were the sum of Timber returns calculated as stumpage value of timber, developed recreation returns collected from campgrounds, special special use returns based on money collected from oil and gas leases, and money collected from range allotment permittees.

Returns to the counties were calculated as 25 percent of the returns to Treasury except for the oil and gas leases which was 25 percent of the 12.5 percent that the forest service receives.

B. JOBS AND INCOME

The following five pages are the analysis and show the estimated annual jobs and income for the first period.

Part 1. Timber Processing **Part 2. NFGT Timber Expenditure**

		VOL	Jobs	Income			
	Jobs	Income					
		MMBF		MM$	MM$		MM
ALT 1	Sawtimber	82.80	1675	48.438	4.812	106	3.53
	Roundwood	29.15	560	30.054			
	Total	111.95	2235	78.492		106	3.53

ALT 2	Sawtimber	98.28	1988	57.494	5.719	126	4.19
	Roundwood	37.79	726	38.961			
	Total	136.07	2714	96.455		126	4.19
ALT 3	Sawtimber	92.84	1878	54.311	5.867	130	4.30
	Roundwood	37.55	721	38.714			
	Total	130.39	2599	93.025		130	4.30
ALT 4	Sawtimber	74.78	1513	43.746	5.352	118	3.92
	Roundwood	18.98	364	19.568			
	Total	93.76	1877	63.315		118	3.92
ALT 4A	Sawtimber	84.93	1718	49.684	6.117	135	4.49
	Roundwood	25.66	493	26.455			
	Total	110.59	2211	76.140		135	4.49
ALT 4B	Sawtimber	82.67	1672	48.362	5.819	128	4.27
	Roundwood	18.96	364	19.548			
	Total	101.63	2036	67.910		128	4.27
ALT 5	Sawtimber	66.63	1348	38.979	4.399	97	3.22
	Roundwood	23.26	447	23.981			
	Total	89.89	1795	62.960		97	3.22
ALT 6	Sawtimber	44.21	894	25.863	3.041	67	2.23
	Roundwood	18.70	359	19.280			
	Total	62.91	1253	45.143		67	2.23
ALT 7	Sawtimber	57.68	1167	33.743	4.727	104	3.46
	Roundwood	10.92	210	11.259			
	Total	68.60	1377	45.001		104	3.46
ALT 8	Sawtimber	89.49	1810	52.352	5.664	125	4.15
	Roundwood	25.96	498	26.765			
	Total	115.45	2308	79.117		125	4.15

PART 3. 25% FUND

	Revenue	25% Fund	Jobs(#)	Income(MM$)			
		MM$	MM$	Roads	Educa		
	Roads	**Educa**					
ALT 1	Timber	21.780	5.445				
	Recreation	0.125	0.031				
	Minerals	1.391	0.043				
	Range	0.247	0.062				
			5.581	113	190	3.412	4.291
ALT 2	Timber	25.933	6.483				
	Recreation	0.165	0.041				
	Minerals	1.391	0.043				
	Range	0.234	0.058				
			6.626	135	226	4.050	5.094
ALT 3	Timber	24.601	6.150				
	Recreation	0.165	0.041				
	Minerals	1.391	0.043				
	Range	0.240	0.060				
			6.295	128	215	3.848	4.840
ALT 4	Timber	19.533	4.883				
	Recreation	0.225	0.056				
	Minerals	1.336	0.042				
	Range	0.241	0.060				
			5.042	102	172	3.082	3.876
ALT 4A	Timber	22.271	5.568				
	Recreation	0.225	0.056				
	Minerals	1.391	0.043				
	Range	0.242	0.061				
			5.728	116	195	3.501	4.404
ALT 4B	Timber	21.516	5.379				
	Recreation	0.225	0.056				
	Minerals	1.358	0.042				
	Range	0.240	0.060				
			5.538	112	189	3.385	4.257
ALT 5	Timber	17.571	4.393				
	Recreation	0.165	0.041				
	Minerals	1.358	0.042				
	Range	0.243	0.061				
			4.537	92	155	2.773	3.488
ALT 6	Timber	11.757	2.939				
	Recreation	0.165	0.041				
	Minerals	1.295	0.040				
	Range	0.231	0.058				

ALT 7	Timber	14.960	3.740				
	Recreation	0.125	0.031				
	Minerals	0.968	0.030				
	Range	0.242	0.061				
			3.862	78	132	2.361	2.969
ALT 8	Timber	22.923	5.731				
	Recreation	0.225	0.056				
	Minerals	1.358	0.042				
	Range	0.237	0.059				
5.888	120	201	3.599	4.527			

PART 4. RECREATION **PART 5. PURCHASER CREDIT ROADS**

		M Rvds	**Jobs**	**Income MM$**	**MM$**	**Jobs**	**MM**
ALT 1	Dev Other	355.753	366	10.278	0.659	27	0.8
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2094	60.342		27	0.8
ALT 2	Dev Other	390.753	402	11.289	0.764	31	0.9
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2130	61.354		31	0.9
ALT 3	Dev Other	390.753	402	11.289	0.806	33	0.9
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2130	61.354		33	0.9
ALT 4	Dev Other	430.753	444	12.444	1.150	47	1.4
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2171	62.509		47	
			1.406				
ALT 4A	Dev Other	430.753	444	12.444	1.149	47	1.4
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2171	62.509		47	1.4
ALT 4B	Dev Other	430.753	444	12.444	1.072	44	1.3
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2171	62.509		44	1.3

	Dev Water	12.140	9	0.266			
	Dsp Other	1020.634	755	21.566			
	Dsp Wild	1.200	1	0.025			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2100	60.515		34	1.01
ALT 6	Dev Other	370.753	382	10.711	0.784	32	0.95
	Dev Water	12.140	9	0.266			
	Dsp Other	1020.634	755	21.566			
	Dsp Wild	2.750	2	0.058			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2101	60.548		32	0.95
ALT 7	Dev Other	370.753	382	10.711	0.617	25	0.75
	Dev Water	12.140	9	0.266			
	Dsp Other	1020.634	755	21.566			
	Dsp Wild	2.000	1	0.042			
	Dsp Hunt&Fish	1134.200	953	27.947			
			2101	60.532		25	0.75
ALT 8	Dev Other	430.753	444	12.444	1.010	41	1.23
	Dev Water	12.140	9	0.266			
	Dsp Other	1033.112	765	21.830			
	Dsp Wild	1.050	1	0.022			
	Dsp Hunt&Fish	1134.200	953	27.947			

SUMMARY OF JOBS AND INCOME BY ALTERNATIVE

		Jobs	**Income** MM$		**Jobs**	**Incor MM$**
Tmb Process	ALT 1	2235	78.492	ALT 2	2714	96.45
Tmb Expend		106	3.532		126	4.198
25% Fund		304	7.703		360	9.145
Recreation		2094	60.342		2130	61.35
Purch. Credit		27	0.806		31	0.934
Total		**4765**	**150.874**		**5361**	**172.0**
Tmb Process	ALT 3	2599	93.025	ALT 4	1877	63.31
Tmb Expend		130	4.306		118	3.928
25% Fund		342	8.687		274	6.958
Recreation		2130	61.354		2171	62.50
Purch. Credit		33	0.985		47	1.406
Total		**5234**	**168.357**		**4488**	**138.1**
Tmb Process	ALT 4A	2211	76.140	ALT 4B	2036	67.91
Tmb Expend		135	4.490		128	4.271
25% Fund		312	7.905		301	7.642
Recreation		2171	62.509		2171	62.50
Purch. Credit		47	1.405		44	1.311
Total		**4875**	**152.448**		**4681**	**143.6**
Tmb Process	ALT 5	1795	62.960	ALT 6	1253	45.14
Tmb Expend		97	3.229		67	2.232
25% Fund		247	6.261		167	4.249
Recreation		2100	60.515		2101	60.54
Purch. Credit		34	1.018		32	0.958
Total		**4272**	**133.983**		**3621**	**113.1**
Tmb Process	ALT 7	1377	45.001	ALT 8	2308	79.11
Tmb Expend		104	3.469		125	4.158
25% Fund		210	5.330		321	8.126
Recreation		2101	60.532		2171	62.50
Purch. Credit		25	0.754		41	1.235
Total		**3817**	**115.087**		**4966**	**155.1**

DIFFERENCE FROM ALTERNATIVE 1 (NO ACTION THEME)

	ALT 2	ALT 3	ALT 4	ALT 4A	ALT 4B	ALT 5	
Jobs	596	469	-277	110	-84	-493	-1144
Income (MM$)	21.211	17.483	-12.758	1.574	-7.230	-16.891	-37.747

VI. Suitability Analysis

The Forest was analyzed for its ability to produce timber on a sustained yield basis in what is called a timber suitability analysis. The suitability analysis has a number of stages which are:

1.Determination of lands tentatively suited for timber production.

2.Examination of the financial and economic efficiency of tentatively suited timber lands.

3.Determination of lands suited for production by alternative.

Stage 1. Determination of Lands Tentatively Suited for Timber Production

Table B - Comparison of Stage 1 Suitability with Alternatives

	Category of Land		**Forest Plan Acres**	**Revision Acres**
1.	Total National Forest and National Grassland Land	673,021	675,572	
2.	Non-forest Land		51,106	56,749
3.	Forest Land		621,915	618,823
4.	Forest Land Withdrawn From Timber Production	37,736	37,162	
5.	Forest Land not Capable of Producing Crops of Industrial Wood	3,949	5,080	
6.	Forest Land Physically Unsuitable: Irreversible Damage Likely to Occur		0	216
7.	Forest Land - Inadequate Information	3,690	3,631	
8.	Tentatively Suit. Forest Lan	572,734	572,734	

The disparity between these two sets of acreage has arisen for two reasons: (1) a net increase in National Forest acreage including some adjustments through land exchange and (2) areas that have been reinventoried since the completion of the Forest Plan.

Stage 2. Examination of Financial Efficiency of Lands Tentatively Suitable **for Timber Production**

The financial analysis reveals the present net value (PNV) for different analysis areas. For the purpose of this financial analysis, PNV is a measure of discounted timber benefits less discounted timber management costs. The actual PNV analysis consisted of a FORPLAN run which examined all the management intensities for all analysis ares. This analysis revealed

the relative profitability of different timber management intensities on analysis areas.

1.To limit analyses for comparison purposes, only those analysis areas with a pine management type were analyzed in FORPLAN. The majority of the lands fell in these analysis areas. The relative ranking of timber management intensities was consistent for all analysis areas. This ranged from 480,629 to 382,000 acres (alternatives 1 and 6 respectively) or 80-65 percent of total forest area.

2.The remaining analysis areas or (20-35 percent) of forested and were analyzed with the use of a spreadsheet program. These acres modeled in the spreadsheet were primarily tentatively unsuitable acres that were removed in the respective alternative due to special area designation.

Based on this financial analysis, the Interdisciplinary Team (IDT) was able to arrive at the following conclusion:

1.Clearcutting with natural regeneration has the highest PNV of all types with shortleaf types the highest.

2.Shelterwood with natural regeneration has a positive PNV for all types.

3.Clearcutting with site preparation and planting has a positive PNV for all types.

4.Group selection and individual tree selection also had a positive PNV for all types.

5.Thinnings had a positive PNV for all types.

The results were used to identify the relative advantage of different emphasis and intensities on the forest.

The "fixed" costs of the Timber Program were included in Stage II analysis but these are not fixed in a classic economic sense. Rather, they contain costs which vary according to the relative size of timber volume offered and costs of administering any timber program.

Stage 3. Identification of Suitable Timber Lands

The results of Stage III (amount of suitable timber land) vary by alternative and are located in the alternative formulation section for each alternative.

VII. Development of Management Requirements

Management requirements (MR's) are directed toward producing a viable level of resources for both the short and long-term. The requirements stem from the National Forest Management Act as interpreted by the implementing regulations (36 CFR 219.27). The following areas of 219.27 contain the basic direction for MR's:

1.Resource Protection
2.Vegetative Manipulation
3.Silvicultural Practices

5.Riparian Areas
6.Soil and Water
7.Diversity

All but a few MR's are accomplished through the use of standards which are incorporated into applicable management area prescriptions (refer to the process paper Forest-Wide Standards) MR's which aren't incorporated into management area prescriptions are analyzed in FORPLAN. The process paper Methods to Attain Management Requirements explains how the IDT met each of these legal requirements.

For the purpose of simplifying the discussion of the portions included in the FORPLAN model, other requirements of the NFMA Regulations incorporated into the FORPLAN model are discussed below.

Nondeclining Yield & Sustained-Yield Link: (36 CFR 219.16) The Forest is currently selling timber based on a policy of nondeclining even-flow. This constraint in the FORPLAN model is designed to ensure that the harvest levels in each decade are equal to, or greater than, the harvest in the previous decade. The harvest level in the last decade of the planning horizon must be less than, or equal to, the long term sustained-yield calculated for the alternative.

Ending Inventory Constraint: (36 CFR 219.16) This constraint attempts to ensure the total inventory volume left at the conclusion of the harvest scheduling planning horizon (150 years) is sufficient to maintain the harvest pattern established for the given alternative.

Rotations at CMAI: (36 CFR 219.16) This constraint is intended to control the minimum age at which a timber stand can be regenerated. The minimum is determined by calculating the age at which the stand achieves 95 percent culmination of mean annual increment of timber volume growth. The constraint is applied through the individual prescription data as input to the FORPLAN model. No prescription that would violate this constraint was considered (CMAI is approximately 35, minimum rotation offered was 40 years for FORPLAN runs).

Dispersion: (36 CFR 219.27 lb) and (d)) These constraints insure that individual cuts created by application of even-aged silviculture will conform to the Regional direction on dispersion of openings.

The percentages of openings or harvest used in the model are less than or equal to Regional constraints. Maximum openings permitted in MA-2 are 12.5 percent (loblolly) or 8.5 percent (longleaf and shortleaf); IDT constraints used were 7 and 5 percent respectively to ensure this with expectation of additional percent from natural causes such as southern pine beetle (SPB), storm damage, and other unplanned openings. The model is limited to harvesting only a portion of any vegetation type within a single decade. The portion is based on the appropriate management area prescription, the rate of growth of the given timber species, and the applicable standards. The constraints also help most resource protective requirements related to water and soil.

Wildlife and Fish: (36 CFR 219.27 (a)) Some indicator species were evaluated for habitat requirements estimated to be necessary to maintain populations. These species were primarily game species that had a fully developed range of evaluated coefficients to accurately assess changes by alternative. Other indicator species were evaluated strictly upon the acreage of forest

constraint was used to provide habitat for the red-cockaded woodpecker. The constraint was applied so that in HMA's (MA-2) restricted openings, rotations and management as per standards outlined in MA-2 were followed.

Soil and Water: (36 CFR 219.27 (a)) Costs associated with soil and water protection were included in all prescriptions. The timber harvest dispersion constraints are also used to prevent excessive sediment production. Additionally, forest-wide soil and water standards (See Forest Plan, Chapter IV) give direction which ensures the Forest will meet management requirements.

VIII. Benchmarks

Benchmarks approximate maximum economic and biological resource production opportunities, are useful in evaluating the compatibilities and conflicts between individual resource objectives, and help define the range within which integrated alternatives can be developed. The following benchmarks were thus developed:

CUR - Current Level Benchmark.

This benchmark provides for management using the current plan, adjusted to incorporate changes necessary to meet current management direction. The benchmark estimates the capability of the planning area to provide for a wide range of goods, services and other uses from the present land allocation. This benchmark is the same as Alternative 1 and meets all requirements specified in the regulations (36 CFR, Part 219).

TMB - Maximum Timber Benchmark.

This benchmark was used to defined the maximum timber output possible for the first decade subject to the following specifications:

1. The objective function maximizes timber in the first decade with a rollover to maximize present value.

2. Apply management requirements, including those for RCW.

3. Apply nondeclining yield.

4. Includes all tentatively suitable land.

MKT - Maximum Present Net Value with Market Values Only Benchmark.

The purpose of this benchmark was to estimate the mix of resource uses and determine a schedule of outputs and costs that would maximize the present net value of those outputs that have an established market price. These outputs include market prices for timber, range, minerals, and developed recreation. The following specifications were applied:

1. The objective function maximizes present net value where only market outputs are valued.

2. Apply management requirements, including those for RCW.

3.Apply nondeclining yield.

4.Includes all tentatively suitable land.

PNV - Maximum Present Net Value with Assigned Values Benchmark.

The purpose of establishing this benchmark was to estimate the mix of resource uses and a schedule of outputs and costs that would maximize the present net value of outputs assigned a monetary value. The following specifications were applied:

1.The objective function maximizes present net value where both market and nonmarket outputs were valued.

2.Apply management requirements, including those for RCW.

3.Apply nondeclining yield.

4.Includes all tentatively suitable land.

MIN - Minimum Level Management Benchmark.

This benchmark represents the minimum level of management needed to maintain and protect the unit as part of the National Forest System. The following specifications were applied.

1. The objective function maximizes present net value where both market and nonmarket outputs were valued.

2.Minimum level was the only prescription applied to all acres except thinning RX for protection of RCW in the HMA area.

WLO - Max Wilderness Benchmark.

The purpose of this benchmark was to evaluate the impacts of maximum wilderness requested during the scoping. It was decided to develop Alternative 6 as this benchmark. Alternative 6 was determined to contain the maximum acreage "legally" allowable (pending USFWS opinion and Court Order) and available for wilderness; this benchmark included:

1.The objective function maximizes present net value where both market and nonmarket outputs were valued.

2.Apply management requirements, including those for RCW.

3.Apply nondeclining yield.

4.All roadless and wilderness study areas have wilderness prescriptions where it did not conflict with other predetermined prescriptions.

It was determined that Other Resource Benchmarks were not necessary, in that the results from Plan Benchmarks were adequate for alternative development and analysis.

GROUPING SUMMARY BY BENCHMARK AND PERIOD TABLES WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

IX. Formulation of Alternatives

Alternatives within this EIS represent alternative "Forest Plans" for managing the Forest for the next 10 to 15 years. Technically, an alternative is a mix of management area prescriptions applied in specific amounts and locations to achieve the overall desired management emphasis as expressed in goals and objectives.

1. OVERVIEW OF PROCESS

The IDT followed a four step process to formulate a broad range of reasonable alternatives.

A. Development of Alternative "Themes"

The Plan and EIS for the NFGT was developed with an emphasis on the "need to change" concept. The basis for change was due to monitoring and evaluation, changes in legal requirements, litigation, and public demands. During the scoping phase of the Revision, and during development of the Analysis of the Management Situation (AMS), a number of possible alternative scenarios or themes were heard internally as well as externally. The NFGT planning team communicated with a wide audience of publics, as well as our internal NFGT family, to identify their vision for the Forests and Grasslands. We asked people what they wanted and didn't want the NFGT to be. We also looked at what can be provided. After full review of our AMS with the Regional Forester and Regional Office IDT, six themes were developed that appeared to provide a range of alternatives that responded to the public's vision for the future for the NFGT.

represented the first attempt to meet the public's varying, and often conflicting wants and needs; while the USFS remains responsible stewards of the land. These themes were the basis for

Alternatives 1, 2, 3, 4, 5, and 6.

Three new alternatives were developed based on the Management Team's recommendations. Alternative 7 was developed with the same land allocations as Alternative 6. However, the use of herbicides was allowed. Alternative 7 would also allow greater management flexibility and promote fire in longleaf and shortleaf ecosystems.

Alternative 4 was developed to provide a wider range in land allocations and activities, as directed in implementing management from the RCW EIS. It was developed with most upland forest acres managed as directed in the RCW EIS. This management direction is described as Habitat Management Areas (HMAs) for RCW and associated plant and animal species, requiring forest characteristics as described in the RCW EIS.

Alternative 4a was developed with the same land allocations for streamside zone management, special areas, and recreation (but with the minimum HMAs). Alternative 4b mirrored most aspects of management in 4 and 4a, but included corridors between RCW habitat that linked isolated sub-populations.

Between Draft and Final Alternative 8 - which is a reflection to responses and to changes needed - was added. It contained adjustments from a modeling standpoint in 5 areas.

1. Adjustments in MA-1, MA-2 and MA-6 (HMA Corridors).
2. Apply uneven-aged management to VQOs that are not modified or max modified.
3. LTA identifiers were used to determine management type and restoration capability.
4. Constraint to develop approximately 500 acres of regeneration and/or restoration per year for each forest.
5. Constraint added to insure that the average single-age harvesting of 35 to 40 acres is speciallyspellible to address concerns regarding fragmentation.

B. Initial Management Area or Management Area Prescription Allocation

The implementing regulations for the National Environmental Policy Act (NEPA) require a "No Action" alternative and a reasonable range of alternatives to address issues identified during scoping. During scoping for the Forest Plan Revision in 1990, over 4,400 comment letters were received. From these comments, 15 issues and 53 sub-issues were identified. (See EIS Appendix A)

All issues raised during scoping have been considered in the planning process. These issues are addressed in the EIS and/or in the Plan standards and guidelines, management area prescriptions, and monitoring requirements.

The IDT, in response to the requirement for a "No Action" alternative, prepared an initial allocation of different portions of the forest to management areas and prescriptions that best correspond to current management. Personnel from each Ranger District and the IDT then prepared additional alternatives that responded to the issues, goals, objectives, and desired future conditions associated with desired themes.

A Management Area prescription was coded in the CISC data base for each stand and for each alternative. Thus, one stand could vary from being considered for wilderness in one alternative, to being intensively management for timber in another.

Since each stand in CISC also had an analysis area associated with it, the acres by management area were summed across each analysis area designation for each alternative. The aggregate of these stands were used for the analysis areas in the FORPLAN model.

FORPLAN was used to estimate the goods and services that could be produced by each alternative. Cost efficiency of the alternative was assured by the use of FORPLAN, and with the "Maximum PNV" objective function. Although limits were placed on the prescriptions available for each management area, FORPLAN was still given the option of selecting a management emphasis which ranged from intensive timber management to minimum level management. <u>See PNV and Summary Tables at end of this appendix for alternative comparison.</u>

3. MAPPING THE ALTERNATIVES

Maps were prepared using working maps prepared by the District personnel and adjustments by the IDT. These maps were drafted on compartment administrative maps and then transferred to a computerized geographical data base.

4. CONSTRAINTS COMMON TO ALL ALTERNATIVES

Constraints identified as "Management Requirements" were applied to all alternatives. Additional constraints common to all alternatives were applied to ensure an implementable solution.

CONSTRAINT: Ensure that the timber harvest volume does not decline from period to period. Ensure in the last decade of the planning horizon that the timber harvest level is less than or equal to long run sustained yield calculated for the alternative.

Purpose: To comply with Federal regulations.

Rationale: Without these constraints, harvest levels could rise and fall erratically allowing industry to expand greatly one decade, only to be put out of business the next. Nondeclining yield constraint prevents these erratic shifts.

CONSTRAINT: Ensure the total forested inventory volume left at the end of the planning horizon (150 years) is sufficient to maintain the harvest pattern established for a given alternative.

Purpose: To comply with Federal regulations.

Rationale: In the absence of this constraint, the FORPLAN model would have no incentive to leave enough inventory of trees at the end of 150 years to sustain timber harvest levels into perpetuity.

(CMAI).

Purpose: To assure timber is not harvested when growing at its maximum rate.

Rationale: Maintain high productivity of stands and abide by Forest Service policy and the NFMA.

5. CONSTRAINTS COMMON TO ALL ALTERNATIVES EXCEPT THE "NO ACTION"

CONSTRAINT: Within MA-2 (HMA), no more than 8.3 percent of longleaf, shortleaf or slash acres within the 0 to 10 age class. To ensure this, a constraint of 5 percent limit was modeled with expectation of additional 3.3 percent from natural causes such as southern pine beetle (SPB), storm damage, and other unplanned openings. This percentage reduction is based on historical record of occurrence of opening from Natural Causes Analysis for this estimate of mortality due to weather, SPB, etc. is on file in the process records in Supervisor's Office NFGT.

Purpose: To implement direction found within the FEIS for Management of RCW in the Southern Region.

Rationale: Minimum Management requirement for RCW.

CONSTRAINT: Within MA-2 (HMA), no more than 12.5 percent of loblolly acres can be within the 0 to 10 age class. To ensure this, a constraint of 7.5 percent was modeled with an expectation of an additional 5 percent from natural causes such as SPB, storm damage, and other unplanned openings; based on IDT estimates as discussed in previous constraint.

Purpose: To implement direction found within the FEIS for Management of RCW in the Southern Region.

Rationale: Minimum management requirement for RCW.

CONSTRAINT: Within MA-2 (HMA), 50 percent of acres designated for harvest would use a multi-stage cutting process (uneven-aged, two-aged, and shelterwood with reserves).

Purpose: To implement direction found within the FEIS for Management of RCW in the Southern Region.

Rationale: Minimum management requirement for RCW.

CONSTRAINT: Within MA-2 (HMA), no more than 12.5 percent of loblolly acres can be within the 0 to 10 age class. To ensure this, a constraint of 7.5 percent was modeled with an expectation of an additional 5 percent from natural causes such as SPB, storm damage, and other unplanned openings. This percentage reduction is based on historical record of occurrence of opening from natural causes. Analysis for this estimate of mortality due to weather, SPB, etc. is on file in the process records in Supervisor's Office of NFGT.

Southern Region.

Rationale Minimum management requirement for RCW.

CONSTRAINT: Within MA-2 (HMA), 50 percent of acres designated for harvest would use a multi-stage cutting process (uneven-aged, two-aged, and shelterwood with reserves).

Purpose: To implement direction found within the FEIS for Management of RCW in the Southern Region.

Rational: Minimum management requirement for RCW.

***Note:** This was modified for Alt 8 to reflect 50% of minimum HMA because of an additional 25,000 acres added to only thinning Rx.

CONSTRAINT: Within MA-2 (HMA), no regeneration within one-fourth (1/4) mile of RCW clusters. Only thinning or minimum level type prescriptions can be applied.

Purpose: To implement direction found within the FEIS for Management of RCW in the Southern Region.

Rationale: Minimum management requirement for RCW.

***Note:** This was modified for Alt 8 to reflect 50% of minimum HMA because of an additional 25,000 acres added to only thinning prescription.

Other constraints were imposed to represent the general theme of a particular alternative. These are typically referred to as discretionary constraints. By adding these constraints, the PNV that results is typically reduced naturally from what it would have been if they had not been applied.

X. Development of Alternatives

Each alternative's purpose is described in Chapter II of the EIS.

Alternative 1 - "No Action". The court ordered management for 1,200-meter zones for active and inactive RCW clusters. The remaining 82 percent of the land is managed under the 1987 Forest Plan and additional direction set forth by the Chief of the Forest Service.

In addition to the previously mentioned constraints that were common to alternatives, the following constraints were necessary to represent the theme of this alternative.
CONSTRAINT: Current timber volume proposed in 1987 Plan, less Chief's adjustment for court ordered 1,200 meters. (Approximately 119 MMBF).

Purpose and Rationale: To simulate existing activities and display future outputs of management actions, if Alternative 1 is implemented.

CONSTRAINT: No management for mixed stands. Existing mixed stands converted to pine or hardwood, based on soil type.

Purpose: To reflect current management.

Rationale: Provide an accurate depiction of the likely effect of continuing current management.

CONSTRAINT: Rotation age: loblolly 70 years; longleaf and shortleaf 80 years; and hardwoods 120 years. Harvest no existing stand until within 10 years of rotation age.

Purpose: To reflect current management and to adjust age classes.

Rationale: Provide an accurate depiction of likely effects of continuing current management.

CONSTRAINT: Limit ASQ harvesting to 119 mmbf.

Purpose: To comply with existing ASQ.

Rationale: To ensure accurate assessment of future outputs in this alternative.

CONSTRAINT: Limit uneven-aged management to no more than 10 percent of MA-1.

Purpose and Rationale: To meet prescriptions developed by the IDT for this alternative.

Alternative 2 - High level of market commodities and recovery of the RCW. The forest is managed to produce a high level of market commodities and for recovery of RCW. This alternative emphasizes commodity production with less emphasis on amenity values, yet amenities are protected as required by law or policy. In this alternative, RCW would be managed under the standards and guidelines of the RCW FEIS.

The Grasslands are managed similar to the 1987 Plan, but with more emphasis on higher levels of market commodities; primarily grazing and minerals. This theme emphasizes commodity production, with less emphasis on amenity values. Amenities are minimal, but are protected as required by law or policy.

The constraints are in addition to those that are common to all alternatives. They include the following:

CONSTRAINT: Rotation age: loblolly 70 years; longleaf and shortleaf 80 years; and hardwoods 120 years based on IDT and Management Team review.

Purpose: To reflect commodity oriented management and to adjust age classes.

Rationale: Provide an accurate depiction of likely effects of continuing current management.

CONSTRAINT: To limit ASQ to MA-1, MA-2, and MA-6.

Purpose: Ensure harvest for ASQ harvest was in suitable acres.

Rationale: To limit harvest to general forest areas.

CONSTRAINT: Limit uneven-aged management to no more than 10 percent of MA-1.

Purpose and Rationale: To meet prescriptions developed by the IDT for this alternative.

Alternative 3 - Moderate to high level of market commodities and recovery of the RCW with minimum HMA area. The Forest is managed for recovery of the RCW, while producing a moderate to high level of market commodities and a low to moderate level of amenity levels. Amenity values are protected as required by law and enhanced where this could be done without major impacts to production of market commodities.

Areas of the Forests and Grasslands in close proximity to major urban centers are managed recognizing the predominately urban user's needs and values. In addition to existing special areas such as wilderness and scenic areas, a few additional areas of the forest are managed to preserve their special characteristics. In this alternative, RCW is managed with the standards and guidelines of the RCW FEIS.

The Grasslands area managed similar to the 1987 Plan, but more emphasis is directed at higher levels of market commodities; primarily grazing and minerals. This alternative emphasizes commodity production with less emphasis on amenity values. Although amenities are minimal,

they are protected as required by law or policy.

The constraints are in addition to those that are common to all alternatives. They include the following:

CONSTRAINT: Rotation ages: loblolly 70 years; shortleaf 80 years; and longleaf 90 years.

Purpose: To reflect management emphasis of Alternative 3.

Rationale: To meet objective of alternative.

CONSTRAINT: Additional acres in special areas and recreation.

Purpose: To ensure certain additional acres are assigned the special and recreation designations.

Rationale: To address public issue for recreation and special areas.

CONSTRAINT: Limit ASQ to MA-1, MA-2, and MA-6.

Purpose: ASQ harvest to suitable acres.

Rationale: To limit harvest to general forest areas.

CONSTRAINT: Limit uneven-aged management to no more than 25 percent of MA-1.

Purpose and Rationale: To meet prescriptions developed by the IDT for this alternative.

Alternative 4 - Moderate level of market commodities and recovery of RCW with maximum HMA area. The forest is managed to provide for recovery of the RCW and to yield moderate levels of market commodities and amenity values. Areas of the forest in close proximity to major urban centers are managed recognizing the predominately urban user's needs and values. In addition to existing special areas, some portions of the forest are managed to

RCW FEIS.

The Grasslands are managed to provide an equal output of market commodities and amenity values. The LBJ unit, which is in close proximity to Dallas - Fort Worth, is managed recognizing the predominately urban user's needs and values. Several Natural Heritage sites on the Caddo and LBJ, in addition to the Cross Timbers Research Natural Area (RNA), are managed to preserve their special characteristics.

The constraints are in addition to those that are common to all alternatives. They include the following:

CONSTRAINT: Rotation ages: loblolly 70 years; shortleaf 80 years; and longleaf 100 years.

Purpose: To reflect management emphasis of Alternative 4.

Rationale: To meet objective of alternative.

CONSTRAINT: Additional acres constrained for special areas and recreational areas.

Purpose: Ensure certain issues related to desire for additional acres assigned to special and recreation designations.

Rationale: To address public issue for recreation and special areas.

CONSTRAINT: Limit ASQ to MA-1, MA-2, and MA-6.

Purpose: ASQ harvest to suitable acres.

Rationale: To limit harvest to general forest areas.

CONSTRAINT: Limit uneven-aged management to no more than 50 percent of MA-1.

Purpose and Rationale: To meet prescriptions developed by the IDT for this alternative.

Alternative 4a - moderate level of market commodities and recovery of RCW with minimum HMA area. This alternative is the same as Alternative 4 except the HMA is held for to a minimum HMA area.

Additional constraints are the same as shown for Alternative 4.

Alternative 4b - Moderate level of market commodities and recovery of RCW with minimum HMA area, plus corridors. This alternative has the same special areas and management perscriptions as Alternative 4a except each HMA has the minimum amount for that HMA, connected by corridors between the subpopulations. Acreage in MA-2 is between Alternative 4 and 4a.

Additional constraints are the same as shown for Alternative 4.

managed for recovery of the RCW while maintaining tall forest cover over most of the Forest. Some commodities are produced, but production of recreation, wildlife, and other amenity values are emphasized. Areas of the Forests and Grasslands in close proximity to major urban centers are managed recognizing the predominately urban user's needs and values. In addition to existing special areas, several parts of the forest are managed to preserve their special characteristics. RCW is managed with the standards and guidelines of the RCW FEIS.

The Grasslands are managed to provide an equal output of market commodities and amenity values. The LBJ unit, which is in close proximity to Dallas - Fort Worth, is managed recognizing the predominately urban user's needs and values. Several Natural Heritage sites on the Caddo and LBJ, in addition to the Cross Timbers RNA, are managed to preserve their special characteristics.

CONSTRAINT: Rotation ages: loblolly 80 years; shortleaf 100 years; mixed and longleaf 120 years' and hardwoods 200 years.

Purpose: To provide older mature forest for dispersed recreation opportunities.

Rationale: To meet objectives of the alternative; to meet the demand for dispersed recreation.

CONSTRAINT: Additional wilderness acres.

Purpose: To ensure that certain additional areas were assigned the wilderness classification.

Rationale: To address public issues for more wilderness areas.

CONSTRAINT: Limit ASQ to the suitable acres.

Purpose: To limit ASQ to MA-1, MA-2 and MA-6.

Rationale: To limit harvest to general forest areas.

CONSTRAINT: Limit uneven-aged management to no more than 45 percent of MA-1.

Purpose and Rationale: To meet prescriptions developed by the IDT for this alternative.

Alternative 6 - Recovery of RCW while retaining tall forest cover with primarily uneven-aged silvicultural methods, without use of fire or herbicides. The forest is managed to produce an environment for recovery of the RCW while retaining tall forest cover. Preservation of unique areas and low impact management are emphasized. Primarily uneven-aged silvicultural methods are used. Forest and Grasslands areas in close proximity to major urban centers are managed recognizing the predominately urban user's needs and values. RCW is managed with the standards and guidelines of the RCW FEIS.

The Grasslands are managed to provide an equal output of market commodities and amenity values. The LBJ unit, which is in close proximity to Dallas - Fort Worth, is managed recognizing the predominately urban user's needs and values. Several Natural Heritage sites on the Caddo and LBJ, in addition to the Cross Timbers RNA, are managed to preserve their special characteristics.

Prescribed burning is seldom used and the use of herbicides is not permitted.

CONSTRAINT: Maximum wilderness acres.

Purpose: To ensure maximum wilderness acres are assigned.

Rationale: To address public issues for more wilderness.

CONSTRAINT: 50 percent of acreage within HMA and 75 percent of acreage outside the HMA managed with an uneven-aged silvicultural method. The objective during the development of this alternative and number 7 was to have 90 percent of the acreage in MA-1 assigned to unevenage prescription. However, the FORPLAN model with constraints for maintaining NDY, LTSY, and not allowing timber to fall 50 percent below demand limit would cause this to go infeasible. So through a number of sensitivity runs to determine the maximum amount of uneven-aged prescription, a figure of 75 percent was determined.

Purpose: To ensure that a large percentage of acres are considered for this silvicultural method.

Rationale: To address public issues for more uneven-aged silvicultural management.

CONSTRAINT: Limit ASQ to MA-1, MA-2 and MA-6.

Purpose: Limit ASQ to the suitable acres.

Rationale: To limit harvest to general forest areas.

Alternative 7 - Recovery of RCW while retaining tall cover with primary uneven-aged silvicultural method with use of fire and herbicides.

This alternative is the same as Alternative 6, except that the use of fire and herbicides is permitted and prescribed. This alternative also shifts some of the wilderness areas in Alternative 6 to special areas. This alternative provides a mix of wilderness and special area designations that meet other demands for recreation and resource management.

CONSTRAINT: Increase in wilderness acres over Alternatives 1 through 5.

Purpose: To ensure more wilderness acres are assigned.

Rationale: To address issues related to maximization of wilderness.

CONSTRAINT: Maximize special area designations.

Purpose: To ensure maximum special acres are assigned.

Rationale: To address issues related to maximization of wilderness.

CONSTRAINT: Fifty percent of acreage within HMA and at least 75 percent of acreage outside HMA is managed with uneven-aged silvicultural methods (Attempted 90 percent uneven-aged prescription = FORPLAN infeasable, see previous alternative).

Rationale: To address public issues for more uneven-aged silvicultural management.

CONSTRAINT: Limit ASQ to the suitable acres.

Purpose: To limit ASQ to MA-1, MA-2 and MA-6.

Rationale: To limit harvest to general forest areas.

Alternative 8 - Moderate level of market commmodities and recovery of RCW with minimum HMA area plus modification of acreage set up for corridor.

CONSTRAINT: Restric harvest method to non clearcut within MA-2 (HMA), all acres with a VQO that are not designated modified or maximum modified that are harvestable plus 5% (five percent) (approximately 106,000 acres). This is equal to approximately 40 percent of the minimum HMA suitable harvestable acres.

[Number of acres was reduced from 50 to 40 percent to reflect the increase of acres for thin only for the new RCW sites within HMA. Minimum 24,600 acres for existing RCW increased to 50,000 acres. Suitable forest acres within MA-2 and HMA part of MA-6 is 263,308 (see suitable acre calculation for Alternative 8, following section Appendix B) times 50% less acreage increase for thinning.]

263308 \over 2 = 131654 - 25400 = 106,254 acres

Purpose: To implement direction found within the EIS for Management of RCW in the Southern Region.

Rationale: Management required for RCW.

CONSTRAINT: Within MA-2 and MA-6, no regeneration within one-fourth (1/4) mile of RCW clusters. Only thinning or minimum type prescriptions can be applied. To this existing 24,600 acres an additional 25,400 acres was included (50,000 acres).

Purpose: To implement direction found within the FEIS for Management of RCW in the Southern Region.

Rationale: Mangement requirement for RCW.

CONSTRAINT: Within MA-1 limit unevenaged management to acres with VQO that is not modified or maximum modified as a minimum and an additional 5 percent for maximum (approximately 30 percent of the suitable acres).

Purpose and Rationale: To meet prescription developed by the IDT for this alternative.

CONSTRAINT: Within MA-1 limited 0-20 age class acreage to 22.2 percent.

Purpose: To insure that Alternative would be implementable on a spatial bases with an average 35 to 40 acres cut.

Rationale: To provide an accurate depiction of implementation of harvesting.

CONSTRAINT: Acres within each forest type within age group 0 to 10.

Purpose: To ensure approximately 500 acres per year of harvesting by Forest.

Rationale: To meet objective of alternative.

CONSTRAINT: Limit ASQ to suitable acres. Suitable acres = 486,072.

Purpose: To limit ASQ to MA-1, MA-2, MA-6.

Rationale: To limit harvest to general forest area.

CONSTRAINT: Rotation ages: loblolly 70 years, shortleaf 80 years and longleaf 100 years.

Purpose: To reflect management emphasis of Alternative 8.

Rationale: To meet objective of the alternative.

CONSTRAINT: Additional acres constrained for special management and recreation areas.

Purpose: Ensure certain issues related to desire for additional acres assigned to special and recreation designations.

Rationale: To address public issue for recreation and special areas.

CONSTRAINT: Maximax timber 1st period rollover followed by the "Maximum PNV" objective function.
Purpose: To maximax net public benefit.

Rationale: To get a timber target that is close to the maximum that can be sustained, given the objectives for other resources. The PNV calculation is used simply to ensure that the ASQ target is produced as efficiently as possible.

ALTERNATIVES 1-8 TABELS WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

Appendix C

Part I - Minerals & Geology

Introduction

The National Forests in Texas and the Caddo National Grasslands lie in what is known geologically as the E Texas Basin. The LBJ Grasslands lie in the Fort Worth Basin. There are 283,806 acres leased for oil and gas both the Forests and Grasslands in Texas and there was a backlog of lease requests. Even during times of low and gas demand and poor industry economics there remains a relatively steady level of leasing. Exploration both U.S. and private rights also continues to be a routine activity. Levels of exploration interest fluctuate w economic conditions within the industry. Development of new plays or prospects (theories of occurrence) a drilling technologies also create renewed interest in the area.

Oil & Gas Situation

There are maps on file in the Supervisor's Office in Lufkin that show the potential of the Plan area for gas and production. Areas are classified as either high, medium, low, or unknown potential.

High Potential: Geologic environments that are highly favorable for the occurrence of undiscovered oil and/or g resources. Includes areas previously classified as Known Geologic Structures (KGS). The area is on or nea producing trend and evidence exists that the geologic controls of reservoir, source, and trap necessary for t accumulation of oil and/or gas are present.

Moderate Potential: Indicates the geologic environment is favorable for the occurrence of undiscovered oil and gas resources; however, one of the geologic controls necessary for the accumulation of oil and/or gas may absent.

Low Potential: The geologic, geochemical, and geophysical characteristics do not indicate a favorable environm for the accumulation of oil and/or gas resources. Evidence exists that one or more of the geologic contr necessary for the accumulation of oil and/or gas is absent.

Unknown Potential: A region where the geologic information is insufficient to otherwise categorize potential.

The relatively recent development of horizontal drilling technology, especially as it relates to Austin Chalk a Saratoga Formations, will quite likely increase potential on several areas of the National Forests from t originally mapped and referenced above.

Following is a brief description of the exploration and development potential for the four National Forests and t National Grasslands.

The National Forests in Texas lie in what is known geologically as the East Texas Basin. The US Geologi Survey (USGS), in Open File 88-450K (Foote, Massingill and Wells, 1988), divided the basin into 8 oil and g plays. These plays are:

(1) N.E. Texas basement structure play;
(2) Mexia/Talco fault system play;
(3) N.E. Texas salt anticline play;
(4) Tyler basin structural play;
(5) Tyler basin Woodbine-Eagle Ford play;

(7) Sabine Uplift gas play;

(8) Sabine Uplift oil play.

The USGS appraised 294 oil and gas fields within the East Texas Basin discovered between 1895 and 1985. Th fields are designated as Class 6 and above (having recoverable quantities of more than 1 million barrels or more oil (MMBO) and natural gas liquids (NGL) or more than 6 billion cubic feet of gas (BCF), using the USGS fi size distribution system.

Class	Oil field size MMBBL (range)	Gas field size BCF (range)
1	0.06125 - 0.0625	0.1875 - 0.375
2	0.0625 - 0.125	0.375 - 0.75
3	0.125 - 0.25	0.75 - 1.5
4	0.25 - 0.5	1.5 - 3
5	0.5 - 1	3 - 6
6	1 - 2	6 - 12
7	2 - 4	12 - 24
8	4 - 8	24 - 48
9	8 - 16	48 - 96
10	16 - 32	96 - 192
11	32 - 64	192 - 384
12	64 - 128	384 - 768
13	128 - 256	768 - 1536
14	256 - 512	1536 - 3072
15	512 - 1024	3072 - 6144
16	1024 - 2048	6144 - 12288
17	2048 - 4096	12288 - 24576
18	4096 - 8192	24576 - 49152
19	8192 - 16384	49152 - 98304
20	16384 - 32768	98304 - 196608

Seventy-six percent of oil fields and 90 percent of gas fields are developed from size 6 or greater field class Forty-six percent of field class sizes 1 through 5 are able to be developed.

Structural, stratigraphic, and combination traps occur throughout the area. While most oil is produced fr stratigraphic traps, most gas and natural gas liquids (NGL) are produced from combination traps.

Summary of Oil & Gas Potential on NFGT

Angelina National Forest - Approximately 15 percent of the Angelina National Forest is within the Tyler ba structural play; that acreage comprises about 3 percent of the total play area. The forest is located on the extre east-southeast quadrant of the play. The closest Class 6 production within this play occurs some 35 miles to west. Approximately 30 percent of the Angelina National Forest is also within the Sabine Uplift oil play; t acreage comprises approximately two percent of the total play. The closest Class 6 production within this pl occurs approximately 20 miles to the west-northwest. The northernmost portion of the forest is also within t Austin-Buda fractured Chalk play of the Gulf Coast Basin. There are currently three horizontal oil and gas wells

is 3300'. Seismic information indicates that future exploration will most likely be within the Brookeland Fie
The Atlas of Major Texas Oil Reservoirs (Galloway et. al. 1983) indicates that the Austin-Buda fractured Ch
lays under the northern portions of the Angelina and Sabine National Forests. However, extensive drilling into t
formation has been occurring on and near the southern Sabine National Forest. Several Austin Chalk wells were

drilled in the same general location in the early 1980's. At least three Austin Chalk wells were drilled on t
southern half of the Angelina National Forest and leasing interest on the southern Angelina has been noted in
last few months. It is evident that the formation extends farther south than indicated in the cited reference.

Because of the production on the Forest, its location within two major plays of the East Texas Basin plays, as w
as the Austin-Buda fractured Chalk play of the Gulf Coast Basin, the Angelina National Forest has high potent
for occurrence.

Davy Crockett National Forest - One hundred percent of the Davy Crockett National Forest lies inside of t
Tyler basin structural play; that acreage comprises 10 percent of the total play. About 50 percent of the Da
Crockett National Forests is within the Woodbine-Eagle Ford play; that acreage comprises some 15 percent of
total play. The Davy Crockett National Forest is also along the Austin-Buda fractured Chalk trend. Tl
southwest-northeast trend contains approximately 50 percent of the forest. There are currently five vertical
wells in the Laura Lavelle Field. The average well site is 0.53 acres with 0.03 miles of new road built. The avera
total depth is 1,800 feet. Possible future exploration is expected in the Laura Lavelle Field.

At least two Class 6 fields, Decker Switch and South Laura Lavelle, are part of the Tyler basin structural pl
within the Davy Crockett National Forest. There is no Class 6 production within the Davy Crockett National For
within the Woodbine-Eagle Ford play. Because of the production on the forest, its location within two of the ma
East Texas Basin plays, as well as within the Austin-Buda fractured chalk play within the Gulf Coast Basin, t
Davy Crockett National Forest has high potential for occurrence.

Sabine National Forest - Approximately 80 percent of the Sabine National Forest is within the Sabine Uplift
play; that acreage constitutes about 6 percent of the total play area. Another 45 percent of the forest lies within
Sabine Uplift gas play; that acreage consists of approximately five percent of the total play area. The northe
portion of the Sabine National Forest is within the Austin-Buda fractured Chalk play of the Gulf Coast Basi
There are currently seven horizontal and three vertical wells on this forest. The average pad size of the horizonta
drilled wells in the Brookeland field is 7.25 acres with 0.06 miles of new access road built to each pad; the to
depth averages 8,650 feet. The vertical wells drilled into the Saratoga Annona have an average pad size of 1.
acres with 0.04 miles of new road construction and their total depth approximates 2,630 feet.

At least three Class 6 fields, the Huxley, West Joaquin, and Hemphill, are located within the Sabine Natio
Forest. In addition the presence of the Hemphill- Pineland, Brookeland, and Huxley known geologic structu
(KGS), at a minimum, indicate the high potential of the Sabine National Forest.

Sam Houston National Forest - Although the Sam Houston National Forest is not located within any of the ei
major plays delineated by the USGS, there is production from private mineral estates within the Forest. The
reservoirs are located within the sandstones of the Upper Wilcox Group and the Yegua Formation. The traps
domal anticlines formed by regional growth faults of the Wilcox Fault Zone to the south of the Forest. The play
considered small and poorly known. There are currently four vertically drilled oil wells within the Coldsprin
field that average 2.44 acres in pad size with 0.21 miles of access road built for each one. The average total de
for these wells is 12,200 feet.

The location of the following fields, Coldspring, Coline, Mercy SW, Morgas, Moroil, and Waverly, in addition
numerous KGS designations, indicates a high potential for development on the forest.

Caddo National Grassland - The Caddo National Grassland is not located within any of the eight major plays the East Texas Basin delineated by the USGS. In fact, it is on the margin of the East Texas Basin. There is production on the Caddo. A new discovery in the western section of the adjacent western county appears to b southern continuation of a northern play. The potential of the Caddo National Grasslands is unknown.

LBJ National Grassland - The LBJ is located totally within the Lower and Middle Pennsylvanian fan delta

sandstone and conglomerate play of the Fort Worth Basin. The location of the Boonsville and the South Alvord, addition to the LBJ being essentially wholly within a KGS, verifies the high potential of the grassland. There currently three vertically drilled gas wells on federal minerals which average 1.88 acres each in pad size and ha 0.11 miles of new access road built. The average total depth of these wells is 6,650 feet.

According to Foote et. al. (1988), the East Texas Basin is a mature province. The potential for undiscover recoverable crude oil and natural gas appears to be in currently producing areas, in extensions to curren productive trends, particularly into the deeper parts of the basin, and in the Morphlet and Werner Formations Middle and Lower Jurassic Age 2 Hydrocarbons may be present also in Triassic (Eagle Mills Formation) a Paleozoic sedimentary strata.

There are currently (10/93) 274 oil/gas wells located on Federal surface. About 27 percent of those wells are dril into private minerals. Not all wells are currently producing, being in varying stages of development, production, plugging and abandonment.

With the exception of wilderness areas, leasing of U.S. mineral rights and their exploration and production w continue with an average of 40 to 60 new leases issued annually. The exercise of reserved and outstanding mine rights under Federal surface will continue.

Table 1. Acres Available for Leasable Energy (Oil and Gas) Minerals[1]
(National Forests)

Alter-natives	Leasing with Standard Lease Terms And Conditions	Leasing With CSU and TL Stipulations	due to No Surface Occupancy	Unavailable Congressional Action[2]
1	None	381,477	40,036	25,642
2	None	366,339	55,074	25,642
3	None	363,550	57,863	25,642
4	None	364,053	57,640	25,642
4A	None	363,989	57,524	25,642
4B	None	363,252	58,261	25,642
5	None	358,350	63,164	25,642
6		No Leasing		
7	None	317,053	104,460	25,642
8	None	363,252	58,261	25,642

[1] Excludes private rights under U.S. surface, about 194,000 acres. Due to scattered pattern of mineral ownership the figures shown here are estimated based on percentage of U.S. rights in the Plan area.

[2] Additional lands would be added to this classification if areas recommended for wilderness study in Alternatives 5 and 7 were designated as wilderness through legislation.

Table 2. Acres Available for Leasable Energy (Oil and Gas) Minerals[1]
(National Grasslands)

Alternatives	Leasing with Standard Lease Terms & Conditions	Leasing with Stipulations, Notices, No Surface Limitations	Leasing with Occupancy
1	None	35,489	263
2-3	None	35,292	460
5-7	No Leasing		
4,4a,4b, & 8	None	35,142	610

[1] Excludes private rights under U.S. surface, about 1,622 acres. Due to scattered pattern of mineral ownership the figures shown here are estimated based on percentage of U.S. rights in the Plan area.

Reasonably Foreseeable Development Scenario

Background

There has been extensive exploration for and development of oil and gas resources both prior to and since the lands comprising the NFGT were acquired. This activity has continued to take place on the privately-owned mineral rights which have reverted to the government as well as on U.S. minerals that were acquired with the surface.

Generally, the oil and gas industry in Texas has grown very conservative and cautious since its experience in the "oil glut" of 1983, and has, since that time, been downsizing their operations, plugging or shutting-in (stopping production, turning the valve off) marginal wells and waiting for the price of oil to stabilize at a price somewhere over $20 a barrel. For the past several years, oil prices have been in the $11-15/barrel range. Similarly, exploration and development for gas production has been sluggish since gas deregulation and the slide of well-head prices towards a dollar per thousand cubic feet. Industry predictions are that serious new activity in gas won't occur until the wellhead price climbs to about $2.20/Mcf. As a result, the new wells being drilled are usually in-fill or step-out wells within/adjacent to currently producing fields. Industry has only drilled a few wildcat wells in this area because of the low prices for hydrocarbons.

New well site actions remained high on the NFGT through 1985 even during the crash of the oil industry in East Texas because other local factors controlled. The first factor was the continued developmental drilling in an extensively drilled, shallow field on the Davy Crockett National Forest. However, with the

low for the last several years. Refer to Exhibit 1 for more information.

Another factor accounting for the high numbers of private wells drilled in 1984 and 1985 was the impending reversion of minerals to the U.S. Some drilling was carried out solely for the purposes of retaining as much of the reverting mineral estate as possible just prior to the reversion date specified in the deed. Most of these wells were unproductive and were either plugged and abandoned (P&A'ed) shortly after the reversion date or are due to be P&A'ed.

Current Situation

As recognized in the analysis for the Forest Plan, the level of demand for oil and gas has been high on all National Forests and the LBJ Grassland. Since there are proven occurrences of oil and gas under almost all of NFGT the level of exploration and development activity has been almost entirely a function of the economic a political circumstances. As the prices of oil and gas have fluctuated, so has the level of interest in re-leas parcels, applications for seismic permits, and exploration/development drilling.

The total number of producing wells has varied very little on the NFGT over the past six years. As wells have be plugged and abandoned there have been an equivalent number of new successful wells completed.

The only real fluctuation has been in the relative numbers of shut-ins to producing wells and even this variati may be due to different reporting/accountings of well status. Likewise, the total number of producing wells has changed drastically. The dip in 1987 is, again, probably due to a different accounting of well status between shut or producing.

One factor which has been at work towards reducing the total number of existing wells on the oil and gas operatic on Forest Service lands in Texas is a stronger effort by the Forest Service to encourage the plugging a abandonment and clean up of shut-in wells which were environmental hazards.

A new aspect affecting the level of exploration activities is the development of new drilling and recov technologies. The two most important factors or developments over the past six years which have affected oil a gas exploration and production activities on the NFGT have been:

1. The reversion of almost 240,000 acres of mineral estate to the U.S.;

2. The new interest in horizontal drilling in the Austin Chalk formation which underlies parts of three of t National Forests in Texas.

Minerals Reversion Summary

The following table shows the gains in U.S. oil and gas minerals estate over the past six years which covers time period when most of the potential reversions would occur. There are some minerals which are still private a held by production on various Forests and some minerals on both the Forests and Grasslands which will revert some future date.

Forests	Action	1/1/85	1987	1988	1989	1/1/90	85-90
Angelina	Reverted to U.S.	677				310	
987							
Davy Crockett	Stayed Private	1,160					1,
	Reverted to U.S.	60,167	169	98	555	1,160	
Sam Houston	Stayed Private	11,690					
	11,046	22,736					
	Reverted to U.S.	103,472	188	241	644		
Sabine	Stayed Private	8,301				2,416	
	10,717						
	Reverted to U.S.	52,053	5,885			57,938	
Total New U.S.	215,692	1,034	98	1,106	7,689		

Grasslands	Acres Since 1985 (Thru May, 1991)
LBJ	13,019
Caddo	586
Total U.S. Minerals Gains	13,605

Horizontal Drilling

Late in 1989 the industry began using a new technology called horizontal drilling to produce oil/gas from t Austin Chalk formation in south Texas. The early successes with this technology in Texas came in the Pearsall a Giddings fields. The Austin Chalk trends up through east Texas under all the National Forests with the excepti of the Sam Houston National Forest. There had been a number of wells drilled vertically into the Austin chalk east Texas including in the National Forests since the late 1970's. These operations were hit and miss because the character of the formation.

The producing zones in the Austin Chalk consist of scattered fractures or cracks rather than a definable poo Where there is a geologic feature underlying the chalk that causes it to be fractured more than normal, probabilities of a successful well increase. Horizontal drilling increases this probability because once the drill enters the chalk it is turned to travel laterally through this geologic formation to intercept multiple cracks. A w drilled vertically would have a chance of hitting only the single fracture lying directly below the surface locati instead of encountering the series of fractures lying parallel to each other.

As these economically successful wells were being brought into production in the southern Austin Chalk fiel geologists and petroleum landmen began searching for other areas where similar successes could be realize Beginning about April of 1990 one area of interest focused on the southern part of Sabine county including the

been approved. On the Angelina National Forest there are three oil and gas producing Tana Oil Company site And on the Tenaha Ranger District there are two gas producing Union Pacific Railroad Company (UPRC) site Along with existing U.S. and private leases which were being bought and sold there were thousands of acres mineral rights, recently reverted to the U.S., which needed to be described properly and run through the new Bure of Land Management (BLM) competitive sale system.

As of April 1, 1994, all of the horizontal wells drilled in the area have been successful. There is some speculati that horizontal drilling has potential for success in the nearby geological Saratoga Chalk formation.

Producing Fields on the National Forests & Grasslands

Brookeland Conglomerate Field

Angelina National Forest - Angelina Ranger District

Horizontal drilling in the Austin Chalk has increased leasing and exploration interest in parts of the Angeli National Forest. The district currently has three producing wells, two permitted future drill locations and four m planned but not yet permitted. The Angelina Ranger District and the Supervisor's Office have responded requests for information about seismic exploration and drilling on private minerals in the far southeastern part the Forest.

This forest has a relatively high percentage of outstanding private minerals or perpetual reservations of t minerals. Also, a relatively high percentage (almost 25 percent) of the total U.S. minerals estate underlies t proclaimed wilderness areas and will remain unavailable for leasing and exploration. Most of the available U.S. and gas rights are either under lease or the forest service has consented to lease and the areas are awaiti competitive sale. Future exploration activity depends on the outcome of any new wildcats using the n technologies, and/or economic forces. Future oil and gas wells would probably be horizontal wells drilled wildcats or within the Brookeland Field.

Sabine National Forest - Yellowpine Ranger District

At the very southern end of the Yellowpine Ranger District is the Brookeland Field. Maersk Energy has drill three horizontal wells into the Austin Chalk formation. They also have another half dozen wells permitted but drilled. Union Pacific Resource Corporation has bought Maersk's interest and the permitted wells will be dril within a short amount of time. Also on the southern portion of the Yellowpine Ranger District Petro-Hunt Co had a horizontal well that was just plugged in 1994. While the well was a decent producer Petro-Hunt had to p too much for the lease and too much out in royalties to make a profit. The beginning production for the we drilled into the Austin-Chalk formation produce an average of 600 to 800 barrels of oil and approximately 2- mcf of gas daily. The highest levels are encountered within the first six months with production taper throughout that time. Toward the end of the life of an Austin-Chalk well it will produce about 30 to 50 barrels oil. Depending on the lease hold and economics of the operation it is likely that the life of a well could prolonged as a stripper if gas can still be economical to produce. It is anticipated that more wells will be drilled the Brookeland Field by horizontal drilling. Presently, there are four interested operators that plan on drilli within the southern part of the Yellowpine Ranger District.

An intense interest in leasing reverted U.S. minerals resulted from this success. One U.S. parcel of 1,042 acres this area received a bid of $540 per acre at a Bureau of Land Management (BLM) sale for a total bid premium the parcel of $562,680. Currently, there are approximately three wells completed, a half dozen or so permitted, a another half dozen planned. It is estimated that a little less than half of these wells will be drilled on U.S. leases the field with the balance being on private leases.

Since the Austin Chalk, (as well as other formations which might be better exploited by horizontal drillir underlies other portions of the Sabine National Forest, increased exploration and development using this technolc may be expected.

Laura Lavelle Field

Davy Crockett National Forest - Trinity Ranger District

Oil and gas development has been occurring in the Laura Lavelle field in the western part of the Trinity Rang District since the early 80's. Mobil Oil is the original lease holder and operator. After a few test wells Mo farmed out parts of their leases to smaller operators such as PAM Petroleum, Goldking, DeNovo, Internatior Operating Services, Valley and Lomak. These operators, particularly PAM, were successful in developing t field of about 40 wells on U.S. leases and more on adjacent private land. The wells are generally located along fault structure which is oriented in a west, south west/east, north east (WSW-ENE) line in the very western part the Trinity Ranger District. The wells typically produce in the range of 10 to 20 barrels of oil/day and also produ quite a bit of water. At the present time this produced water is not particularly briny. There were two other areas oil/gas exploration activity on the Forest. Three exploratory wells were drilled to a Total Depth (TD) of just o 9,000 feet on private mineral estate in what was called the Apple Springs (Buda) field in 1978. These wells w completed for gas but almost immediately the original operator ran into market problems and subsequent operat had no better luck. The wells were eventually plugged and abandoned.

Glen Rose/Petit Formations

Davy Crockett National Forest - Neches Ranger District

On the Neches Ranger District two wildcat wells came up dry in the eastern portion of the district in 1984. T production on the Neches is from fairly shallow zones (Carrizo and Wilcox sands, 1600-1700 feet). Odyss Federal Inc. is currently drilling a well into the Petit formation. Strago Petroleum Corporation has a proposed w to be drilled into the Glen Rose formation. There have been a couple of successful wells completed just outside the Davy Crockett National Forest in the far northwestern sector of the Neches Ranger District. The operator a has recently acquired U.S. leases on adjacent Federal minerals. This operator has made preliminary contacts w the district regarding his intention to drill at least two wells on U.S. minerals.

Saratoga Annona Field

Sabine National Forest - Yellowpine Ranger District

On the Yellowpine Ranger District in Sabine County, there remain six producing or producible wells on priv minerals in the Hemphill field. These wells are marginal oil or gas wells. They have been completed to produ from various depths, and the present operator has expressed an interest in trying to re-complete or off-set from the wells using horizontal technology.

East Bridges Field

Sabine National Forest - Tenaha Ranger District

Oil and gas exploration and development drilling on the Tenaha Ranger District has been sporadic over the past years. Most of the activity has been associated with attempts to produce gas from either the Fredericksberg Lime

because the market price is too low to pay for a pipeline. Union Pacific Railroad Corporation currently h horizontal wells into the E. Bridges Field that have an approximate total depth of 10,000 feet and produce gas.

Center Field

Sabine National Forest - Tenaha Ranger District

There is also a vertical well drilled by Winston into the Center Field (Saratoga Formation). The Tenaha Rang District has a a total of eight producing Federal wells. Other producing fields include Center, Huxley, and Earn Hill.

Coldsprings/Coline/Mercy

Sam Houston National Forest - San Jacinto Ranger District

Oil and gas activity on this National Forest has been limited to reworking of old wells on private minerals with occasional development well or wildcat well being drilled. In this area, the target is for natural gas. There ha been no wells drilled on Federal leases on this Forest in the last six years. This lack of U.S. drilling can attributed to the fact that, until 1985, most of the mineral estate was privately owned. Additional mineral rig reverted to the U.S. in 1990.

On the San Jacinto Ranger District, there are two fields which were first developed prior to U.S. acquisition of surface in the late thirties. The Mercy Oil Field in the southern end may have had as many as 30 oil we producing at one time from the Wilcox and Yegua formations at depths of about 8,000 to 9,000 feet. These we have watered out over the years, and the remaining eight producing oil wells in this field within the for boundaries are now classified as ``strippers." Generally, this means that they produce less than 15 barrels of oi day (when they actually can pump). They also produce a lot of very salty water with each barrel of oil. The ratio salt water to oil can be as high as 20 to 1. The Coline field is situated about 12 miles north of the Mercy field n Coldspring, Texas. There are eight wells producing on private minerals-Forest Service surface in this field. Th are approximately an additional half dozen producing wells located adjacent to Forest Service land. Depending the zone from which the operator produces some of the rock formations produce only oil while others produce o natural gas. The last development well on U.S. surface in this field was drilled in 1988.

The wildcat wells that have been drilled in this area were vertically drilled to total depths (TDs) of 11,800 a 12,400 feet by Royal Oil and Gas Corp. There are also two vertical wells that are drilled by Famcor Oil and C into the Coldsprings field that have total depths of approximately 12,500 feet.

Morgas/Moroil/Morian

Sam Houston National Forest - Raven Ranger District

On the Raven Ranger District in Walker County, there are three oil fields within U.S. Forest Service boundar which are still producing. These wells are all on private mineral estate. Thornberry Oil and Gas has four Fede mineral interest wells that were vertically drilled and produce either oil or gas.

The Morgas/Moroil field has seven very marginally producing gas wells and one oil well. The Waverly field h one stripper oil well.

are also located on private minerals within the forest surface ownership.

The last exploratory well drilled on this district was P&A'ed as a dry hole in 1986. There has been some ne exploratory drilling on private lands adjacent to where the Raven and San Jacinto Districts meet in the north part the forest.

Boonsville Conglomerate Field

LBJ National Grasslands

Oil and gas activity is widespread on the LBJ and production is from two fields which are in the same area. Th are over 60 producing wells now located on U.S. minerals. The majority of these wells were producing for priv mineral owners until roughly 1987. At this time, mineral reservations in the numerous acquisition deeds began expire. In contrast to the reservation language used in the National Forest deeds, the Grassland deeds required minerals to revert to the U.S. even if production was occurring.

Oil is produced in the Alvord South-Caddo Conglomerate (ASCC) Field (5,000 to 7,000 feet) and the Bryson Sa (3,000 feet). The wells not involved in the ASCC Unit are strippers. A major portion of the ASCC unitized fiel undergoing secondary (waterflood) recovery and, beginning a couple of years ago, tertiary recovery. Mitch Energy, the major operator, had constructed a carbon dioxide injection plant in the field which was a key part of tertiary production activity; however, Mitchell is no longer using the tertiary recovery method. These recove systems call for most of the wells to be alternately switched from producing to injection wells.

The most recent drilling activity is in the Boonesville (Bend Conglomerate) at depths of 6,000 to 8,000 feet for g In the LBJ area, approximately 75 percent of production from this field is gas. The most recent completion in t field on U.S. minerals was the Mitchell Energy's Gage Brothers ``A" {\tt #}5. This well is reportedly capable producing 8MMcf of gas/day. Mitchell has plans to drill more development wells in this field. Even though market is very poor nationwide for gas development activities, Mitchell evidently has a favorable local mark There is a possibility that Mitchell and some other operators in the area will try using the new horizontal drill technology in Barnett Shale formation at depths of 7,000 to 8,000 feet.

EXHIBIT 1 - WELL ACTIVITY ON THE NFGT - FY 84 THRU FY 93 MUST BE REVIEWED HARD CO IN YOUR EIS.

To develop an unconstrained reasonably foreseeable development (RFD) scenario, it is necessary to deal with uncertainties by making assumptions. The assumptions must be reasonable, supportable, and based on best pres knowledge. The basic assumption used in coming up with this RFD is that the price of oil/gas will not increase decrease appreciably from what it has been over the past several years. Consequently, the current level of drill activity will be expected to continue at the same rate for the duration of this planning period. Should the price oil rise to $20/barrel or higher, more wells would be drilled than this RFD predicts. If the price drops bel $10/barrel, drilling in the forest would essentially cease.

The power of Organization of Petroleum Exporting Countries (OPEC) to arbitrarily raise oil prices is very we For the last few years, the countries making up this cartel have failed to cut back oil production even though organization votes to do so. Additionally, non-OPEC countries (e.g., England, Norway, Canada) have stepped their petroleum production to the point that there is a surplus of oil on the world market that will not soon be u

technology and is adding more to the world petroleum market.

It must first be understood that any decision by the Forest Service to lease or not lease Federal minerals usually v NOT affect the location or rate of drilling or development of the private minerals within or near the boundaries the National Forest System lands. Thus, most of what is reasonably foreseeable oil and gas exploration a development in this portion of Texas will occur regardless of what leasing decisions the Forest Service does or d not make at this time because there is so much private mineral estate both within and adjacent to the for boundaries. If the Federal minerals are not available to drill on, the companies would have private mineral rights develop. In fact the presence of unleased Federal acreage within or near areas of discovery and/or development

may encourage some private mineral owners or their lessees to drill near, and drain, the federal acreage before can be leased and developed.

Situation

Crude Oil

Crude oil pricing is critical to future oil and gas development. Since 1979, year to year price movements have be as high as 43 percent upward and 50 percent downward. The most recent long-range projections published by Department of Energy and Energy Information Administration (DOE/EIA) were developed prior to the Ir invasion of Kuwait. The Annual Outlook for Oil and Gas 1990, published in early 1990, projected crude oil pr increases by the year 2000 in base, low, and high scenarios (Table 3). Other independent forecasts developed DRI/McGraw-Hill, the Gas Research Institute, and the American Gas Association also predicted rapidly increasi oil prices after 1990 as non-OPEC crude production peaks and slowly declines. What has happened, however, that added production by OPEC and non-OPEC nations has kept the world market inundated with available oil a world oil usage has not increased appreciably. This has resulted in oil prices dropping to 20 year lows. For cru oil prices to rise to the $20/barrel level, a major disruption in Middle East production must take place or wo demand must consistently increase. Neither of these are likely to happen in the near future.

Table 3. World Crude Oil Prices and Gross National Produce Assumptions
1988-2010

Assumptions	**1988**	**1989**	**1995**	**2000**	**2005**
World Crude Oil Price					
(1989 dollars per barrel)					
Base	15.27	18.07	20.40	27.80	32.90
Low Price	15.27	18.07	14.30	19.80	23.90
High Price	15.27	18.07	25.90	33.90	41.90
Gross National Product					
(Billion 1982 dollars)					
Base	4,024	4,142	4,783	5,392	6,066
Low Growth	4,024	4,142	4,585	5,088	5,654
High Growth	4,024	4,142	4,985	5,697	6,514

Source: Annual Outlook for Oil and Gas 1990

Economic Growth

economies rate of growth as measured by changes in the gross national product. Table 3 displays the gross national product assumptions for the base, low, and high scenario projections. The base case economic growth projections assume an annual growth rate of 2.4 percent per year. Under the low and high growth assumptions, the economy grows at annual rates of

approximately 2.0 and 2.8 percent, respectively. In general, the greater the increase in the gross national product, the higher the demand will be for all energy.

Demand

U.S. petroleum demand is another primary factor that influences oil production. As indicated above it is clearly linked to economic growth, but other factors such as price and environmental and national security issues will also affect demand. The U.S. has the most stringent environmental rules regarding petroleum production in the world, and development from Federal lands is constrained even more than from private lands. This tends to make oil companies look overseas for spending on exploration and development. Within the United States, development would likely occur on private lands prior to taking place on federal lands.

Lower world oil prices result in increased domestic demand but reduced domestic production. And oil prices are and have been at 20-year lows for the past few years. Consequently, demand is met by increased imports. In 1993, the U.S. imported 48 percent of its total oil needs, the highest percentage ever in the history of the nation. Conversely, when world oil prices are high, domestic production is stimulated, but domestic demand is reduced.

Environmental and national security issues may also stimulate conservation and use of alternative fuels. The DOE/EIA has included some growth in the demand for nonrenewable energy forms in the forecasts presented in the Annual Energy Outlook 1990. However, the forecasts do not attempt to specifically quantify environmental concerns or address new policy initiatives.

Historically, demand has been measured by consumption patterns (as product supplied); forecasts are made with the same methodology. Consumption has increased since the early 1980s, although less dramatically than during the 1970s. As forecast by the DOE/EIA in the Annual Outlook for Oil and Gas 1990, petroleum consumption is projected to increase moderately from 17.2 million barrels per day in 1989 to 18.8 million barrels per day in the year 2000 under the base price scenario. Product demand will be higher under a low price scenario than under a high price scenario, but in all cases there are some increases.

It is important to point out that despite predicted growth in demand and predicted continued reliance on petroleum as the principal source of energy for the U.S., use of petroleum is projected to decline in relation to other energy sources. In 1993, petroleum accounted for about 42 percent of the U.S. energy market. By 2010, it is projected to make up about 39 percent according to the Annual Outlook for Oil and Gas 1990. This is a continuation of a present trend; in 1978 petroleum accounted for 49 percent of the U.S. energy market.

Petroleum Imports

Petroleum imports to the U.S. have been increasing in the past and this trend is projected to continue over the next ten years. Petroleum imports in 1993 were about 8.5 million barrels of oil/day which represents an all time high. The concerns about the dependency on foreign oil are

within this planning period.

Domestic Production

Despite forecasts of higher prices and increased demand, domestic production was predicted to decline according to the DOE/EIA Annual Outlook for Oil and Gas 1990. (see Table 4). Price is

the most important factor affecting U.S. production. As current oil/gas fields are being produced and depleted, new fields are not being discovered to make up the difference. This is because the low oil prices do not make it economical to explore for and develop new fields due to the current cost of labor, equipment, and environmental constraints. Yet even the high price scenario through the year 2010 (as projected in the Annual Energy Outlook 1990) indicate lower U.S. production. Under that scenario, prices are expected to go as high as $47.40 per barrel by 2010, but domestic production is projected to decline. The graph `Total U.S. Crude Production 1970-2010' illustrates a production decline under all projected pricing scenarios developed by the DOE/EIA in 1990.

Table 4. Crude Oil and Natural Gas Production, 1988 - 2010, Base Case

Production	**1988**	**1989**	**1995**	**2000**	**2005**	**2010**
Crude Oil **(**million BPD**)**						
Lower-48 Onshore	5.07	4.74	4.10	3.91	3.66	3.36
Lower-48 Offshore	1.05	1.02	0.97	1.01	1.08	1.03
Alaska	2.02	1.87	1.28	0.96	0.65	0.46
Total Crude Oil	8.14	7.63	6.34	5.88	5.39	4.85
Natural Gas (trillion CF**)**						
Lower-48 Onshore						
Nonassociated						
Conventional	8.56	8.70	10.21	11.96	11.26	9.85
Unconventional	1.03	1.22	2.12	2.70	3.28	3.62
Associated-Dissolved	2.26	1.97	1.75	1.70	1.59	1.48
Lower-48 Offshore	4.79	4.80	4.46	3.86	3.41	3.27
Alaska	0.36	0.34	0.40	0.40	0.82	1.66
Total Natural Gas	16.99	17.03	18.95	20.62	20.37	19.88

[1] Having recoverable quantities of at least l million barrels of oil and natural gas liquids or more than 6 billic cubic feet of gas.
Source: Annual Outlook for Oil and Gas 1990

Natural Gas

Natural gas production which had been declining since 1973 has increased since 1986. This upward trend expected to continue into the next century, especially since the Clinton administration is emphasizing the use natural gas as a clean, environmentally preferred fuel. Table 4 indicates recent historical information f production, consumption, and price, and forecasts that data through the year 2010. Both domestic productic and imported natural gas are anticipated to increase substantially over the next ten years. Domestic productic is projected to increase from an estimated 17 trillion cubic feet in 1989 to a level greater than 24 trillion cub

feet at the wellhead to $3.23 per thousand cubic feet in 2000, an average annual increase of 8 percent under t DOE/EIA base case scenario. The rise in natural gas prices is attributable to the depletion of natural ga reserves combined with an increased demand for gas. The price rise in the forecast is less than the 14 perce average annual real increase in wellhead prices of gas from 1975 to 1984. Canadian natural gas imports a assumed to be priced competitively with U.S. production throughout the forecast period.

Assumptions Carried Forward - Economic Factors

1. World oil prices will remain relatively stable in the $12-$15/barrel range over the next decade. Any increase world demand will be absorbed by the new production coming on line in both OPEC and non-OP countries.

2. Short-term fluctuations in oil prices are unlikely to turn around the downward domestic production trends o the next 10 years.

3. Any new legislative or regulatory requirements related to oil exploration, development, processing, a consumption imposed in the next decade will have a negative effect on development in the National Fore in Texas.

4. Natural gas prices will increase in accordance with the DOE/EIA base case scenario. National price increases 8 percent per year do not exceed previous peak periods. Consequently it is projected that without higl price increases or other external factors, gas exploration will continue in the same manner.

Historical Activity

There is presently oil and gas leasing on the NFGT. On September 30, 1981 there were 202,960 total acres un lease; on December 4, 1986 there were 208,464 total acres under lease; and on May 5, 1991 there were 199,9 total acres under lease within the NFGT. Therefore, in the last 10 years there have been approximately 200,0 acres of lands consistently under lease for oil and gas within the NFGT. In April of 1994, there were 283,8 acres leased on both the forests and grasslands. Of this total approximately 21,632 acres are held by producti (hbp).

At present, approximately 7,069 acres within the LBJ and Caddo National Grasslands are under lease for oil a gas. Of this total approximately 1,136 acres are hbp on the LBJ. Much of the mineral acreage within the L Grasslands which has active oil and gas development has been private minerals which have just recently reverted Federal ownership. Those minerals have been leased for the continuation of existing oil and gas production and conduct any additional drilling and production activities which may be essential for the conservation and protecti of the federal mineral resource.

The following is a listing of the number of new leases issued on the NFGT by fiscal year (FY) for the last fo years:

FY 1990	33
FY 1991	47
FY 1992	61

Drilling

There has been extensive exploratory and development (in-fill) drilling for oil and gas resources prior to and sir the tracts of land comprising the NFGT were acquired and up to the termination of the privately-owned mine reservations. The following is a listing of the number of oil and gas wells drilled on private and U.S. mine estates by FY since 1984:

FY 1984	31
FY 1985	36
FY 1986	11
FY 1987	16
FY 1988	8
FY 1989	7
FY 1990	11
FY 1991	6
FY 1992	7
FY 1993	13

Producing Wells

The total number of oil and gas wells producing from private and U.S. minerals within the administrati boundaries of the NFGT has been fairly consistent, as the following list indicates:

FY 1984	139
FY 1985	138
FY 1986	134
FY 1987	125
FY 1988	134
FY 1989	130
FY 1990	138
FY 1991	139
FY 1992	140
FY 1993	139

Although the total number of producing wells has remained fairly constant since FY 1984, the number of U producing wells has increased while the number of private wells has decreased. This is due to the mine reversions which are occurring on the NFGT. Also, while new wells are being drilled and put into producti wells that are marginal producers or are environmental hazards are being plugged and abandoned.

Unconstrained Reasonably Foreseeable Development (RFD) Scenario

Based upon an analysis of the data listed on EIS-Chapter III, it is possible to reasonably forecast some explorati and development trends for the specific National Grasslands and Forests of Texas over the next 10 years. Using last four years activity (during which the petroleum prices and operational constraints are expected to remain fai constant), below is the anticipated reasonably foreseeable development by forest and Ranger District. By sayi

wells anticipated.

Location	Producing Wells/Yr		Dry Holes/Yr	
	U.S.	**Private**	**U.S.**	**Private**
Brookeland Field				
Angelina RD	1	1	0	0
Yellowpine RD	2	0	1	0
Laura Lavelle Field				
Trinity RD	2	0	0	0
Glen Rose/Petit Formation				
Neches RD	1	0	0	0
Saratoga Annona Field				
Yellowpine RD	0	1	0	1
East Bridges Field				
Tenaha RD	1	0	0	0
Center Field				
Tenaha RD	0	0	1	0
Coldsprings/Coline/Mercy				
San Jacinto RD	0	1	0	0
Boonsville Conglomerate Field				
LBJ National Grasslands	1	0	0	0
Average distribution would be:	8	3	2	1

Also estimated are two wildcats: one vertical and one horizontal for a total of 16 wells and producers.

Reasonably Foreseeable Development (RFD) For Each Known Field

Brookeland Field -

Angelina Ranger District - It is expected that 1 producing well/year will be drilled on Federal leases within the Brookeland Field. The average length of new access road is 0.06 miles or 0.23 acres. The well pad needed for a wildcat or Austin-Chalk well has in the past averaged 4.13 acres. After the production is established and the unneeded portion of the drill site is reclaimed, the area of unreclaimed disturbance ranges from 2.0 acres for the federal sites and up to 4.0 acres for the private sites.

Yellowpine Ranger District - It is expected in the RFD that 3 wells/year will be drilled on Federal leases within this field. One of the three wells drilled per year will be a dry hole. These wells are horizontal and have an average depth of 8,770 feet. Because these wells are deep and permitteed for two wells per site, the area disturbed for the drill pad will be larger by an average of 8.2 acres. The access road length would be about 0.06 miles or 0.23 acres. The total area initially disturbed for 30 wellsites over the next ten years would be approximately 252.9 acres. Since ten of the wells would be dry holes, they would be reclaimed and the acres reduced by that amount while the smaller area needed for producing wells brings the ultimate surface area of disturbance down to approximately 86.6 acres/year.

Laura Lavelle Field -

Trinity Ranger District - The RFD foresees 2 wells/year being drilled and that both will be producers. These will likely be in the Laura Lavelle Field and the average length of road is 0.33 miles or 1.28 acres. The average depth to the target formation is 1,800 feet and a drill pad of approximately 0.55 acres would be needed to accommodate a rig that size. The expected total surface disturbance would be 3.66 acres/year initially. However, after production is established, only about half of the original drill pad is needed for the well head and production facilities. Thus, the area of surface disturbance minus the reclaimed areas totals 3.11 acres/year.

Glen Rose/Petit Formation -

Neches Ranger District - It is expected that 1 producing well/year will be drilled on Federal leases, and it will likely be in the Petit or the Glen Rose Formation. The average length of new access road is 0.09 miles or 0.35 acres. The well pad needed for this size rig ranges from 3.0 acres to

about 6.5 acres with the average in the past being 3.67 acres. After the production is established and the unneeded portion of the drill site is reclaimed, the area of unreclaimed disturbance ranges from 1.85 acres for the smaller sites and up to 3.6 acres for the larger sites with the average in the past being 2.19 acres/year.

Saratoga Annona Field -

Yellowpine Ranger District - It is expected in the RFD that 2 wells/year will be drilled on private minerals and one will be a dry hole. The wells are vertical and the area disturbed for the drill pad averages 5.3 acres. The access road length would be about 0.08 acres. The total area initially disturbed for twenty wellsites over the next ten years would be approximately 107.6 acres. Since 10 of the wells would be dry holes, they would be reclaimed and the acres reduced by 80.3 acres while the area needed for producing wells is reduced to 27.3 acres.

East Bridges Field -

Tenaha Ranger District - The RFD anticipates that 1 producing well/year will be drilled in Federal minerals. The well is a horizontal well with an average depth of 8,450 feet which will require a drill pad of approximately 4.88 acres with an average road length of 0.05 miles (0.19 acres). Initial surface disturbance is expected to be 50.70 acres over the next ten years. The area for the producing Federal well would be reduced after reclamation to 26.30 acres for production.

Center Field -

Tenaha Ranger District - The RFD anticipates that 1 dry hole/year will be drilled in Federal minerals. The well is a vertical well with an average well depth of 2,627 feet which will need a drill pad about 1.26 acres and an average new road length of 0.06 miles (0.23 acres). Initial surface disturbance is expected to be 14.90 acres over the next ten years. Since all of the wells are expected to be dry holes they will be completely reclaimed.

Coldsprings/Coline/Mercy Field -

San Jacinto Ranger District - The RFD foresees one producing well/year being drilled on private lands within the Forest. The average length of new road is 0.21 miles (0.8 acres) and the depth to

acres which tends to be larger on private minerals than on Federal lands. The initial disturbance expected over the next ten years is about 32.0 acres. Once production is established, the surface of the drill pad is partially reclaimed and reduces to about 20.0 acres for the next ten years.

Boonsville Conglomerate Field -

LBJ Grasslands - It is expected that 1 producing well/year will be drilled on Federal leases, and it will likely be in the Boonsville field. The average length of new access road is 0.11 miles or 0.43 acres. The target formation is Fan Delta Sandstone Conglomerate which lies 6,700 feet below the surface. The well pad needed for this size rig ranges from 1.0 acre to 4.0 acres with the average in the past being 1.8 acres. The initial disturbance anticipated is about 22.3 acres. After the production is established and the unneeded portion of the drill site is reclaimed, then the area of unreclaimed disturbance equals about 13.3 acres over the next ten years.

The composite amount of new disturbance for unreclaimed roads and drill pads over the next ten years will be 27.27 acres. However, the total net surface disturbance associated with oil/gas development will show a net decrease as the formerly producing wells cease economic production,

are plugged and abandoned, and the sites rehabilitated. As of 1993, the forest had 139 producing wells, and many of these are marginally profitable. A large number of them will be P&A'd as the petroleum bearing trap/structure is depleted or the costs of operating the well becomes too great. Also, while initial disturbance occurs from new sites being created the overall negative environmental effects will be minimal with the mitigating measures and stipulations that are required of the operators.

There are positive economic impacts resulting from well drilling activities. Lessees/operators usually contract locally for road and drill pad construction. They purchase food, fuel, lodging and other supplies from local sources and may subcontract certain parts of the operation to local well servicing companies. Most of the salaries paid the workers is spent in the local area. Laborers for construction, operation, and maintenance of the proposed wells and pipelines would be recruited from the local area. The Bureau of Land Management has estimated that the average rig hand generates $200/day to the local community for salary spent and supplies/services purchased. A typical well drilling operation will have an average of 20 workers which would translate into about $4,000/day spent in the local area. Since the average East Texas well takes 3 weeks to drill, this would mean that some $84,000 per well goes into the local economy. Additionally, there is a multiplier effect so that additional jobs are created in the non-oil/gas section because of the money generated from oil/gas development. Still another economic benefit from the industry are the taxes (sales/franchise) it pays to the local, State, and Federal coffers.

Other money generated comes from lease bonus bids, rentals, and production royalties. The State of Texas receives 25 percent of all Federal revenues received from oil/gas activities. In Fiscal Year 1993, the Minerals Management Service, U.S. Department of Interior, recorded that 295,954.14 barrels of oil were produced from Federal leases on the Texas National Forests having a value of $5,390,500.38. Another 2.23 trillion cubic feet of natural gas came from these leases with a value of $3,339,800.57. This totals to $8,730,300.95 and the Federal royalty (12.5 percent) amounted to just under $1.1 million. According to the charts for "Well Activity on the NFGL - 1984-1993", there were 102 wells producing oil/gas on Federal leases in 1993. The average value of production from each well was $85,600. Combined with the local economic benefits, each producing well can be expected to generate about $170,000 during it 1st year in operation.

In the next 10 years, it is likely that new geophysical techniques will be perfected that will allow better interpretation and delineation of petroleum bearing structures. Also, new geological theories on where oil/gas traps may be found could emerge to indicate new areas for exploratory drilling outside of currently producing fields. An example of this can be found in drilling off the Gulf Coast. A company decided to test the idea that there may be oil and gas deposits to be found beneath this salt layer, and a recently completed well has confirmed this to be so.

In the next 10 years in which this may occur, the following description is, by necessary, fairly generic. Some of the assumptions used in constructing this development scenario are: there will be two fields containing one well each/year; one field will be drilled using horizontal drilling technology; the other will involve vertical drilling; and sixteen of the twenty wells will produce economic quantities of oil and gas (8 of the 10 wells in each field). Consequently, this scenario envisions an average of two well (one horizontal and one vertical) drilled per year during the next 10 years.

Drilling Process and Associated Impacts

The combined surface disturbance associated with horizontally drilled locations average about 7.5 acres of area cleared and graded. For vertically drilled wells, the pad/reserve pit area is much smaller, approximately 1.5 acres. Access roads to the drill pad locations are approximately 30 feet wide The average length of new access road expected to be constructed is about 0.3 miles.

Drilling a horizontal well takes anywhere from four to six weeks to drill and complete. Vertical wells take somewhat less time, about one to three weeks.

Mud will be used as the circulating medium. Mud pumps would be needed to force mud down the drillpipe, thereby forcing the rock cuttings out of the wellbore, through the shale shaker, and into the reserve pit. The fluid is then recirculated back through the drillstem to repeat the process. Water used to make the mud would normally be obtained from a water well drilled on site, but it could be pumped to the drill pad from a nearby pond, lake, or stream through a pipe laid on the surface.

For producing wells, pipelines/flowlines will need to be constructed to transport the oil/gas from the well head to storage and distribution points. For the most part, these are buried in the access road right-of-way and must comply with the Federal Safety Standard for Gaslines, 49 CFR, Title 192. About 0.25 acres of new disturbance result per each new well drilled.

There are a number of environmental impacts, both adverse and beneficial, which can reasonably be expected to occur during the drilling of a well. As a result, each lease has a list of stipulations which requires the lessee/operator to avoid and/or mitigate any adverse impacts to surface resource values. The environmental analysis written as a result of the proposed application for permit to drill (APD) requires additional, site specific mitigating measures the driller must meet in order to address local resource impacts. Many of the Forest Plan standards and guidelines preclude locations where drilling could take place, for example, red-cockaded woodpecker (RCW) cluster sites and riparian zones.

The Forest Service has the authority to relocate the drilling site anywhere within 200 meters (656 feet) of the originally proposed location. This helps to mitigate most concerns regarding visual sensitivity, steep slopes, unstable soils, and sensitive species. Seasonal drilling restrictions also serve to alleviate resource concerns, especially with regard to seasonally wet areas and animal species mating/nesting/hatching times. The normal process of saving and stockpiling topsoil to be used in reclaiming part (if a producer) or all (if the well is a dry hole) lessens the concern about erosion and sedimentation.

Positive economic impacts resulting from the drilling include wages paid to the workers, a portion of which is spent in the local communities for food, lodging and recreation. The drilling company infuses money into the local area by contracting out services. The counties will receive 25 percent of all royalties derived from the production of oil/gas in addition to the taxes paid by the company and its personnel. See the previous section on the dollar value associated with the drilling of a well for specific amounts.

General Impacts of Projected Future Development

This section describes the cumulative impacts of the anticipated oil and gas development in wildcat areas (places where there are no current or past fields) within the forest on Federally owned mineral rights during the life of this Forest Plan. The following assumptions were used in this analysis:

Since Texas is a mature oil and gas producing province which has been extensively drilled and produced we expect two wildcat plays to develop in the next ten years. One will be drilled horizontally and one will be drilled vertically. Of those drilled, 2 of the horizontal and 2 of the vertical will be plugged and abandoned because they are either dry or not economical to produce. We predict 10 wells will be drilled horizontally and 10 will be drilled vertically over the next ten years. On average, the amount of surface disturbance associated with horizontal wells is 7.5 acres and the amount of surface disturbance associated with vertical wells is 1.5 acres. Water required for the circulating medium will be obtained from a nearby pond, lake or stream near the area or from a water well drilled on site. Flowlines and pipelines used to transport the oil and gas are usually buried adjacent to the road right-of-way. The horizontal wildcat wells will, in all likelihood, be drilled to test new areas in the Brookeland field Austin-Chalk. In that regard the impacts will likely be similar to those associated with the Brookeland field on the Angelina and Yellowpine Ranger Districts. The vertical wells will, in all likelihood, be deep wells, over 10,000 feet; and have impacts similar to those listed for the Neches Ranger District.

Over the 10-year life of the Forest Plan, an initial surface disturbance from drilling oil/gas wells outside of the currently producing areas would total some 90 acres or 9.0 acres per year. Assuming that two horizontal and two vertical wells will be non-producers and their associated road and drill pad is re-claimed, the total unreclaimed disturbance narrows back 72 acres. Additionally, once production is established, the size of the drill pad needed for production operations is less than that required for drilling the well. This will reduce the unreclaimed surface disturbance by another 34-36 acres overall. The average disturbance would then become 36-38 acres over the next ten years.

Part II - Leasable Energy Minerals

Standard Operating Procedures

This section describes the current standard operating procedures for oil and gas leasing and development on t National Forests and Grasslands in Texas. It is included to provide the reader a better understanding of some of standard methods and practices used to protect the environment during leasing and development phases. T contents should be viewed as a general overview and not as a detailed statement of all of the standards a procedures. Such details are appropriately contained in various Federal Onshore Oil and Gas Orders a Regulations.

Oil and gas rights on acquired lands are subject to leasing and development under the Mineral Leasing Act Acquired Lands of August 7, 1947, as amended (30 U.S.C. 351-359)

The Federal Onshore Oil and Gas Leasing Reform Act of 1987 requires that all federal oil and gas leases be subj to competitive bidding. Sales are held quarterly by the Bureau of Land Management (BLM), New Mexico St Office (NMSO) and include eligible lands in the NFGT which have received nominations from either industry, public, or the Forest Service. The leasing procedure begins with the BLM receiving expressions of interest specified lands. They send these to the Forest Service Regional Office along with a listing of expired/termina leases and ask for consent to lease the nominated tract(s). The Regional Office forwards this listing to the NF for their recommendation on the consent to lease decision and for any lease development stipulations.

Standard Lease Terms and Conditions

Federal oil and gas leases include standard lease terms, most of which are designed to protect surface resourc The standard terms are found on the back of the lease form (see Exhibit 1). These stipulations include t following requirements pertaining to environmental protection:

Sec. 6. Conduct of Operations - Lessee shall conduct operations in a manner that minimizes adverse impacts the land, air, and water, to cultural, biological, visual, and other resources, and to accomplish the intent of t section. To the extent consistent with lease rights granted, such measures may include, but are not limited modification to siting or design of facilities, timing of operations, and specification of interim and final reclamati measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leas lands , including the approval of easements or rights-of-ways. Such uses shall be conditioned so as to prev unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may requ inventories or special studies to determine the extent of impacts to other resources. Lessee may be required complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipa environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations t would result in the destruction of such species or objects.

Sec. 7. Mining Operations - To the extent that impacts from mining operations would be substantially different greater than those associated with normal drilling operations, lessor reserves the right to deny approval of su operations.

Sec. 9. Damage to Property - Lessee shall pay lessor for damage to lessor's improvements, and shall save a hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

affected wells in condition for suspension or abandonment, reclaim the land as specified by lessor and withir reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation producible wells.

Leasing Process

The Forest reviews the direction in the Forest Plan for a specific lease proposal and determines if that area available for leasing. A determination is also made as to what, if any, stipulations need to be added to the leasi recommendation. There are three stipulation forms available for attaching to leases: Controlled Surface U Stipulation, No Surface Occupancy Stipulation, and Timing Limitation Stipulation (see Exhibits 2, 3, and 4 Each of these stipulation forms, when used, is completed with the specific stipulation details the limitati locations, etc., as fits the local situation. Exhibit 5 is a list of local stipulation titles currently used to add specific to the stipulation forms referenced above. When special needs, beyond the scope of existing stipulations, a identified for a specific lease proposal the Forest develops additional local stipulations to fit the situation. Exhibi is a sample Notice to Lessee used to highlight a special feature or area that the lessee should be aware of potentially affecting operations. Exhibit 6 shows the types of notices which may be given. The forest th recommends consent to the Regional Office on those lands available for leasing and provides any stipulatic and/or notices to be attached to the lease. The consent and the stipulations are sent to the BLM and are collated a published for the upcoming sale. Forty-five days before the lease auction, a notice of the sale is posted in t Supervisor's Office and at the BLM. At the sale, each lease tract is offered in an auction with oral bidding. T minimum bid is $2.00/acre. Those parcels not receiving the minimum bid will be offered non-competitively (ov the-counter) beginning the day after the auction and will be available for non-competitive leasing for a period two years. The primary term for both competitive and non-competitive leases is ten years. Either type of lease c be extended beyond the primary term by active production of commercial quantities of oil or gas or by acti drilling operations. Unitization or Communitization Agreements with adjacent productive leases can also crea lease extensions without development of the lease surface.

Lease Rights

Once a Federal oil and gas lease is issued, the lessee has the right to explore and develop the petroleum resou subject to the stipulations attached to the lease. However, merely because a lease has been issued does not mea will be developed. Nationwide, only 10 percent of all oil and gas leases issued have ever had any developme occur on them. If an Application for a Permit to Drill a well (APD) is received, the Forest will then do a si specific environmental analysis on it to determine if additional operating stipulations are needed.

A lessee has a right to use the leased lands as necessary to explore for, drill for, mine, extract, remove and dispo of all the leased resources in a leasehold. This is subject to relevant Federal regulations (e.g. 36 CFR 228E, 43 C 3160, etc.), stipulations attached to the lease, restrictions derived from specific, non-discretionary statutes, and su reasonable measures as may be required by the authorized officer to minimize adverse impacts to other resou values, land uses, or users not addressed in the lease stipulations at the time operations are proposed. Su conditions are considered consistent with the lease rights granted provided that they do not require relocation proposed operations by more than 200 meters or require that the operations be sited off the leasehold. Wh measures not included in the lease terms are added to an operational permit, they are included as Conditions Approval (COA's).

Waivers, Exceptions or Modifications

other stipulation. The Forest Service may authorize the BLM to grant the change if: 1) the change is consist with Federal law and the Forest Plan, 2) management objectives which led to the stipulation can be met followi the change, and 3) the environmental impact of the change is acceptable. If the change "substantially modifies" terms of the lease, public notice must be given at least 30 days before the results of an environmental analysis approved (Federal Onshore Oil and Gas Leasing Reform Act of 1987).

Geophysical Exploration - Application

Should the lessee choose to exercise his exploration and development rights, the first logical step would be to loc subsurface hydrocarbon traps and/or structures through the use of geophysical investigations. Seismic explorati lines may be laid out in grid, parallel, or perpendicular arrays over the target area. The operator must contact forest and file an application giving location, timing, and geophysical method (shot-hole, vibroseis, etc.) to be us The forest will analyze the proposed action and issue a seismic exploration permit which includes operat requirements designed to mitigate surface impacts. No fee will be charged if the entire survey is restricted to land leased to the operator. If part of the survey extends onto unleased land, land leased to another party, or la where the U.S. does not own the mineral rights then the forest will charge a fee for that portion of the geophysi investigation off the leasehold. Lessees of Federal oil and gas rights do not have exclusive surface rights geophysical surveys; non-lessees may also do geophysical surveys on lands leased to someone else. A bond m be required to ensure compliance with the permit stipulations.

Geophysical Exploration

An oil and gas lease is not required for geophysical exploration to occur; it may take place prior to or subsequent leasing. Exploration activities may occur across the same area many times and continue over a period of yea Generally, geophysical lines are run on widely spaced intervals and become more narrowed and concentrated smaller geographic areas as the target area is better defined. A separate permit is issued by the forest for ea geophysical request, and it will include specific mitigating measures for public safety warnings, wildlife concer sensitive areas, underground aquifers, property protection (fences, wells, buried utility lines, etc.), and reclamation.

One method of geophysical exploration, vibroseis, uses large trucks equipped with metal plates (occasiona surfaced with wooden boards) which are lowered from beneath each vehicle to the ground. With some or all of weight of the truck resting on the plate, a hydraulic system vibrates the plate which transfers the energy into ground to be picked up by seismic detectors (geophones) arrayed along the line of survey. An instrument tru equipped with a seismograph records the seismic information. From two to eight vibroseis trucks are used tandem. Unless the topography is relatively flat and open, the trucks are restricted to existing roads and trai Little surface resource disturbance occurs with this type of geophysical exploration.

Another way to impart energy into the ground for the seismograph to record is by use of explosives. This can accomplished by setting off charges in a hole, on, or above the surface. Shot-point cluster surveys are the m commonly used method of explosive seismic surveys in Region 8. The most common method in Texas is sin explosions in evenly spaceholes along a more or less straight line. The spacing would generally be 10-20 holes mile of line with depths commonly reaching 50-100 feet. An explosive is placed in each hole and detonated w the resulting shock waves recorded by geophones and passed on to the seismograph. Shot-point cluster uses technique of drilling shallow holes and shooting several small charges simultaneously instead of one large char The holes are drilled to depths of 10 feet or less. An explosive is placed in each hole and detonated with resulting shock waves recorded by geophones and passed on to the seismograph. Shot holes are usually drilled w a vehicle-mounted drill. The seismic exploration equipment commonly used in East Texas includes articulat

capable of crossing most forested terrain in east Texas. They operate in tandem. One carries a hydraulica operated drill and drill pipe and the other carries drilling water, mud, and explosives. In very sensitive are smaller, portable drills are occasionally used and may be carried by ATVs or even back-packed. However, t environmental advantage of the portability of these drills is offset by the need to drill clusters of shot holes to gat the same information as in deep shotholes.

The use of helicopters to ferry people, equipment and materials is a common practice in some areas of the nati due to difficult terrain but is not a practical method of off-road access here. With mitigating measures there is no significant amount of disturbance to warrant this expensive method of transportation in Texas.

Exploration - Drilling

Lands included in issued oil and gas leases may be explored and developed, subject to lease stipulations, additio site-specific environmental analysis and a Forest Plan conformance determination. On the NFGT, most wells m be drilled to depths of 1600 feet or more to intersect the possible target horizons.

The first phase of the operation is construction of the access road. Transporting and setting up a drill rig capable reaching these depths requires an access road sufficient to handle semi-trucks and trailers of heavy equipment an daily traffic of 20-30 vehicles or more. Existing or abandoned roads are upgraded and used as much as possib An average of 0.1 miles of new road is built to support the drilling operation. Surfacing is almost always requir Drainage must be provided for the entire road. Usually this is accomplished by use of drainage ditches a culverts.

The second phase is construction of the well pad and reserve pit. The well pad is needed to set up and operate rig. The dimensions and layout of a well site vary based on the depth of the well, the natural contour of the la and the surface resource values involved. In the planning area, the total well site area varies depending on whet it is a vertical or horizontal well. Vertical wells require less space ranging from less than one acre to 3 1/2 acr Horizontal wells require more surface occupancy and range from 4 to 9 acres. The surface soil material is remov from the construction site and stockpiled. This material is used later for reclamation. The area of the well pad t supports the drilling rig substructure must be level and capable of supporting the rig. Ideally, the rig should located on cut material as opposed to less stable fill material. The site is designed to drain with "rig flui channeled toward the reserve pit while normal runoff from rainwater drains off the location. The pad is slightly

sloped so that rain water drains off the location. Runoff water from off-site areas is diverted away from the w site by ditches, waterbars, or terraces above and below the cut slopes.

Reserve pits are normally a part of a well site and are used for storage or disposal of water, drilling mud, a cuttings. This pit is located in cut material. The reserve pit should be constructed below original ground level prevent failure of the pit dike. The depth of the bottom of the reserve pit is dependent upon the location of cl layers, which if present, are used as a liner. If there is no natural clay layer available, a plastic or bentonite liner used to prevent seepage of the fluids into the soil zones. Dikes around the reserve pit are compacted. In certa soils and in floodplains portable tanks rather that reserve pits are used to store drilling fluids in order to avo undesirable infiltration or high water conditions.

Water for drilling is either hauled or piped to the rig from rivers, creeks, reservoirs, and water wells, or else a wa well is drilled on the well pad. Drilling is accomplished by rotating a bit at the end of the drill string under press or bearing a controlled portion of the drill string weight. Drilling mud (a mix of water and other constituen usually bentonite) or rarely, air, is circulated through the drill string. As the bit cuts into the rock, the cuttings pushed up the hole by the circulating medium (drilling mud or air). In a mud system, the mud is separated from

drilling with air the cuttings are normally blown into the reserve pit. Cuttings, mud, and waste drilling fluids m all be contained in the reserve pit. When total depth of the hole is reached 1) logging, which measures porosi permeability, and saturation of the formation, or 2) drill stem testing, which allows the potential production o formation to be measured, is conducted. This is either accomplished in open or cased holes. Open hole loggi and testing is conducted when there is integrity of the wellbore.

Casing with steel pipe and cementing the pipe in place prevents caving of the hole, seals off other formations, a protects ground water aquifers. If the well is capable of producing commercial quantities of oil and/or g production casing is installed and the casing is perforated to allow oil/gas from the formation to enter it. Sometin the formation has to be stimulated by fluid fracture or acid dissolution to increase the flow capacity of t formation. If producible oil and/or gas is discovered, the well will be shut-in until production facilities installed. If commercial quantities of hydrocarbons are not encountered, the well will be plugged and abandon and the well site reclaimed.

Once the drilling rig is set-up, drilling usually takes place on a 24-hour day, seven days/week basis. In the plann area drilling is usually completed within two days for shallow wells and up to 45 days for horizontal wells or dee conventional wells.

DRILLING - Analysis and Decision Making

Onshore oil and gas operations on Federal minerals are subject to Federal regulations contained in Title 43 C Part 3160. These regulations are administered through the Bureau of Land Management (BLM). Under t Reform Act, the Forest Service is responsible for administration of oil and gas operations as it pertains to surf use on National Forest lands. The regulations pertaining to National Forest System lands are contained in Title CFR 228 Subpart E. The requirements for approval of drilling operations are specifically contained in Onshore and Gas Order No. 1 (43 CFR 3164). Chapter 2, "Procedural Guidelines for Oil ad Gas Operations" of the Oil a Gas Surface Operating Standards for Oil and Gas Exploration and Development summarizes the agenc requirements and regulations. Prior to the approval of any drilling activities on the lease, the operator must obtai permit from BLM. The permitting process begins when the applicant submits either an Application for Permit Drill (APD) or a Notice of Staking (NOS) to the BLM, Tulsa District Office (TDO). An NOS may also be fil with the Forest Service. These two options are available under Order No. 1. Notice of an APD or NOS must posted in the affected Forest Service and BLM offices at least 30 days prior to approval. Upon receipt of either APD or an NOS, an onsite inspection is conducted. The onsite inspection is integral to the environmental analy conducted on the proposed drilling operation.

Onsite Inspection:

On National Forest System lands, the Forest Service coordinates the onsite inspection. Participants would norma include the Forest Service, applicant, earth-work contractor and drilling contractor. The Forest Service participa often include specialists in various disciplines such as engineers, wildlife biologists, archeologists, soil a watershed specialists, etc. Other participants might include BLM and/or other interested parties. The purpose the on-site inspection is to gather and exchange information about the site, discuss alternatives to meet For Service mitigating requirements, and determine what additional information is required for the environmen analysis. The site visit will result in development of site-specific Conditions of Approval (COAs) that will required for approval of the APD.

APD Option:

information on the probable subsurface geologic conditions and includes specific information regarding the drilli testing, casing, and cementing programs. The BLM reviews and approves the drilling plan. The applican proposal for use of the surface is provided in the SUPO. This plan provides a detailed description of the existi roads, proposed access road location and design, location of existing wells, proposed production facilities, wa supply, construction materials, waste disposal, ancillary facilities, well site layout, plans for surface reclamati surface ownership, lessee's or operators representative, and any other additional information that may be helpful processing the APD. The Forest Service must approve the SUPO before the BLM can approve the APD. If application process starts with the filing of an APD, then an onsite inspection is scheduled and the SUPO reviewed onsite. Proof of bond coverage must also be submitted prior to the approval of an APD.

NOS Option:

A NOS (Notice of Staking) is a simple notice that a proposed well site has been staked. It may be filed with eitl the Forest Service or BLM. The NOS satisfies the 30 day posting requirement. It includes general informati concerning the name and address of the operator and the well name and location. It also includes an appropri map. Upon receipt of the NOS, an onsite inspection is conducted. The inspection is the basis for developing site-specific contents of the SUPO contained in the APD which, under this method, is filed after the inspection.

Both the APD and NOS options arrive at the same end point through interdisciplinary participation a development of Conditions of Approval.

The Forest Service and BLM have developed a Memorandum of Understanding describing the agency actions a relationships to each other for the APD processing and approval.

Environmental Review:

Once a complete APD is submitted, the Forest Service, in conjunction with the BLM, will complete environmental analysis of the proposed operation and prepare an appropriate environmental document under National Environmental Policy Act of 1969 (NEPA). The appropriate level of analysis and type of NE documentation will be based on the nature and scope of individual proposals. On existing leases, the lessee has right to explore the leasehold subject to the terms of the lease. The analysis does not determine whether drilli will or will not occur. This allocation was previously made through the Forest Plan or other leasing analysis. Si specific analysis of the drilling proposal determines the environmental consequences of the proposed drilling an reasonable range of alternatives to that proposal, and it is the basis for developing appropriate Conditions Approval relative to resource protection and/or enhancement.

The Forest Service is designated as the lead agency for the environmental analysis of a proposed drilling operati occurring on national forests and is responsible for completion of the NEPA document relative to the surfa resources. BLM completes the document relative to the subsurface resources (geologic hazards, ground water, a other mineral resources), and other surface/subsurface resources that may be impacted due to techni drilling/production operations. Results of public scoping and Forest Service/BLM input are considered in analysis. Mitigating measures to supplement those stated in the lease stipulations are needed and are included the SUPO that becomes part of the Conditions of Approval of the APD.

Upon completion of the NEPA document, the Forest Service will complete a decision document pertaining to approval/disapproval of the SUPO and the BLM will complete a decision document for approval/disapproval of APD. The approved SUPO is sent to the BLM along with the Forest Service consent to approve the APD. Alo

BLM to assure that amount is available prior to issuing the APD approval.

The process of on-site review, environmental analysis, and development of mitigating requirements is handled the affected Ranger District with specialized support and advice available as needed from the Forest Supervisc Office. The District Rangers have been delegated the authority to approve SUPOs and communicate directly w BLM in this process.

DEVELOPMENT

A producing well will usually generate additional drilling to determine the size and extent of the reservo Associated with reservoir or field development are more roads (some upgraded to all-weather travel), util corridors for pipelines and powerlines, and space for storage tanks and separators.

Production Facilities:

If the well is a commercial producer, then a portion of the original site is needed for continued operation and acc for the life of the well (some over 40 years). Areas of the drill site no longer needed for production are reclaim and the site stabilized to prevent soil erosion. If the well is a gas producer, production will then be shut-in waiti for construction of a pipeline into the site, which will often follow the access road corridor. If the well produces or both oil and gas, the oil may be either trucked out or be moved to market through a pipeline. If by pipeline, well may be shut-in until pipeline construction is complete. Producing well sites will normally have a metal p with valves exiting from the well (commonly called a "Christmas tree"), if the well is free-flowing. Free-flow wells are usually gas wells. In a non-flowing well, the petroleum is brought to the surface using artificial (pump) methods. Depending on whether the well is a gas producer only, a gas and oil producer, or an oil produ only, the nature of the production facilities vary. For a gas well, a small tank collects condensates or oily distillat and a gas/liquid separator is installed on the pipeline. With several producing gas wells there will be the need added facilities to produce, treat, and transport the natural gas. From the well, gas would be piped to offs production treatment facilities before being sent to market. Where several oil wells are in close proximity, a sin tank battery may be used to store produced water and oil for removal from the site. Dehydrators and separators used to separate the gas, oil, and water. This facility is typically located on the well pad. Meters are used measure the amount of oil and gas produced before it is put into a transmission pipeline. Any produced wa would be temporarily stored in tanks and must be properly disposed of according to federal and state standards. some cases, the water is removed from the site and disposed of by injecting it down an injection well and into approved formation (subsurface layer of rock) capable of absorbing the fluid.

Either pipelines or trucks may be used to move oil from the production facilities to market. Gas is moved pipeline, sometimes called a trunk line, to the main transmission line from the area. Trunk lines are generally 6 t inches in diameter and are buried, as are transmission lines which vary in diameter from 10 to 36 inches. The a required to construct a pipeline varies depending on size of pipe, topography, and whether existing utility corridc

are used. Normally, gathering and trunk flow lines require from 5 to 30 feet of right-of-way. Larger transmissi lines will require more space for construction.

Well Spacing:

Well spacing depends on the State's regulations and the type of hydrocarbons found, and varies from 10 acres shallow oil wells to 640 acres for gas wells. In additions to spacing, State of Texas rules also serve to prot reservoirs in adjacent leases by governing how far a well must be from the lease (ownership) line.

Based on the exploration well results, a lessee/operator may want to continue development of the field. If the a to be developed is intermingled with private land then wells and other facilities may also be sited on private la Each additional planned well site on U.S. land must be proposed through submittal of an application to the BL Off-lease facilities are always under the sole authority of and permitted by the Forest Service and on-lease facilit other than wells may be authorized by either agency. If the Forest Service permits an on-lease facility in support mineral operations it coordinates with the BLM, and, of course, BLM coordinates with and obtains Forest Serv concurrence when BLM is going to authorize the facility. An environmental analysis is required prior to a decision regarding a proposal of new surface disturbance. All facilities used for production, treatment, a transmission of oil and gas are considered leasehold facilities to the point where the product is sold. This inclu facilities that are off-lease and authorized under an off-lease special use permit. Such facilities include stora tanks and processing facilities, sales facilities, all pipelines upstream from such facilities, and other facilities to production such as water disposal lines and gas or water injection lines. When subsequent operations result in n surface disturbance, the proposal is subject to the same type of environmental review process used prior to drill the first well. The application is reviewed and evaluated by the Forest Service to assess the surface impacts of proposal and appropriate NEPA documentation is prepared. The cumulative impacts of field development would considered in the evaluation and, in some cases, an additional environmental analysis may be needed to assess potential effects of the anticipated field development. This type of analysis would assess the potential effects field development, production activities, and pipelines. If the cumulative impacts of the proposed developm appear to significantly exceed the level as projected in the Forest Plan, then additional planning analysis will required. The environmental analysis typically results in documentation in either an EA or EIS, depending on scope of the proposal.

ABANDONMENT AND RECLAMATION

Well abandonment operations may not be started without prior approval of the BLM. In the case of newly dril dry holes, failures, and emergency situations, oral approval may be obtained from the authorized officer subject written confirmation by application.

Well plugging and abandonment requirements vary with the type of geologic rock formations drilled into, presence of subsurface water, well depth, and other factors. Generally, the area below the surface casing is fil with heavy drilling mud and cement plugs are installed at various points to protect aquifers and known oil and producing formations. A cement plug is installed at the top of the surface casing. A pipe monument (dry h marker) giving the location and name of the well is required unless waived. If waived, the casing may be cut below ground level.

A reclamation plan is included as part of the SUPO of the APD. If the well is a dry hole or commercial producti ceases, then the entire site is restored according to the reclamation plan. Reclamation normally involves contouri of the site, spreading of stockpiled topsoil, and a combination of seeding, mulching, liming, and fertilizing revegetate the site. All surface equipment and facilities are removed. The access road will be reclaimed unles has been determined that it is needed for forest administrative purposes. All pits must have liquids removed and

then backfilled to a safe and stable condition. All other excavation must be closed by backfilling once dry a graded to conform, as much as possible, to the surrounding terrain.

Site preparation prior to seeding may include ripping, scarifying, contour furrowing, terracing, reduction of ste cut and fill slopes, waterbarring, etc. The disturbed sites should be prepared to provide a seedbed for establishment of desirable vegetation and reshaped to blend with the natural contour. Stockpile topsoil is sprea Mulching, fertilizing, tree planting, fencing, or other practices may be required.

Reclamation and abandonment of pipelines and flowlines may involve replacing fill in the original cuts, reduci and grading cut and fill slopes to conform to the adjacent terrain, replacement of surface soil material, waterbarri and revegetating in accordance with normal rehabilitation practices. Pipelines associated with production may abandoned in place if the District Ranger determines the impact of removal is greater than leaving it in place.

Before the period of liability of the bond is terminated, the Forest Service must be satisfied that the drill site a road have been adequately rehabilitated. No new leases will be issued to a person or company who is in mater non-compliance with reclamation requirements on existing leases. (See 30 U.S.C. 226).

ADMINISTRATION

When on-the-ground well development or geophysical activities begin the administrative duties commence. I wells these include marking timber for removal from a site to be cleared, inspection of work in progress during ro and pad development, regular visits during drilling and more routine visits during production operations. At clo out and reclamation time intensity of visits increases to assure correct application of requirements. For geophysi work administration can consist of a visit or two during operations and a thorough inspection when work completed. A prework conference is a common practice to assure all parties understand the terms of the govern permits. These types of rights are explained below.

Needed correction action is usually documented in writing although minor problems caught early may be dealt w verbally on-site. Persistent or flagrant failures or overt acts of violations are dealt with as the circumstanc indicate. Criminal misdemeanor citations are an option. The Texas Railroad Commission, EPA, and Texas Pa and Wildlife Department are sources of support and expert advice as needed for particular problems. BLM will consulted where their expertise is useful for a resolution of an administrative problem.

Reserved and Outstanding Rights Activities

This section focuses on leasing, exploration, development and administration of non-U.S. owned mineral righ The purpose of this section is to discuss how the Forest Service manages exploration and development on reserv and outstanding rights (ROR) under U.S. surface.

There are currently about 219,086 acres of private mineral rights under U.S. surface. Of these, about 29,253 ac will eventually revert to the United States per the terms of the deed acquired by the U.S. The balance will alwa be in private ownership unless acquired by the U.S. in a later action.

An important difference in administration of ROR is that exercise of those rights is not a privilege, but a ri owned by a private party. As such, the U.S. has no role in leasing, and the BLM is not involved in approval of Application for Permit to Drill (APD). Since there is no lease or approved APD, there is no contractual agreem to be met in the case of outstanding rights. Reserved rights are subject to State laws and the Secretary's Rules a Regulations which were made part of the deed of acquisition when the land was purchased by the United Stat Under the terms of the most common version of the Secretary's Rules and Regulations, the 1911 version, a permi not required. Later versions require a permit, but one must be issued if the operator agrees to abide by t reasonable requirements for surface protection. Thus issuance of a permit is never discretionary and a NE decision is not made.

When an operator proposes a well on reserved or outstanding mineral rights, the Forest Service, as the surfa owner, reviews the proposal and conducts the same resource studies as are done for wells into U. S. minera Using this information, recommendation for mitigating measures are developed. If significant conflicts betwe surface values and the operator's plans are discovered, the U.S. will request modifications of the plans to reduce

differences particular to the specific site, the expectation is that the operating plan will attempt to implement t same requirements as are used for activities on U. S. minerals. This operating plan will be part of the permit t Forest Service will request the operator's to accept prior to commencing operations.

For more than 15 years it has been the local practice to obtain a permit for all ROR mineral activities. The pract of obtaining a signed permit for those activities not legally requiring a permit will be continued where the opera is willing to accept such. In reserved mineral cases, a minerals operation permit will be approved and outstanding minerals a minerals operations plan will be negotiated. If an operator should refuse to accept a pern as is possible for exercise of rights not specifically requiring a permit, the operator will still be required to deve an operating plan for Forest Service review and recommendations.

Administration of operations on ROR is with the same intensity as on U.S. rights. Due to the fact that t regulations for operations on U.S. rights do not apply to ROR activities, the Forest Service theoretically somewhat constrained when necessary to resort to legal action in the case of uncorrected or purposeful violations the permit. In practice, we have been able to use other regulations to prosecute in the few instances flagrant persistent violations have occurred. The net result is that there is little observable difference between mod operations on either U.S. rights or ROR.

Geophysical exploration permits frequently involve a mix of ROR and U.S. minerals. Except that exploration U.S. rights by a lessee is at no charge, the standards and enforcement are the same regardless of who owns t mineral rights.

Exhibit 2

CONTROLLED SURFACE USE STIPULATION #1A
NATIONAL FORESTS IN TEXAS

Surface occupancy or use is subject to the following special operating constraints.

Portions of this lease contain riparian areas (floodplains, wetlands). As a minimum these areas are established as feet from an intermittent stream, 100 feet from perennial streams, and 100 feet from the normal pool level cont of lakes. Site-specific proposals for surface-disturbing activities within these areas will be analyzed. Such analy could result in establishment of protective requirements or limitations for the affected site.

On the lands described below:

Tract

For the purpose of:

To meet visual quality objectives and protect riparian areas in accordance with the National Forests and Grasslar in Texas Final Land and Resource Management Plan, as amended, May 20, 1987.

Any change to this stipulation will be made in accordance with the land use plan and/or the regulatory provisic for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 19 and 2820.)

Exhibit 3

NO SURFACE OCCUPANCY STIPULATION #2A
NATIONAL FORESTS IN TEXAS

No surface occupancy or use is allowed on the lands described below (legal subdivision or other description.

Recreation Area except hand-laying of electronic gear or apparatus could be further considered. Propos for drilling sites within 1000 feet or less from the recreation area may be subject to special requirements limitations, such to be determined on a case-by-case basis.

For the purpose of:

To meet visual quality objectives and to protect recreation values in accordance with the National Forests a Grasslands in Texas Final Land and Resource Management Plan, as amended May 20, 1987.

Any change to this stipulation will be made in accordance with the land use plan and/or the regulatory provisic for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 19 and 2820.)

Exhibit 4

TIMING LIMITATION STIPULATION #1A
NATIONAL FORESTS AND GRASSLANDS IN TEXAS

No surface use is allowed during the following time period(s). This stipulation does not apply to operation a maintenance of production facilities.

Site-specific proposals for activities within these areas will be analyzed. Such analysis could result establishment of protective requirements, limitations for the affected site, or possibly require relocation of t activities during the specified time period.

March 1 to June 30

On the lands described below:

Entire lease

For the purpose of (reasons):

To protect Turkey nesting areas, in accordance with the National Forests and Grasslands in Tex Final Land and Resource Management Plan, as amended May 20, 1987.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisic for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 19 and 2820.)

Exhibit 5

OIL AND GAS LEASING STIPULATIONS
NATIONAL FORESTS AND GRASSLANDS IN TEXAS

Controlled Surface Use Stipulations

CSU #1A - Riparian Areas on Forests
CSU #1B - Trails
CSU #1C - Toledo Bend Reservoir Shoreline
CSU #1D - Sam Rayburn Reservoir Shoreline
CSU #1E - Grasslands Streams
CSU #1F - Grasslands Eroded Areas
CSU #1G - River Bottom Areas
CSU #1H - Texas Natural Heritage Program Areas
CSU #1I - Grasslands Flood Control and Erosion Control Structures

No Surface Occupancy Stipulations

NSO #2A - Recreation Areas
NSO #2B - Scenic Areas
NSO #2C - Lake Conroe
NSO #2D - Research Natural Areas

Timing Limitation Stipulations

TLS #1A - Turkey Nesting Areas

Exhibit 6

NOTICE TO LESSEE
NATIONAL FORESTS AND GRASSLANDS IN TEXAS

NTL #3A - Red-cockaded woodpeckers
NTL #3B - Cemeteries
NTL #4A - Toledo Bend Concurrence with Sabine River Authority & COE
NTL #4B - Sam Rayburn at Recreation Areas Concurrence with COE
NTL #5 - Wilderness Areas

NOTICE TO LESSEE #3A
NATIONAL FORESTS IN TEXAS

Red-cockaded woodpecker clusters. Portions of the land in this lease are, or may be, occupied by clusters of endangered red-cockaded woodpecker. Exploration and development proposals may be limited or modificatic thereof required if activity is planned within the boundaries of a red-cockaded woodpecker colony as it then exis In addition, similar but less stringent limitations or modifications may be required in the event of an occupan proposal within 1200 meters of a colony boundary. Upon receipt of a site specific proposal, the Forest Service v provide current inventory records of colony locations and may require that localized surveys be performed to ass no uninventoried colonies are present.

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Appendix D

Evaluation of Roadless Areas

Purpose

This appendix contains an evaluation of 17 identified roadless areas on the National Forests and Grasslands in Texas (NFGT). The purpose of this appendix is to present a detailed and site-specific evaluation of the areas of the Forest that have been tentatively identified as being essentially unroaded or undeveloped. It includes a description of the resources, physiographic and biologic features, and the present management situation for each area.

Background

This evaluation of roadless areas has been conducted in a setting following some important background legislation and activities. These include: the Wilderness Act; the Eastern Wilderness Act; the second Roadless Area Review and Evaluation (RARE II); the National Forest Management Act; and the Texas Wilderness Act of 1984.

The 17 roadless areas were identified in RARE II or in scoping for the Forest Plan Revision. All but one of the roadless area proposals received during scoping for the Forest Plan Revision identified areas previously identified in RARE II. The one area not previously identified, Longleaf Ridge, overlaps one RARE II study area (Jordan Creek) and part of another (Graham Creek).

Parts of five of the original RARE II study areas were designated wilderness with passage of the 1984 Texas Wilderness Act. However, none of the designated wildernesses encompassed all of any of the study areas.

Wilderness Act of 1964.

The 1964 Wilderness Act establishes the National Wilderness Preservation System, defines wilderness, and provides for activities which may occur within designated Wilderness areas.

The Act defines wilderness as an area where the earth and its community of life are untrammeled by humans, where a person is a visitor who does not remain...an area of undeveloped Federal land containing its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) ...is of sufficient size as to make it practical for its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, education, scenic, or historical value.

The Act provides that rights of access to non-National Forest lands surrounded by a wilderness will be granted the landowner. In addition, the Act provides that subject to valid existing rights, minerals in lands within wilderness are withdrawn from mineral production. Forest Service proposals for wilderness are recommendations only. Final decisions on wilderness designation have been reserved by the Congress itself.

Eastern Wilderness Act.

On January 3, 1975, Congress passed the Eastern Wilderness Act. This Act established several wilderness areas in states east of the 100th meridian (none in Texas but some in adjoining states), reaffirmed the importance of wilderness in the eastern United States, and eliminated the 5,000-acre minimum size requirement that was included in the 1964 Wilderness Act.

Roadless Area Review and Evaluation (RARE II).

In January, 1979, the Forest Service issued nationally a Final Environmental Impact Statement (FEIS) documenting a review of 62 million acres of roadless and undeveloped areas. The purpose of RARE II was to determine which areas were suitable for wilderness.

The RARE II Environmental Impact Statement (EIS) was the basis for recommending that Congress designate 15.1 million acres as wilderness; that about 36 million acres should be managed for multiple-use purposes other than wilderness; and that the remaining 10.8 million acres needed further planning before a decision could be made. This EIS was subsequently challenged and the Federal court ruled that the RARE II EIS was inadequate for this purpose.

National Forest Management Act.

In September 1983, the National Forest Management Act (NFMA) Regulation [36 Code of Federal Regulations (CFR) Part 219.17] was revised, directing that unless otherwise provided by law, roadless areas within the National Forest System will be evaluated and considered for recommendation as potential wilderness during the Forest Planning process (including Forest Plan Revisions).

Roadless areas subject to evaluation include those previously inventoried in RARE II, in a unit plan or in a Forest Plan which remain essentially roadless and undeveloped, and which have not yet been designated as wilderness or non-wilderness by law.

<u>Texas Wilderness Act</u> - On October 30, 1984, the Texas Wilderness Act was signed into law [Public Law 98-574). This act added five wilderness areas from the National Forests and Grasslands in Texas to the National Wilderness System. The Act stated "that review and evaluation . . . shall be deemed for the purposes of the initial land management plans . . . to be an adequate consideration of the suitability of such lands for inclusion in the National Wilderness Preservation System and the Department of Agriculture shall not be required to review the wilderness option prior to the revisions of the plans . . ." [Public Law No. 98-574, sec. 5(b)(2)].

The Texas Wilderness Act of 1984 established 34,346 acres of wilderness in Texas. On October 29, 1986, Congress passed Public Law 99-584 which made technical corrections to the boundaries of the previously established wilderness areas. As a result of this law, the acreage of wilderness increased to 36,347 acres. Since then, some private inholdings in the existing wilderness areas have been acquired through land exchange. This has increased the wilderness acreage to the present day total of 37,162 acres.

Evaluation of This Appendix

Revision, a boundary encompassing all particular proposals for that roadless area was established. Enclosed in this appendix are reports on 17 roadless areas in Texas. The evaluation

freports that follow rate the potential of the 17 roadless areas in three categories:

Capability.

The qualities that make a roadless area available or not available for wilderness.

Availability.

The non-wilderness resources and demands of the area.

Need.

The amount of wilderness in the area and region.

The roadless areas total about 69,000 acres. Those roadless areas that are found to be capable of being wilderness could be recommended to Congress for designation as wilderness. All of the 17 roadless areas have several qualities in common; one is the amount of existing wilderness in the surrounding area. There are 84,012 acres of wilderness in the State of Texas; 37,162 acres of which are within the boundaries of the National Forests and Grasslands in Texas. In addition, there are 22,524 acres in neighboring Oklahoma; 17,046 acres in neighboring Louisiana; and 128,362 acres in neighboring Arkansas. Existing wilderness acreages are shown in Table D-1.

Another quality the 17 roadless areas have in common is landform. All areas are located in the Western Gulf section of the Coastal Plain Physiographic Province [U.S. Geological Survey (USGS) 1946]. Based on the U.S. Forest Service (USFS) Region 8 Soil Resource Inventory (R-8 1977), all of the specific landforms found (e.g. ridgetops, floodplains, stream terraces, etc.) in these areas are also found in other wilderness areas on the Forest.

Most of the roadless areas occur in the NFGT's Mixed Forest Ecosystem [same as: Bailey's (1980) Southeastern Mixed Forest Ecoregion or Texas Natural Heritage Program's (TNHP's) (Orzell 1991) Mixed Pine-Hardwood Forest Ecological Region]. This ecosystem is also represented by several existing wilderness areas in Texas and surrounding states. A few of the roadless areas occur in NFGT's Longleaf Dominated Ecosystem [same as: Bailey's Beech-Sweetgum-Magnolia-Pine-Oak Forest Ecoregion or TNHP's Longleaf Pine Forest Ecological Region]. This ecosystem is also represented in existing wilderness areas on the Forest and in wilderness areas in other states.

Each of the evaluation reports were prepared using a "standard" format and procedure. This format, also utilized for evaluating roadless areas on other Forests in the Southern Region, involved evaluating the roadless areas capability, availability, and need by addressing a standard set of criteria. The criteria, listed in Forest Service Handbook 1909.12 (Land Management Planning Handbook), are shown below:

1.The land is regaining a natural, untrammeled appearance.
2.Improvements existing in the area are being affected by the forces of nature rather than humans and are disappearing or muted.

nonsurface, that could ensure perpetuation of identified wilderness values.

4. The location of the area is conducive to the perpetuation of wilderness values. Consider the relationship of the area to sources of noise, air, and water pollution, as well as unsightly conditions that would have an effect on the wilderness experience. The amount and pattern of Federal ownership is also an influencing factor.

5. The area contains no more than a half mile of improved road for each 1,000 acres, and the road is under Forest Service jurisdiction.
6. No more than 15 percent of the area is in non-native, planted vegetation.
7. Twenty percent or less of the area has been harvested within the past 10 years.
8. The area contains only a few dwellings on private lands and the location of these dwellings and their access needs insulate their effects on the natural conditions of Federal lands.

Each of the roadless area evaluations was prepared by a District Interdisciplinary (ID) Team; reviewed for consistency, objectivity and accuracy by the Forest ID Team, the Planning Team and Forest Management Team; and reviewed for consistency, objectivity, and completeness by members of the Southern Region's ID Team. Each area description has a listing of the gross area, which includes all lands bounded within the boundaries of the analysis area; and net area, which is the actual Forest Service ownership within the analysis area.

In addition to containing evaluation reports, this appendix also contains tables summarizing some of the key attributes of the roadless areas and maps showing the general vicinity and specific location of the roadless areas. More detailed maps are contained in the planning records in the Forest Supervisor's Office, 701 North First, Lufkin, Texas 75901.

Summary and Conclusions

All alternatives developed in the NFGT Forest Plan Revision contain existing wilderness areas. Roadless areas evaluated in this appendix were included in Alternatives 5, 6 and 7 to address considerations and issues identified during the planning process. All roadless areas reviewed contained a number of attributes that, when evaluated according to the standard criteria (Table D-2), found them to be undesirable wilderness candidates. Most roadless areas evaluated (with the exception of the Stark Tract on the Sabine National Forest, which has historical records only) were found in identified red-cockaded woodpecker (RCW) 1,200-meter zones, or in potential habitat management areas for the RCW (Management Area 2). Management that would provide habitat for the recovery of the endangered RCW and perhaps other threatened or endangered species was considered to be in conflict with wilderness designation. This factor, as well as the other criteria used in the evaluation, led the Forest to conclude that none of the 17 areas evaluated should be recommended to Congress for wilderness designation in their present state. Areas identified in Alternatives 5, 6, and 7 as proposed wilderness, however could be recommended to Congress for wilderness designation if actions were taken to correct those criteria that did not conform to wilderness standards. These corrective measures, in most cases, would not be possible without changes in existing laws and ownership status.

TABLE D-1

EXISTING WILDERNESS IN TEXAS AND ADJOINING STATES

TEXAS

Angelina NF	Turkey Hill	5,286
	Upland Island	13,39
Davy Crockett NF	Big Slough	3,639
Sabine NF	Indian Mounds	11,03
Sam Houston NF	Little Lake Creek	3,810
Guadalupe Mountains Nat'l Park	Guadalupe Mountain	46,85
State Total		84,01

OKLAHOMA

Ouachita NF	Black Fork Mountain	8,700
	Upper Kiamichi River	9,371
Wichita Mountain Nat'l Wildlife Refuge	Wichita Mountain	8,570
State Total		17,04

LOUISIANA

Breton Nat'l Wildlife Refuge	Breton	5,000
Kisatchie NF	Kisatchie Hills	8,700
Lacassine Nat'l Wildlife Refuge	Lacassine	3,346
State Total		17,04

ARKANSAS

Big Lake Nat'l Wildlife Refuge	Big Lake	2,144
Buffalo Nat'l River	Buffalo Nat'l River	10,52
Ouachita NF	Black Fork Mountain	7,568
	Caney Creek	14,34
	Dry Creek	6,310
	Flat Side	10,10
	Poteau Mountain	10,88
Ozark NF	East Fork	10,77
	Hurrican Creek	15,17
	Leatherwood	16,95
	Richland Creek	11,82
	Upper Buffalo	11,74
State Total		128,3
FOUR STATE REGIONAL TOTAL	251,944	

Alabama Creek

Roadless Area Review and Evaluation

Description of the Analysis Area

Roadless area name and number of acres.

ALABAMA CREEK: Gross area approximately 13,263 acres; net area approximately 12,783 acres.

Location and vicinity.

The analysis area is located in the southeastern portion of the Trinity District of the Davy Crockett National Forest. It is south of the towns of Apple Springs and Nigton, and east of Diboll in Trinity County, Texas.

Describe access to the analysis area, including roads and trails leading to the area.

Access is by Farm-to-Market (FM) 2262 from the southeast and the north, by FM 2174 from the southeast, and by FM 357 and Forest Service Road (FS) 509 from the west.

General description of the analysis area's geology.

The analysis area is in the western Gulf Coastal Plain and is underlain by the Caddell-Manning geologic formation. This formation is 36 to 58 million years old and consists of clays, quartz, sands, lignite, glauconite, and fossil wood. Soils associated with this formation are Moten-Mutley, Alazan-Besner, Koury-Pophers-Rosewall, Fuller-Kurth-Keltys, and Ray-Lake-Moswell-Herty.

General description of the analysis area's topography.

The analysis area is in the western Gulf Coastal Plain, which is made up of ridges and valleys approximately parallel to the Gulf of Mexico coastline. Its topography is generally level to

gently rolling, but short slopes are as steep as 40 percent near the Neches River. Elevation varies from 140 to 320 feet above sea level.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is covered with forest. The predominant plant community is loblolly pine-oak. Loblolly pine and shortleaf pine are the most common forest cover types and together they occupy more than 75 percent of the analysis area. The water oak-willow oak, and to a lesser extent the swamp chestnut oak-willow oak, plant communities commonly occur on more mesic sites along the Neches River. The tree species most common in the analysis area are loblolly pine, shortleaf pine, sweetgum, post oak, white oak, Southern red oak, water oak, willow oak, and cherrybark oak. Common understory species include flowering dogwood, yaupon, wax myrtle, red maple, and greenbrier.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

Some of the oldest forest stands are impressive, especially near the Neches River. The analysis area contains three active and two inactive clusters of red-cockaded woodpeckers (RCW). The RCW is an endangered species. The Neches River, which adjoins the analysis area on the east, has been nominated as a wild and scenic river and is being managed as such. The National Rivers Inventory (NPS 1982) determined that the Neches River possessed outstandingly remarkable scenic, recreation, fish, and wildlife values.

Wild turkey are being reintroduced into the analysis area. Some people travel to the analysis area to view the turkeys.

The analysis area is also designated as a Wildlife Management Area (WMA). This designation places the analysis area under special rules for deer hunting and results in publicity for the analysis area. Part of the special fee hunters pay to use WMA's is used to manage wildlife on those areas.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

   The National Forest System purchased the land in 1935. Most of the analysis area had been cut over a short time earlier. Since its acquisition in 1935, the analysis area has been managed intensively for multiple use. Recent activities include timber cutting, road construction, creation of wildlife openings, cattle grazing, and prescribed burning.

2. To what degree is the area natural or natural-appearing and free from disturbance?

   Old tramways are the only evidence of turn-of-the-century logging and farming activities. These are not obvious to the casual visitor. However, more recent activities are very evident. Only a small portion of the analysis area is free from disturbance. Man's influence is evident in most of the analysis area. The analysis area is dissected by roads. Some of these are major roads.

   Timber has been cut on most of the analysis area. Regeneration areas--where all or most of the timber is cut to make room for a new crop of trees--occupy approximately 13 percent of the acreage. Stands occupying about 90 percent of the remaining areas have been thinned.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural untrammeled appearance?

   No. Most of the analysis area has been and is being managed intensively as part of the general forest area according to principles of multiple-use management. Recent management activities are evident, and only small portions of the analysis area appears natural.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

   Subsurface mineral rights are owned privately or owned federally and leased. Surface occupancy for the purposes of mineral exploration and production, with mitigating measures implemented, must be allowed where mineral rights are privately owned or leased. Therefore, perpetuation of wilderness values can not be ensured.

preclude perpetuation of wilderness values; however, provisions for permanent access would have to be made. The parcel containing the boys camp would probably not be available or suitable for acquisition and management as wilderness.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No.

Improvements, structures and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a.Air strips or heliports: No.

b.Electric installations: There is an aerial powerline to the boys camp.

c.Areas displaying evidence of historic mining at least 50 years old: No.

d.Areas under current mineral lease that contain a "no surface occupancy" stipulation? No.

e.Areas under current mineral lease where the lessee has not exercised development and occupancy rights: Two parcels, totaling 561.8 acres are under oil and gas lease. There are no active wells on these leases.

f.Recreation improvements such as occupancy spots or minor hunting or outfitter camps: The analysis area contains three designated hunter camps. These camps receive heavy use for three months of hunting seasons, and very light use the remainder of the year. The Holly Bluff site, a popular boat launch site and fish camp, receives moderate use all year.

g.Timber harvest areas where logging and prior road construction are or are not evident: Almost all timber was removed from about 13 percent of the analysis area in the last 10 years. Some timber was removed in ordinary logging operations, some was removed in storm salvage operations, and some was removed to create openings for wildlife. Stands on almost all of the remaining acreage have been thinned commercially. There are no significant areas where no timber has been removed in the last 10 years. Most of the analysis area displays evidence of logging and logging roads.

Two timber sales were contracted in May, 1992. These sales included: 4 thinning units totaling 1,523 acres; 4 seed-tree cuts totaling 158 acres; and 7 clearcuts totaling 204 acres.

h.Cultural treatments involving plantations or plantings: The 1,654 acres harvested in the last 10 years have been planted to southern pines. The trees in these plantations are now from 2 to 20 feet in height.

i. Private inholdings in the area: There are two private inholdings. Each consists of approximately 240 acres.

j. Dwellings on private inholdings: One of the inholdings is a 40 to 60 person boys camp containing several buildings. There is a temporary dwelling on the other inholding.

k. Nonconforming structures and improvements: The boys camp buildings and associated powerline, and two oil and gas pipelines with a total length of 9.3 miles.

l. Ground-return telephone lines: There are such lines along FM 2262 and along the access to the boys camp from the east.

m. Watershed treatment areas: No.

n. Roads: There are 6.4 miles of paved farm-to-market highway and 32 miles of improved gravel and dirt roads. There are 0.3 miles of graveled and graded county road. Approximately 50 percent of the improved gravel and dirt road is all-weather road maintained to levels III and IV. The other 50 percent is maintained to level I and II, and is operable only during dry weather.

or natural deterioration?

The FS roads and hunter camps could be terminated. The farm-to-market highways (which belong to the State of Texas), access to the boys camp and the other private parcel, access for management of RCW, access to privately owned and federally leased minerals, the 9.3 miles of gas and oil pipelines, and 0.4 miles of powerline cannot be mitigated or terminated.

3. Are improvements in the analysis area being affected by the forces of nature rather than by humans and are they disappearing or muted?

The improvements described in g.-j., l., and n., above are being maintained for long-term service.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the last 10 years?

Yes. Approximately 13 percent of the area has been harvested within the last 10 years. Approximately 90 percent of the remaining area has been thinned commercially. Also, 1,523 acres of thinnings, 158 acres of seed-tree harvesting, and 204 acres of clearcutting are being conducted.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are approximately 3.1 miles of improved road per 1,000 acres.

6. Are all existing roads under Forest Service jurisdiction?

No. There are 6.4 miles of State FM roads and 0.3 miles of Trinity County road (0.53 miles of road per 1,000 acres).

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the area provide the opportunity for solitude and serenity?

The existing road network, pipeline corridors, and past and present activities within the analysis area and on nearby private land limit opportunities to experience solitude and serenity. More than 95 percent of the analysis area has an inventoried Recreation Opportunity Spectrum (ROS) of roaded-natural or influenced by existing roads. The areas not influenced by roads are small chunks that are scattered throughout the analysis area.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

The abundance of roads and the gentleness of the topography makes access very easy. The analysis area presents opportunities for recreational activities that imply varying degrees of

detailed under a.-m. below.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation, including:

a. Camping: Numerous locations are suitable for primitive camping. These include three small, unimproved and designated primitive camping areas.
b. Hunting: The analysis area is one of the best deer hunting areas on public land in east Texas, and is very popular. Squirrel hunting is also excellent and turkey numbers are good. Rabbits, wild hogs, quail, and woodcock are present and can be hunted.
c. Fishing: The Neches River provides good fishing for catfish, bass, bream, and crappie. Many small ponds are stocked with catfish, bass, and bream.
d. Canoeing: The adjoining Neches River affords excellent canoeing. The only other canoeing opportunities are a few small ponds.
e. Boating: The Neches River provides good boating for small boats.
f. River rafting: The analysis area contains no streams or rivers large enough to support this activity.
g. Backpacking: There is some opportunity for backpacking on old woods roads and closed roads; there is very little backpacking activity at present.
h. Hiking: There is some opportunity for hiking on old woods roads and closed roads; but there are no established hiking trails, and the underbrush makes hiking difficult elsewhere.
i. Riding: There is some horseback riding in the analysis area. There are no established riding trails, but horse clubs ride on logging roads and pipeline clearings.
j. Photography: There are good opportunities to photograph plants and animals near small ponds and the Neches River. There are few opportunities for panoramic photography.
m. Other: Mayhaw gathering is very popular in the analysis area.

Special features.

1. What is the analysis area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

Because the analysis area is and has been managed intensively, there are now very few opportunities for such education and study. In the long run, however, Alabama Creek would offer opportunities similar to those offered by any other wilderness in the Forest.

2. Is there an abundant and varied wildlife population?

The analysis area is well known for its abundance of game and nongame animals. There are also three active and two inactive clusters of the endangered RCW.

Manageability.

1. What are the characteristics of the surrounding area, including ROS classification, adopted VQO, and present and planned uses?

Most of the surrounding area is tree farms, hunting clubs, ranches and farms. The ROS is roaded natural. Visual Quality Objectives (VQO's) of adjoining National Forest lands are retention and partial retention because a main travel route is present.

the boundary that might result in demands to allow nonconforming structures or activities in the wilderness?

Such demands are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

The Neches River provides some protection against prohibited use, but most sections of the boundary provide no such protection.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The Neches River, on the eastern boundary, provides some shielding; other boundaries do not.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting of deer, waterfowl, squirrels, doves, and other small game is by far the greatest recreational use. Fishing and swimming in the numerous ponds and the adjacent Neches River are the only other significant recreational uses. In the spring, the Neches River bottom is popular with the mayhaw collectors. Some horseback riding occurs on pipelines and old logging roads.

b. Information on wildlife species, population and management needs: The analysis area has been managed very intensively, in cooperation with Texas Parks and Wildlife Department, as a WMA. Hunters must purchase licenses to hunt deer in this area. Some proceeds from these license sales are returned for wildlife habitat improvement. Featured species are deer and turkey. Populations of deer and turkey are high. Wild turkey management has been a success story here. After initial stocking in 1987 and extensive food plot establishment (34 plots of approximately 2 acres each), the turkeys were well established in the analysis area. In 1991, wildlife biologists with the Texas Parks and Wildlife Department started live-trapping turkeys in the analysis area and transplanting them into other areas in east Texas.

c. Water availability and use: There is adequate water for wildlife and livestock, but the available water is not suitable for human consumption unless treated.

d. Livestock operations: There is an active 100-head cattle allotment in the northwest portion of the analysis area.

e. Timber: Most of the analysis area is well stocked with pine timber. All timber except that in RCW clusters, stringers along streams, and the Neches River Protective Corridor is under intensive management for multiple uses including the protection of the RCW. A 1/4-mile corridor along the Neches River is being managed as a potential wild and scenic river. No timber is harvested in this corridor.

f. Minerals: Mineral rights on six parcels, totaling 268.97 acres are privately owned. Mineral rights on two parcels, totaling 561.8 acres, are Federally owned and are under oil and gas lease.

One oil well was drilled and abandoned prior to 1980. Production data for this well is not

years.

The analysis area has been evaluated as having a high potential for oil and gas occurrence. The Austin chalk formation, which underlies part of the analysis area, is being actively explored in the Sabine National Forest and is producing there. It is possible this activity may move to this area in the future.

g. Cultural resources: Much of the analysis area may contain archeological and historical sites or both (historic properties). The Neches River provided and ideal conditions for early settlement. Fertile bottomlands, abundant wildlife, and other resources attracted and supported Native American inhabitants for more that 5,000 years. Numerous prehistorical sites, ranging from Paleo-Indian to Neo-Historic, have been found in the analysis area. Future surveys will likely reveal additional sites, and evaluations of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

There are several historic sites in the analysis area, including historic farmsteads and cemeteries. The remains of old logging trams or railways also occur throughout.

h. Authorized and potential land uses: The currently authorized land uses are 0.2 miles of county road, a 1,100-foot road easement to Champion; 0.4 miles of overhead powerline to the boys camp, a 0.1-mile water line, two 30 foot oil and gas pipelines (9.3 miles in length), and two segments of FM 2262 totaling 16.4 miles in length.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: There are two inholdings (See Figure 1 - Alabama Creek). If prescribed fire were excluded for 10 years or more, the accumulation of fuels would increase the complexity of fire control and the probability that wildfires in the analysis area would threaten adjacent private property. The absence of timber management would eventually increase the potential for a southern pine beetle (SPB) epidemic.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities--primarily hunting, camping and fishing occur. The analysis area's high site quality and gentle topography makes timber management very productive.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. The area contains three active RCW clusters. Under wilderness management, the habitat would decline in quality and eventually the birds would be forced to relocate. Additional areas of the Forest would have to be managed to provide replacement habitat.

The analysis area is also managed for wild turkey. Wilderness management would provide habitat for turkeys; however, ongoing habitat enhancement efforts, such as the development of food plots, could not be implemented.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

The area is relatively small but has been assessed as having a high potential for occurrence of oil, gas, and lignite coal. There are no known reservoirs and no known potential for other mineral resources.

6. Does the analysis area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

F 7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. The analysis area is currently included in the Forest's timber base. Any reduction in this base would result in a reduction in the Forest's production of wood.

In addition, the analysis area is currently included in the base of lands open and available for minerals exploration and production. Part of the analysis area is currently leased, and because the analysis area is underlain by the Austin chalk formation, mineral exploration and production are not unlikely. Receipts from timber sales and minerals activities are very important to the county.

Roads crossing the analysis area provide popular and important access to the Neches River. The analysis area also provides important habitat for the RCW.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. There are two timber sale contracts, two special use pipelines, a water line, a power line, a special use road, and leases of mineral rights.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in the State of Texas, as well as additional land in nearby states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Big Slough Wilderness is located 25 miles to the north of the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

On the average, the wilderness areas in Texas have been receiving about 0.2 Recreation Visitor Days (RVD's) of use/acre/year, or about 10 percent of capacity. Wilderness use has slowly increased from about 5,800 RVD's in 1987 to about 10,900 RVD's in 1991. Monitoring and research show that most wilderness use is related to hunting and is primarily day use.

The nearby Big Slough Wilderness received an estimated 1,900 RVD's of use in 1991 (0.52 RVD's/acre, or about 25 percent of capacity).

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas increased 0.6 percent annually from 1980-1987; and this slow increase is expected to continue. The large metropolitan areas such as Houston and Dallas grew at much faster rates (17 percent and 27 percent, respectively, 1980-87). These population centers are about 100 miles (Houston) to 175 miles (Dallas) from the analysis area.

The population of the Deep East Texas region, which includes Trinity County, increased about 26 percent from 1980 to 1987. The population of Deep East Texas is expected to increase about 50 percent over the next 35 years.

Nonwilderness lands.

vicinity? If so, where?

There are such opportunities on the Davy Crockett National Forest. The National Forests

in Texas now contains 82,348 acres of land providing opportunities for primitive or semi-primitive recreation.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

Yes. There are several active and inactive RCW clusters in this analysis area. There is a 200-foot boundary and a 1200-meter foraging habitat zone around each RCW cluster. The RCW is protected under the Endangered Species Act, and its habitat is managed under court-ordered direction.

The eastern wild turkey, which has been reintroduced into the analysis area, is somewhat sensitive. Some roads in the area have been closed to protect its habitat.

2. Could their needs be provided for through means other than wilderness designation?

Yes, through seasonal or year-long road closures.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

No.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1977)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

This part of the upper Coastal Plain consists of floodplains, stream terraces, concave foot slopes, and gently sloping ridge tops. The side slopes are characterized by inclined surfaces on broad interstream divides with narrow floodplains and branch head inclusions. These landforms are common in the region, and in wilderness areas in Texas.

2. What is the area's ecosystem classification? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The area has loblolly pine, shortleaf pine, loblolly pine-hardwood, swamp chestnut oak-cherrybark oak, white oak-hickory, white oak-black oak-yellow pine, sweetgum-Nutall oak-willow oak, and sweet bay-Swamp tupelo-redbay forest cover types. This vegetation is typical of the southern Coastal Plains. The plant communities most common in the analysis areas are loblolly pine-oak, shortleaf pine-oak, water oak-willow oak, and swamp chestnut oak-willow oak. This ecosystem is represented in existing wilderness areas in Texas.

Big Creek

Sam Houston National Forest, San Jacinto Ranger District

Roadless Area Review and Evaluation

Description of **Analysis Area**

BIG CREEK: Gross area approximately 6,767 acres; net area approximately 6,767 acres.

Location and vicinity.

The analysis area is located in the central portion of the San Jacinto Ranger District of the Sam Houston National Forest. The analysis area is approximately 5 miles south of Coldspring or 15 miles north of Cleveland, Texas, on Farm-to-Market (FM) 2025. It is bounded by Forest Service (FS) Roads 217, 221, 220, and private land on the east.

Describe access to the analysis area including roads and trails leading to the area.

State Highway (SH) 150 and FM 2025 and 2666 provide access to FS 217, 221, and 220.

A 6-mile portion of the Lone Star Hiking Trail bisects the analysis area. It also contains a system of four loop trails that are part of the Big Creek Scenic Area trail system. A parking area and trail head on FS 217 serve the trail network.

General description of the analysis area's geology.

The San Jacinto Ranger District is on the western Gulf Coastal Plain. It is underlain by the Bently formation, which is Pleistocene in age. The principal soils are developed from unconsolidated beds of clay, sand, sandy clay, or clay shale materials comprising old, noncalcareous sediments.

General description of the analysis area's topography.

The analysis area displays gentle but noticeable changes in elevation and is fairly well drained. The main drainages are Double Lake and Henry Lake branches, which drain into Big Creek. Elevation of the highest point is 315 feet, and elevation of the lowest point is 190 feet.

Big Creek is a tributary of the Trinity River system. Little Creek, an intermittent stream, flows through the easternmost portions of the analysis area.

General description of the analysis area's vegetation, including the ecosystem type.

Big Creek is a biologically diverse area containing examples of four ecological landtypes (associations) and many plant communities described by the Texas Natural Heritage Program (TNHP). The Inland Bays Association consists of poorly drained flats or depressions, with water oak-willow oak and water oak-sweet gum plant communities. The Bottomlands Association is characterized by swamp chestnut oak-willow oak, water oak-willow oak, and water oak-sweetgum communities. The Riparian Association consists of American beech-southern magnolia, American beech-white oak, loblolly pine-oak, sweetbay magnolia, and hardwood forest communities on lower slopes, creek bottoms, and stream terraces. Vegetation of the Medium Texture Association is primarily the loblolly pine-oak plant community.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The Scenic Area and its trail network are very popular attractions. The TNHP inventoried the area and described it as the most ecologically intact and botanically significant area in the Sam Houston National Forest.

The area contains the State champion black tupelo and the third largest Littlehip Hawthorne in the United States. One sensitive plant species, slender wake-robin (trillius gracile), occurs in this area. It is also a popular area for viewing orchids and other flowering plants.

Big Creek Scenic Area contains an inactive red-cockaded woodpecker (RCW) cluster and recruitment stand. The RCW is an endangered species and a popular birding attraction in east Texas.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

   Turn-of-the-century logging, farming, and grazing partly determined the analysis area's present condition and vegetation. More recent land disturbing activities have reduced the hardwood component and increased the pine component in the various plant communities. This created a diverse and well balanced mixture of plant species. Present-day southern pine beetle (SPB) control efforts are creating openings that will be dominated by early successional plant species. Past and current beetle control efforts have created a mosaic of plant communities, but have not significantly affected natural ecological processes.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

   Clearing and stumps caused by SPB suppression activities are evident throughout the Big Creek Scenic Area. Hiking trails and logging roads also detract from the analysis area's naturalness. The analysis area contains several pine plantations, permanent roads, and oil or gas production facilities. Some of these features may detract from the naturalness of the analysis area for many years to come.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

   The analysis area has not yet regained a natural appearance following recent SPB infestations and activities to control SPB. Hiking trails and logging roads will disappear if they are not maintained.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

   The ownership pattern ensures the perpetuation of such values in the Big Creek Scenic Area, but not in the remainder of the evaluation area. Rights to minerals in part of the analysis area are reserved. Therefore, the Federal government cannot prevent mineral exploration or development activities inconsistent with wilderness conditions.

5. Is more than 15 percent of the area in non-native vegetation?

   No.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.

d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: No.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: There is a primitive campsite near Double Lake Creek and the Lone Star Trail at Road 220. This campsite is popular with scout troops.

g. Timber harvest areas where logging and prior road construction are or are not evident: There are no timber harvest areas in Big Creek Scenic Area. However, Big Creek Scenic Area contains area where SPB infestations occurred. Trees were felled for treatment purposes, and in most cases hauled away. There are plantations and evidence of harvesting in parts of the analysis area that are outside the scenic area. Plantations and evidence of harvesting are visible along FS 218, 279, 220, 220C, and 217C. These roads are surfaced and open to traffic. Plantations and other evidence of harvesting are also visible from many woods roads that are open only to foot traffic.

h. Cultural treatments involving plantations or plantings: Yes.

i. Private inholdings in the analysis area: No.

j. Dwellings on private inholdings: No.

k. Nonconforming structures and improvements: Pacline Inc. gas pipeline, three oil and gas well sites, pump house at FS 220, and Henry Lake Branch.

l. Ground-return telephone lines: No.

m. Watershed treatment areas: No.

n. Roads: Level C (open) roads 218, 279, 220, 220C, and 217C. Level D (closed) roads are numerous.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

The oil and gas production facilities cannot be terminated. It is likely, however, that they will be abandoned in the future. If this happens, mitigation measures and natural restoration processes would remove evidence of these uses in a relatively short period of time. Other nonconforming uses can be terminated, removed, or mitigated.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

No.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

In Big Creek Scenic Area, yes. In the analysis area as a whole, no.

6. Are all existing roads under Forest Service jurisdiction?

Yes.

Capability

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

Big Creek Scenic Area has a well developed trail system and excellent visual resources; therefore, it is an excellent place in which to enjoy the solitude and serenity of the forest. In the remainder of the analysis area, the presence of roads, oil wells, truck traffic, etc. reduces opportunities for solitude and serenity.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Access is easy and the trail system is already developed. Big Creek Scenic Area and the trail management corridor along Big Creek and the Lone Star Hiking Trail offer many of these opportunities. Except where improvements and nonconforming structures are present, the rest of the analysis area provides similar opportunities.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Excellent capability.
b. Hunting: Excellent capability (especially for deer hunting) because of low road densities in Big Creek Scenic Area; however, the current Forest Plan prohibits hunting.
c. Fishing: Limited capability with existing fish populations. Good capability with a fisheries program.
d. Canoeing: None. There are no streams or other bodies of water large enough for canoeing.
e. Boating: No capability.
f. River rafting: No capability.
g. Backpacking: Big Creek Scenic Area is a very popular destination for casual hikers and backpackers.
h. Hiking: The analysis area has a system of excellent hiking trails.
i. Riding: Big Creek Scenic Area and the existing trails are designated for foot traffic only, but there is ample opportunity to create horse and llama trails.
j. Photography: Diversity of flora and fauna is a key attraction in the analysis area. Orchids and other flowering plants and interior bird species offer excellent photo opportunities.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

Because the analysis area supports a diversity of plant and animal communities, there are many opportunities for environmental education and research compatible with natural values.

2. Is there an abundant and varied wildlife population?

Although inventories have not been completed, the analysis area is considered prime habitat for fauna typical of east Texas. Of special interest are the interior bird species that are attracted to the old-growth habitat.

Manageability.

1. What are the characteristics of the surrounding area including its ROS classification, adopted VQO, and present and planned uses?

The 1,420-acre scenic area is managed under Special Management Area Standards and Guidelines. Exceptions are the 1,200-meter influence zones, two inactive clusters, two replacement stands, and four recruitment stands managed as endangered species (RCW) habitat. The remainder of the analysis area, and adjoining National Forest area, is managed as general forest for multiple use. The surrounding area on the east (along about half of the boundary) is private land and is managed mostly for timber production. The remaining boundary is mostly Forest Service road. National Forest land along these roads is managed with maximum modification Visual Quality Objectives (VQO). Recreation Opportunity Spectrum (ROS) along these roads is rural.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Adjacent private lands are primarily rural and to a lesser extent residential, but activities on these lands would not create demand problems or conflicts with National Forest uses or wilderness conditions in the analysis area.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

No. Access is more restricted in some areas than in others, but in general access by boundary road and hiking trail is relatively easy.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

Yes, except where boundaries are roads that could be sources of intrusive sights or sounds. The vegetation common in the region will buffer most sounds and sights.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

-a. Recreation: The analysis area is popular with hikers and sightseers. It is an excellent place for birding and environmental education. It is also used by numerous scout troops.

of quail and turkey, wildlife species are adequately represented. A need to stock quail and turkey and manage habitat for these species has been identified.

-A monitoring program for interior bird species and other neotropical migrants is needed also.

-c. Water availability and use: Surface water eventually becomes a domestic water supply for metropolitan Houston. There are no special uses of water or other water rights in the analysis area.

-d. Livestock operations: There are no grazing operations in the analysis area and none are planned.

-e. Timber: Site indices are high in most of the analysis area, and large old-growth pines and hardwoods are prevalent. Timber has been managed by even-aged methods outside the Big Creek Scenic Area and the Lone Star Hiking Trail corridor. Southern pine beetle is killing many overmature pines, and control methods appear to be adversely affecting the characteristic old-growth hardwood-pine forest of the Big Creek Scenic Area and adjoining areas.

-f. Minerals: Oil and gas production on lands with reserved mineral rights along FS 220 will continue until the wells play out. No Federally owned minerals are leased.

-g. Cultural resources: There are no recorded historic properties, but it is likely that intensive surveys would locate such properties. The Double Lake and Henry Lake branches of Big Creek have been designated as a cultural resource probability zone (medium probability), and must be surveyed for historic properties before land-disturbing activities are authorized. There are no known conflicts with current or planned management direction or the Antiquities Act of 1906, the National Historic Preservation Act of 1966, or the Archaeological Resource Protection Act of 1979.

-h. Authorized and potential land uses: There are no current or anticipated special uses in Big Creek Scenic Area. Three oil and gas well sites and a natural gas pipeline are permitted for the area along FS 220 near Double Lake Branch. Since production from these wells is relatively low, the potential for additional exploration is low.

-i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: There are no parcels of private land within the analysis area. Exterior boundaries, however, follow several private ownership boundaries. Wildfires have been infrequent and are not a major management concern. Forest diseases are also of relatively minor concern. The incidence of SPB infestation, however, has been high throughout the analysis area and is expected to increase. The high basal area and number of stems per acre in the large, overmature pine trees make the analysis area's forests highly susceptible to SPB. A major management concern is how to deal with the effects of SPB infestations and their control on ecosystems in Big Creek Scenic Area.

2. What outputs are currently produced or could be produced in the future?

Commodity outputs are timber and minerals. Present and possible amenity and noncommodity outputs are wildlife and scenery viewing, birding, hiking, camping, hunting, auto touring, photography, and other forms of recreation.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

The Bureau of Land Management has not studied the possibility of constructing reservoirs or other storage systems in the analysis area. It appears that storage outside the analysis area is adequate for regional needs.

management measures of considerable magnitude and importance?

Yes. Wilderness designation would impact management for Threatened and Endangered (T&E) species.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

No.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

No.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes, in existing deeds that reserve mineral rights.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

Little Lake Creek Wilderness, on the Raven Ranger District, is the only wilderness in the Sam Houston National Forest. It contains 3,810 acres. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

Approximately 40 miles.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Little Lake Creek has an average annual use of 500 Recreation Visitor Days (RVD's). There is a general lack of awareness of National Forest activities and offerings in the region. However, the trend is toward much greater demand for and use of public land.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

Population growth is greatest in the "bedroom" communities within commuting distance of metropolitan Houston. Private parcels adjacent to the Forest are being bought and subdivided. The population of Texas increased by 19.4 percent between 1980 and 1990. Harris County, in which Houston is located, has a population of 2.8 million. Texas is now the third most populous State in the United States.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

known as the Big Woods offer such opportunities. However, most of the Sam Houston National Forest does not offer opportunities for primitive recreation.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

The analysis area includes no known active primary habitats of threatened, endangered, or sensitive wildlife species. However, two inactive RCW clusters affect management of the Big Creek Scenic Area. One cluster is on the southern edge of the scenic area. A second is located northwest of the scenic area, but much of the 1,200-meter zone associated with the second cluster falls within the scenic area. Increased development could negatively affect active management of RCW. The slenderwake-robin (trillium gracile), occurs in Big Creek Scenic Area. The TNHP lists this slender species wake-robin as an S 3 species, which means that only 21 to 100 occurrences are known within the State of Texas. Habitat for this species should be maintained in the Big Creek Scenic Area.

2. Could their needs be provided for through means other than wilderness designation?

Classification of the scenic area as a Research Natural Area (RNA), botanical area, or similar special area would provide for management for the trillium. Red-cockaded woodpeckers require open stands of older pines. Such habitat is best maintained by

means of active management, and active management is not permitted in designated wilderness.

3. Is there a need to provide a sanctuary for species that cannot survive in less than primitive surroundings?

No such need is known at this time. Studies of declining populations of neotropical migrant birds might show that these birds need habitats of kinds represented in Big Creek Scenic Area.

Landform and ecosystem preservation.

What is the analysis area's landform type based on Edwin Hammond's classification system? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

This area of the western Gulf Coastal Plains consist of floodplains, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes are characterized by inclined surfaces on broad interstream divides with narrow floodplains and branch head inclusions.

Table 1. Big Creek Mineral Interest and Leasing Status of Areas
Within Proposed Big Creek **as of May 29, 1992**

Tract	U.S. Interest	Outstanding/Reserved Acres	Issued Leases

58178			
	4,768.50 (50%)	** 77.50 (50%)	*NM-
58179			
J-2-XXIV	335.00	**468.00	*NM-
58185			
Total	6,191.50	575.50	

*Lease applied for; none issued to date.
**Held by production (May revert to U.S. ownership if production ceases on or before 1/1/95).

Big Slough

Davy Crockett National Forest, Neches Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

BIG SLOUGH: Gross area approximately 1138 acres; net approximately 1,138 acres.

Location and vicinity.

The analysis area is located in the northeastern portion of the Neches Ranger District in the Davy Crockett National Forest. It lies just west of the Neches River in Houston County, Texas. It is bounded by private land on the north, Forest Service (FS) 511 on the west, FS 517 on the south, and the National Forest boundary on the east.

Describe access to the analysis area, including roads and trails leading to the area.

Access is by FS 511, FS 517, a few private roads, and the 4-C National Recreation Trail, which passes through the south end of the analysis area.

General description of the analysis area's geology.

This part of the western Gulf Coastal Plain is underlain by recent alluvial deposits and the Sparta Sand geologic formation. The recent alluvial deposits consist of gravels, sands, silts, and clays and are less than 2 million years old. The Sparta Sand formation consists of clays, quartz sands, lignite, glauonitic marl, and marine megafossils and is 36 to 58 million years old. Soils associated with these formations are the Socul, Cuthbert, Kurth, Lilbert, Kerwin, Ozias, and Pophers series.

General description of the analysis area's topography.

Approximately 50 percent of the area is flat and 50 percent is rolling ridges.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area contains a variety of vegetation types. Loblolly pine is the dominant forest type (46 percent of total area), followed by shortleaf pine (26 percent of total area), mixed pine and hardwood types (20 percent of total area) and oak types (8 percent of total area).

The western part of the analysis area is dominated by shortleaf pine, with red oak, white oak, and sweetgum the major associated species. The eastern part supports loblolly pine, bottomland red oaks, sweetgum, and sycamore. Other species typical of mesic sites flourish also. The Texas Natural Heritage Program (TNHP) loblolly pine-oak and shortleaf pine-oak series are the dominant plant communities.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

Approximately 1.5 miles of the 4-C National Recreation Trail passes through the analysis area, providing interior access. There are several large pine and hardwood trees to view. Many areas support water-loving plants. A beaver pond is present and the area is a classic example of a water-related ecosystem.

One active and three inactive red-cockaded woodpecker (RCW) clusters are present. Cluster 22-3 is active and includes nine cavity trees. Two of these cavity trees have artificial cavity inserts. The cluster is near the end of FS 517, near the Big Slough Wilderness Area. Cluster 22-1 is inactive and has 4 live cavity trees. Cluster 22-2 consists of 6 cavity trees, all inactive. Two of these trees have artificial cavity inserts. Cluster 15-1 is inactive, extends over into Compartment 22, and consists of four cavity trees. There is only one cluster tree is in Compartment 22.

No sensitive wildlife species are known to be present. A detailed inventory of the analysis area's flora and fauna has not been completed.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Logging began in the late 1800's, and the analysis area was cut over heavily. The analysis area was almost completely logged off between 1920 and about 1930. Only a few isolated islands of small pine, stumps, and scrub hardwoods are left. The analysis area's vegetation has since recovered. However, old tramway grades, pieces of narrow gauge steel track, and other artifacts provide evidence of past logging activity. The midstory vegetation in all RCW clusters and replacement stands has been removed by chainsaw or shear or both. Compartment 22 is being thinned according to guidelines for management within 1,200-meters of RCW clusters.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

the casual visitor. Timber was harvested from most of the area in the 1920's and 1930's. The few old skid trails and haul roads have grown over and are being used as hiking or horse trails. Activities associated with the 4-C Trail are visually evident but have not had any significant or permanent influence on the analysis area's ecological processes. The 4-C Trail and associated side trails are maintained and improved periodically. Midstory vegetation has been removed from all RCW clusters and replacement stands. The analysis area includes 111 acres of 20-year-old regeneration and 11 acres of 30-year-old regeneration. The analysis area also contains about 4.9 miles of road and 1.2 miles of utility corridor.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Apart from regeneration areas, roads, a utility corridor, and the RCW management sites, the analysis area appears somewhat natural. Under the 1987 Forest Plan, the analysis area will continue to be managed for multiple use and will not regain a natural appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. All mineral rights are leased, and surface occupancy with mitigating measures implemented must be allowed in order to accommodate mineral exploration and production. However, surface ownership patterns do not appear to preclude perpetuation of wilderness values.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a.Airstrips or heliports: No.

b.Electronic installations: No.

c.Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.

d.Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: All the mineral rights underlying this area have been leased, but no rights have been exercised.

f. Recreation improvements such as occupancy spots or minor hunting or outfitter camps: The 4-C Trail, a National Recreation Trail, passes through the southern part of the analysis area. Approximately 1.25 miles of this trail is within the analysis area. Primitive dispersed camp spots are scattered throughout the analysis area, but are inconspicuous. Signs are present along the trails.

g. Timber harvest areas where logging and prior road construction are or are not evident: Major logging took place in the analysis area in the 1930's. The only remaining evidence of this active logging is the old logging tram which crosses the area from north to south. Old timber haul roads and skid trails are overgrown and are only evident to the keen observer. Many of these roads are now being used as hiking and horse trails. In 1973, 11 acres were clearcut. An additional 11 acres were regenerated in 1959.

old stands. No cultural treatments are being applied in plantations or plantings.

i. Private inholdings in the area: No.

j. Dwellings on private inholdings: Not applicable.

k. Nonconforming structures and improvements: There are three parking areas with bulletin boards along FS 517. There are about 1.2 miles of utility corridor and 4.9 miles of road. The utility corridor contains a 20-foot right-of-way to Houston County Co-op and a 5-foot right-of-way to GTE.

l. Ground-return telephone lines: There is one phone line. This phone line, permitted to GTE, is about 1.2 miles long. The right-of-way for this is five feet wide.

m. Watershed treatment areas: No.

n. Roads: The analysis area contains all or sections of Houston County Road (HST) 27 (0.75 miles); Forest Development Road (FDR) 5122 (0.5 miles); FDR 517B (1.0 miles); FDR 517C (0.4 miles); and FDR 517 (2.25 miles). HST 27 serves the H.R. Conner residence, and FDR 517 is used to access private property.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

The 4-C Trail's purpose and character are generally consistent with management of the analysis area as wilderness. The trail and its related structures may support a desirable existing use that provides for visitor health and safety. Traditional trail marking and footpath maintenance should continue. Mechanized or motorized tools would not be used for maintenance except as expressly allowed by the land-managing agency. All mineral rights have been leased and are not subject to immediate termination. Surface occupancy, with mitigation implemented, must be allowed in order to accommodate exploration and development. The Forest was restocked with wild turkeys in 1990 and 1991. One release site was in the general vicinity of the analysis area. However, there have been no reported turkey sightings in the analysis area. RCW occur in the analysis area. They thrive only where midstory vegetation is prevented from encroaching on cavities. If midstory removal activities (hand, mechanical, fire) are discontinued, then RCW would disappear from the analysis area as they disappeared from the Big Slough Wilderness Area.

3. Are improvements in the analysis area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

The roads, trails, and features developed under special use permits are being maintained for long-term services.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. None of the analysis area has been harvested within the past 10 years. Compartment 22 is scheduled for a RCW 1,200-meter-zone thinning.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. The area contains 4.9 miles of road or about 4.31 miles per 1,000 acres.

6. Are all existing roads under Forest Service jurisdiction?

No. There are 4.15 miles of Forest Service road (3.65 miles/1,000 acres) and 0.75 miles of county road (0.66 miles/1,000 acres) in the analysis area.

Evaluation of Potential Wilderness

Capability.

designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

Hikers frequent the 4-C Trail although developments on private land are visible. A recent Recreation Opportunity Spectrum (ROS) inventory indicates none of the analysis area offers opportunities for primitive or semiprimitive recreation characterized by solitude and serenity.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

The 4-C Trail and adjacent roads makes access reasonably easy. The terrain offers some opportunities for adventure and challenge. Cross-country foot travel could be moderately challenging for the novice.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Numerous locations are suitable for primitive camping.
b. Hunting: The analysis area offers opportunities to hunt both small and large game species. Deer hunting is more popular than small game hunting because deer have been abundant in the analysis area.
c. Fishing: The Neches River, which is just east of the area, is one of east Texas's major streams and presents good fishing opportunities. Closure of FDR 517 would affect recreational use of the river. People are now walking from the end of FDR 517 to the river or slough. This would be impractical if the area were made wilderness and the road closed.
d. Canoeing: Canoeing on the Neches River is excellent.
e. Boating: The Neches River provides limited opportunities for boating.
f. River rafting: There are no streams or rivers large enough to support this activity.

g. Backpacking: The analysis area is excellent for the resident and through hiker. The 4-C Trail is a popular National Recreation Trail. Backpackers sometimes use this trail.
h. Hiking: Same as for backpacking. The trails are in an acceptable condition.
i. Riding: Horseback riding opportunities are extremely limited. The 4-C Trail is restricted to foot travel only.
j. Photography: Good opportunities exist.

Special Features.

1. What is the analysis area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

biology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

The abundance and variety of game and nongame animals appear to be typical for remote and mature forests of the region. Accurate populations figures, however, are not available.complete inventory of the analysis area's flora and fauna has not been completed.

Wild turkey were restocked in the general area in 1990 and 1991. There have been no reported turkey sightings in the analysis area. The analysis area also contains one active and three inactive RCW clusters.

Manageability.

1. What are the characteristics of the surrounding area including ROS classification, adopted VQO, and present and planned uses?

According to a recent inventory, ROS on the entire area is roaded natural. The Visual Quality Objective (VQO) generally varies from partial retention to maximum modification because there are distinctive landscape and aesthetic values along the main travel corridors.

Under 1987 Forest Plan guidance, future land use will continue to stress multiple-use management with sensitivity toward the visual resource. Under the current plan, the 337 acres of the area within 1,200 meters of a RCW cluster will continue to be intensively managed to provide habitat for this species. Neches Bluff, a National Forest Observation Site, is located just to the north of the area. Ratcliff Lake Recreation Area is located south of the area. Adjacent private lands are valued for their timber production and pasture. Private lands are being developed for residential purposes also.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development is likely to continue on private land near the analysis area, encroachments are not expected to be a serious problem. The eastern boundary adjoins existing wilderness and thus is protected.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked. The other boundaries follow existing wilderness (which is marked) or easily located.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

Some portions of the boundary are located in areas that would be difficult to cross or access. However, there would be many areas where the prohibition against the use of motorized vehicles, such as All Terrain Vehicles (ATVs) would be difficult to administer.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The forested terrain provides some degree of protection along some of the boundary. However, farm scenes, homes, and agricultural lands are evident along the northern

public roads near the boundary would reach the analysis area. The Big Slough Wilderness Area would shield the eastern boundary.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. Existing roads would provide good access along the western boundary.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: The analysis area serves users of the 4-C Trail. Hiking use is moderate; hunting use is heavier. There is some ATV trespass in the Big Slough Wilderness, to the south.

b. Information on wildlife species, populations, and management needs: The analysis area supports species associated with late successional habitat. Deer is currently the featured wildlife species. The RCW is the only threatened and endangered species known to occupy the analysis area.

c. Water availability and use: Potable water is available at the trail shelter. Water is readily available for wildlife.

d. Livestock operations: None.

e. Timber: All of the analysis area, except the stringers adjoining perennial and intermittent streams, are classified as suited for timber production. The analysis area's timberland is needed to provide part of the timber for sale program described in the 1987 Plan. The analysis area is considered a high-quality site for timber production. Site indices are generally from 70 to 100 for pines and in the 80's for oaks in the hardwood stands. None of the stands in the analysis area are less than 10 years old, but stands occupying about 15 percent of the acreage are about 20 years old. The average age of the analysis area's timber is 80 to 100 years. District records indicate that the last timber harvest in the analysis area took place in 1973. Thinning in a 1,200-meter RCW zone is planned.

f. Minerals: There are no privately owned mineral rights. The analysis area has been evaluated as having a moderate to high potential for oil and gas occurrence. All minerals rights have been leased.

g. Cultural resources: Much of the analysis area could have provided camping opportunities for prehistoric populations. A number of sites probably offered prehistoric populations the resources necessary for survival. Additional surveys could result in the discovery of more prehistoric sites. The analysis area has not been investigated intensively enough so that significance of the prehistoric sites can be assessed. Many sites in the analysis area were probably used by Native Americans. These sites, and the objects and other physical evidence left behind by early travelers and settlers, are an important part of our cultural heritage. Artifacts found in the past indicate early Caddoan influences in the Hickory Creek drainage. Designation of the analysis area as wilderness would not be inconsistent with the requirements of the Antiquities Act of 1906, the National Historic Preservation Act of 1966, the Archaeological Resource Protection Act of 1979, and several other laws providing protection for cultural resources on Federally owned lands.

h. Authorized and potential land uses: Two special uses are authorized. One is issued to GTE and the other to the Houston County Rural Electric Co-op.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: Fire protection and successful fire suppression efforts have resulted in a moderate buildup of light and heavy fuels. Existing Forest Service roads provide relatively good access for fire suppression. Potential spread of the southern pine beetle (SPB) is extremely high because pine stands occupy much of the acreage. The large, old trees

some mortality can be expected in the near future. There are no private in-holdings. Thinnings in 1,200-meter RCW zones help to reduce SPB hazard and open up the area. Prescribed burning is extensively used to control midstory vegetation. Installation of artificial cavities is proving to be a very important method of replacing cavity trees lost to SPB. These management tools could not be used in wilderness. If the analysis area becomes wilderness, management for RCW will stop. If this happens, it is probable that RCW will eventually disappear as a result of increases in midstory density and SPB-caused mortality of cavity trees.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities--primarily hunting and hiking (including backpacking)--should continue at about the same low to moderate level. The prominence and visibility of the analysis area make it desirable to manage the area with sensitivity to visual quality. Conventional logging methods are being used now. These same methods are to be used a 1,200-meter RCW zone thinning. This analysis area is considered suitable timberland and is expected to produce part of the Forest's sustained output of timber. Federally owned minerals in the analysis area are available for exploration and production. Mineral rights in the analysis area are leased. The analysis area is considered to have a moderate to high potential for oil and gas production and may produce oil and gas in the future.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. Wilderness designation would adversely affect management for the endangered RCW (See i. in previous section for more information).

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

The analysis area is considered to have a moderate to high potential for oil and gas occurrence. Designation as wilderness would preclude future leasing of mineral rights and future mineral exploration and development.

6. Does the analysis area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No. However, wilderness designation would affect public access of the Neches River.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. Wilderness designation would reduce the Forest's base of suitable timberland and would result in a reduction in the volume of wood available to industry. The analysis area has a high potential for oil and gas production, and all mineral rights are currently leased. Wilderness designation would preclude oil and gas production after the expiration of leases in effect at the time of wilderness designation.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. All mineral rights in the analysis area have been leased.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in the State of Texas and additional land in nearby States. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The 3,639-acre Big Slough Wilderness is adjacent to the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Big Slough Wilderness received an estimated 1,900 Recreation Visitor Days (RVD's) use in 1990. This level of use (0.52 RVD's/acre) is well below capacity (2.0 RVD's/acre). There has been no significant over-use of the Big Slough Wilderness. Recreational use of Big Slough has increased gradually.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. Metropolitan Dallas and Houston have grown much faster (27 percent and 17 percent respectively, 1980-87). These population centers are about 100 miles (Houston) to 150 miles (Dallas) from the analysis area. Their combined population is more than 5 million persons. The population of the Deep East Texas Region, which includes Houston County and the analysis area, increased 10 percent between 1980 and 1988. The region's population is expected to increase about 50 percent over the next 35 years. The analysis area is in Houston County, where the population increased from 22,299 in 1986 to 23,988 in 1988.

Nonwilderness lands.

1. Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Many acres of National Forest land within 1 to 2 hours driving time of the analysis area are suitable and available for primitive recreation use. The National Forests in Texas include 82,348 acres that provide opportunities for semi-primitive or primitive recreation.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

No.

2. Could these needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

This is unknown at present. Various scientific and interested groups, along with other individuals are conducting studies and collecting data that will answer this question.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1977)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area consist of floodplains, stream terraces, concave foot slopes, side slopes and ridge tops. There are no unique landforms within the analysis area.

2. What is the area's ecosystem classification? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area is classified as: loblolly pine (46 percent); shortleaf pine (28 percent); white oak-yellow pine (9 percent); bottomland hardwood-yellowpine (5 percent); white oak-red oak-hickory (6 percent); shortleaf pine-oak (4 percent); and loblolly pine hardwood (2 percent). These types are typical of the southern Coastal Plains and are commonly found in Big Slough and other wildernesses in Texas. The most common plant communities are the TNHP loblolly pine-oak and shortleaf pine-oak series. The analysis area's ecosystem is commonly represented in existing wilderness areas in Texas.

Big Woods

Sam Houston National Forest, San Jacinto Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

BIG WOODS: Approximately 1,335 acres.

Location and vicinity.

This analysis area unit is in the northwest portion of the San Jacinto Ranger District, Sam Houston National Forest. It lies north of Highway 150 in San Jacinto County, Texas; west of the town of Coldspring; east of Old Waverly; and north of Evergreen. It is almost triangular and is bounded by Forest Roads (FR) 202 and 207 and by private land.

Describe access to the analysis area including roads and trails leading to the area.

The analysis area's west side can be reached by going north on Farm-to-Market (FM) 2693 and FR 207. For access to the east side, travel north from Highway 150 on FR 202. The Lone Star Hiking Trail starts at the south boundary and continues to the analysis area's northernmost point at the intersection of FR's 202 and 207.

General description of the analysis area's geology.

The analysis area is on the western Gulf Coastal Plain and is underlain by the Willis Geological Formation. The Willis Formation is less than 2-1/2 million years old and consists of clay, silt, sand, and siliceous gravel of granule to pebble size, including some petrified wood. Soils

series.

General description of the analysis area's topography.

The analysis area is in the western Gulf Coast Plain and consists of floodplains, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes are characterized by inclined surfaces on broad interstream divides with narrow floodplains and branchhead inclusions.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is within the Southern Mixed Forest Ecosystem. The predominant forest type is loblolly pine. Oaks and other hardwoods make up an average of 15 percent of the crown cover in the loblolly pine forest. Shortleaf pine also occurs in the overstory. Yaupon is the most common understory species. Riparian vegetation on lower slopes, creek bottoms, and stream terraces is mainly loblolly pine-oak and hardwood slope forest. The Texas Natural Heritage Program (TNHP) loblolly pine-oak series is the predominant plant community in the analysis area.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

No special features or biotic communities are known to be present. Because the analysis area has gentle relief and the old-growth forest has a closed canopy, the analysis area is a favorite with local hunters. Wild pigs and white-tailed deer are the favorite game species.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Man has altered ecological processes in the analysis area significantly. Much of the analysis area was logged or cleared for agriculture (or both) around the turn of the century. Since then, additional timber management, southern pine beetle treatment, and road construction has occurred. Planned harvests and increased levels of southern pine beetle (SPB) infestation have created many openings in stands. The forest is now a mosaic of clearings and mature stands.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

Much of the analysis area has been disturbed by harvesting, salvage operations, and SPB suppression activities. Pine plantations from 0 to 25 years old occupy about 27 percent of the analysis area. These plantations do not appear natural.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

The analysis area is regaining a natural appearance, but it will take thirty or more than forty years for the plantations to out grow their man-made appearance. Harvesting of mature stands will continue. Under the 1987 Forest Plan, the analysis area will continue to be managed for multiple use and will not regain a natural appearance. As pines stands mature, susceptibility to SPB infestations will increase, and both infestations and their control measures will affect the analysis area's appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

Yes.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.

d. Areas under current mineral lease that contain a "no surface occupancy' stipulation: No. However, two applications for leases have been received.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: No.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: Although there are no recreational improvements, an open area known as the Big Woods Hunting Camp receives much use.

g. Timber harvest areas where logging and prior road construction are or are not evident: Plantations, stumps, roads, and other logging evidence are prevalent throughout the analysis area.

h. Cultural treatments involving plantations or plantings: Yes. There are 343 acres of plantations and another 76 acres of SPB cuts in the analysis are. An additional 221 acres of mature pine stands have been thinned in recent years.

i. Private inholdings in the area: No.

j. Dwellings on private inholdings: Not applicable.

k. Nonconforming structures and improvements: No.

l. Ground-return telephone lines: No.

m. Watershed treatment areas: No.

n. Roads: There are four permanent, surfaced, (FR 202, 202A, 207 and 207A) along the analysis area's boundaries. The analysis area also contains numerous unsurfaced "woods" roads (total length 4 miles) and 3.3 miles of trail.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Yes.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

Yes.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. About 77 acres or 6 percent of the area has been harvested in the past 10 years.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

Yes.

6. Are all existing roads under Forest Service jurisdiction?

Yes.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

It provides some opportunities for solitude and serenity. Forest Service roads and activities on private land are visible from a number of vantage points. A recent Recreation Opportunity Spectrum (ROS) inventory indicates that about 390 acres or 29 percent of the analysis area provides opportunities for semi-primitive recreation and thus an opportunity to experience serenity.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Access is easy and relatively high wildlife populations offer hunters excellent opportunities for these experiences.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Excellent.
b. Hunting: Excellent. The analysis area is popular with deer and wild hog hunters. There are also opportunities for squirrel hunting.
c. Fishing: None.
d. Canoeing: None.
e. Boating: None.
f. River rafting: None.
g. Backpacking: The Lone Star Trail, a National Recreation Trail that passes through the analysis area, provides good backpacking. Otherwise, backpacking opportunities are limited by the analysis area's small size and dense vegetation.
h. Hiking: The Lone Star Trail, a National Recreation Trail, passes through the analysis area and provides excellent hiking opportunities. Some of the woods roads also provide good hiking opportunities. Off these routes, the opportunity for hiking would be limited by the dense vegetation.
i. Riding: Excellent horseback riding.

panoramic views.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

Like most areas within the Sam Houston Forest, the analysis area presents opportunities for outdoor education in a variety of subjects.

2. Is there an abundant and varied wildlife population?

Yes. Wildlife found in this area are typical of the Southern Mixed Ecosystem. Because the analysis area contains varied habitat, a wide variety of early and late successional wildlife species are present.

Manageability.

1. What are the characteristics of the surrounding area, including ROS classification, adopted VQO, and present and planned uses?

The characteristics of the surrounding area and the analysis area are the same. The ROS classification is roaded natural (71 percent of area) and semiprimitive motorized or semiprimitive nonmotorized (29 percent of area). The inventoried Visual Quality Objective (VQO) is 66 percent retention (along the trail, FR 207, and FR 202); 15 percent partial retention; and 19 percent maximum modification. Under the 1987 Forest Plan, future land use will stress multiple-use management.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

No.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked, and the other boundaries follow roads and are easily identified.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

No. Little of the analysis area's boundary is located in areas that would be difficult to cross or access.

5. Do boundaries shield the wilderness environment inside the boundary from the sights and sounds of civilization?

No. Many of the analysis area's boundaries are open Forest Service roads where the sounds of civilization are generated. Much of the southern boundary adjoins private land that is a source of sights and sounds that could detract from wilderness experiences.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. The adjacent roads and Lone Star Trail provide excellent access.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

analysis area.

b. Information on wildlife species, populations, and management needs: Feral hogs are abundant and may be a problem in the future if not adequately controlled by hunters and predators. There is a fair deer herd and squirrel populations are relatively low. An inventory and monitoring program to provide accurate data on plant, animal, and bird populations is needed. Presently, there are no red-cockaded woodpecker (RCW) clusters in the analysis area. However, a small portion of the area is within 1,200 meters of a cluster.

c. Water availability and use: There are no perennial streams in the analysis area, but water for wildlife is abundant. There are no sources of domestic-use or potable water within the analysis area.

d. Livestock operations: None. There is a long history of trespass problems, however.

e. Timber: Site quality is excellent; site indices range from 70 to 120, and are 90 to 100 in most places. Timber types are loblolly (approximate 80 percent) and shortleaf (approximately 20 percent). Stands on 77 acres (6 percent of the area) are less than 10 years old. Stands on approximately 270 acres (21 percent of the area) are 10 to 25 years of age. All of the analysis area, except the stringers along creeks and the RCW clusters, is classified as general forest and is available for timber production. A small portion of the analysis area is within RCW management areas in which timber harvest operations are constrained.

f. Minerals: There are no reserved or outstanding mineral rights. There are no leases.

g. Cultural resources: There are no known historic properties in the analysis area. However, the area along FR 202 is designated as having a very high probability for the occurrence of significant historic properties. The remainder of the analysis area is considered low probability. There are no known conflicts with management direction or archeological regulations.

h. Authorized and potential land uses: No special uses are authorized or anticipated.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: There are no private parcels of land within the boundary. Wildfires have been infrequent and have not caused any significant damage. Southern pine beetle (SPB) infestations are a major concern and will continue to kill many pines. Wilderness designation would limit management tools for suppression and would have a significant effect on species composition and ecological processes in the analysis area.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation and clean water are produced and will continue to be produced under the current management plan. The analysis area is currently considered suitable timberland and is expected to produce a part of the Forest's sustained output of timber. The analysis area is being used in ways that may not be possible if it is designated wilderness. The quality of deer habitat and deer hunting could decline, and RCW management would not be possible.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. Wilderness designation would negatively affect the management of the analysis area as habitat for RCW. With wilderness management, the absence of measures to control midstory vegetation and SPB would eventually reduce the value of the analysis area as RCW habitat severely.

restrictions or controls resulting from wilderness designation would not be in the public interest?

No. This analysis area is considered to have a high potential for oil and gas occurrence. Despite this, the analysis area is not currently leased and is neither being explored actively nor producing minerals. However, the analysis area is available for mineral leasing, and two applications have been filed.

6. Does the analysis area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. The analysis area is currently part of the Forest's base of suitable timberland. Any reduction in this base would reduce the amount of wood available for local industry.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

No.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

Little Lake Creek Wilderness Area is the only wilderness in the Sam Houston National Forest at the present time. The National Wilderness Preservation System includes 84,012 acres of wilderness in Texas and additional lands in nearby states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

It is approximately 20 miles to the Little Lake Creek Wilderness Area. Wilderness areas on the National Forests and Grasslands in Texas (NFGT) range from 1 to 3 hours driving time from the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

The Little Lake Creek Wilderness Area received an estimated 500 Recreation Visitor Days (RVD's) of use in 1991. Low visitor use of Little Lake Creek may result partly from a general lack of awareness of National Forest offerings. However, the trend is toward a much greater demand for and use of public lands.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas grew much faster (17 percent between 1980 and 1987). Nearby Harris County is the third largest county in the United States, and its population grew about 15 percent between 1980 and 1987. Private parcels in the vicinity are frequently purchased by people who commute to Houston.

San Jacinto County and the analysis area are located in the Deep East Texas Region. The population of Deep East Texas increased about 10 percent between 1980 and 1988. In San

population of San Jacinto County is expected to grow about 119 percent over the next 35 years.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Several thousand acres of adjoining land in the Big Woods Wilderness Area offer the same recreational opportunities the evaluation area offers. However, most of the Sam Houston National Forest does not provide the opportunity for unconfined and primitive recreation. The 84,012 acres on the NFGT provide semi-primitive or primitive recreation opportunities.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

There are no active clusters of the endangered RCW or other known sensitive, threatened, or endangered species in the analysis area at this time.

2. Could their needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

No such need has been identified.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8, 1977)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area consists mostly of gently sloping ridgetops, side slopes, and occasional floodplains similar to those that occupy most of the area in adjacent counties. These landforms are not unique and are common in existing wilderness areas in east Texas.

2. What is the analysis area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the vicinity?

The analysis area's forest cover is classified as loblolly pine and shortleaf pine forest cover types (SAF 1980), which are typical of the western Gulf Coastal Plain. The plant communities most common in the analysis are the TNHP loblolly pine-oak and shortleaf pine-oak series. The analysis area forms part of the Southern Mixed Forest Ecosystem. This ecosystem is commonly represented in existing wilderness areas in Texas.

Boggy Creek

Angelina National Forest, Angelina Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

BOGGY CREEK: Gross area approximately 1,897 acres; net area approximately 1,897 acres.

Location and vicinity.

Boggy Creek is located in the central portion of the Angelina National Forest. The area is approximately 2.5 miles west of Farm-to-Market (FM) 705 in San Augustine County, Texas. It is bounded by FS 300 and private land on the east, by Forest Service (FS) 317 and private land on the west, by private land on the north, and by U.S. Forest Service land on the south.

Describe access to the area, including roads and trails leading to the area.

This analysis area is accessible by FS 300 or FS 317, which connect with FM 83 and FM 705.

General description of the area's geology.

This area is in the western Gulf Coastal Plain and is underlaid by the Yegua geologic formation. This formation is 36 to 58 million years old and consists of clay, quartz sands, lignite, glauconitic marl with marine megafossils. Soils associated with the Yeuga formation are the Fuller and Kurth series.

General description of the area's topography.

This area of the western Gulf Coastal Plain is characterized by floodplains, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes typically occur on broad interstream divides with narrow floodplains and branch head inclusions.

General description of the analysis area's vegetation, including the ecosystem type.

The area is almost entirely forested with the loblolly pine and shortleaf pine forest cover types characteristic of the southern Coastal Plain. Loblolly is dominant except on drier sites and ridges. Hardwood species may be present in the overstory and include sweetgum, southern red oak, post oak, white oak, and hickory. The most common plant communities are the Texas Natural Heritage Program (TNHP) Loblolly Pine-Oak and Shortleaf Pine-Oak Series.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

No key attractions are associated with the analysis area. There are no known red-cockaded woodpecker (RCW) clusters, eagle nests, or sensitive plant species in this or immediately adjacent areas. Sam Rayburn Reservoir, which provides both scenic and recreational opportunities, is located approximately 1 mile to the south of the analysis area. Bald eagles are known to nest along the shore of Sam Rayburn Reservoir and may be seen perching in trees on the shoreline or flying over the lake.

Area Inventory

Human influence.

processes and conditions?

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. These lands were acquired from timber companies and other private landowners, during the 1930's and early 1940's. Most of the anaylis area was cutover in the early 1900's. After acquisition by the Forest Service, the analysis area was replanted by the Civilian Conservation Corps (CCC). Natural ecological processes have generally been functioning in the analysis area, but some timber harvesting has taken place recently (see item 2. following).

Southern pine beetle (SPB) has attacked the area's pines in the past, and the area is moderately susceptible to infestation. As of the spring of 1992, there were no known SPB infestations in the analysis area.

There are several abandoned borrow pits in the analysis area. The fertile topsoil was removed when the pits were created, so revegetating the pits has been a slow process.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

The analysis area generally appears natural. There is little visible evidence of turn-of-the-century logging and farming activities within this area. Within the last few years, several areas have been regenerated by means of seed-tree or clearcut harvesting. These areas total approximately 294 acres.

There are approximately 6.6 miles of roads (6.3 FS and .3 County) within the analysis area. Skid trails and some haul roads associated with past logging activities have grown over and are not readily apparent.

Most of the analysis area has been prescribed burned over the past 10 years.

The abandoned borrow pits are still evident but are slowly being covered by grasses, pine, and other plants.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

With the exceptions of the regeneration areas, borrow pits, and FS roads, the analysis area appears natural. A pond has been constructed within the area, but it is natural in appearance and blends in with the surrounding topographic features. Under current (1987 Forest Plan) management direction, the analysis area will continue to be managed for multiple use and will not regain an untrammeled appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. The Federal government owns the mineral rights to a 130-acre block, but mineral rights in the rest of the analysis area are owned privately. A five-year lease of mineral rights to the 130-acre block was issued to Triad in the spring of 1992. Therefore, perpetuation of wilderness values cannot be insured. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate mineral exploration and production where mineral rights are owned privately or are leased.

No. No nonnative plant species are known to occur in the analysis area.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features or nonconforming uses present?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.

d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: Yes. The lessee of mineral rights in a 130-acre block has not exercised such rights. The lease will be valid for five years.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: There are no developed recreation improvements or camps. However, there are some primitive camps, which are used primarily during the hunting season. They receive minor use in other parts of the year.

g. Timber harvest areas where logging and prior road construction are or are not evident: The analysis area contains approximately 294 acres of regeneration currently less than 10 years old and 6.6 miles of improved graveled road. The regeneration areas and roads are very evident. Old timber haul roads and skid trails are overgrown and are evident only to the keen observer. There were once tramways throughout the forest, and evidence of these still exists.

h. Cultural treatments involving plantations or plantings: The only evidence of timber stand or wildlife habitat improvement in the analysis area were described above.

i. Private inholdings in the area: No.

j. Dwellings on private inholdings: No.

k. Nonconforming structures and improvements: Yes. There are 0.3 miles of graveled county road, which are maintained by San Augustine County. The Deep East Texas Electric Co-op maintains approximately 0.6 miles of aerial powerlines. The right-of-way for the powerline is 20 feet wide.

l. Ground-return telephone lines: Yes. Continental Telephone maintains approximately 0.3 miles of such lines. The right-of-way for the telephone line is 10 feet wide.

m. Watershed treatment areas: No.

n. Roads: There are 6.6 miles of improved graveled roads (including 0.3 miles of San Augustine County road) in use within the area. There are some old unimproved roads; these are becoming overgrown.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Approximately 6.6 miles of roads are in use within the area. All but 0.3 miles under county jurisdiction could be closed if this were necessary for wilderness management.

All of the mineral rights except those to 130 acres are retained by private individuals and are not subject to termination.

Surface occupancy, with some mitigation measures implemented, must be allowed in order to accommodate exploration and production equipment.

humans, and are they disappearing or muted?

The 6.6 miles of road and the powerline and telephone line rights-of-way are the only improvements being maintained for long-term needs. These improvements are not disappearing.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. There are approximately 294 acres in regeneration in the 0-to 10-years age class. This acreage accounts for approximately 15 percent of the total area.

5. Does the area contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are approximately 3.47 miles of improved road per 1,000 acres. All but 0.3 miles of road (0.16 miles/1,000 acres) are under Forest Service jurisdiction.

6. Are all existing roads under Forest Service jurisdiction?

No. Approximately 0.3 miles of road are under the jurisdiction of San Augustine County (county road easement).

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following

characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

There are some opportunities for this area for solitude and serenity. Forest Service roads and activities on private land are visible from some points. The area is bounded on the north and partially bounded on the east and west by private land. Activities and noises on these private lands may reduce the opportunity for solitude and serenity. A recent Recreation Opportunity Spectrum (ROS) inventory indicates that about 350 acres (or 18 percent) of the area provides opportunities for semi-primitive recreation. Visitors might have opportunities to experience solitude and serenity on these 350 acres.

Challenge.

Does the area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Opportunities for these experiences are similar to those at the nearby Turkey Hill and Upland Island Wilderness Areas and Wilderness Areas.

Existing FS roads make access reasonably easy. The terrain is relatively flat with some low ridges; hiking could be moderately challenging.

Outdoor recreation opportunities.

1. Describe the analysis for providing primitive and unconfined types of recreation including:

a. Camping: There are numerous locations suitable for primitive camping.

b. Hunting: Small and large game species occur in the analysis area and can be hunted.

c. Fishing: The analysis area does not present opportunities for fishing, but Sam Rayburn Reservoir is within 1 mile of the analysis area and offers excellent fishing opportunities.

d. Canoeing: There are no streams or rivers large enough to support canoeing, but it is possible to enjoy this activity on the nearby Sam Rayburn Reservoir.

e. Boating: There is no opportunity for boating within the analysis area, but Sam Rayburn Reservoir is approximately 1 mile south of the area and provides excellent boating opportunities.

f. River rafting: The analysis area has no streams or rivers large enough to support this activity.

g. Backpacking: There are some opportunities for backpacking. The lack of a trail system and the presence of undergrowth detract from the quality of backpacking experiences, however.

h. Hiking: Same as for backpacking.

i. Riding: Riding opportunities do exist; however, there are no developed trails.

j. Photography: Good opportunities exist.

Special Features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area provides the same types of opportunities that existing wilderness areas in the Forest provide. These include opportunities in archeology, biology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

Population of game and nongame animals are typical of those in southern pine-hardwood forests in the southern Coastal Plains. Accurate population figures are not available for all species, however.

Manageability.

1. What are the characteristics of the analysis area, including its ROS classification, adopted VQO, and present and planned uses?

The analysis area is classified as either semiprimitive motorized (about 350 acres or 18 percent), or roaded natural (about 1,550 acres or 82 percent). The Visual Quality Objective (VQO) is primarily modification along the FS roads and maximum modification outside the road influence area.

Under the 1987 Forest Plan, future land use will stress multiple-use forest management with sensitivity to the visual resource.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on National Forest land or private land around and near the boundary, demands for nonconforming structures or activities are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

No. The southern boundary follows an arbitrary line and does not conform with terrain or other features constituting a natural or man-made barrier. Few portions of the boundaries are in areas that would be difficult to cross or access. In most places, the prohibition against the use of motorized vehicles would be difficult to administer.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The northern boundary is adjacent to private land and the east and west boundaries are adjacent to FS roads and private land. The area inside the boundary would not be shielded from sights and sounds from private developments and these roads.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. There are points where visitors could transfer from motorized to non-motorized transportation.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting and camping are currently the dominant uses, while horseback riding and hiking appear to be second in importance.

b. Information on wildlife species, populations, and management needs: The analysis area contains both game and nongame animals commonly found in the southeastern Coastal Plains, including gray squirrel and white-tailed deer.

c. Water availability and use: There are no sources of potable water in the analysis area. Creeks flowing through the analysis area and a pond provide water for wildlife.

d. Livestock operations: None.

e. Timber: This area is a high-quality site for timber production. Loblolly pine site indices range from 75 to 95. Timber types are loblolly pine (85 percent), shortleaf pine (5 percent), loblolly-hardwood (9 percent), and hardwood (1 percent). Hardwood types (mostly oak-hickory) are found in the creek bottoms and intermixed with pine types.

Approximately 294 acres, or 15 percent of the area, is in stands less than 10 years old. Approximately half of the timber (47 percent by stand area) is between 40 and 70 years old. An estimated 26 percent of the timber is more than 70 years old.

All of the area except the stringers lying along the intermittent stream courses is classified as suited for timber production. The analysis area is to provide timber for the sale program specified in the 1987 Forest Plan.

f. Minerals: All mineral rights, except those for 130 acres, are owned privately and are not subject to Forest Service jurisdiction. The area is considered to have a moderate potential for oil and gas occurrence.

The 130 acres of government minerals was leased in March, 1992. The lease to Triad is for five years.

Where mineral rights are either owned privately or leased, the Forest Service must allow the construction and maintenance of access routes and drilling sites.

g. Cultural resources: Much of the analysis area is considered to have high potential for the presence of archeological sites, historical sites, or both (historic properties). The Angelina and Neches Rivers created ideal conditions for early settlement. Numerous Paleo-Indian to Neo-Historic prehistoric sites have been recorded within the analysis area. Future surveys will likely reveal additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

These sites, and the objects and other physical evidence they contain, are an important part of our cultural heritage.

h. Authorized and potential land uses: Currently, Deep East Texas Electric Co-op, Continental Telephone, and San Augustine County are authorized to maintain their rights-of-way within the analysis area. No other special uses are authorized and none are anticipated.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: The analysis area has been burned to reduce fuel build-up approximately every five years since the Forest Service acquired the land in the 1930's.

No wildfires have been recorded in the analysis area. Should a wildfire occur, the gently rolling terrain would not present suppression difficulties unless there were adverse conditions such as high winds or very dry fuels.

Potential for spread of the SPB is moderate because loblolly and shortleaf pines, the preferred host species, are present. Although few infestations have occurred in this area, the majority of the standing timber is at or near maturity and this could increase susceptibility.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities, such as hunting, should continue at about the present moderate to high level.

This area is considered suitable timberland and is expected to produce a sustainable output of timber. The next silvicultural examination and prescription process is scheduled to take place in the late 1990's.

The Federally owned minerals in the analysis area are available for mineral exploration and development. The analysis area's mineral rights are leased, and oil and gas may be produced in the future.

3. Is the area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

No.

restrictions or controls resulting from wilderness designation would not be in the public interest?

This area is not highly mineralized but is considered to have a moderate potential for oil and gas occurrences. A lease of the 130-acre block of government-owned minerals was issued March 1992, and will be valid for 5 years. Since the mineral rights are either owned privately or leased, permission to drill would be granted. Exploration would be permitted, as would construction and maintenance of roads, and necessary drilling sites.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, minerals, or developed recreation?

Yes. There are currently demands for dispersed recreation (hunting and fishing), minerals, and timber.

Designation of the analysis area as wilderness would reduce the amount of wood available to industry.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. Mineral rights to all but 130 acres of land are owned privately, and several special use permits have been issued.

Need.

Other Wildernesses

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in Texas, as well as additional lands in nearby States. See Table 1 (found in

the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

Turkey Hill Wilderness, consisting of 5,286 acres, is approximately 8 miles to the north.

3. What is the current level of use in nearby wilderness? What are the trends in the use of these areas?

Upland Island Wilderness about 20 miles southwest from Boggy Creek, received approximately 3,000 Recreation Visitor Days (RVD's) which is the average annual use; 500 of which involved overnight camping (3,000 RVD's is about 11 percent of Upland Island's estimated capacity). The average size of visiting groups was 2.6 people. More than 56 percent of visitors to Upland Island visit there more than twice per year. An estimated 27 percent of visitors go into the wilderness alone. Visitors are there to hunt or to scout places for future hunting trips. A large percentage of visitors are under 16 years of age. (This information is from Alan E. Watson and others, "Use Patterns, Visitor Characteristics, and Visitor Preferences in three Forest Service Wildernesses in the South.)"

which 500 involved overnight camping. Most of the use was related to hunter use. Users have not had any significant effects on the area's wilderness qualities or resources. A small increase in use over the next 10 to 20 years is anticipated.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew at much faster rates (27 percent and 17 percent respectively, 1980-87). These population centers are about 100 miles (Houston) to 175 miles (Dallas) from the analysis area. The combined populations of Houston and Dallas totals more than 5 million.

The population of Deep East Texas, which includes San Augustine County and the analysis area, increased about 10 percent between 1980 and 1988. The population of the Deep East Texas area is expected to increase about 50 percent over the next 35 years.

The analysis area is located in San Augustine County, the population of which grew from 8,785 to 9,174 between 1980 and 1990 (a 4.43-percent increase). The populations of adjacent Angelina and Jasper Counties increased by 8.96 percent and 4.01 percent respectively over the same period. The combined population of Angelina and Jasper Counties was estimated to be 105,965 in 1990 (Albers).

Nonwilderness lands.

1. Are there opportunities for unconfined and primitive recreation experiences on nonwilderness areas in the vicinity? If so, where?

Many acres of National Forest land within a reasonable distance of Boggy Creek are suitable and available for primitive recreation use. There are 84,012 acres of wilderness in Texas, and another 82,348 acres of National Forest land in Texas provide opportunities for semi-primitive or primitive recreational opportunities on the Forest.

Habitat needs.

1. Are any biotic species in the area directly competing with increasing public use and development?

No.

2. Could their needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

No.

Landform and ecosystem preservation.

1977)? Does the area represent a unique landform type that is not represented in any existing wilderness areas in the general vicinity?

The analysis area is within the Coastal Plain of eastern Texas. The dominant landforms are stream terraces, side slopes, low ridges, and ridges. These areas have gently sloping topography, with flat or undulating areas that receive moisture from stream terraces. These landforms are not unique and are typical of Turkey Hill Wilderness Area, approximately eight miles to the north.

2. What is the area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area's vegetation is classified as Loblolly Pine and Shortleaf Pine forest cover types (SAF 1980), which are typical of the southern Coastal Plains. The areas most common plant communities are the Loblolly Pine-Oak and the Shortleaf Pine-Oak Series (Orzelle 1991). The analysis area's ecosystem is commonly represented in existing wilderness areas within the State.

Bounds Peninsula

Angelina National Forest, Angelina Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

BOUNDS PENINSULA: Gross area approximately 1,492 acres; net - approximately 1,492 acres.

Location and vicinity.

The analysis area is in San Augustine County, Texas, and is located on the north shore of Sam Rayburn Reservoir in the central portion of the Angelina National Forest. The area is west of Farm-to-Market (FM) 705, approximately seven miles south of FM 83. It is bounded by Sam Rayburn Reservoir on the south and west; by private land on the north; and by U.S. Forest Service land on the east.

Describe access to the analysis area, including roads and trails leading to the area.

The analysis area is accessible by Forest Service (FS) 318 or FS 310, which connect with FM 705. The area can be reached by boat on Sam Rayburn Reservoir.

General description of the analysis area's geology.

The Yuega geologic formation underlies the area. This formation is 36 to 58 million years old and consists of clays, quartz sand, and lignite. The upper part of the formation is mostly clay and the lower part is mostly sand. Also present is glauconitic marl with marine megafossils. The formation's thickness ranges from 600 to 1,000 feet. Soil series associated with the Yuega

the analysis area.

General description of the area's topography.

The analysis area part of the upper Coastal Plains and is characterized by slightly concave ridgetops and moderately steep side-slopes. The ridgetops are characterized by broad interstream divides with gently sloping topography. The side-slopes typically occur on broad interstream divides with narrow floodplains and branchhead inclusions. All of the narrow floodplains and most of the branchhead inclusions are inundated by Sam Rayburn Reservoir.

General description of the analysis area's vegetation, including the ecosystem type.

The area is almost entirely forested with loblolly pine and shortleaf pine forest cover types characteristic of the southern Coastal Plains. Loblolly is dominant except on drier sites and ridges. Hardwoods that may be present in the overstory include sweetgum, southern red oak, post oak, white oak, and hickory. The predominant plant communities found in the area are the Texas Natural Heritage Program (TNHP) Loblolly Pine-Oak and Shortleaf Pine-Oak Series. Other plant communities in the analysis include the TNHP Overcup Oak and Baldcypress-Water Tupelo Series.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

This area is adjacent to Sam Rayburn Reservoir, which provides both scenic and recreational opportunities. This area is suitable habitat for bald eagle roosting and nesting, and there is active nesting along the shore of Sam Rayburn Reservoir. There is one active eagle nest in the analysis area. There are no known red-cockaded woodpecker (RCW) clusters or sensitive plant species in this area or in immediately adjacent areas.

Area Inventory

Human Influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. These lands were acquired from private landowners during the 1930's and early 1940's. Significant portions of these lands were acquired from timber companies. Most of the area was heavily cut-over in the early 1900's. Southern pine beetle (SPB) has attacked the area's pines, and the area is moderately susceptible to infestation. As of the spring of 1992, there were no known SPB infestations in the analysis area.

Sam Rayburn Reservoir was in completed in 1966. This 114,500-acre lake is under the jurisdiction of the U.S. Army Corps of Engineers. There is some dispersed camping along the reservoir's shoreline. The campsites are primitive and are used mainly for hunting purposes. This activity disturbs the shoreline only slightly.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

There is little visible evidence of turn-of-the-century logging and farming activities within the analysis area. Within the last 10 years, several areas have been regenerated by

are approximately 4.6 miles of FS roads within the analysis area. Skid-trails and some haul roads associated with past logging activities have become overgrown and are not readily apparent. The area was last burned in 1988, when prescribed fire was applied.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance.

With the exceptions of the regeneration areas, pipelines, and FS roads, the analysis area appears natural. Under 1987 Forest Plan guidance, the analysis area will continue to be managed for multiple use and will not regain an untrammeled appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. Surface management is not a problem within this area; however, subsurface mineral rights are currently retained in private ownership. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate mineral exploration and production of privately owned minerals. Therefore, perpetuation of wilderness values cannot be ensured.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No. No nonnative plant species are known to occur in the analysis area.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): None.

d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: No.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: There are no developed recreation improvements or camps, but the lakeshore is accessible by motorboat, and there are no restrictions on overnight primitive camping. Such camping is especially common during hunting seasons.

g. Timber harvest areas where logging and prior road construction or are not evident: There are approximately 219 acres of regeneration that is less than 10 years old. The regeneration and improved roads are very evident. However, the old timber haul roads and skid trails are overgrown and are evident only to the keen observer. There were once tramways throughout the forest, but all evidence of these has disappeared.

h. Cultural treatments involving plantations or plantings: The only evidence of timber stand or wildlife habitat improvement in the area was described previously.

i. Private inholdings in the area: No.

j. Dwellings on private inholdings: No.

k. Nonconforming structures and improvements: Yes. United Gas maintains approximately 0.4 miles of buried pipeline in the western part of the analysis area. The right-of-way for the pipeline is 50 feet wide.

l. Ground-return telephone lines: No.

m. Watershed treatment areas: No.

roads in use within the analysis area. There are some old unimproved roads; these are becoming overgrown.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Approximately 4.6 miles of FS roads are in use within the area. These roads could be closed if this were necessary for wilderness management; however, the mineral rights were retained by private individuals and are not subject to termination. Surface occupancy, with mitigation measures implemented, must be allowed in order to accommodate mineral exploration and production.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

Roads and the pipeline are the only improvements being maintained for long-term service. These improvements are not disappearing.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. There are approximately 219 acres in regeneration in the 0-to 10-years age class. This acreage accounts for about 15 percent of the total area.

5. Does the area contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are approximately 3.08 miles of improved road per 1,000 acres. These roads (4.6 miles) are all under Forest Service jurisdiction and could be closed to promote wilderness conditions.

6. Are all existing roads under Forest Service jurisdiction?

Yes.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

There are some opportunities for solitude and serenity. Forest Service roads and activities on private land are visible from some points. The area is bounded by private lands on the north, and activities on the private land may reduce opportunities for solitude and serenity. Motorboat traffic or maintenance work on the pipeline right-of-way (ROW) may detract from the solitude of the area. A recent Recreation Opportunity Spectrum (ROS) inventory indicates that about 176 acres, or 12 percent of the area, provide opportunities for semi-primitive recreation. Visitors might have opportunities to experience solitude and serenity on these 176 acres.

Challenge.

challenge, initiative, or self-reliance? Is access easy or difficult?

The area offers limited opportunities for these experiences, as do the nearby Upland Island and Turkey Hill Wilderness Areas. The FS road system now in use makes access reasonably easy. The terrain is relatively flat with some low ridges; hiking could be moderately challenging. A significant portion of the area is adjacent to Sam Rayburn Reservoir, which could offer the visitor the opportunity for excitement, initiative, or self-reliance.

Outdoor recreation opportunities. Describe the analysis for providing primitive and unconfined types recreation including:

a. Camping: There are numerous locations suitable for primitive camping.
b. Hunting: Small and large game species occur in the analysis area and can be hunted there.
c. Fishing: Sam Rayburn Reservoir is adjacent to the analysis area and offers excellent fishing opportunities.
d. Canoeing: There are no streams or rivers large enough to support canoeing, but it is possible to enjoy this activity on Sam Rayburn Reservoir.
e. Boating: Sam Rayburn Reservoir is adjacent to the analysis area and provides excellent boating opportunities.
f. River rafting: There are no streams or rivers large enough to support this activity.
g. Backpacking: Backpacking opportunities are limited by the area's small size, the absence of a trail network, and the presence of undergrowth.
h. Hiking: Same as for backpacking.
i. Riding: Horseback riding opportunities do exist; however, there are no developed trails.
j. Photography: Good opportunities exist.

Special Features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area provides the same types of opportunities that existing wilderness areas in the Forest provide. These include opportunities in geology, archeology, biology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

Populations of game and nongame animals are typical of those in southern pine-hardwood forests in the southern Coastal Plains. Most wildlife found in the existing habitat are late successional forest dwellers. Limited populations of early successional species are present in the analysis area.

Accurate population figures are not available for all species. Two known bald eagle nests are being monitored. At present, one is active and the other inactive.

Manageability.

1. What are the characteristics of the surrounding area, including its ROS classification, adopted VQO, and present and planned uses?

The area is classified as semiprimitive motorized (about 4 percent), semiprimitive nonmotorized (about 7 percent), and roaded natural (about 89 percent). The Visual Quality Objective (VQO) is primarily partial retention along the lakeshore and

Reservoir are considered very important.

Under the 1987 Forest Plan, future land use will stress multiple-use management with sensitivity toward aesthetic values. The Forest Plan is being revised, and the new Plan may place additional emphasis on the importance of maintaining the aesthetic values associated with lakeshore views adjacent to Sam Rayburn Reservoir. It is possible that the partial retention zone along the shore will be changed to a retention zone.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on National Forest land or private land around and near the boundary, demands for nonconforming structures or activities are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

Some portions of the boundary are in areas that would be difficult to cross or access; a major portion of the boundary consists of lakeshore that is accessible only by foot or boat. There are other boundaries where the prohibition against the use of motorized vehicles would be difficult to administer. The northern boundary follows the old tract boundary. Both of these boundaries follow arbitrary lines that do not conform with terrain or other features constituting natural or man-made barriers.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The lakeshore boundary provides some degree of protection; however, sights and sounds of boats on Sam Rayburn Reservoir may detract from solitude. The northern boundary is adjacent to private land. It is possible that private development and road construction could occur near this boundary and that these could produce sounds incompatible with wilderness.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. There are points where visitors could transfer from motorized to nonmotorized transportation.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting, camping, and boating are currently the dominant uses, while horseback riding and hiking appear to be less popular.

b. Information on wildlife species, populations, and management needs: The analysis area contains two known bald eagle nesting sites. These sites are located adjacent to the lakeshore and are protected under the Endangered Species Act. Management activities within 1,500 feet of the sites are governed by United States Department of the Interior (USDI) guidelines. Under these guidelines, the seed trees that were left to provide seed for regeneration were not removed. The analysis area also supports both game and nongame animals commonly found in the southeastern Coastal Plains, including gray squirrel and white-tailed deer.

c. Water availability and use: There are no sources of potable water in the analysis area. The adjacent Sam Rayburn Reservoir and other water resources, such as creeks and other low areas, provide water for wildlife.

d. Timber: The analysis area is a high-quality site for timber production. Loblolly pine site indices range from 8 to 90. Timber types are: loblolly (92 percent); pine (5 percent); and longleaf pine (3 percent). Some hardwood types (mostly oak-hickory) are found in the creek bottoms and intermixed with pine types. Approximately 219 acres, or 15 percent of the area, is in stands less than 10 years old. Approximately 76 percent of the standing timber is at least 70 years old. There is also a 40-acre stand of shortleaf pine which is approximately 100 years old.

The stringers along perennial and intermittent streams are classified as unsuitable for timber production in the 1987 Forest Plan. The remainder of the analysis area is classified in the 1987 Plan as suited for timber production.

e. Minerals: All mineral rights are owned privately and are not subject to Forest Service jurisdiction. The area is considered to have moderate potential for oil and gas occurrence, and there have been inquiries about drilling in the analysis area. The main access for the proposed drilling activity would be FS 310. Since mineral rights are reserved or outstanding, the Forest Service must allow the construction and maintenance of access routes and drilling sites. The analysis area is on the Austin Chalk formation, which is being explored actively and is currently producing gas and oil in marketable quantities several miles to the east on the Sabine National Forest.

f. Cultural resources: Much of the analysis area is considered to have high potential for the presence of archeological sites, historical sites, or both (historic properties). The Angelina and Neches Rivers created ideal conditions for early settlement. Numerous Paleo-Indian to Neo-historic prehistoric sites have been recorded within the analysis area. Future surveys will likely reveal additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

These sites, and the objects and other physical evidence they contain, are an important part of our cultural heritage. The National Forests and Grasslands in Texas (NFGT) is charged with the protection and management of these valuable historic properties by laws and regulations.

g. Authorized and potential land uses: United Gas has approximately 0.4 miles of buried pipeline in the western portion of the analysis area. United Gas has the right to maintain the right-of-way for the line. No other special uses are authorized in the analysis area.

h. Management considerations including fire, insects and diseases, and presence of non-Federal lands: The analysis area has been burned to reduce fuel build-up approximately every five years since the Forest Service acquired the land in the 1930's. No wildfires have been recorded in the analysis area. Should a wildfire occur, the gently rolling terrain would not present suppression difficulties unless there were adverse conditions such as high winds or very dry fuels.

Potential for spread of the SPB is moderate because loblolly and shortleaf pines, the preferred host species, are present throughout the area. Although few infestations have occurred in the analysis area, the majority of the standing timber is at or near maturity and this could increase susceptibility.

production. This land is part of a potential land exchange and may be acquired in the future.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreational activities, such as hunting and fishing, should continue at about the present moderate to high level. The analysis area is adjacent to Sam Rayburn Reservoir, which is now accessible by FS roads. Five Fingers Bay, which receives much fishing use, is accessible through the analysis area. Because the analysis area is visible from Sam Rayburn Reservoir, it is desirable to manage the lakeshore for aesthetic and recreational purposes.

The analysis area is considered suitable timberland, and is expected to produce a sustainable output of timber volume. The next silvicultural examination and prescription process is scheduled to take place in the late 1990's. There are plans to harvest the seed trees on two areas within the next few years.

3. Is the area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

The major concern is the bald eagle. Wilderness designation would prevent the use of vegetation management as a tool for habitat. However, it appears that U.S. Fish and Wildlife guidelines for managing bald eagles are compatible with wilderness designation. The emphasis in protecting bald eagle nesting habitat involves avoiding or minimizing any human-related disturbances.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or resulting from wilderness designation would not be in the public interest?

This area is not highly mineralized, but considered to have moderate potential for oil and gas occurrences. There have been inquiries about the possibility of drilling within and adjacent to the analysis area. Since the mineral rights are owned privately, it is not necessary to obtain the Forest Service's permission to drill or to construct and maintain drilling sites and road to such sites.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, minerals or developed recreation?

Yes. There are now high demands for dispersed recreation (hunting and fishing), minerals, and timber. Seed trees are to be removed from two areas on Bounds Peninsula. Designation of the analysis area as wilderness would reduce the amount of wood available to industry.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. There are outstanding rights to all minerals within this area, and United Gas has an outstanding right for a pipeline.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in Texas as well as additional lands in nearby states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

Turkey Hill Wilderness, consisting of 5,286 acres, is approximately 14 miles to the north.

3. What is the current level of use in nearby wilderness? What are the trends in the use of these areas?

Upland Island Wilderness, about 35 miles to the west, received approximately 3,000 Recreation Visitor Days (RVD's) of use, of which 500 involved overnight camping (3,000 RVD's is about 11 percent of estimated capacity). The average size of visiting groups was 2.6 people. More than 56 percent of visitors to Upland Island visit there more than twice per year. An estimated 27 percent of visitors to Upland Island go into the wilderness alone. Most visitors are there to hunt or to scout places for future hunting trips. A large percentage of visitors are under 16 years of age.

Turkey Hill Wilderness received an estimated 1,500 RVD's (about 14 percent of capacity), of which 500 involved overnight camping. Most of the use was related to hunter use. Users have not had any significant effects on the area's wilderness qualities or resources. A small increase in use over the next 10 to 20 years is anticipated.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew at much faster rates (27 percent and 17 percent respectively, 1980-87). These population centers are about 100 miles (Houston) to 175 (Dallas) from the analysis area. The combined population of Houston and Dallas is more than 5 million.

The population of Deep East Texas, which includes San Augustine County and the analysis area, increased about 10 percent between 1980 and 1988. The population of Deep East Texas is expected to increase about 50 percent over the next 35 years.

The analysis area is located in San Augustine County, the population of which grew from 8,785 to 9,174 between 1980 and 1990 (a 4.43-percent increase). The populations of adjacent Angelina and Jasper Counties increased by 8.96 percent and 4.01 percent respectively over the same period. The combined populations of Angelina and Jasper Counties was estimated to be 105,965 in 1990.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

suitable and available for primitive recreation use. There are 84,012 acres of wilderness in Texas, and another 82,348 acres of National Forest lands in Texas provide opportunities for semi-primitive or primitive recreation.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

Yes. There is one known active bald eagle nesting site on Bounds Peninsula. No management activity is allowed within 750 feet of the site, and only minimal activity is allowed within 1,500 feet of the site.

2. Could their needs be provided for through means other than wilderness designation?

Yes, through seasonal or year-long closures or restrictions.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

No. Through conscientious vegetation management practices and mitigation of disturbances, suitable habitat can be maintained for these species.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8, 1977)? Does the area represent a unique landform type that is not represented in any existing wilderness areas in the general vicinity?

The analysis area is on the Coastal Plains of eastern Texas. The dominant landform characteristics are low ridge segments, ridge segments, and side slope segments. These are areas with gently sloping topography or flat or undulating areas that receive moisture from stream terraces. These landforms are not unique and are typical of Turkey Hill Wilderness Area, approximately 14 miles to the north.

2. What is the analysis area's ecosystem classification based on the TNHP report? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area's vegetation is classified as loblolly pine and shortleaf pine forest cover types, which are typical of the southern Coastal Plains. The plant communities most common in the analysis area are the TNHP Loblolly Pine-Oak and Shortleaf Pine-Oak Series. The analysis area's ecosystem is commonly represented in existing wilderness areas in Texas.

Chambers Ferry

Sabine National Forest, Tenaha Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

CHAMBERS FERRY: Gross area approximately 4,695 acres; net area approximately 4,690 acres.

Location and vicinity.

The analysis area is located in the southeastern portion of the Tenaha Ranger District of the Sabine National Forest in Texas. It is on the western shore of Toledo Bend Reservoir, just south of the town of East Hamilton. It is bordered by private land on the south, and by private land and

Forest Service land on the north. State Highway 87 forms the analysis area's southwest boundary.

Describe access to the analysis area including roads and trails leading to the area.

Access is by State Highway 87, by Forest Service (FS) 121 and FS 121A, and by boat from Toledo Bend Reservoir.

General description of the analysis area's geology.

The Sabine National Forest is underlain by sedimentary materials laid down from the early Cretaceous to the present. The two most recent sediments are alluvium and fluviatile terrace deposits that date from the present to about 2.5 million years ago. Eleven geologic formations were created in the Miocene, about 25 million years ago. The Nash Creek Formation was created in the Oligocene or Upper Eocene between 25 and 40 million years ago. The Yazoo, Moodys Branch, Yegua, Cook Mountain, Weches, and Reklaw Formations were formed in the Eocene and Paleocene, about 36 to 63 million years ago as were the Wilcox Group undivided and the Sparta and Carrizo sands.

General description of the analysis area's topography.

The Sabine National Forest is on the western Gulf Coastal Plain. Elevations range from 140 to 590 feet above sea level. The steepness of slopes along ravines ranges from 0 to 55 percent. The analysis area is generally drained by the Sabine River; tributaries of the Sabine drain portions of the analysis area along Martinez Bayou and Patroon Bayou.

General description of the analysis area's vegetation, including the ecosystem type.

Two major plant communities are present--the American beech-white oak series and the loblolly pine-oak series as described by the Texas Natural Heritage Program (TNHP). The American beech-white oak series is a mesic, calciphilic forest that occupies ravines and ridges within creek bottoms, mostly in southeastern Texas. Acid-loving species such as southern magnolias are absent, and a rich vernal calciphilic forest forb flora is present. Representative forbs include bigleaf snowbells, blue-stem goldenrod, and chalk maple.

The loblolly pine-oak series is an upland, mainly deciduous forest that occurs primarily on sandy or loamy, low-pH soils in eastern Texas. Old-growth communities are dominated by combinations of post oak, white oak, water oaks, hickories, other hardwoods, loblolly pine, and shortleaf pine. Understory species include flowering dogwood, yaupon holly, wax-myrtle, and

disturbance type after logging, and thus is highly variable.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The red-cockaded woodpecker (RCW), a Federally listed endangered species, occurs in the analysis area. There are now three RCW clusters in Compartment 62; two are active and one is inactive. There are only three active clusters in the Tenaha Ranger District. An active bald eagle nest is located in Stand 13 of Compartment 64. The bald eagle is a Federally listed endangered species.

The Beech Ravines Scenic Area (approximately 1,269 acres) is located within the analysis area and is relatively undisturbed. It was inventoried and recommended for designation as a

Botanical Area by TNHP. The Beech Ravine primary area identified by the TNHP is approximately 827 acres of botanically significant ravine forest and is considered an area of outstanding regional significance. The topography of Beech Ravines Scenic Area consists of exceptionally deeply cut, north and east facing, steep-sided ravines draining into Toledo Bend Reservoir. These mesic ravines support mixed hardwoood forest dominated by sweetgum, blackgum, water oak, and large beech dominants in the canopy of these mesic ravines.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

The analysis area was farmed in the 1930's before it was acquired by the U.S. Forest Service. Currently, stands on 364 acres (or about 8 percent of the U.S. Forest Service ownership) is in the 0- to 10-years age class.

During 1991, 746 thousand board feet (MBF) were salvaged from southern pine beetle (SPB) mortality and hail damage.

Eight stands located in Compartment 62 (totaling 100 acres) have been treated as RCW habitat. The treatment consists of basal area reduction, midstory vegetation removal and prescribed burning. The remainder of the analysis area has been burned with prescribed fire at 3- to 5-year intervals. Stands on 85 percent of the analysis area have been thinned in salvage operations. There are logging skid trails and woods roads throughout the analysis area.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

Only the Beech Ravines Scenic Area appears natural and largely undisturbed. Boating activities on Toledo Bend Reservoir, which is adjacent to Beech Ravines, are the only activities that might disturb visitors to Beech Ravines.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

No. Maintenance of RCW habitat involves prescribed burning and removal of midstory hardwoods. These activities are ongoing. Some evidence of salvage harvesting is visible.

and subsurface, ensure perpetuation of identified wilderness values?

No. The analysis area is surrounded by several hundred acres of privately owned cut-over timberland in the early stages of regeneration. Also, there is a subdivision adjacent to the analysis area boundary at the confluence of Martinez Bayou and Toledo Bend Reservoir. Mineral rights on 2,356 acres are reserved or outstanding.

5. Is more than 15 percent of the analysis area in non-native vegetation?

No.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so where?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.

d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

e. Areas under current mineral lease where the leasee has not exercised development and occupancy rights: See Table 1 near the end of this evaluation.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: The analysis area is popular with local hunters and campers. The bluffs overlooking the Toledo Bend Reservoir receive most of this use. Primitive, dispersed camp spots are evident at the end of 121A and on the numerous bluffs overlooking Toledo Bend Reservoir. Most of the adjacent private timber company land has been leased by hunting clubs. These leased areas have gated roads and large hunter camps.

g. Timber harvest areas where logging and prior road construction are or are not evident: Two pipe gates were installed to block access into two RCW clusters. The blocked roads were temporary haul roads for previous timber sales. Also, several hundred acres of private timberland adjacent to the analysis area is in young regeneration.

h. Cultural treatments involving plantations or plantings: There are 205 acres of Forest Service land with vegetation in the seedling or sapling stage. An additional 159 acres, which were harvested as a result of SPB damage, are revegetating naturally with a variety of tree species. Several hundred acres of adjacent private timberland is in seedlings or saplings.

i. Private inholdings in the analysis area: Bennet's Cemetery and another small parcel of private land are the only inholdings. Total area in inholdings is about five acres.

j. Dwellings on private inholdings: No.

k. Nonconforming structures and improvements: Two gates block access on both Forest Service land and private timber company land. Steel restrictor plates have been installed on eight cavity trees within two active RCW clusters.

l. Ground-return telephone lines: No.

m. Watershed treatment areas: No.

n. Roads: The analysis area has 12.99 miles of improved roads.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Yes. The gates could be removed. Restrictor plates could be removed if analysis showed that this would not be harmful to RCW.

humans, and are they disappearing or muted?

No.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. Ninety-five percent of the analysis area has been harvested within the last 10 years.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. The analysis area contains 12.99 miles of improved road, or 2.8 miles of road per 1,000 acres. Roads and their lengths are:

FS Road	Miles	FS Road	Miles
121	3.26	1211	0.76
121A	2.12	SAB38	1.00
1612 and 1612A	1.33	1625	0.75
1212	0.76	1624	0.50
121M	0.38	1623	0.61
131	1.14	1627	0.38

6. Are all existing roads under Forest Service jurisdiction?

Yes.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

Yes.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Numerous roads to and within the analysis area make access easy. The analysis area presents opportunities for forms of recreations that involve excitement, challenge, initiative, and self-reliance.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

b. Hunting: There are opportunities for both small and big game hunting.
c. Fishing: Toledo Bend Reservoir offers outstanding bass fishing.
d. Canoeing: It is possible to canoe in coves and close to the shoreline of Toledo Bend Reservoir. Martinez Bayou also offers some canoeing opportunities.
e. Boating: The adjacent Toledo Bend Reservoir can support this activity.
f. River rafting: There are no opportunities for river rafting.
g. Backpacking: The analysis area offers some backpacking opportunities, but the lack of a trail system and presence of undergrowth detracts from the experience.
h. Hiking: Same as backpacking.
i. Riding: The analysis area offers only limited opportunities for horseback riding.
j. Photography: Good opportunities exist, especially in the Beech Ravines site when sensitive plants are flowering.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

There are opportunities in areas such as biology, botany, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

The game and nongame species present are typical of those occurring in Coastal Plain forests. Two active RCW clusters are present.

Manageability.

1. What are the characteristics of the surrounding area,including its ROS classification, adopted VQO, and present and planned uses?

Recreation Opportunity Spectrum (ROS) on a majority of the analysis area is Roaded Natural (RN). The Beech Ravines site is mostly Semi-Primitive Non-Motorized (SPNM). Visual Quality Objective (VQO) ranges from Maximum Modification (MM) to Modification (M), Partial Retention (PR), Retention (R), and Preservation (P). Only the Beech Ravines site has a VQO of P.

Future land use will continue to stress habitat enhancement for the endangered RCW. Pest management activities such as treatment of SPB infestations will continue also.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

No.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

Some portions of the boundary are located in areas that would be difficult to cross or access. However, there would be many areas where the use of motorized vehicles, such as All Terrain Vehicles (ATV's), would be difficult to administer.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

some sounds. Boating activities on Toledo Bend Reservoir will also contribute sounds.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. Existing roads within the analysis area provide adequate opportunity for access and traveler transfer. If the analysis area were designated wilderness and these roads were closed, it would still be possible to reach the analysis area by way of State Highway 87, or by boat on Toledo Bend Reservoir. There are points where visitors could transfer from motorized to nonmotorized modes of transportation.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: The analysis area serves dispersed recreation users. Primitive camping and hunting are popular.

b. Information on wildlife species, populations, and management needs: The analysis area provides habitat for game and nongame species common in Coastal Plain forests. The endangered RCW is present in two active clusters in Compartment 62. Population figures for game and nongame species are not available.

c. Water availability and use: Water for human consumption is not available. Water is readily available for wildlife.

d. Livestock operations: None.

e. Timber: The analysis area has high-quality timber sites. Site indices range from the 70's to the 90's. Most of the timber is mature or immature sawtimber. Thinning operations have been conducted throughout the analysis area to improve RCW habitat or reduce the risk of infestation by SPB.

f. Minerals: Mineral rights are outstanding on more than half the analysis area. (See Table 1 near the end of this evaluation.)

g. Cultural resources: The analysis area has a high potential for archeological prehistoric and historic sites, but none have been inventoried.

h. Authorized and potential land uses: No special uses are authorized and none are anticipated.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: The analysis area has been included in the district's control burning program in recent years. Fuel loading is light to moderate.

Bennet's Cemetery, a private inholding, is located within the analysis area.

The analysis area has a high hazard rating for potential SPB infestation. High basal area densities and overmature stands account for the high hazard rating. During recent years, salvage operations have been conducted to treat SPB in the analysis area. The treatments have created numerous scattered openings throughout the analysis area.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities, primarily primitive camping and hunting, should continue at about the present low to moderate level.

3. Is the area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measure of considerable magnitude and importance?

Yes. The future of the active RCW clusters will be compromised if the habitat is not maintained with fire and midstory vegetation control. Currently, the District has only

cockaded woodpecker habitat has been improved not only in the colony sites, but also in the replacement and recruitment stands. The investment of manpower and dollars will be lost if the analysis area is designated as wilderness.

There is an active eagle nest in Stand 13 of Compartment 64. Although the endangered bald eagle is not dependent on midstory control or a prescribed fire regime, it is associated with sparse basal area conditions. Seed-tree harvesting, shelterwood harvesting, and thinning operations can make habitat more suitable for bald eagles.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

No.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

The land is needed to perpetuate a Federally listed endangered species, the RCW. There are currently demands for dispersed recreation (hunting and fishing), minerals, and timber. Designation of the analysis area as wilderness would reduce the amount of wood available for industry.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. Rights to minerals on 652 acres are leased, and rights to minerals on 1,496 acres are shared by the United States and a second party.

Need.

Other wildernesses.

1. What is the locations, sizes, and types of other wildernesses in the general vicinity?

There are no other wildernesses in the general vicinity. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Indian Mounds Wilderness is 14 air miles south of the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Use of the Indian Mounds area is low. Use of that area is increasing slightly.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population around the Indian Mounds Wilderness Area is stable but substantial.

Nonwilderness lands.

vicinity? If so, where?

Yes, anywhere on the District.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

No.

2. Could their needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for species that cannot survive in less that primitive surroundings?

No.

Landform and ecosystem preservation.

1. What is the analysis area's landform type? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area is located within the Gulf Coastal Plain physiographic province. The Indian Mounds Wilderness Area is also located within the same physiographic province, and contains the same general landforms.

2. What is the area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area is included in the mixed pine-hardwood forest of the Piney Woods. The Indian Mounds Wilderness Area is located within the same ecosystem.

Table 1. Mineral Interest and Leasing Status of Areas Within
Proposed Chamber's Ferry **as of April 8, 1992**

Tract	U.S. Interest	Outstanding Issued Leases	Reserved Acres	In	Perpetuity
S-26	--		--	55.00	NM-60892, effective 12/1/89 for 10 years
S-65	28.00 (15/16)	--	22.43	None	
S-1Ap-I	1,468.00 Parcel 1 sold 1/92 50 percent		850.00	2,149.00	Other parts of tract still available
S-5d	--		--	42.84	None

S-5f	--	--	45.07	None
S-5g	--	--	3.50	None
S-5h	--	--	0.63	None
S-29r	--	5.03	--	Not leasable
S-29r-I	--	6.46	--	Not leasable
S-29r-II	--	0.37	--	Not leaseable
S-29r-III	--	0.35	--	Not leasable
S-29r-IV	--	0.18	--	Not leasable
S-29r-V	--	12.87	--	Not leasable
Total	1,496.00	875.26	2,318.74	

Four Notch

Sam Houston National Forest, Raven Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

FOUR NOTCH: Gross area approximately 7,135 acres; net area approximately 6,640 acres.

Location and vicinity.

The analysis area is located seven miles southeast of Huntsville, Texas, and is in the north central portion of the Sam Houston National Forest.

Describe access to the analysis area, including roads and trails leading to the area.

U.S. Highway 190 and Farm-to-Market (FM) 2929 and FM 2296 provide access to the analysis area.

General description of the analysis area's geology.

The analysis area is in the southern Gulf Coastal Plains and the Texas Blackland Prairies. The soils have developed from sedimentary material and are classified as recent, pleistocene, and tertiary. The Willis formation consists largely of clayey sand and gravel and some local clay beds. The Fleming formation underlies and is the parent material for the blacklands, which consists of calcareous clay and sandstone.

General description of the analysis area's topography.

This part of the southern Gulf Coastal Plains and the Texas Blackland Prairies consists of floodplains, streams, and gently sloping ridgetops. The elevation between the stream bottoms and ridge tops is approximately 80 feet, and slopes are between 3 and 7 percent.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is almost entirely forested. A pine-hardwood mix occupies the ridges and gives way to a hardwood forest along some of the streams. Species such as loblolly pine, red oaks, white oaks, and hickories may be found on the upper slopes. Species such as sweetgum, various oaks, beech, and hickory may be found along the streams.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The analysis area is essentially an upland site. Its wildlife include deer and red-cockaded woodpecker (RCW), an endangered species. No sensitive plant or species are known to occur in the analysis area.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

The National Forests in Texas were acquired primarily under the authority of the Weeks Act. These lands were acquired from private landowners during the 1930's and early 1940's. A significant proportion of the land was acquired from timber companies. Most of the analysis area was cut-over severely during the early 1900's.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

Little evidence of turn-of-the-century logging and farming is present today. However, traces of more recent activities are evident. A southern pine beetle epidemic killed many of the analysis area's pines in the mid-1980's. About 3,435 acres, or 52 percent of the analysis area, is now in regeneration less than 10 years old. During the mid-1980's, salvage operations were conducted in much of the analysis area. These operations salvaged much of the timber affected by the beetles and prepared the way for stand regeneration, which was completed subsequently.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Most of the analysis area reflects the southern pine beetle (SPB) activity of the mid-1980's and the regeneration work completed soon thereafter. The analysis area is now a mosaic of young and old timber stands dominated by the regeneration in the late 1980's. The 1987 Forest Plan specifies that the analysis area will continue to be managed for multiple use and will not regain natural appearance unless management direction changes toward less intensive management.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

The existing pattern of surface ownership would make it possible to manage the analysis area's surface features so that wilderness conditions would be perpetuated. However, the mineral rights within the analysis area are nearly 100 percent outstanding or reserved, and are not Federally owned. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate minerals exploration and production. Therefore, perpetuation of wilderness conditions cannot be ensured.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No exotic species are known to be present.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a. Airstrips or heliports: None.

b. Electronic installations: None.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): None.

d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: None.

occupancy rights: Mineral rights on all but 42 acres are owned privately. The 42 acres are leased but no development has occurred.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: The analysis area receives moderate use from hunters and contains some undeveloped, dispersed campsites. The Lone Star Hiking Trail also traverses the analysis area.

g. Timber harvest areas where logging and prior road construction are or are not evident: Yes. The analysis area was managed for timber before acquisition by the U.S. and has been managed for timber by the Forest Service since the 1930's.

h. Cultural treatments involving plantations or plantings: Extensive pine plantations are present. There is no additional evidence of past timber stand or wildlife habitat improvement.

i. Private inholdings in the area: Several inholdings are scattered throughout this area.

j. Dwellings on private inholdings: Yes. There are farmhouses and other farm buildings on the inholdings.

k. Nonconforming structures and improvements: Three improved roads with a total length of approximately 7.2 miles are present.

l. Ground-return telephone lines: Yes. The lines provide service to local residents.

m. Watershed treatment areas: No.

n. Roads: Three improved roads (total length 7.2 miles) are present. Approximately 6 miles of road is surfaced and maintained on a regular basis. Some of the improved roads provide access for local residents.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Some of the roads crossing Four Notch provide access to private property and must be maintained for continuing service. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate mineral exploration and production equipment. Existing powerline and telephone cable must be maintained as specified in special use permits.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

The county road, 4.9 miles of aerial transmission lines, and 4.4 miles of oil and gas transmission lines are being maintained for long-term service.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

No. Approximately 3,435 acres, or 52 percent of the analysis area, is in stands less than 10 years old.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No.

6. Are all existing roads under Forest Service jurisdiction?

Yes. Approximately 11 miles of Forest Service (FS) roads are maintained cooperatively with the county. An additional 4.2 miles of roads are on easements and is maintained privately or by the county.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following

determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

The analysis area provides limited opportunities for solitude and serenity. Activities on private land and associated roads are visible from several locations. Vehicle noise may be heard from any of the roads that traverse the analysis area and from the perimeter roads. Recreation Opportunity Spectrum (ROS) for the entire analysis area is roaded-natural.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

The analysis area offers few opportunities for these experiences, and the experiences offered are similar to those available in the Little Lake Creek Wilderness. The existing road system makes access reasonably easy. The analysis area has some rolling terrain variation. The largest stream in the analysis area, Boswell Creek, could offer the visitor limited opportunity for excitement, initiative, or self-reliance.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Several locations are suitable for primitive camping.
b. Hunting: Hunting for some small and large game species is readily available.
c. Fishing: None. The limited stream flow is inadequate to support consistent fishing opportunities.
d. Canoeing: None. The streams are too small for canoeing.
e. Boating: None.
f. River rafting: None.
g. Backpacking: The Lone Star Hiking Trail traverses the analysis area and provides several miles of hiking opportunities.
h. Hiking: Same as for backpacking.
i. Riding: Horseback riding opportunities do exist, but there are no developed equestrian trails.
j. Photography: Good opportunities exist for close-up photography. There are no opportunities for panoramic or scenic shots.

Special Features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area provides opportunities for education and study in subjects such as biology and dispersed recreation. Forestry teachers have conducted class exercises in the analysis area.

A variety of game and nongame species occur in the analysis area. Species are typical of those occurring in forests of the southern Coastal Plain.

Manageability.

1. What are the characteristics of the surrounding area including ROS classification, adopted VQO, and present and planned uses?

The ROS is roaded natural. The Visual Quality Objective (VQO) is modification. Under the 1987 Forest Plan, future land use is to be multiple use.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on private land around and near the boundary, encroachments are not expected to be a serious problem. The biggest concern is the possibility that inholdings might be subdivided. Subdivision of inholdings would reduce wilderness values.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

Generally, no. Forest Service Road 206 runs along the east boundary for about five miles and constitutes a barrier to some prohibited uses.

5. Do boundaries, to the extent practicable, shield to protect the wilderness environment inside the boundary from the sights and sounds of civilization?

No. Inholdings in the center of the analysis area are sources of sights and sounds of civilization detectable throughout much of the analysis area.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes.

Availability.

1**. Describe other (nonwilderness) resource demands and uses. What current uses exist?**

a. Recreation: Hunting is currently the dominant use, while horseback riding and hiking are less popular. These activities would be compatible with wilderness.

b. Information on wildlife species, populations, and management needs: The analysis area supports various game and nongame species commonly in forests of the southern Coastal Plain.

c. Water availability and use: There is no source of potable water. Water is readily available for wildlife.

d. Livestock operations: None.

e. Timber: The analysis area is presently included in the Forest's base of land suited for timber management. Loblolly pine forest predominates, and pine-hardwood forest occurs along streams. Approximately 72 percent of the analysis area is in loblolly pine, 90 percent is in shortleaf pine, and 19 percent is in white oak, red oak, or hickory types. Site indices generally run from 80 to 100 for the pines and hardwoods.

f. Minerals: Rights to minerals on all but 42 acres are owned privately. There has been no exploration or development for surface or subsurface minerals.

or historical or both (historic properties).

The National Forests and Grasslands in Texas are charged with the protection and management of these valuable historic properties by law and regulation.

h. Authorized and potential land uses: Sam Houston Electric Company and Southwestern Bell Telephone Company have permits to provide services to residents along FS 223.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: Because the analysis area has been protected from wildfire and because fire suppression efforts have been successful, there is a possibility of a fuel build-up. However, a schedule of prescribed burning has helped to control the fuel loading and reduce the fire danger.

Southern pine beetle (SPB) may infest pines in the analysis area if the trees are stressed or damaged.

There are private inholdings within this area.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreational use, primarily hunting, hiking, and fishing, should continue at the present low to moderate level.

The analysis area is expected to produce timber. Any decline in the acreage available for timber harvesting will result in a decline in timber production on the Forest.

Mineral rights are mostly outstanding and reserved, and potential future exploration is controlled by the company owning the rights.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

No. Management activities to increase populations of game species such as wild turkey would not be possible, but failure to implement such projects would not significantly impair existing populations or habitat viability.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls due to wilderness designation would not be in the public interest?

No. The potential for oil and gas exploration and development is high. Owners of private mineral rights would likely want compensation if exploration could not occur.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. The current Forest Plan designates the analysis area as part of the timber management land base.

in concert with wilderness requirements?

Yes. Rights to minerals on all but 42 acres are owned privately.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in the State of Texas, and additional wilderness in nearby States. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Little Lake Creek Wilderness (3,810 acres) is approximately 20 miles southwest from the analysis area. It is north of Montgomery, Texas, and west of FM 149.

3. What level of use currently exists in near-by existing wilderness? What trends exist in the use of these areas?

Little Lake Creek wilderness had an estimated 500 recreation visitor days in 1991. A small increase in wilderness use is expected over the next 10 to 20 years.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The populations of Dallas and Houston grew 27 percent and 17 percent respectively, from 1980 to 1987. The analysis area is about 60 miles from Houston and 225 miles from Dallas.

The combined population of Montgomery and Walker Counties increased from about 135,000 in 1980 to about 180,000 in 1988.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Many areas in the Sam Houston National Forest and the Little Lake Creek Wilderness are available to the public for primitive recreation. The Raven Ranger District of Sam Houston National Forest has 102,000 acres of land that provides opportunities for primitive recreation.

Habitat needs.

1. Are there any biotic species in the area that are directly competing with increasing public use and development?

No. No sensitive plant species are known to occur in the analysis area.

2. Could their needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

protected sites, suitable habitat can be maintained for all species.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1972)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

Most of the analysis area is on the southern Gulf Coastal Plain, and a very small acreage is in the Texas Blackland Prairies.

2. What is the analysis area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area is classified as a Southern Gulf Coastal Plain Forest. This same ecosystem occurs in existing wilderness areas in Texas.

Graham Creek

Angelina National Forest, Angelina Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

GRAHAM CREEK: Approximately 1,280 acres.

Location and vicinity.

The analysis area is located in the southern portion of the Angelina National Forest. The analysis area consists of eight separate parcels of land adjacent to Upland Island Wilderness. These parcels are discussed separately as necessary. The parcels are:

Area 1	Cypress Creek Unit 1	8 acres
Area 2	Rueda Unit 41 acres	
Area 3	Graham Creek Unit	2 acres
Area 4	Cypress Creek Unit 2	5 acres
Area 5	Martin Unit 127 acres	
Area 6	Marshall Unit	106 acres
Area 7	Bouton Unit 51 acres	
Area 8	Green Creek Unit	940 acres

Area 1 is located along the western boundary of Upland Island Wilderness, on Forest Service (FS) 302. Area 2 is just south of Area 1, also along the western boundary of Upland Island Wilderness. Area 3 lies just south of County Road 4-5, along the western boundary of Upland Island Wilderness. Area 4 also lies along the wilderness boundary, and is south of County Road 4-5 and southeast of Area 3. Area 5 lies along the western boundary of Upland Island Wilderness, south of Areas 1 through 4. Area 6 lies along the southern boundary of Upland Island Wilderness, east of Area 5. Area 7 lies south of FS 314, along the southeastern boundary of Upland Island Wilderness. Area 8 lies along the eastern boundary of Upland Island Wilderness, just east of FS 303. Refer to the attached map for locations of these areas.

Describe access to the analysis area, including roads and trails leading to the area.

Primary access to Areas 1 through 5 is from U.S. Highway 69, south of Zavalla, Texas. Area 1 can be accessed by FS 302. Areas 2, 3, and 4 can be accessed from Angelina County Road 4-5, south of FS 302. Area 5 lies just east of U.S. 69 and north of FS 314 and can be accessed by FS 314. Areas 6 and 7 lie south along FS 314 and can be accessed from FS 314 or from FS 303 along the eastern boundary of Upland Island Wilderness. Area 8 lies along FS 303, east of Upland Island Wilderness. Access to areas 6, 7, and 8 is possible by State Highway (SH) 63, north of Upland Island Wilderness and east of Zavalla, Texas.

General description of the analysis area's geology.

Manning geologic formations and recent fluviatile terrace deposits. The Manning and Whitsett

formations are 36 to 58 million years old and consist of clays, quartz sands, lignite, glauconite, and an abundance of fossil wood. Soil series associated with these formations are Koury, Kisatchie, Diboll-Fuller, and Rayburn-Corrigan.

General description of the analysis area's topography.

This part of the western Gulf Coastal Plain consists primarily of road floodplains and stream terraces. The stream terraces are characterized by hummocky surfaces on which the mounds are 2 to 3 feet higher than the depressions. There are minor areas of gently sloping ridgetops, side slopes, and concave foot slopes.

General description of the analysis area's vegetation, including the ecosystem type.

The eight areas are almost entirely covered with vegetation of the loblolly pine forest type, which occurs intermittently along the Atlantic Coastal Plains. Loblolly pine is dominant. Other pine species and some hardwoods have intruded as a result of changing fire patterns and extensive logging. Principal hardwood species include water oak, willow oak, swamp chestnut oak, southern red oak, water tupelo, sweetbay magnolia, blackgum, dogwood, and sweetgum. Associated plant communities include the Texas Natural Heritage Program (TNHP) Loblolly Pine-Oak, Sphagnum-Beakrush, Sweetbay Magnolia, Baldcypress-Water Tupelo, Swamp Chestnut Oak-Willow Oak, Water Oak-Willow Oak, and Longleaf pine-Little Bluestem Series. In general, pine is dominant on the uplands, while bottomland hardwoods are intermixed with pine along river bottoms and streams.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The eight areas are adjacent to the Upland Island Wilderness and portions of the Neches River bottom. They present recreational and history study opportunities. Bouton Lake campground lies southeast of Area 7 and is the trailhead for the Sawmill Hiking Trail. The Sawmill Hiking Trail is 5-1/2 miles long and leads to the Old Aldridge Sawmill ruins, the Neches River bottom, and Boykin Springs Recreation Area. The eight areas are near the Caney Creek, Boykin Springs, and Sandy Creek National Forest Campgrounds. Visitors use each of there campgrounds year-round. Portions of Area 8 have been identified by the THNP as supporting a unique plant community. The Big and Green Creek Bottoms of Area 8 represent an intact example of southern scenic bottomland and support diversity of trees and herbaceous plants.

Area Inventory

Human influence.

<u>1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?</u>

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. These lands were acquired from private landowners during the 1930's and early 1940's. Significant portions of these lands were acquired from timber companies. Most of the analysis area had been cut-over heavily. Some of the analysis area was replanted by the Civilian Conservation Corps (CCC) in the late 1930's.

Sam Rayburn Reservoir was completed in 1966. This 114,500-acre lake is under the jurisdiction of the U.S. Army Corps of Engineers and is located to the northeast of the analysis area.

Natural ecological processes and conditions have been disturbed by human activity. Major disturbances occurred during the early 1900's, when the analysis area was logged heavily. Other disturbances include numerous more recent timber harvests, road construction, special uses (grazing, powerlines, pipelines, etc.), borrow pits, and small parking lots for Upland Island Wilderness.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

Several locations exhibit evidence of activities that took place during the early 1900's. Portions of an extensive tram system that supported early logging activities still remain. Evidence of the tramways is visible, but the tramways are gradually becoming more natural in appearance.

Area 6 contains one red-cockaded woodpecker (RCW) colony, which is currently inactive. Under current court orders, a 1,200-meter habitat zone and a 200-foot colony boundary are managed for RCW habitat. This management includes thinning, frequent burning, and control within the RCW colony and recruitment stands. Areas 6 and 7, containing approximately 157 acres, are within 1,200-meter RCW habitat zone.

The CCC's replanted several locations with slash pine during the early 1930's. Slash pine is not native to the region, and the areas planted will eventually be converted to longleaf pine. Areas 2, 5, 6, and 7 have been burned by prescribed fire within the last five years and some wildfires do occur. Most wildfires are man-caused and are extinguished quickly. Several special uses have been permitted. Some of these (such as roads, overhead powerlines and pipelines) are unnatural in appearance. (See Table 1).

Areas 1, 4, 6, and 8 have graveled parking lots ranging from 1/10 acre to 1/2 acre in size. These parking lots serve the needs of visitors who utilize Upland Island Wilderness for recreational activities such as hunting, camping, horseback riding, and hiking. There is also a borrow pit along the southern boundary of Area 7.

Area 5 is bordered on the east by an active railroad owned and operated by the Texas and New Orleans Railroad. However, this railroad is not used on a daily basis. Area 5 also contains an outstanding right-of-way owned by Lion Oil Company for the transport of oil from Beaumont, Texas to Longview, Texas.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Some of the analysis area has regained a natural appearance, but the presence of roads and active timber management make human activity evident. There is an extensively used road system, and there are several regeneration areas. There are some old roads and haul roads, but these are becoming overgrown and are visible only to the keen observer. The old tram system for

communities display a natural appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. Mineral rights to 685 acres (see Table 1) within the analysis area are owned privately. The Forest Service retains mineral rights on approximately 595 acres of land in Area 8. The U.S.

Forest Service is obligated to allow surface occupancy for exploration and production activities, with mitigation, on areas where minerals are owned privately and where government-owned minerals are leased. Therefore, perpetuation of wilderness values cannot be ensured.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No. Approximately 53 acres, or 4 percent of the analysis area is planted to slash pine, a nonnative species. Current plans call for conversion of the slash pine acreage to longleaf pine, which is native to the area.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: No.
b. Electronic installations: Areas 3, 4, 6, 7, and 8 contain powerlines that are permitted as special uses and listed in Table 2.
c. Areas displaying evidence of historic mining at least 50 years old. (Do not include areas of significant current mineral activity): Yes. There are several gravel pits or borrow pits (or both) in the analysis area. These are becoming overgrown with timber.
d. Areas under current mineral leases that contain "no surface occupancy" stipulations: No.
e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: Yes. Area 8 contains one such area. The lease (number 86835) belongs to Caddis Resources, Inc. and will expire in 1996.
f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: The analysis area receives some dispersed recreational use by horseback riders and hunters who camp in the area. There are no developed campsites, but there are wilderness parking lots in Areas 1, 4, 6, and 8.
g. Timber harvest areas where logging and prior road construction are or are not evident: There are approximately 33 acres of regeneration currently less than 10 years old. There are old timber haul roads and skid trails throughout the analysis area. These are overgrown but are somewhat evident on a few sites. There were once tramways throughout the analysis area; these were used to transport timber to various sawmills during the early 1900's.
h. Cultural treatments involving plantations or plantings: Approximately 157 acres of the analysis area are within 1,200-meter RCW habitat zones. These areas are being thinned according to a cour decision regarding the management of the RCW habitat in the National Forests in Texas. All mid-story hardwoods and midstory nonmerchantable pines are also being removed within the 200-foot colony boundaries.
i. Private inholdings in the area: No.
j. Dwellings on private inholdings: No.

which are detailed in Table 2. There are also approximately 5.43 miles of inventoried roads, which include Forest Service, State, and county roads.

Lion Oil Company owns a right-of-way through Area 5 and maintains an oil pipeline on that right-of-way. This pipeline was in place before the Forest Service acquired the land and is not subject to mitigation. There is also an active railroad along the analysis area's eastern boundary. This railroad is on a privately owned right-of-way between Area 5 and the boundary with Upland Island Wilderness.

There are also parking lots in Areas 1, 4, 6, and 8. These parking lots are utilized by visitors to Upland Island Wilderness and other places in the National Forest.

l. Ground-return telephone lines: There is an estimated 3.39 miles of buried telephone lines in the analysis area. There are no pay phone lines in the analysis area. The telephone permittees are listed in Table 2.

m. Watershed treatment areas: No.

n. Roads: There are 2.87 miles of improved graveled Forest Service roads in use within this analysis area. Of this, 0.5 miles of road are under special use permit for access to a private dwelling. There are 2.56 miles of road under county jurisdiction. There are also some old woods roads and haul roads; these are overgrown and are visible only to the keen observer.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Approximately 2.87 miles of Forest Service roads are in use within the analysis area. Overgrown woods roads and old haul roads that are no longer in use or maintained could be closed if this were necessary to promote wilderness management. However, there are several county roads that could not be closed or mitigated, and FS 314 and FS 303 are access roads for several adjacent private landholders. Lion Oil Company has a right-of-way, and there are privately owned and leased minenal rights that cannot be controlled unless purchased by the United States. Special uses that are permitted must be maintained if they are to continue their service.

3. Are improvements in the analysis area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

All inventoried roads are being maintained for long-term service. Other permanent improvements, including special uses, are also maintained for long-term use.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. There are approximately 33 acres in regeneration in the 0-to 10-years age class. This acreage accounts for about three percent of the total area.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are approximately 5.38 miles of improved roads and 0.5 miles of access road to a private dwelling in the analysis area (4.20 miles/1,000 acres). Both Forest Service and county roads are present.

Only 2.56 miles of the 5.38 miles of road are under county jurisdiction (2 miles/1,000 acres). Forest Service (FS) 302, FS 314, and FS 303 provide access to several parcels of private land adjacent to the analysis area.

county roads, FS 302, FS 314, FS 303, and 0.5 miles of unimproved access road to a private dwelling.

6. Are all existing roads under Forest Service jurisdiction?

No. Approximately 2.56 miles of road are under the jurisdiction of Jasper County or Angelina County.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

The analysis area presents few opportunities for solitude and serenity. Forest Service roads and activities on private land are visible from many areas. Some recreational activities, such as camping and All Terrain Vehicles (ATV) use, can cause noise that could disturb solitude and serenity.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Existing Forest Service, State, and county roads make access to all of the analysis area reasonably easy. The analysis area's terrain is relatively flat with some low elevation ridges. The analysis area is adjacent to Upland Island Wilderness, which could offer casual and novice opportunities to experience challenge, excitement, and self-reliance. Sam Rayburn Reservoir and the Neches River are close to the analysis area, and may also offer opportunities for excitement, initiative, or self-reliance. Campgrounds and hiking trails near the analysis area offer various opportunities for adventure and challenge.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Numerous locations are suitable for primitive camping. Three developed recreation areas (Caney Creek, Sandy Creek, and Boykin Springs) are within 10 miles of the analysis area. Bouton Lake is a primitive campground and is located approximately two miles southeast of Area 7.

b. Hunting: Small and large game species occur in the analysis area and can be hunted there.

fishing opportunities. The nearby Angelina and Neches Rivers also offer fishing opportunities.

d. Canoeing: Although the Neches and Angelina Rivers are not adjacent to any of the eight areas within the Graham Creek analysis area, both are within a reasonable distance and provide adequate flows for enjoyable float trips. It is also possible to canoe on Sam Rayburn Reservoir, which is close to the analysis area.

e. Boating: No opportunities exist on the analysis areas, but Sam Rayburn Reservoir is near and provides excellent boating opportunities.

f. River rafting: There are no river rafting opportunities in the analysis area.

g. Backpacking: Some opportunities for backpacking are available, but there are no developed trails within the analysis area.

h. Hiking: Same as for backpacking.

i. Riding: Horseback riding opportunities do exist. Riders use parking lots in Areas 1, 4, 6, and 8 in Upland Island Wilderness and on adjacent Forest Service land.

j. Photography: Good opportunities exist.

Special Features.

1. What is the analysis area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area offers opportunities for education and study in geology, archeology, biology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

Game and nongame animals that are typical of pine-hardwood forests in the eastern Coastal Plains are relatively abundant in the analysis area. Accurate population figures are not available for many species, although squirrel and deer populations are good. The analysis area does contain one inactive red-cockaded woodpecker (RCW) cluster site (in Area 6). The RCW listed on the Federal list of endangered species and is protected under the Endangered Species Act.

Manageability.

1. What are the characteristics of the surrounding area, including its ROS classification, adopted VQO, and present and planned uses?

The Recreation Opportunity Spectrum (ROS) on the majority of the analysis area is Roaded Natural (RN). For the most part, the Visual Quality Objective (VQO) ranges from retention (R) to maximum modification (MM), because of aesthetic values along the boundary of Upland Island Wilderness. Under the 1987 Forest Plan, land use will stress multiple-use forest management with sensitivity for the visual resource.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on private land around and near the boundary, demands for nonconforming structures or activities that would conflict with the wilderness concept are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

Most of the boundaries are arbitrarily designated property lines and do not conform with terrain features or geographical barriers. Some portions of the boundary are located in areas that would be difficult to cross or access. A major portion of the boundary is adjacent to Upland Island Wilderness, and thus is accessible only by nonmotorized means. There are other boundaries where the prohibition against use of motorized vehicles would be difficult to administer.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The Upland Island Wilderness boundary does provide some degree of protection for part of the analysis area. However, private land holdings and roads along the boundaries of the analysis area may interfere with solitude, and result in some sights and sounds of civilization. It is possible that private developments and road construction could take place near these boundaries and that these could give rise to sights and sounds incompatible with wilderness.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

transportation. Parking lots in Areas 1, 4, 6, and 8 could accommodate these transfers.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting and camping are currently the dominant uses, while horseback riding, ATV riding, and hiking appear to be second in importance.
b. Information on wildlife species, populations, and management needs:

The analysis area contains one inactive RCW cluster (in Area 6), which is protected under the Endangered Species Act. Management of RCW habitat is governed by a court court. Under these guidelines, 1,200-meter habitat zones have been established to provide protected habitat for the RCW. Management activities include removal of midstory vegetation within 200 feet of each cluster tree and prescribed burning within 1,200 meters of each cluster tree. Currently, this cluster site occupies 4 acres and the replacement stand 10 acres. The area of the 1,200-meter habitat zones totals 157 acres.

The analysis area also supports both game and nongame species commonly found in the Gulf Coastal Plains, including gray squirrel and white-tailed deer. Wildlife management activities on the area outside the RCW habitat zones are generally directed toward improving habitat for white-tailed deer.

c. Water availability and use: The analysis area contains no natural sources of potable water. Potable water is available in developed recreation areas. The Sam Rayburn Reservoir and the Neches River are close to the analysis area. Creeks and low areas provide water for wildlife.
d. Livestock operations: None.
e. Timber: The analysis area is a high-quality site for timber production. Loblolly pine site indices range from 70 to 100. Timber types are loblolly pine (approximately 64 percent), slash pine (4 percent), and various hardwoods (26 percent). Some hardwoods (mostly oaks, hickory, and some Beech-Magnolia timber type) can be found in the creek bottoms, intermixed with pines. Approximately 33 acres, or 3 percent, of the analysis area is in timber less than 10 years old. These regeneration areas are in Area 8. Approximately 53 percent of the standing timber is between 50 and 70 years old. An estimated 24 percent of the timber is more than 70 years old, and 14 percent is between 10 and 30 years old.
f. Minerals: Mineral rights on 685 acres are owned privately (See Table 1) and are not subject to Forest Service jurisdiction. Where mineral rights are outstanding, the Forest Service must allow the construction and maintenance of exploration sites. Mineral rights in the remaining 595 acres are owned by the government. The 595-acre area is considered to have a moderate potential for oil and gas occurrence.
g. Cultural resources: Some of the analysis area may contain archeological sites, which are considered historic properties. A number of Paleo-Indian to Neo-historic prehistoric sites have been recorded on areas associated with the Angelina and Neches Rivers. Future surveys reveal the presence of additional sites.

Some historic sites are found within and near the analysis area. The Aldridge Mill complex is perhaps the best example of a turn-of-the-century sawmill in the National Forests in Texas. There are also old logging trams and numerous cemeteries, most notably the Boykin Cemetery, near the analysis area.

Forests and Grasslands in Texas is charged with the protection and management of these

valuable historic properties by laws and regulations. The historic properties are also educational and interpretive landmarks that increase public use and area interest.

h. Authorized and potential land uses: Currently, there are a variety of commercial and noncommercial special uses in the analysis area. The permittees, the special uses, and the mileage along Forest Service roads or boundaries are listed in Table 2.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: This analysis area has been burned periodically to reduce fuel build-up since the Forest Service acquired the land in the 1930's. The controlled burns have been conducted approximately every 3 to 5 years. Wildfires do occur, but are infrequent. The analysis area's terrain is gentle with rolling hills. Therefore, it would not be difficult to suppress wildfires unless adverse conditions (high winds and/or very dry fuels) occurred.

Potential for spread of the Southern Pine Beetle (SPB) is moderate because loblolly pine, a preferred host, is the predominant species. Although few infestations have occurred in the analysis area, the majority of the standing timber is at or near maturity and this could increase susceptibility during an epidemic.

The presence of private land is not a major consideration for management of the analysis area as general forest land. However, difficulties related to access and other special use needs must be resolved if the analysis area is to be managed as wilderness.

This analysis area presents complex problems because it consists of eight separate areas which are scattered around and adjacent to Upland Island Wilderness. Many of these areas are quite small and have several conflicting uses.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities, such as hunting and camping, should continue at about the present moderate to high level. Since the analysis area is adjacent to Upland Island Wilderness, there is access by existing FS and county roads. Because the analysis area is visible from Upland Island Wilderness, it is desirable to manage the analysis area for aesthetic and recreational purposes.

3. Is the analysis area located in such a way that the need for increase water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. The presence of RCW in Area 6 necessitates habitat maintenance activities that are not conducive to wilderness conditions.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

This analysis area is not highly mineralized but is considered to have a moderate potential for oil and gas occurrence. Where mineral rights are outstanding, permission to drill would be granted. Permission to construct and maintain access roads and drilling sites would be granted also.

that general public access and special development to facilitate public enjoyment should be available?

Yes. The analysis area supports an intact example of southern scenic bottomland.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. There are demands for dispersed recreation (hunting, camping, horseback riding, and ATV use) and timber.

Timber stands within the 1,200-meter RCW foraging zones are being thinned to comply with the a court order. This thinning contributes to the timber harvest on the Angelina National Forest.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. There are reserved and outstanding rights to minerals on 685 acres within the analysis area. Surface occupation, with mitigation measures implemented, must be allowed in order to accommodate exploration and production equipment. Lion Oil Company also retains an outstanding right-of-way for an oil transport pipeline that was in place prior to Forest Service land acquisitions. There are also several special use permits which are listed in Table 1. The U.S. owns 595 acres of mineral rights that are not leased at present.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in Texas. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness in Texas.

2. How far is it to the closest existing wilderness?

Upland Island Wilderness (13,390 acres) is adjacent to all sections of the analysis area. Turkey Hill Wilderness (5,286 acres) is approximately 26 miles to the north. Both of these wildernesses are on the Angelina National Forest.

3. What is the current level of use in nearby wilderness? What are the trends in the use of these areas?

Upland Island Wilderness received approximately 3,000 Recreaton Visitor Days (RVD's), about 11 percent of estimated capacity. Of these, 500 RVD's involved overnight camping. The average size of visiting groups is 2.6 people. More than 56 percent of visitors to Upland Island Wilderness visit there more than twice per year. An estimated 27 percent of visitors to Upland Island go into the wilderness alone. Most visitors are there to hunt or to scout for future hunting trips. A large percentage of visitors are under 16 years of age.

The Turkey Hill Wilderness received an estimated 1,500 RVD's (about 14 percent of capacity), of which 500 involved overnight camping. Most of the use was related to hunter use. Users have not had any significant effects on the areas wilderness qualities or resources. A small increase in use over the next 10 to 20 years is anticipated.

increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew at much faster rates (27 percent and 17 percent respectively, 1980-87). These population centers are about 100 miles (Houston) to 175 miles (Dallas) from the analysis area. The combined population of Houston and Dallas is more than 5 million.

The Graham Creek analysis area is located in Angelina and Jasper counties. The population of Angelina County grew from 64,172 in 1980 to 69,920 in 1988. The population of Jasper County grew from 30,781 in 1980 to 32,014 in 1988. The population of San Augustine County, located to the north of the analysis area, grew from 8,785 in 1980 to 9,174 in 1988. Generally, the populations of the counties near the analysis area have increased steadily over the past 10 years. The population of Deep East Texas, in which the analysis area is located, is expected to increase about 50 percent over the next 35 years.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Yes. Many acres of National Forest land within reasonable distance of the Graham Creek analysis area are suitable and available for primitive recreation use.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

Yes. There is one inactive RCW cluster in Area 6. This cluster and the associated replacement stand occupy 14 acres of Forest Service land. There are a 200-foot boundary and a 1200-meter foraging habitat zone around each RCW cluster. The RCW is protected under the Endangered Species Act, and its habitat is managed under direction of a court order.

Area 8 contains sensitive plant coumnunities.

2. Could their needs be provided for through means other than wilderness designation?

Yes. Wilderness designation would limit management options for meeting the needs of the RCW and the sensitive plant communities.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

No. Suitable habit can be maintained by means of conscientious vegetation management and mitigation of disturbances.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1977)? Does the area represent a unique landform type that is not represented in any existing wilderness areas in the general vicinity?

The Graham Creek analysis area is on the Coastal Plain of eastern Texas. The dominant landforms are floodplain and stream terraces, low ridges, side slopes, and ridge tops.

The same landforms are typical of Upland Island Wilderness Area, which s adjacent to the Graham Creek analysis area.

2. What is the analysis area's ecosystem classification based on the TNHP Report? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The plant communities most common in the analysis area are the Loblolly Pine-Oak Series, Water Oak-Willow Oak Series, Swamp Chestnut Oak-Willow Oak Series,

Longleaf Pine-Little Bluestem Series, Sphagnum-Beakrush Series, Sweetbay Magnolia Series, and Baldcypress-Water Tupelo Series. These plant communities represent the wide natural diversity found in the National Forests of east Texas.

Table 1. Mineral Interest and Leasing Status of Areas Within
Proposed Graham Creek as of April 16, 1992

Area	U.S. Tract	Reserved Interest	Outstanding		In Perpetuity
	Issued Leases				
1	A-26	--	8.00	--	Not Leasable
2	A-1a-I	--	--	41.00	Not Leasable
3	A-1a-I	--	--		2.00
	Not Leasable				
4	A-1a-I	--	--		5.00
	Not Leasable				
5	A-1a-I --	--	127.00		Not Leasable
6	A-1a-I --	--	106.00		Not Leasable
7	A-1a-I --	--	51.00		Not Leasable
8	A-1a-I &	595.00	--		345.00
	The U.S.				
	A-8a				
	interest is				
	presently being				
					u
pdated to					
					o
ffer as a part					
					o
f Parcel #4					
Total		595.00	8.00	677.00	

Table 2. Special Uses For Graham Creek

Area 2...Rueda Unit
Telephone Lines

0.57 miles along Angelina County Road 383-B

Area 3...Graham Creek Unit

Aerial Powerlines

Texas Power & Light: ROW width 10 ft.

0.08 miles along both sides of Angelina County Road 4-5

Telephone Lines

Contel/Continental Telephone: Buried ROW width 10 ft.

0.08 miles along Angelina County Road 4-5

Area 4...Cypress Creek Unit #2

Aerial Powerlines

Texas Power & Light: ROW width 10 ft.

0.19 miles along Angelina County Road 4-5

Telephone Lines

Contel/Continental Telephone: Buried ROW 10 ft.

0.19 miles along Angelina County Road 4-5

Special Use Road (easement)

Gulley Road: ROW width 30 ft.

0.05 miles south from County Road 4-4 to FS boundary

Area 5...Martin Unit

Telephone Lines

Contel/Continental Telephone: Buried ROW width 10 ft.

0.25 miles south along FS 314

Southwestern Bell: Buried ROW width 10 ft.

0.23 miles between FS boundary and Texas & New Orleans (SP) Railroad ROW

Pipelines

Lion Oil Company: ROW width 30 ft.

(Outstanding Right)

0.03 miles across Forest Service land

Area 6...Marshall Unit

Aerial Powerlines

Jasper-Newton Electric Co-op: ROW width 25 ft.

0.11 miles across Forest Service land (southeast corner)

Telephone Lines

Contel/Continental Telephone: Buried ROW width 10 ft.

0.76 miles along Jasper County Road 8

0.38 miles along FS 314

Area 7...Bouton Unit

Aerial Powerlines

Jasper-Newton Electric Co-op: ROW width 25 ft.

0.26 miles along FS 314

Telephone Lines

Contel/Continental Telephone: Buried ROW width 10 ft.

0.26 miles along FS 314

0.10 miles along FS 314B

Area 8...Green Creek Unit

Aerial Powerlines

Jasper-Newton Electric Co-op: ROW width 25 ft.

0.38 miles along FS 302
0.47 miles along Angelina County Road 4-13
0.68 miles along Angelina County Road to FS boundary.

Telephone Lines

Contel/Continental Telephone: Buried ROW 10 ft.
0.57 miles along FS 303

Harmon Creek

Sam Houston National Forest, Raven Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

HARMON CREEK: Gross area approximately 1,960 acres; net area approximately 1,960 acres.

Location and vicinity.

The analysis area is located in the northern portion of the Raven Ranger District of the Sam Houston National Forest. It is east of Highway 19, north of Highway 190, and approximately 3.0 miles east of Huntsville in Walker County, Texas.

Describe access to the analysis area, including roads and trails leading to the area.

To reach the analysis area, travel approximately 3.0 miles west from Huntsville, Texas, on Highway 190. Turn north on Forest Development Road (FDR) 227 and travel approximately 1.0 mile to the analysis area, which is on the east side of the road.

General description of the analysis area's geology.

The analysis area is on the western Gulf Coastal Plains and the Texas Blackland Prairies. The soils have developed from sedimentary material and are of recent, pleistocene, and age. The Willis formation consists largely of clayey sand and gravel and some local clay beds. The Fleming formation underlies and is the parent material for the Blacklands, which consist of calcareous clay and sandstone. Soils occurring in the analysis area are the Annon, Depcor, Huntsburg, and Kanebreak series.

General description of the analysis area's topography.

This part of the western Gulf Coastal Plain of Texas and the Texas Blackland Prairies consists of floodplains, stream terraces, and gently sloping side slopes and ridgetops. The elevation between the stream bottoms and ridge tops is approximately 80 feet, and slopes are between 0 and 15 percent.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is within the Southern Mixed Forest Ecosystem. The predominant forest type is loblolly pine. Oaks and other hardwoods mixed with the pines. Shortleaf pine also occurs in the overstory. Yaupon is the most common understory species. Riparian vegetation on lower slopes, creek bottoms, and stream terraces is mainly loblolly pine-oak and hardwood slope forest. The Texas Natural Heritage Program (TNHP) loblolly pine-oak series is the predominant plant community.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

Visitors to the analysis area have opportunities to view game, non-game, and threatened and endangered animal species. No sensitive plant species are known to occur in the analysis area.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. The land was acquired from private owners during the 1930's and early 1940's. A significant amount of land was acquired from timber companies. Most of the area was cut over severely during the early 1900's.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

Little evidence of turn-of-the-century logging and farming remains, but more recent management is evident. The analysis area has been managed intensively for timber production in the last 20 to 30 years. The analysis area contains numerous pine plantations from 2 to 20 years old. Mature timber in the analysis area has been thinned to improve endangered species habitat. Several old woods roads are present. Very little of the analysis area retains a natural appearance or is free from disturbance.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural untrammeled appearance?

No, most of the analysis area is marked by southern pine beetle (SPB) control activities, woods roads, and extensive past harvesting. The Forest Plan specifies that the analysis area will continue to be managed for multiple uses.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

Existing surface management can be modified, but reserved mineral rights could pose a problem. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate minerals exploration and production, so perpetuation of wilderness values cannot be ensured.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No exotic species are known to be present in the analysis area.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: No.
b. Electronic installations: Yes. Sam Houston Electric Company has a permit for a power transmission line.
c. Areas with evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.
d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

occupancy rights: No.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: Yes, the analysis area receives moderate use from hunters and has some dispersed camping areas.

g. Timber harvest areas where logging and prior road construction are or are not evident: There are woods roads and harvest units throughout the analysis area, which has been managed as timberland since the 1930's.

h. Cultural treatments involving plantations or plantings: There is evidence of past timber stand and wildlife habitat improvement. Numerous plantations ranging from 2 to 20 years old are present. Many of the plantations are quite large (up to 85 acres).

i. Private inholdings in the area: No. The analysis area borders scattered private holdings.

j. Dwellings on private inholdings: No. There are dwellings on adjacent private property.

k. Nonconforming structures and improvements: Woods roads, garbage dump areas, power transmission lines, pipeline, forest development roads, and harvest units are present.

l. Ground-return telephone lines: No.

m. Watershed treatment areas: No.

n. Roads: The analysis area contains 6.6 miles of surfaced and maintained roads (FDR Roads 227, 236, 236a, and 257). There are also FDR woods roads in the analysis area. Approximately 112.1 miles of FDR 227g, 227h, 227d, 257d, 257e, 257e1, 257c, 257c1, 257f, 2024, 241, and 241c border or are within the analysis area.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Many can be mitigated through replanting, reforestation, and revegetation. Surface occupancy with mitigating measures implemented must be allowed in order to accommodate mineral exploration and production rights.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

Forest Service roads and 227, which is maintained by Walker County, are being maintained for long-term use.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Most of the area has been harvested, and about 21 percent of the acreage has been harvested within the past 10 years.

5. Does the area contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are approximately 18.7 miles of FDR and several miles of non-system woods roads in the 1,960-acre analysis area.

6. Are all existing roads under Forest Service jurisdiction?

Yes, with the exception of FDR 227, which Walker County maintains under a cooperative agreement.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following

determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

Such opportunities are very limited, as the analysis area is small and is located in an urban National Forest. Noise from FDR's can be heard throughout the analysis area. Recreation Opportunity Spectrum (ROS) is semiprimitive motorized and roaded-natural.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

The analysis area offers few opportunities for these experiences. The existing road system makes access reasonably easy.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Several locations are suitable for primitive camping.
b. Hunting: Hunting is readily available for some small and large game species.
c. Fishing: None.
d. Canoeing: None.
e. Boating: None.
f. River rafting: None.
g. Backpacking: There are some opportunities for backpacking. The lack of a trail system and presence of undergrowth makes backpacking difficult.
h. Hiking: Same as for backpacking, above.
i. Riding: There are opportunities for horseback riding along the FDR's and woods roads. No trails have been developed for equestrian use.
j. Photography: There are good opportunities existing for some kinds of nature photography. There are no opportunities for panoramic or scenic shots.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area provides opportunities for study and education in subjects such as forestry, archeology, biology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

A variety of game and nongame animals--including threatened and endangered species--can be found in the analysis area. Species are typical of those found in the western Gulf Coastal Plain forests of Texas.

1. What are the characteristics of the analysis area including ROS classification, adopted VQO, and present and planned uses?

The ROS is semiprimitive motorized and roaded-natural. The Visual Quality Objective (VQO) is maximum modification. The 1987 Forest Plan specifies that the analysis area is to be managed for multiple uses and that aesthetic qualities and recreational uses are to be emphasized.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

No. Private land around and near the boundary may be developed in the future, but encroachments are not expected.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The analysis area is bounded by existing roads and by the National Forest boundary, which is marked.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

No.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

No. The area is bordered by private land, and terrain features and vegetation along the boundary provide minimal protection.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. Several FDR's allow access to all parts of the analysis area.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting, horseback riding, and dispersed camping are popular.

b. Information on wildlife species, populations, and management needs: The area supports various game, nongame, and threatened and endangered species found in forests of the western Gulf Coastal Plain of Texas.

c. Water availability and use: There is no source of potable water. Water for wildlife and livestock is readily available.

d. Livestock operations: The analysis area is in the Harmon Creek range allotment.

e. Timber: The analysis area is included in the Forest's base of lands suited for timber management and contributes to meeting the National Forests and Grasslands in Texas Final Land and Resource Management Plan (FLRMP) goals. There are 153 acres of slash pine, 1,069 acres of loblolly pine, 623 acres of shortleaf pine, and 115 acres of bottomland hardwoods-yellow pine forest cover. Site indices generally range from 70 to 90 for the pines and hardwoods.

f. Minerals: Sanhall Corporation has an oil lease. There has been no mineral exploration or development within the analysis area.

g. Cultural resources: The analysis area may contain archeological or historical sites or both. Surveys of the analysis area may reveal new sites.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: Fire protection and successful fire suppression have created the possibility of fuel build-up. Prescribed burning has helped to control the fuel loading and reduce the fire danger.

Infestations of SPB could develop if pines in the analysis area are stressed or damaged.

There are no inholdings.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreational activities including hunting, camping, and horseback riding should continue at the present low to moderate level.

The analysis area is expected to produce some timber. Any decrease in the acreage available for timber harvesting will result in a decline in timber production on the Forest.

Prescribed burning, establishment of food plots, or other measures could be employed to improve habitat for red-cockaded woodpecker (RCW) and other wildlife.

The reserved minerals may be explored and developed.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. The area contains four inactive RCW clusters. Habitat improvement projects would be limited severely under wilderness management.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

No. However, the mineral rights are owned privately, and development is high.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. The analysis area is included in the Forest's timber base.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

No. However, minerals are owned privately.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The Little Lake Creek Wilderness, a Federally designated wilderness, is located in the Raven Ranger District of Sam Houston National Forest and consists of 3,810 acres. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Little Lake Creek Wilderness Area is approximately 25 miles southwest of the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Little Lake Creek Wilderness had an estimated 500 recreation visitor days in 1991. Wilderness use is expected to increase slightly over the next 10 to 20 years.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The populations of Dallas and Houston grew 27 percent respectively, from 1980 to 1987. The analysis area is about 60 miles from Houston and 225 miles from Dallas.

The combined population of Montgomery and Walker Counties grew from 135,000 in 1980, to 180,000 in 1988.

Nonwilderness lands.

Are there opportunities for un-confined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Many areas of the Sam Houston National Forest, which is adjacent to the analysis area, are suitable for primitive recreation use. The Raven Ranger District of the Sam Houston National Forest includes 102,000 acres that provide opportunities for primitive recreation.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

No. There are no known sensitive plant species found in Harmon Creek.

2. Could their needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

Not applicable.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Guide (R-8 1972)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area consists of floodplains, stream terraces, gently sloping side slopes, and ridgetops. There landforms are common throughout the western Gulf Coastal Plain.

ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area's ecosystem is Western Gulf Coastal Plain Forest. This ecosystem occurs in existing wilderness areas in Texas.

Indian Mounds

Sabine National Forest, Yellowpine Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

INDIAN MOUNDS: Approximately 4,862 acres.

Location and vicinity.

The analysis area is located in the northeastern portion of the Yellowpine Ranger District of the Sabine National Forest, west of Toledo Bend Reservoir, in Sabine County, Texas. The analysis area is divided into three noncontiguous units, which are separated by private property and the Indian Mounds Wilderness Area. The northern unit contains approximately 3,663 acres and is bounded on the north and east by Toledo Bend Reservoir, on the south by State Highway 83, and on the west by Farm-to-Market (FM) Road 3121. The eastern unit contains about 435 acres and is bounded on the east by Toledo Bend Reservoir, on the north by an inlet of the reservoir, on the west by FM 3382, and on the south by County Roads 28 and 29. The southwestern unit contains 764 acres and is bounded on the southwest by FM 944, on the northeast by Indian Mounds Wilderness Area, and on the southeast by a commercial pipeline.

Describe access to the analysis area, including roads and trails leading to the area.

Access to the northern unit is by State Highway 83, FM 3382, and Sabine County Roads 31, 32, and 33. The eastern unit is accessed by FM 3382 and County Roads 28 and 29. The southwestern unit is accessed by FM 944, FM 1368, County Roads 24 and 26, and Forest Service (FS) Roads 104 and 160.

General description of the analysis area's geology.

The analysis area is in the western Gulf Coastal Plain and is underlain by fluviatile terrace deposits and the Sparta Sands geological formation. The fluviatile terrace deposits, which consist of gravels, sands, and silts, are less than 2 million years old; whereas the Sparta Sands, which consist of clays, quartz, sand, lignite, glauconitic marl, and marine megafossils are 36 to 58 million years old. Soils associated with these formations are the Sacul-Cuthbert-Kurth Series.

General description of the analysis area's topography.

The analysis area consists of floodplains, stream terraces, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes generally occur as inclined surfaces on broad

floodplains and some of the branchhead inclusions have been inundated by Toledo Bend Reservoir.

General description of the analysis area's vegetation, including the ecosystem type.

Loblolly forest and shortleaf pine forests predominate. Longleaf pine is present, but usually occurs as single trees or in small groups. White oak, red oak, sweet gum, magnolia, hickory, American beech, and longleaf pine occur in the overstory and midstory of the loblolly and shortleaf forest cover. Loblolly-hardwood cover types, and one area of American beech-magnolia cover type, are represented. Understory trees, shrubs, vines, and herbaceous vegetation include red maple, dogwood, ironwood, persimmion, Japanese honeysuckle, greenbrier, gallberry, yaupon, huckleberry, panicums, and sedges.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The key attractions are Toledo Bend Reservoir and Mill Creek Cove Scenic Area. Places within the analysis area provide natural vistas of Toledo Bend Reservoir. These usually occur on small ridges immediately adjacent to the reservoir, but can be farther from the reservoir. Mill Creek Cove Scenic Area offers the opportunity to view a mature Beech-Magnolia hardwood forest.

Bald eagles have nested near the analysis area. They have been observed perching and feeding along the shoreline of Toledo Bend, and it is likely they have used the shoreline within the analysis area. American alligator probably occupy suitable habitat along the shoreline of Toledo Bend Reservoir. No other threatened, endangered, or sensitive species are known to be present, but a detailed inventory of the fauna has not been completed.

The Texas Natural Heritage Committee has completed an inventory of natural plan communities and rare plant species in the analysis area. The inventory identified two sensitive communities, Mill Creek Cove and Suprise Beech. Mill Creek Cove is an old-growth American Beech-Southern Magnolia Community, and Suprise Beech a mature American Beech-White Oak Community.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

The Federal Government acquired the analysis area in the mid-1930's. Most of the land was virtually denuded of trees. Recent activities have included timber harvesting, reforestation, southern pine beetle (SPB) suppression, prescribed burning, wildlife habitat improvement, seismographic mineral prospecting, and road construction and reconstruction.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

There is little, if any, evidence of the major logging activities that took place during the early part of this century. There is evidence of timber harvesting, reforestation, SPB suppression, mineral exploration, and pipeline and road construction since 1960. There are

Mill Creek Cove Scenic Area and the peninsula just north of Mill Creek Cove.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Only Mill Creek Cove Scenic Area and a few other undisturbed areas appear natural.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. The analysis area is not a contiguous unit, and it adjoins private property in many places. The adjoining private land generally lacks wilderness characteristics and would not be easy to acquire.

Some subsurface minerals are owned privately, and the private owners have legal rights to explore and develop their mineral interests. If these rights were exercised, the land surface with be affected.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old. (Do not include areas of significant current mineral activity): No. However, there are two oil well sites in the Mill Creek Cove Scenic Area. These date to the 1930's.

d. Areas under current mineral leases that contain "no surface occupancy" stipulations: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: There are several such areas.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: There are no developed recreation improvements within the analysis area. Primitive, dispersed camping sites are scattered throughout. Some are inconspicuously located along the lakeshore and along woods roads. Others are adjacent to State, county, and Forest Service roads and are quite conspicuous.

g. Timber harvest areas where logging and prior road construction are or are not evident: The analysis area exhibits evidence of recent harvesting activities and road construction. It cannot be described as heavily logged, but there have been regeneration cuts, intermediate cuts (thinnings), and SPB suppression by timber sales. Most of the analysis area was classified as general forest area in the Final Land and Resource Management Plan (FLRMP), which was approved in May, 1987, and was scheduled to be evaluated for timber harvesting. The most recent timber sale was in the western section of the northern unit. The sale had 290 acres of regeneration cutting, 61 acres of thinning, and 5 acres of cutting to clear road rights-of-way. The sale involved 0.88 miles of road construction and 1.20 miles of road reconstruction. The sale terminated in November, 1990.

h. Cultural treatments involving plantations or plantings: The 290 acres that were clearcut have been site prepared and planted.

i. Private inholdings in the analysis area: There are two inholdings.

j. Dwellings on private inholdings: There are two dwellings on private inholdings.

the analysis area.

l. Ground-return telephone lines: None known.

m. Watershed treatment areas: None.

n. Roads: The northern unit has the following roads: FM 3382; FS 171, 172, 172-A, 1783, 1784, 1791, 1792, 1793, 1794, 1795, 1796, and 1797; and Sabine County 31, 32, and 33. The southwestern unit has FS Roads 104, 106 and Sabine County Road 24. The eastern unit has Sabine County Road 28 and an unnamed county road.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Timber management could be terminated, and woods roads, skid trails, and other evidences of timber management could be mitigated. Some Forest Service roads could be closed and mitigated. County roads and roads providing access to inholdings and special uses must be maintained for long-term service. Rights-of-way for water, power, and telephone lines must also be maintained for long-term service.

3. Are improvements in the analysis area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

The improvements noted previously are being maintained to meet long-term needs.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. The analysis area contains approximately 7.72 miles of improved roads (surfaced with gravel or bituminous material), or 1.68 miles of improved road for each 1,000 acres.

6. Are all existing roads under Forest Service jurisdiction?

No. Only 2.99 miles of the improved roads are under Forest Service jurisdiction. The remainder are controlled by the State of the county.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

The area provides few such opportunities. Traffic on roads within and adjacent to the analysis area disturb solitude and serenity, and adjacent developments-which include subdivisions, marinas, and a county dump-does not provide a good backdrop for solitude and serenity.

Challenge.

challenge, initiative, or self-reliance? Is access easy or difficult?

The numerous roads adjacent to and within the area make access easy. The analysis area presents opportunities for recreational activities that can involve adventure, excitement, challenge, initiative, and self-reliance.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: There are numerous locations for primitive camping.
b. Hunting: Hunters can take small game and deer. Use is moderate and access is good.
c. Fishing: There is excellent fishing in Toledo Bend Reservoir, which is adjacent to the analysis area.
d. Canoeing: None of the analysis area's streams or rivers are large enough to support this activity.
e. Boating: Same as for canoeing.
f. River rafting: Same as for canoeing.
g. Backpacking: The analysis area is not large enough to offer a challenge to a seasoned backpacker.
h. Hiking: The northern unit is suitable for hikes of very short distance and is better suited for novice hikers. The eastern and southeastern units are too small for hiking.
i. Riding: The primitive roads could be utilized for horseback riding, but cross-county riding would be challenging, particularly for the novice, because the undergrowth is dense.
j. Photography: Opportunities for vista photography are good in areas adjacent to Toledo Bend Reservoir and poor elsewhere. The entire analysis area presents good opportunities for plant and animal photography.

Special Features.

1. What is the analysis area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

Opportunities are limited. The best opportunities are in the Mill Creek Cove Scenic Area and the Suprise Beech area.

2. Is there an abundant and varied wildlife population?

Game and nongame animals typical of western Coastal Plain forests are present. Wildlife populations are more abundant or varied than in other lakeshore or near-lakeshore areas of Forest Service land in Texas.

Manageability.

1. What are the characteristics of the surrounding area, including its ROS classification, adopted VQO, and present and planned uses?

Recreation Opportunity Spectrum (ROS) on the majority of the area is Roaded Natural (RN). Four small areas (about 200 acres total) in the northern unit are classified as Semiprimitive motorized (SPM). Visual Quality Objective (VQO) ranges from retention for the Mill Creek Cove Scenic Area to maximum modification for the majority of the

rated partial retention, and areas adjacent to the improved roads are rated modification.

Future land use will continue to stress aesthetic values in association with residential and dispersed recreation uses. There are several private marinas and residential subdivisions in the immediate area, but demand for recreational use and residential development has stabilized.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Development of adjacent private land will continue, but encroachments are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked, and the analysis area's boundary coincides with easily defined natural or man-made features where it does not coincide with the Forest boundary.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

The boundary presents a barrier to prohibited use only where the boundary coincides with Toledo Bend Reservoir shoreline.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

No. Marinas, residential developments, traffic on roads, and recreational use on the lake are visible and audible from certain points in the analysis area.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting and dispersed camping during the hunting season are the most common uses. The level of hunting and camping use is moderate.

b. Information on wildlife species, populations, and management needs: The analysis area contains game and nongame animals typical of the western Coastal Plain. Deer is the featured species in most of the analysis area, but gray and fox squirrel are featured in the Mill Creek Cove Scenic Area, in pine-hardwood stands, and in hardwood stands. The deer population is estimated to be increasing and the squirrel population stable. Trends in squirrel numbers depend on mast production.

c. Water availability and use: Water suitable for human consumption is not available.

d. Livestock operations: None.

e. Timber: With the exception of Mill Creek Cove Scenic Area, the analysis area has been managed intensively for timber. Road development is considered economically feasible, and road construction and reconstruction has occurred.

Site indices for southern yellow pines are excellent, ranging from the 80's to the 90's. On the better hardwood sites, site indices for upland hardwoods range from the 70's to the 80's. On pine sites, site indices for upland hardwoods range from the 50's to the 60's.

f. Minerals: There are reserved and outstanding mineral rights. There has been no recent interest in mineral exploration and development, but there has been a flurry of oil and gas exploration within 15 or 20 miles of the analysis area.

g. Cultural resources: Much of the analysis area may have a high potential for the presence of archeological or historical sites or both (historic properties). The Sabine River provided ideal conditions for early settlement. Fertile bottomlands and abundant wildlife attracted and supported Native American inhabitants for more than 5,000 years. Numerous Paleo-Indian to neo-Historic prehistoric sites have been found in the analysis area. Future surveys should reveal additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

There are several historic sites in the analysis area. The remains of old logging trams, or railways, may be found throughout. Historic farmsteads and cemeteries may also be found within the analysis area.

These sites and the objects and other physical evidence they contain are an important part of our cultural heritage. The National Forests and Grasslands in Texas are charged with the protection and management of these valuable historic properties by laws and regulations.

h. Authorized and potential land uses: An individual has a special use authorization for a road. Utility companies have easements for telephone, water, and electric lines. The telephone and electric lines are overhead and the water lines are buried. All lines are on road rights-of-way. These rights-of-way are held by various government entities.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: Fire protection, aggressive fire suppression, and the lack of regularly scheduled prescribe burning have resulted in a build-up of light and heavy fuels. Suppression is usually not difficult; access to the analysis area is good, and tractor plow units can operate effectively because the terrain is not difficult.

Southern pine beetle (SPB) has been and will continue to be a problem.

There are two private in-holdings in the analysis area, but they are small and present only very minor problems.

2. What outputs are currently produced or could be produced in the future?

The analysis area is producing a proportionate share of the District's annual timber sale program and is expected to continue to do so. The analysis area will also continue to provide moderate levels of dispersed recreation, primarily hunting and dispersed camping during hunting and fishing seasons.

3. Is the analysis area located in such a way that the need for increase water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

No.

restrictions or controls resulting from wilderness designation would not be in the public interest?

No.

6. Does the analysis area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

No.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. Individuals, government entities, and private corporations have special use authorizations for roads and utility lines.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System (NWPS) includes approximately 35,437 acres of designated wilderness in east Texas. The Kisatchie Wilderness Area, in central Louisiana, contains approximately 8,700 acres. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Indian Mounds Wilderness Area (11,307 acres) is located approximately two miles south of the northern unit. The southwestern unit and eastern unit are located immediately adjacent to Indian Mounds Wilderness Area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Indian Mounds Wilderness Area had approximately 3,300 visitor days of recreational use in 1990. Most use is related to hunting. The area is used lightly, and use is not affecting it negatively. Use has remained stable since the wilderness was established in 1984.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The analysis area is located in Sabine County, where the population grew from 8,702 in 1980 to 9,562 in 1990. The populations of most of the surrounding counties are increasing more slowly.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

National Forest land, within a reasonable distance, is suitable and available for primitive recreation use.

Habitat needs.

development?

The bald eagle and American alligator may be competing with public use and development, but this has not been demonstrated. If there is such competition, it is taking place on private land adjacent to Toledo Bend Reservoir.

2. Could their needs be provided for through means other than wilderness designation?

Yes.

3. Is there a need to provide a sanctuary for species that cannot survive in less than primitive surroundings?

This cannot be determined without comprehensive study and data collection by various scientific and interested groups. The Indian Mounds Wilderness Area provides some protection for the bald eagle and American Alligator. However, these species are heavily dependent upon Toledo Bend Reservoir for their livelihood, so any sanctuary would have to include portions of this lake.

Landform and ecosystem preservation.

1. What is the analysis area's landform type? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area consists of floodplains, stream terraces, concave foot slopes, side slopes, and gently sloping ridgetops. These landforms are common in the western Gulf Coastal Plain.

The same landforms occur in the Indian Mounds Wilderness Area.

2. What is the analysis area's ecosystem classification? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area's ecosystem is Loblolly Pine-Oak, which is an upland, mainly deciduous forest that occurs primarily on sandy or loamy, low-Ph soils in east Texas. This ecosystem occurs in existing wilderness within the State of Texas.

Jordan Creek

Angelina National Forest, Angelina Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

JORDAN CREEK: Approximately 9,776 acres.

Location and vicinity.

The analysis area is located in the southern portion of the Angelina National Forest. The analysis area is south of Sam Rayburn Reservoir, along State Highway (SH) 63, in Angelina and Jasper Counties, Texas. It is bounded on the north by Forest Service (FS) 306 and on the south by SH 63 and private land. A United Gas pipeline right-of-way (ROW) forms the west boundary. The area is bordered to the east by private land, land owned by the U.S. Army Corps

the analysis area.

Describe access to the analysis area, including roads and trails leading to the area.

Primary access to the analysis area is from SH 63, which runs from northwest to southeast and parallels a portion of the area's southern boundary. The most direst access is by FS 333, which turns north from SH 63 and goes to Sandy Creek campground, bisecting the western part of the analysis area. Additional access is by FS 335, which turns north from Farm-to-Market (FM) 255R and leads to Harveytown and the Letney boat ramp. This road bisects the eastern part of the analysis area. Other access routes include SH 63, FM 255R, and FS 347, 306, 332, and 306E. Limited access is also possible from the Angelina River and the shore of Lake Sam Rayburn.

General description of the analysis area's geology.

The analysis area is in the western Gulf Coastal Plain and is underlain by the Catahoula, Whistsett, and Manning geologic formations. These formations are 25 to 58 million years old and consist of clays, quartz sands, mudstone, tuffaceous lignite, and fossil wood. Soils associated with these formations are the Koury, Corrigan, Kisatchie, Letney, Rayburn, and Tehran series.

General description of the analysis area's topography.

This part of the western Gulf Coastal Plain consists of floodplains, stream terraces, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes generally occur as inclined surfaces on broad interstream divides with narrow floodplains and branchhead inclusions. Some of the narrow floodplains, stream terraces, and branchhead divides have been inundated by Sam Rayburn Reservoir.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is almost entirely covered by a Longleaf Pine-Little Bluestem Series plant community, which occurs intermittently along the Atlantic and Gulf Coastal Plains. Longleaf pine is dominant, but other pine species and some hardwoods have intruded as a result of changing fire patterns and extensive logging. Hardwood species most common in the analysis area include dogwood, southern red oak, blackjack oak, bluejack oak, water oak, blackgum sassafras, persimmon, and sweetgum. Other associated plant communities, as listed in the Texas Natural Heritage Program (TNHP) report, include the Little Bluestem-Nutall's Rayless Golden Rod Series, the Sphagnum-Beakrush Series, and the Sweetbay Magnolia Series.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

This analysis area lies between Sam Rayburn Reservoir and SH 63. It presents scenic, recreational, and history study opportunities. The Sandy Creek campground, which is a National

Forest campground, is located within the analysis area and is open from April to October. The Ebenezer campground, a Corps of Engineers campground, is adjacent to the analysis area and open all year. The analysis area is also known to be suitable habitat for red-cockaded woodpecker (RCW) and several sensitive or endangered plant species (bog coneflower, Drummond's yellow-eyed grass, grasspink, bent sedge, incised goovebur, and nodding nixie).

Lake Sam Rayburn. They may be seen flying over the lake or nesting in trees along the shoreline.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. These lands were acquired from private landowners during the 1930's and early 1940's. Significant portions of these lands were acquired from timber companies. Most of the analysis area had been cut-over heavily. Much of the analysis area was replanted by the Civilian Conservation Corps (CCC) during the late 1930's. About 297 acres in the analysis area display evidence of active timber management; this acreage is in trees 0 to 10 years old. Another 6,511 acres are in 1,200-meter RCW habitat zones that are actively managed as directed by a court order.

In 1966, Sam Rayburn Reservoir was completed. This 114,500-acre lake is under the jurisdiction of the U.S. Army Corps of Engineers. Since the lake was constructed, there have been varying amounts of shore disturbance and shoreline erosion. Both the U.S. Forest Service and the Corps of Engineers have developed campgrounds around the shore of the lake, and three of these are located within or adjacent to the analysis area.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

There is physical evidence of human activity that took place in the analysis area around the turn of the century. Old railroad tram grades are still evident. These grades were built in the early 1900's when the Forest was being logged by private timber companies. There is some evidence of longleaf pine seed collection operations conducted during the late 1950's or early 1960's. The collection site is near the intersection of FS 343 and FS 306.

The analysis area contains more than 12 RCW clusters, 2 of which are active. Under current court orders, a 1,200-meter zone around each cluster is managed for RCW habitat. This management included thinnings, frequent burning, and control of midstory vegetation in the RCW clusters and in the associated replacement and recruitment stands. Currently, the 1,200-meter RCW habitat zones in the analysis area have a total of about 6,511 acres.

The CCC replanted several areas with slash pine during the early 1930's. This species is nonnative, and area's in slash pine are being converted to longleaf pine. The majority of the analysis area has been burned with prescribed fire within the last five years. Wildfires do occur; however, most are man-caused and are extinguished quickly.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, appearance?

Compartment 79 contains approximately 100 acres of land that was acquired in 1991. This land had been cleared in the 1920's and had been roaded in the mid-1970's in anticipation

of subdivision and the sale of lots. A dam had been constructed and a 10-acre lake was formed on Ward Branch. The lots were never sold, and the old road system and lake bed

this site as a primitive horse camp and day-use fishing facility. Redevelopment would include reconstruction of the dam and spillway.

The longleaf pine seed collection area was abandoned in the 1970's and has begun to revert to its natural condition. Regeneration has been abundant and vigorous, and the seed collection area is not readily apparent. A ground target associated with the abandoned airbase at Boykin Springs is located about 0.25 miles south of FS 306 and just west of FS 343. This bombing target was used during the 1940's. Many casings and shell fragments can be found in the area.

Areas previously clearcut or seed-tree cut have since been replanted or restocked and appear to be natural parts of the landscape.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. The mineral rights in parts of the analysis area are owned privately. Therefore, perpetuation of wilderness value cannot be ensured. Surface occupancy, with mitigating measures implemented, will be allowed in order to accommodate exploration and production equipment.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No. Approximately 570 acres, or 6 percent of the analysis area is planted to slash pine, which is nonnative. Current plans call for conversion of this acreage to longleaf pine. An estimated 67 acres have already been converted from slash pine to longleaf pine.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): The analysis area may contain gravel pits that have become overgrown with timber.

d. Areas under current mineral leases that contain "no surface occupancy" stipulations: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: No.

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: The analysis area contains one campground (Sandy Creek) which receives moderate to high usage. Letney, an abandoned campground, does receive some dispersed recreational use. The analysis area has several trails that are used by all terrain vehicles (ATVs) and horseback riders.

g. Timber harvest areas where logging and prior road construction are or are not evident: There are approximately 297 acres of regeneration currently less than 10 years old. Old timber haul roads and skid trails are overgrown and are evident only to the keen observer. There were once tramways throughout the analysis area; these were used to transport timber to various sawmills during the early 1900's. A seed production area was established and was a source of seed for longleaf pine regeneration on FS 343 just south of FS 306. It has been abandoned and is returning to its natural condition.

h. Cultural treatments involving plantations or plantings: Approximately 6,511 acres of the analysis area are within 1,200-meter RCW habitat zones. These areas are being thinned according to an October 20, 1988 court decision regarding the management of the RCW

pines are being removed also.

i. Private inholdings in the analysis area: Yes. There is one private inholding (approximately 17 acres) in the analysis area.

j. Dwellings on private inholdings: Yes. There are several dwellings on the private inholding within the analysis area. The small tract of land along FS 333 and FS 333A is occupied and owned by Scott Dodson, heir to Burtis L. Wigley.

k. Nonconforming structures and improvements: Yes. These include a variety of special uses which are detailed in Table 1. There are also approximately 47.7 miles of inventoried roads, which include state and county roads. There are range fences in the analysis area. The analysis area has one developed recreation area, Sandy Creek. An abandoned recreation area, Letney, does receive some use. Letney's campsites and restrooms have been dismantled, but the boat ramp is still intact.

l. Ground-return telephone lines: There are an estimated 8.3 miles of buried telephone lines in the analysis area. There are also 1.1 miles of aerial line. There are no pay phone lines. Telephone permittees are listed in Table 1.

m. Watershed treatment areas: No.

n. Roads: There are 41.6 miles of inventoried FS roads and 6.07 miles of roads under state and county jurisdiction. There are also some old woods roads and haul roads, these are overgrown and are visible only to the keen observer.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

No. Approximately 47 miles of FS roads are in use in the analysis area. Some roads (overgrown woods roads and old haul roads that are no longer in use or maintained) could be closed if necessary to promote wilderness management. However, several state and county roads could not be closed or mitigated. These include SH 63, FM 255R, and various other county roads that receive heavy use from local residents living within or adjacent to the analysis area. Other nonconforming uses, such as the campground and outstanding mineral rights, cannot be removed or mitigated. Special uses that are permitted must be maintained if they are to continue their service.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

All inventoried roads are being maintained for long-term needs. Other permanent improvements, such as the recreational areas and those constructed under special use permits, are also maintained for long-term use. The longleaf pine seed collection area has been abandoned and is reverting back to its natural state. The abandoned bombing target is apparent only to the keen observer.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. Approximately 297 acres are in regeneration in 0-to 10-years age class. This acreage accounts for about three percent of the total area.

5. Does the area analysis contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are 41.6 miles of FS improved roads within the analysis area and 6.07 miles of state and county roads (4.8/1,000 acres).

Only 6.07 miles of roads are under state and county jurisdiction (0.35 miles/1,000 acres). However, FS 306 and FS 335 access several parcels of private land adjacent to the proposed area, and are being considered for conversion to county jurisdiction. Such conversion would increase the road density of county roads to approximately 1.2 miles/1,000 acres.

for access to private inholdings, adjacent private land, or special use (microwave radio tower)

sites. These roads, the 3.5 miles of existing state and county roads, and FS 306 and FS 335 would have to be kept open. In addition, FS 333 provides access to Sandy Creek Recreation Area. This road is paved and maintained so that the public can make use of the recreational facilities. Total density of roads that cannot be closed is 1.5 miles/1,000 acres.

6. Are all existing roads under Forest Service jurisdiction?

No. State Highway (SH) 63 and FM 255R are under the jurisdiction of the State of Texas, and various roads are under the jurisdiction of Jasper County or Angelina County.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that make would it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

The analysis area provides some opportunities for solitude and serenity. Forest Service roads and activities on private land are visible from some points. Also, SH 63 runs along part of the analysis area's southern boundary, and FM 255R runs through the analysis area. Each is a source of highway noise. Recreational activities such as camping and ATV use can cause noise that could disrupt solitude and serenity.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Existing FS, state, and county roads make access to the analysis area reasonably easy. The terrain is rolling and broken by creeks. The varying topography and elevations could offer the visitor some opportunities for excitement, initiative, or self-reliance. There are also campgrounds and an informal network of hiking trails; these offer various opportunities for adventure and challenge.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Numerous locations are suitable for primitive and developed camping.
b. Hunting: Small and large game species occur in the analysis area and can be hunted there.
c. Fishing: Sam Rayburn Reservoir is adjacent to this area and offers excellent fishing opportunities.

an enjoyable float trip. It is also possible to canoe on Sam Rayburn Reservoir, to the north.

e. Boating: Sam Rayburn Reservoir is adjacent to the analysis area and provides excellent boating opportunities.

f. River rafting: The Angelina River is large enough to support this activity, but the flow is slow and log and brush jams can block the way.

g. Backpacking: There are many opportunities for backpacking in the analysis area.

h. Hiking: Same as for backpacking, but there is no developed trail system.

i. Riding: Riding opportunities do exist. The Tree Farm Recreation Complex is a planned project that will accommodate approximately 100 horse or camping rigs. Horseback riders are now using a large network of informal trails.

j. Photography: Good opportunities exist.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area presents opportunities for education and study in geology, archeology, biology, and dispersed recreation. Trout Creek is a proposed Research Natural Area (RNA) and is located within the analysis area. Most of the analysis area is also being considered for designation as a proposed recreational, wildlife, and historical area. Several bogs in the analysis area have been the subject of study, and more such study is anticipated. The RCW clusters in the analysis area have also been the subject of scientific study.

2. Is there an abundant and varied wildlife population?

Game and nongame animals that commonly occur in pine-hardwood forest in the eastern Coastal Plains are found in the analysis area. Accurate population figures are not available for all species. The analysis area does contain a significant number of active and inactive RCW cluster sites. The RCW is listed on the Federal list of endangered species and is protected under the Endangered Species Act.

Manageability.

1. What are the characteristics of the analysis area including its ROS classification, adopted VQO, and present and planned uses?

Recreation Opportunity Spectrum (ROS) on the majority of the analysis area is Roaded Natural (RN). For the most part, Visual Quality Objectives (VQO) range from partial retention (PR) to modification (M) because of aesthetic values along the existing state and FS roads, and the lakeshore along Sam Rayburn Reservoir.

Future land use will stress aesthetic values, forest management, and recreational uses. The Forest Plan, which is being revised, may place increased emphasis on the importance of maintaining the aesthetic values associated with views adjacent to Sam Rayburn, along the Angelina River, and in campgrounds and roads within the analysis area.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on private land around and near the boundary, encroachments are not expected to be a serious problem.

the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

Some portions of the boundary are located in areas that would be difficult to cross or access. A portion of the boundary consists of lakeshore and the Angelina River bottom

and is accessible only by foot or boat. Other boundaries are in places where the prohibition against the use of motorized vehicles would be difficult to administer. Most of the southern boundary is adjacent to private land, and the northern boundary is formed by FS 306 and the shore of Sam Rayburn Reservoir. The communities along the lakeshore require access through Forest Service lands, and therefore roads accessing these areas could not be closed.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The lakeshore boundary does provide some degree of protection for some of the analysis area. However, parts of the north and south boundaries are adjacent to roads and private land. It is possible that private development and road construction could take place near these boundaries and that these could give rise to sights and sounds incompatible with wilderness.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. There are points visitors could transfer from motorized to nonmotorized transportation.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting, camping, and boating are currently the dominant uses, while horseback riding, ATV riding and hiking appear to be second in importance.

b. Information on wildlife species, populations, and management needs: The analysis area contains several RCW clusters, which are protected under the Endangered Species Act. Management of RCW habitat is governed under a October 20, 1988 court decision regarding the management of RCW habitat in the National Forests in Texas. Under these guidelines, 1,200-meter habitat zones have been established to provide protected habitat for the RCW. Management activities include mid-story removal and prescribed burning within the 1,200-meter boundaries. The analysis area also contains both game and nongame species commonly found in the southeastern Coastal Plains, including gray squirrel and white-tailed deer. Outside the RCW habitat zones, white-tailed deer is the featured species.

c. Water availability and use: Drinking water is available at Sandy Creek Campground. Sam Rayburn Reservoir, creeks, and low areas provide water for wildlife.

d. Livestock operations: Currently, one permittee is authorized to graze livestock within the analysis area. The McGee Bend Allotment is 2,307 acres. Twenty-five head of cattle are permitted on the allotment for grazing purposes for nine months (March 1 through November 30) each year. This permit is valid through February 28, 2001.

e. Timber: The analysis area is considered a high-quality site for timber production. Loblolly pine indices range from 70 to 95. Timber types are longleaf pine (71 percent), loblolly (17 percent), pine (3 percent), shortleaf pine (3 percent), slash pine (6 percent), and various hardwoods (3 percent). Oaks, bay, and magnolia may be found in the creek bottoms,

than 10 years old. Approximately 80 percent of the standing timber is between 40 and 70 years old. An estimated 4 percent of the timber is more than 70 years old.

f. Minerals: Most of the mineral rights are owned privately and are not subject to Forest Service jurisdiction. Where mineral rights are outstanding, the Forest Service must allow the construction and maintenance of exploration and production sites.

g. Cultural resources: Much of the analysis area may contain archeological sites or historical sites, or both (historic properties). The Angelina and Neches Rivers created ideal conditions for early settlement. Fertile bottomlands, abundant wildlife, and cool artesian

springs attracted and supported Native American inhabitants for more than 5,000 years. Numerous Paleo-Indian to Neo-Historic prehistoric sites have been found in the analysis area. Future surveys will result in the discovery of additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

The analysis area also contains several historic sites. Old logging trams are common also.

These sites and the objects and other physical evidence in them are an important part of our cultural heritage. The National Forests and Grasslands in Texas is charged with the protection and management of these valuable historic properties, by laws and regulations.

h. Authorized and potential land uses: A variety of commercial and noncommercial special uses are authorized in the analysis area. These permittees, the special uses, and the mileages along Forest Service roads or boundaries are listed in Table 1.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: The analysis area has been burned periodically to reduce fuel build-ups since the Forest Service acquired the land in the 1930's. Prescribed burns have been conducted approximately every three to five years. Wildfires do occur, but are rather infrequent. The analysis area's terrain is rolling. Therefore, it would not be difficult to suppress wildfires unless adverse conditions (high winds or very dry fuels) occurred.

Potential for spread of the Southern Pine Beetle (SPB) is low because longleaf pine is the predominant tree species. Although few infestations have occurred in the analysis area, the majority of the standing timber is at or near maturity and this could increase susceptibility during an epidemic.

There is one tract of private land inside the analysis area's boundary. This will be a consideration if the analysis area is managed as wilderness.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities, such as hunting and fishing, should continue at about the present moderate to high level. The analysis area is adjacent to Sam Rayburn Reservoir, which is now accessible by means of FS roads. Because the analysis area is visible from Sam Rayburn Reservoir, it is desirable to manage the lake's shore for aesthetic and recreational purposes.

The analysis area is contributing significant timber volumes to the District sales program and is expected to continue to do so in the future.

additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. The presence of RCW necessitates habitat maintenance activities that are not conducive to wilderness conditions.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

The analysis area is not highly mineralized and is considered to have a low potential for oil or gas occurrence. However, it would be necessary to permit drilling where mineral rights

are outstanding. Permission to construct and maintain access roads would have to be granted.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

Yes. The analysis area supports sensitive plants. Also, the developed recreation areas should remain available to the public.

7. Is the land needed to meet clearly documented resource demands such as for timber, mineral production, or developed recreation?

Yes. There are large demands for dispersed recreation (hunting, camping, horseback and ATV riding, and fishing), minerals, grazing, and timber.

Timber stands within the 1,200-meter RCW foraging zones are being thinned to comply with the court order. This thinning contributes to the timber harvest on the Angelina National Forest.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. There are outstanding rights to all of the minerals within the analysis area. There are also several special use permits which are listed in Table 1.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest wilderness?

Upland Island Wilderness (13,390 acres) is approximately 4.5 miles to the west, and Turkey Hill Wilderness (5,286 acres) is approximately 18 miles to the north.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Upland Island Wilderness received approximately 3,000 Recreation Visitor Days (RVD's) of use. Of these, 500 RVD's involved overnight camping. The average size of visiting groups is 2.6 people. More than 56 percent of visitors to Upland Island Wilderness visit here more than twice per year. An estimated 27 percent of visitors to Upland Island go

trips. A large percentage of visitors are under 16 years of age.

Turkey Hill Wilderness received an estimated 1,500 RVD's (about 14 percent of capacity), of which 500 involved overnight camping. Most of the use was related to hunter use. Users have not had any significant effects on the area's wilderness qualities or resources. A small increase in use over the next 10 to 20 years is anticipated.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew at much faster rates (27 percent and 17 percent respectively, 1980-87). These population centers are about 100 miles (Houston) to 175 miles (Dallas) from the analysis area.

The population of Deep East Texas which includes Angelina and Jasper Counties and the analysis area, increased by about 10 percent between 2980 and 1988. The population of Deep East Texas area is expected to increase by about 50 percent over the next 35 years.

The analysis area is located in Angelina and Jasper Counties. The populations of these counties have generally increased steadily over the past 10 years.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Many acres of National Forest land within reasonable distance of the analysis area are suitable and available for primitive recreation use.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

Yes. There are many active and inactive RCW clusters in the analysis area. The active colonies occupy 111 acres and the inactive clusters 129 acres. There is a 200-foot boundary and a 1,200-meter foraging habitat zone around each RCW cluster. The RCW is protected under the Endangered Species Act, and its habitat is managed under direction of a court order.

The analysis area also supports several plant species identified as sensitive by the TNHP. These species are bog coneflower, Drummond's, and nodding nixie. Habitat for most of these plants can be maintained only by frequent burning.

2. Could their needs be provided for through means other than wilderness designation?

Yes.

3. Is there a need to provide a sanctuary for species that cannot survive in less than primitive surroundings?

No. Through conscientious vegetative management and mitigation of disturbances.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1977)? Does the area represent a unique landform type that is not represented in any existing wilderness areas in the general vicinity?

The analysis area is on the Coastal Plain of eastern Texas. The dominant landforms are low ridge segments and ridge segments. Deep sandy soils predominate on gently sloping areas, while areas that are flat or undulating receive moisture from stream terraces.

The same landforms are typical of Upland Island Wilderness Area, about four miles west of the analysis area.

2. What is the area's ecosystem classification based on the Texas Natural Heritage Program Report (1990)? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The plant communities found in the analysis area are the Sphagnum-Beakrush, Little Bluestem-Nutall's Rayless Goldenrod, and Sweetbay Magnolia Series. These communities are typical of the Southern Coastal Plains.

Some of these plant communities are unique to the analysis area. However, there is some overlap of these communities onto adjacent Forest Service lands.

Table 1. Jordan Creek Special Uses

Aerial Powerlines

Jasper-Newton Electric Co-op: ROW width 25ft.

2.6 miles along FS 347
1.2 miles along Angelina county road 22
1.9 miles along FS 333
0.8 miles along FS 306
1.1 miles along FS 306E
0.8 miles along Jasper county road 3
0.3 miles along Hawk Development road
0.6 miles between 255R and Hawk Development road
0.6 miles along FS 332
0.4 miles along Dallas Matthews road (Jasper county)
0.8 miles along 255R
0.2 miles across FS land just south of 255R
0.1 miles along Jasper county road 4

Water lines

Upper Jasper Water Authority: ROW width 10ft.

1.1 miles between Hawk Development road and FS 306
0.8 miles along Jasper county road 3
0.8 miles along FS 306
0.4 miles along FS 333 between FS 347 and FS 306
2.5 miles along FS 347
1.1 miles along Angelina county road 22

Westwood Water Supply Corp.: ROW width 10ft.
1.1 miles between Hawk Development road and FS 306

Telephone lines

Southwestern Bell Telephone (buried): ROW width 10ft.
1.3 miles along Edward B. Mack road (Angelina county)
1.1 miles along Angelina county road 22
0.4 miles along FS 333 between FS 347 and FS 306
0.4 miles along FS 306
1.9 miles along both sides of FS 335
1.4 miles along FS 332
0.2 miles along Dallas Matthews road (Jasper county)
1.5 miles along 255R
0.1 miles along Jasper county road 4
Southwestern Bell Telephone (aerial): ROW width 25ft
1.1 miles along FS 347 between FS 333 and Angelina county road 22

Pipeline

United Gas Pipeline: ROW width 50ft. (Outstanding Right)
3.6 miles between Parker Point and State Highway 63

Other Uses

McGee Hills Sign
Westwood Water Supply Well and Pumphouse

Little Lake Creek

Sam Houston National Forest, Raven Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

LITTLE LAKE CREEK: Gross area approximately 691 acres; net area approximately 691 acres.

Location and vicinity.

The analysis area is in the southwestern part of the Raven Ranger District of the Sam Houston National Forest. It is located along the south and west side of Farm-to-Market (FM) 149, approximately 16 miles east of Interstate 45, in Montgomery County, Texas. The site is adjacent to Little Lake Creek Wilderness Area.

To reach the analysis area, go first to the junction of FM 1375 and FM 149. Follow FM 149 north approximately one mile to Forest Development Road (FDR) 211. Take FDR 211 south approximately one mile to the analysis area, which will be on the east side of the road.

General description of the analysis area's geology.

The analysis area is on the western Gulf Coastal Plain. Its soils have developed from sedimentary material and are recent, pleistocene, and tertiary. The Willis formation, which underlies part of the analysis area, consists largely of clayey sand and gravel and some local clay beds. The Fleming formation underlies and is the parent material for the Blacklands, which consists of calcareous clay and sandstone. Soils associated with the analysis area are the Vicksburg and Blanton series.

General description of the analysis area's topography.

This part of the southern Gulf Coastal Plain and the Texas Blackland Prairies consists of gently sloping side slopes and ridgetops. The difference between the elevations of stream bottoms and ridgetops is approximately 80 feet. Slopes are between 3 and 7 percent.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is almost entirely forested. Loblolly and shortleaf pines dominate on the ridges and upper slopes, where red oaks, white oaks, hickories, and sweetgum are present also. Hardwoods become more dominant near streams, but pines remain a significant component of vegetation in most places.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The analysis area provides the opportunity to view game, nongame, and threatened and endangered animal species. No sensitive plant species are known to occur in the analysis area.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

The land that makes up the National Forests in Texas was acquired primarily under the authority of the Weeks Act. The land was acquired during the 1930's and early 1940's from private owners. A significant amount of land was acquired from timber companies. Most of the area was cut over severely during the early 1900's.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

The analysis area displays little evidence of turn-of-the-century logging and farming, but signs of more recent management are obvious. The analysis area has been managed intensively for timber production in the last 20 to 30 years. Many 2 to 20 year-old pine plantations are present. Mature timber in the analysis area has been thinned to improve

Very little of the analysis area retains a natural appearance or is free from disturbance.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

No. Most of the analysis area reflects southern pine beetle (SPB) control activities and extensive past harvesting; many woods roads are present. Under the current Forest Plan, the analysis area is to be managed for multiple uses.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

Yes. Surface management can be modified over time to perpetuate wilderness conditions.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No exotic species are known to be present.

Improvements, structures, and non-conforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: No.
b. Electronic installations: No.
c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.
d. Areas under current mineral leases that contain "no surface occupancy" stipulations: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: No.
f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: Yes. The analysis area receives moderate use from hunters and from hikers on the Lone Star Hiking Trail, and has some dispersed campsites.
g. Timber harvest areas where logging and prior road construction are or are not evident: There are woods roads, pipelines, and harvest units throughout the analysis area, which has been part of the timber management base since the 1930's.
h. Cultural treatments involving plantations or plantings: Yes. There is evidence of past timber stand and wildlife habitat improvement. Numerous plantations from 2 to 20 years old are present. Many of these plantations are quite large (up to 85 acres).
i. Private inholdings in the area: No.
j. Dwellings on private inholdings: Not applicable.
k. Nonconforming structures and improvements: Yes. Woods roads, garbage dump areas, pipelines, forest development roads, and harvest units are present.
l. Ground-return telephone lines: No.
m. Watershed treatment areas: No.
n. Roads: Yes. There are several miles of woods roads within the analysis area. Approximately 1.2 miles of FDR 211 and 4.3 miles of FDR 244 parallel the west and southwest boundaries.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

Yes, through replanting, reforestation, and revegetation.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

County and by the Forest Service, respectively.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. Most of the area has been harvested and where regeneration cutting has occurred, about half of the regeneration is less than 10 years old.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. The analysis area, which consists of 691 acres, contains about 5.5 miles of FDR and an additional length of woods roads.

6. Are all existing roads under Forest Service jurisdiction?

Yes. However, Montgomery County maintains FDR 211 under a cooperative agreement.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have contain the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

Such opportunities are very limited because the analysis area is very small and is part of an urban National Forest. The FDR's are a source of vehicle noise. The analysis area's Recreation

Opportunity Spectrum (ROS) is semiprimitive motorized and roaded-natural. The Little Lake Creek Wilderness, which adjoins the analysis area on the northeast, does provide an opportunity for solitude and serenity.

Challenge.

Does the analysis analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

The analysis area offers few opportunities for these experiences. Existing roads and trails make access reasonably easy.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Several locations are suitable for primitive camping.
b. Hunting: There is hunting for some small and large game species.
c. Fishing: None.
d. Canoeing: None.
e. Boating: None.
f. River rafting: None.

opportunities for backpacking.

h. Hiking: The Lone Star Hiking Trail traverses the analysis area.

i. Riding: The FDR's and woods roads are suitable for horseback riding. No trails have been developed for equestrian use.

j. Photography: There are good opportunities for some types of nature photography. There are no opportunities for panoramic or scenic shots.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area is a suitable setting for study and education in subjects such as forestry, archeology, biology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

A variety of game and nongame animals, including threatened and endangered species, occur in the analysis area. Species are typical of those occurring in the Gulf Coastal Plain forests of Texas.

Manageability.

1. What are the characteristics of the surrounding area, including ROS classification, adopted Visual Quality Objective VQO, and present and planned uses?

The ROS is semiprimitive motorized and roaded-natural. The Visual Quality Objective (VQO) reflects aesthetic values along roads bordering Little Lake Creek Wilderness. The 1987 Forest Plan specifies that future land use is multiple-use management, stressing aesthetic qualities and recreational uses.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

No. The analysis area is surrounded by National Forest land.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The analysis area is bounded by roads.

4. Do boundaries, where possible, conform with terrain or other features that constitute a barrier or prohibited use?

No. The current area is identified by the existing roads on the west and southwest sides, and Little Lake Creek Wilderness on the northeast sides.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

No. The analysis is so small that its boundaries can provide only minimal buffering. The analysis area is the buffer zone for Little Lake Creek Wilderness.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. FDR's 211 and 244 provide access along the west and southwest boundaries.

Availability.

1. Describe other (non-wilderness) resource demands and uses. What current uses exist?

be compatible with wilderness.

b. Information on wildlife species, populations, and management needs: Yes. The area supports various game, nongame, and threatened and endangered species typical of Gulf Coastal Plain forests of Texas.

c. Water availability and use: There is no source of potable water, but water is readily available for wildlife and livestock.

d. Livestock operations: The analysis area is in the Pole Creek range allotment.

e. Timber: The analysis area is included in the Forest's base of land suited for timber management. Forest cover types are loblolly pine (95 percent), and various hardwoods (5 percent along streams). Site indices for the pines and hardwoods are generally from 70 to 90.

f. Minerals: The U.S. owns all mineral rights in the analysis area. No exploration or development for surface or subsurface minerals has been initiated. However, four lease applications have been approved.

g. Cultural resources: The analysis area may contain archeological or historical, or both sites. Evaluation of any sites discovered should broaden our knowledge of the region's history and prehistory.

h. Authorized and potential land uses: None.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: Fire protection and successful fire suppression have created the possibility of fuel build-up. Prescribed burning has helped to control the fuel loading and reduce the fire danger.

Infestations of SPB could develop if pines in the analysis area are stressed or damaged.

There are no inholdings in the analysis area.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreational activities, including hunting, hiking, and horseback riding should continue at the present low to moderate level.

The analysis area will be expected to produce a portion of the Raven Ranger District's quota of timber. Any decrease in the acreage available for timber harvesting will result in a decline in timber production on the Forest.

Prescribed burning, establishment of food plots or other measures could be employed to improve habitat for red-cockaded woodpecker (RCW) and other wildlife.

Oil and gas may be explored for and developed.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. Wilderness designation would preclude wildlife habitat improvement. Management activities to develop game species and protect threatened and endangered species would

species significantly, like the RCW.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

The potential for oil and gas exploration and development is moderate.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. The analysis area is included in the Forest's timber base and is currently under an active prescription.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. An active timber sale is being conducted.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The Little Lake Creek Wilderness, a Federally designated wilderness, is located in the Raven Ranger District of the Sam Houston National Forest and consists of 3,810 acres. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Little Lake Creek Wilderness adjoins the analysis area on the northwest.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Little Lake Creek Wilderness had an estimated 500 Recreation Visitor Days (RVD's) of use in 1991. Wilderness use is expected to increase slightly over the next 10 to 20 years.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The populations of Dallas and Houston grew 27 percent and 17 percent, respectively, from 1980 to 1987. The analysis area is about 60 miles from Houston and 225 miles from Dallas.

The population of Montgomery County increased from 99,320 in 1980 to 139,320 in 1988.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Many areas of the Sam Houston National Forest, which adjoins the analysis area, are suitable for primitive recreation use.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

No. No sensitive plant species are known to occur in the analysis area.

2. Could their needs be provided for through means other than wilderness designation?

Not applicable.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

Suitable habitat for all species can be maintained by means of conscientious vegetation management and mitigation of disturbances to protected sites.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Guide (R-8 1972)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area consists of gently sloping side slopes and ridgetops. These landforms are common in designated wilderness areas in the region.

2. What is the analysis area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area's ecosystem is Southern Gulf Coastal Plain Forest. This ecosystem occurs in existing wilderness areas in Texas.

Longleaf Ridge

Angelina National Forest, Angelina Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

LONGLEAF RIDGE: Approximately 24,625 acres.

Location and vicinity.

The analysis area is located in the southern portion of the Angelina National Forest. The analysis area is south of Sam Rayburn Reservoir, along State Highway (SH) 63, in Angelina and Jasper counties. It is bounded on the north by Sam Rayburn Reservoir, on the south by the Neches River, and on the west by Upland Island Wilderness. The analysis area is bounded by both government and private land on the east. Sam Rayburn Reservoir Dam lies directly east of the analysis area.

Describe access to the analysis area, including roads and trails leading to the area.

Primary access to the analysis area is from SH 63, which runs from northwest to southeast through the analysis area. Access from the east is by Farm-to-Market (FM) 255R. From the

Island Wilderness and the analysis area. Other access is by a network of Forest Service, State, and county roads. These include FS 313, 347, 333, 306, and 335; SH 63; and FM 255R. This analysis area is also accessible from the Sawmill Hiking Trail along the Neches River.

General description of the area's geology.

The analysis area is in the western Gulf Coastal Plain and is underlain by the Catahoula, Whitsett and Manning geologic formations. These formations are 25 to 58 million years old and consist of clays, quartz sands, mudstone, tuffaceous lignite, and fossil wood. Soils associated with these formations are the Koury, Corrigan, Kisatchie, Letney, Rayburn, and Tehran Series.

General description of the analysis area's topography.

This part of the western Gulf Coastal Plain consists of floodplains, stream terraces, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes generally occur as inclined surfaces on broad interstream divides with narrow floodplains and branchhead inclusions. Some of the narrow floodplains, stream terraces, and branchhead divides have been inundated by Sam Rayburn Reservoir.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is almost entirely covered with Texas Natural Heritage Program (TNHP) Longleaf Pine-Little Bluestem Series vegetation, which is found intermittently along the Atlantic and Gulf Coastal Plains. Longleaf pine is dominant, but other pine species and some hardwoods have intruded as a result of changing fire patterns, extensive logging, and planting. Some slash pine has been planted in longleaf areas. Hardwood species most common in the analysis area include dogwood, southern red oak, blackjack oak, water oak, blackgum, sassafras, persimmon, and sweetgum. Other associated plant communities include (TNHP) Sphagnum-Beakrush Series, Sweetbay Magnolia Series, Bluejack Oak-Pine Series, Little Bluestem-Nuttall's Rayless Goldenrod Series, and Loblolly Pine-Oak Series. Generally, pine is dominant on the uplands, while bottomland hardwoods are intermixed with pines along river bottoms and stream zones.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

This analysis area lies between Sam Rayburn Reservoir and the Neches River. It presents scenic, recreational, and history study opportunities. Boykin Springs and Sandy Creek, two National Forest campgrounds located in the analysis area, are used all year. The analysis area also contains the Old Aldridge Sawmill Hiking Trail, which leads to the sawmill ruins and the Neches

River bottom. The analysis area is popular with off-road vehicle (ORV) enthusiasts and horseback riders.

The analysis area is suitable habitat for the endangered red-cockaded woodpecker (RCW) and several sensitive species of plants. The analysis area contains examples of most of the ecosystems found on the National Forests in Texas. TNHP nominated numerous sites within the analysis area for having exemplary plant communities.

The Sam Rayburn Reservoir Dam is just east of the analysis area. There is a visitor's center at the dam; it provides a scenic vista and information about the dam and its operation.

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. These lands were acquired from timber companies and other private landowners during the 1930's and early 1940's. Most of the analysis area had been cutover heavily. Most of the analysis area was replanted by the Civilian Conservation Corps (CCC) in the late 1930's.

Natural ecological processes and conditions in the analysis area have been disturbed by human activity. In 1966, Sam Rayburn Reservoir was completed. This 114,500-acre lake is under the jurisdiction of the U.S. Army Corps of Engineers. The analysis area was logged heavily during the early 1900's. Disturbances include numerous timber harvests, road construction, and special uses such as grazing, and pipelines.

Approximately 932 acres are in trees less that 10 years old. Approximately 14,168 acres in the analysis area are within 1,200-meter RCW habitat zones. These areas have been thinned or will be thinned within the next 10 years, as required by a court order. All midstory hardwoods and all nonmerchantable midstory pines within the 200 foot cluster boundaries are now being removed.

2. To what degree is the area natural or natural appearing and free from disturbance?

Several areas display evidence of human activity that took place around the turn of the century. The Old Aldridge Sawmill site displays such evidence. The analysis area contained an extensive tram system that supported early logging activities, and evidence of the tramways is still visible to the keen observer. During the Great Depression, CCC workers built Boykin Springs Recreation Area as part of Franklin Delano Roosevelt's (FDR's) New Deal, which was to relieve unemployment and provide reforestation in the region.

The analysis area contains several active and inactive RCW clusters. Under current court order, many overlapping 1,200-meter zones are managed for RCW habitat. Management includes thinnings, frequent burning, and control of midstory vegetation in the RCW clusters and recruitment stands. The 1,200-meter RCW habitat zones in the analysis area have a total area of approximately 14,168 acres.

The CCC replanted several areas with slash pine during the early 1930's. This species is nonnative and areas in slash pine are being converted back to longleaf pine. The majority of the analysis area has been burned with prescribed fire within the last five years. Wildfires do occur;

however, most are man-caused and are extinguished quickly. Several special uses have been permitted and some of these are unnatural in appearance. Permitted special uses include a microwave tower, overhead powerlines, and a municipal water system tank.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Much of the analysis area has regained a natural appearance. There is an extensively used road system, and there are several regeneration areas. As previously noted, several areas

looking sensitive plant communities. There are longleaf pine stands of several hundred acres which appear relatively intact.

At tract of approximately 100 acres, which had been cleared during the 1920's, was acquired in 1991. In the early 1970's, this tract was clearcut and roaded in anticipation of subdivision and the sale of lots. A dam was also constructed, and a 10-acre lake was formed on Ward Branch. The lots were never sold. The old road system is still evident, but the dam is breached and the lake bed overgrown with pine saplings. There are plans to redevelop this site (The Tree Farm Recreation Complex) as a primitive horse camp and day-use fishing facility. Redevelopment is to include reconstruction of the dam and spillway.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

No. Some of the mineral rights in the analysis area are owned privately. The perpetuation of wilderness conditions cannot be ensured where this is the case. The Forest Service does retain mineral rights on approximately 1,545 acres of land on the western boundary of the analysis area. There are currently two oil and gas leases. Beard Oil Co. has a 10-year lease (number 60598) on a 240-acre tract. This lease will expire on June 30, 1995. Caddis Resources, Inc. leases 1437.72 acres; this lease number 86835 will expire in FY 1996. The Forest Service is obligated to allow surface occupancy for exploration and production activities on these leases and where mineral rights are owned privately.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No. Approximately 820 acres, or 3 percent, of the analysis area is planted to slash pine, which is nonnative. Current plans call for conversion of this acreage to longleaf pine. An estimated 45 acres have already been converted from slash pine to longleaf pine.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: Yes. Boykin Springs is the site of an abandoned airbase that was used as a training ground in the 1940's. An abandoned runway is located approximately 0.5 miles southeast of Boykin Springs Recreation Area. Artifacts associated with the airbase can be found near the abandoned runway. A bombing target associated with the abandoned airbase is located about 0.25 miles south of FS 306 and just west of FS 343. The target was bombed from the air during the 1940's, and many casings and shell fragments can be found near it. These areas are overgrown and remnants of the airbase are visable only to the keen observer. All facilities associated with the airbase were abandoned in the late 1940's.

b. Electronic installations: There is a microwave radio tower just north of Boykin Springs Recreation Area. This tower is permitted to AT&T and is also utilized for Forest Service radio transmission. Other special use electronic installations are listed in Table 1.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): Yes. There are several gravel or borrow pits in the analysis area. These are becoming overgrown with timber. Sexton Lake is an old borrow pit that has filled naturally with water. Its depth is unknown, but estimated at 15 to 20 feet. Sexton Lake is within 40 feet of FS 326. The lake area is used heavily by campers and all terrain vehicles (ATV) users. The lake covers approximately four acres, and is occasionally stocked with catfish.

e, Areas under current mineral lease where the lessee has not exercised development and occupancy rights: Yes. There are two such areas. The leases belong to Beard Oil Co. (lease 60598, expiring June 30, 1995) and to Caddis Resources Inc. (lease 86835, expiring in FY 1996).

f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: The analysis area contains two recreation areas, Boykin Springs and Sandy Creek, which receive moderate to high usage. Letney, an abandoned campground, receives some dispersed recreational use. The boat ramp at Letney is still intact and is utilized by the public. Letney is also used as a horse camp by several equestrian organizations. The Sexton Lake area receives moderate to high use for dispersed camping and ATV activities.

g. Timber harvest areas where logging and prior road construction are or are not evident: There are approximately 866 acres of regeneration that is currently less than 10 years old. A system of old timber haul roads and skid trails extends throughout the analysis area. Many of these roads and trails are overgrown and are evident only to the keen observer. There were once tramways throughout the analysis area; they were used to transport timber to sawmills throughout the area during the early 1900's.

A longleaf pine seed production area was established and utilized during the 1960's and 1970's. The seed production area was just south of FS 306 and adjacent to FS 343. It has been abandoned and the site is returning to its natural condition.

h. Cultural treatments involving plantations or plantings: Approximately 14,168 acres of the analysis area are within 1,200-meter RCW habitat zones. These areas are being thinned according to a court order. All mid-story hardwoods and nonmerchantable midstory pines within the 200-foot cluster boundaries are being removed also.

i. Private inholdings in the analysis area: Yes. There are an estimated 567 acres of private inholdings within the analysis area.

j. Dwellings on private inholdings: Yes. There are several dwellings on private inholdings within the analysis area. The inholding on the western boundary contains at least one dwelling owned by Dressor Frazier. The small inholding along FS 333 and FS 333A is occupied and owned by Burtis L. Wigley. There are several homes on a tract of private land just south of Letney. This area is referred to as Harveytown. There are numerous private dwellings in the subdivisions along Sam Rayburn Reservoir.

k. Nonconforming structures and improvements: Yes. These include a variety of special uses which are detailed in Table 1. There are also approximately 109.18 miles of inventoried roads, including paved State and county roads.

This analysis area includes two developed recreation areas, Boykin Springs and Sandy Creek. An abandoned recreation area, Letney, receives some use. The campsites and restrooms at Letney have been dismantled, but the boat ramp is still intact.

The Boykin Springs Lake Trail follows the shore of Boykin Springs Lake, a 9-acre lake constructed by the CCC during the early 1930's. The Sawmill Hiking Trail is 5-1/2 miles long and begins at Bouton Lake and ends at Boykin Springs Recreation Area. A 3/4-mile spur trail

leads to the old abandoned Aldridge Sawmill site. The sawmill is a historic site and dates back to early 1900's.

United Pipeline maintains a gas pipeline on a right-of-way through the analysis area. This pipeline was in use before the Forest Service acquired the land and is not subject to mitigation.

l. Ground-return telephone lines: There are an estimated 16 miles of buried telephone lines in the analysis area. There are also 1.1 miles of aerial line. There are no pay phone lines in the analysis area. Telephone permittees are listed in Table 1.

m. Watershed treatment areas: No.

n. Roads: There are 89 miles of improved graveled FS roads and approximately 6 miles of paved roads in use in the analysis area. There are 14.18 miles of roads under State and county jurisdiction. Approximately six miles of these roads are paved, and the remainder is improved graveled road. There are also some old woods roads and haul roads, these are overgrown and are visable only to the keen observer.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

No. Approximately 95 miles of FS roads are in use in the analysis area. Some roads (overgrown woods roads and old haul roads that are no longer in use or maintained) could be closed if necessary to promote wilderness management. However, several State and county roads could not be closed or mitigated. These include SH 63, FM 255R, and various other county roads that receive heavy use from local residents living within or adjacent to the analysis area. Other nonconforming uses, such as the radio tower, campgrounds, and outstanding rights for pipeline and minerals, cannot be removed or mitigated. Special uses that are permitted must be maintained if they are to continue their service.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

All inventoried roads are being maintained for long-term services. Other permanent improvements, such as the recreational areas and those constructed under special use permits, are also maintained for long-term use. The hiking trails are maintained, but the Old Aldridge Sawmill ruins are not maintained and are deteriorating. The sawmill site has not been nominated for listing in the National Register for Historic Sites, although it may be nominated in the future. All of the permitted special uses are being maintained.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the past 10 years?

Yes. Approximately 866 acres are in regeneration in the 0 to 10 years class. This acreage accounts for about four percent of the total area.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. There are approximately 109 miles of improved roads within the analysis area (4.4 miles/1,000 acres). This includes Forest Service, State, and county roads.

Only 14 of the 109 miles of road are under State or county jurisdiction (0.6 miles/ 1,000 acres). However, FS 306, FS 333, and FS 335 provide access to several parcels of private land adjacent to the analysis area and are being considered for conversion to county jurisdiction. Such conversion would increase the road density to 0.9 miles/1,000 acres.

An additional 5.6 miles of road administered by the Forest Service is under special use permit for access to private inholdings, adjacent private land, or special use (microwave radio tower) sites. These roads, the 14 miles of existing State and county roads, and FS 306 and FS 335 would have to be kept open.

FS 333 provides access to Sandy Creek Recreation Area and FS 313 provides access to Boykin Springs Recreation Area. These roads are paved and maintained so that the public can make use

open.

6. Are all existing roads under Forest Service jurisdiction?

No. State highway 63 and FM 255R are under the jurisdiction of the State of Texas, and various county roads are under the jurisdiction of Jasper County or Angelina County.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does that analysis area provide the opportunity for solitude and serenity?

The analysis area provides some opportunities for solitude and serenity. Forest Service roads and activities on private land are visible from many areas. Also, SH 63 runs through the analysis area and is a source of some highway noise. Recreational activities such as camping and ATV use can cause noise that could disrupt solitude and serenity. Motorboat traffic on Sam Rayburn Reservoir and the Neches River may affect solitude.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Existing FS, State, and county roads make access to the analysis area reasonably easy. The terrain is relatively flat with some low ridges. A significant portion of the analysis area is adjacent to Sam Rayburn Reservoir and the Neches River, which could present opportunities for excitement, initiative, or self-reliance. There are also campgrounds and hiking trails; these offer various opportunities for adventure and challenge.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Numerous locations are suitable for primitive and developed camping.
b. Hunting: Small and large game species occur in the analysis area and can be hunted there.
c. Fishing: Sam Rayburn Reservoir is adjacent to the analysis area and offers excellent fishing opportunities. The Angelina and Neches Rivers also offer fishing opportunities, as do Boykin and Sexton Lakes.
d. Canoeing: The Neches and Angelina Rivers are adjacent to small sections of the analysis area's southern and eastern boundaries. Both provide adequate flows for enjoyable float trips. It is also possible to canoe on Sam Rayburn Reservoir, to the north.

e. Boating: Sam Rayburn Reservoir is adjacent to the analysis area and provides excellent boating opportunities.

f. River rafting: The Neches and Angelina Rivers are large enough to support this activity, but the flow is slow and log and brush jams can block the way.

g. Backpacking: The Sawmill Hiking Trail, a 5-1/2-mile developed trail, begins at Bouton Lake and ends at Boykin Springs Recreation Area. A 3/4-mile spur trail leads to the Old Aldridge Sawmill ruins on the Neches River.

h. Hiking: Same as for backpacking. The Sawmill Hiking Trail is a developed and well marked trail system. The Boykin Springs Lake trail follows the shore of a 9-acre spring-fed, artificial lake in the Boykin Springs Recreation Area.

i. Riding: Horseback riding opportunities do exist. The Tree Farm Recreation Complex is a planned project that will accommodate approximately 100 horse or camping rigs. The analysis area is used heavily by horseback riders on an informal network of trails. The Tree Farm Recreation Complex will be inconsistent with wilderness management objectives.

j. Photography: Good opportunities exist.

Special Features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area presents opportunities for education and study in geology, archeology, biology, and dispersed recreation. The analysis area includes three areas that have been proposed as Research Natural Areas (RNA's); these are Trout Creek, Neches River Banks, and Boykin Springs-Longleaf. The Boykin Springs area has also been proposed as a botanical area. Most of the analysis area is also being considered for designation as a National Recreational, Wildlife, and Historical Area (NRA). Most of these proposals would be compatible with wilderness designation.

2. Is there an abundant and varied wildlife population?

Game and nongame animals that commonly occur in eastern pine-hardwood forest in the eastern Coastal Plains are found in the analysis area. Accurate population figures are not available for all species. The analysis area does contain several active and inactive RCW cluster sites. The RCW is listed on the Federal list of endangered species and is protected under the Endangered Species Act.

Manageability.

1. What are the characteristics of the analysis area including its ROS classification, adopted VQO, and present and planned uses?

The Recreation Opportunity Spectrum (ROS) on the majority of the analysis area is Roaded Natural (RN). For the most part the Visual Quality Objective (VQO) ranges from retention (R) to modification (M) because of aesthetic values along the Neches River, hiking trails, campgrounds, and the lakeshore along Sam Rayburn Reservoir.

Future land use will stress aesthetic values, forest management, and recreational uses. The Forest Plan currently being revised, may place increased emphasis on the importance of maintaining the aesthetic values associated with views adjacent to Sam Rayburn Reservoir, along the Angelina and Neches Rivers, and in campgrounds and trail systems within the analysis area.

the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on private land around and near the boundary, encroachments are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries conform with terrain or other features that constitute a barrier to prohibited use?

Some portions of the boundary are located in areas that would be difficult to cross or access. A major portion of the boundary consists of lakeshore, and the Neches River bottom is accessible only by foot or boat. Other boundaries are in places where prohibition against the use of motorized vehicles would be difficult to administer. Most of the southern boundary is adjacent to private land, and part of the northern boundary is adjacent to private tracts along the shore of Sam Rayburn Reservoir. The boundaries between the private tracts follow arbitrary lines and do not conform to geographical barriers. The communities along the lakeshore require road access through Forest Service lands, and the access roads could not be closed.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The lakeshore boundary does provide some degree of protection for some of the analysis area. However, motorboat traffic on the lake or the Neches River may interfere with solitude. Parts of the northern and southern boundaries are adjacent to private land. It is possible that private development and road construction could take place near these boundaries and that these could give rise to sights and sounds incompatible with wilderness.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. There are points where visitors could transfer from motorized to nonmotorized transportation.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting and camping are currently the dominant uses, while horseback riding, ATV riding, and hiking appear to be second in importance.

b. Information on wildlife species, populations, and management needs: This analysis area contains several RCW clusters and these are protected under the Endangered Species Act. Management of RCW habitat is governed under a court order. Under its guidelines, 1,200-meter habitat zones have been established to provide protected habitat for the RCW. Management activities include removal of midstory vegetation within 200 feet of each cluster tree and prescribed burning within 1,200 meters of each cluster tree. Currently, there are 389 acres of active cluster sites and 300 acres of inactive sites. The analysis area contains 507 acres of replacement stands, for active and inactive clusters. It also contains 345 acres of recruitment stands. The 1,200-meter habitat zones total 14,168 acres.

The analysis area also contains both game and nongame species commonly found in the southeastern Coastal Plains. The species present include gray squirrel and white-tailed deer.

water is available at Sandy Creek and Boykin Springs Recreation Areas. Sam Rayburn Reservoir, the Angelina and Neches Rivers, and creeks and other low areas provide water for wildlife.

d. Livestock operations: Two permittees are authorized to graze livestock within the analysis area. The Boykin Allotment is 2,983 acres. Twenty-five head of cattle are permitted on the allotment for grazing purposes from March 1 through November 1 each year.

e. Timber: The analysis area is considered a high-quality site for timber production. Loblolly pine site indices range from 70 to 95. Timber types are longleaf (53 percent); loblolly pine (35 percent); shortleaf pine (3 percent); slash pine (3 percent); and various hardwoods (5 percent). Some hardwood (mostly oaks, hickory, and some Beech-Magnolia timber type) can be found in the creek bottoms, intermixed with the pines. Approximately 866 acres, or four percent, of the area is in trees less than 10 years old. Approximately 60 percent of the standing timber is between 50 and 70 years old. An estimated 20 percent of the timber is greater than 70 years old, and 2 percent is more than 100 years old. All of the analysis area except stringers along intermittent stream courses, is classified in the 1987 Forest Plan as suited for timber production. The timber sale targets established by the 1987 Forest Plan can be met only if timber is harvested in this analysis area.

f. Minerals: The U.S. owns mineral rights to 2,490 acres in the analysis area; mineral rights to more than 22,000 acres are owned privately. The Forest Service must allow the construction and maintenance of exploration sites where mineral rights are owned privately. The area is considered to have moderate potential for oil and gas occurrence. There are currently two oil and gas leases on land where the U.S. owns the mineral rights. Beard Oil Company (lease 60598) has a 10-year lease on 240 acres. This lease will expire June 30, 1995. Caddis Resources, Inc. has a five-year lease on 70 acres which expires in 1996.

g. Cultural resources: Much of the analysis area may contain archeological or historical sites (historic properties). The Angelina and Neches Rivers provided ideal conditions for early settlement. Fertile bottomlands, abundant wildlife, cool artesian springs attracted and supported Native American inhabitants for more than 5,000 years. Numerous Paleo-Indian to Neo-Historic prehistoric sites have been found in the analysis areas. Future surveys will likely reveal additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

There are several historic sites in the analysis area. The Aldridge Mill complex is perhaps the best example of a turn-of-the-century sawmill in the National Forests in Texas. There are numerous cemeteries in the analysis area. The Boykin Cemetery, at Boykin Springs Recreation Area, is the most notable of these. Old logging tramways are also common.

These sites and the objects and other physical evidence they contain are an important part of our cultural heritage. The National Forests and Grasslands in Texas (NFGT) are charged with the protection and management of these valuable historic properties by laws and regulations.

h. Authorized and potential land uses: A variety of commercial and noncommercial special uses are authorized in the analysis area. The permittees, the special uses, and the mileages along Forest Service roads or boundaries are listed in Table 1.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: The analysis area has been burned periodically to reduce fuel build-up since the

approximately every 3 to 5 years. Wildfires do occur, but are infrequent. The analysis area's terrain is gentle with rolling hills. Therefore, it would not be difficult to suppress wildfires unless adverse conditions (high winds or very dry fuels) occurred.

Many of the analysis area's plant communities identified by the TNHP are fire dependent. The presence of manmade barriers such as roads and reservoirs prevents the rapid spread of natural fire through the analysis area. Controlled fire is needed to retain the fire-dependent communities.

Potential spread of the southern pine beetle (SPB) is low because longleaf pine is the predominant tree species. Although few infestations have occurred in the analysis area, the majority of the standing timber is at or near maturity and this could increase susceptibility during an epidemic.

The presence of private land is not a major consideration in managing the analysis area as General Forest land. Inholdings would complicate wilderness management because they imply access and other special use needs. Private ownership of mineral rights could cause problems in wilderness management.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities, such as hunting and fishing, should continue at about the present moderate to high use level. The analysis area is adjacent to Sam Rayburn Reservoir, which is now accessible by means of FS roads. Because the analysis area is visible from Sam Rayburn Reservoir, it is desirable to manage the lake's shore for aesthetic and recreational purposes. The analysis area is contributing significant timber volumes to the District sales program and is expected to continue to do so in the future.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

Yes. The presence of RCW necessitates habitat maintenance activities that are not conducive to wilderness conditions.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

The analysis area is not highly mineralized, but is considered to have at least a moderate potential for oil and gas occurrence and development. Since most of the mineral rights are outstanding, permission to drill in the analysis area would be granted. Permission to construct and maintain access roads would be granted also.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

Yes. The analysis area contains the Boykin Springs and Sandy Creek Recreation areas, which receive moderate to high usage. There are also developed trail systems which receive moderate use. There are areas of historic importance within the analysis area, including the Old Aldridge Sawmill ruins and the Boykin Springs Recreational Area.

as exemplary plant communities. At least three areas within the analysis area have been proposed as RNA's.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. There are demands for developed and dispersed recreation (hunting, fishing, camping, horseback riding, and ATV use), grazing, and timber. Designation of the analysis area as wilderness would reduce the amount of wood available to industry.

Timber stands within the 1,200-meter RCW foraging zones are being thinned to comply with a court order. This thinning area contributes to the timber harvest on the Angelina National Forest.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. Mineral rights in most of the analysis area are reserved or outstanding. Surface occupation, with mitigation measures implemented, must be allowed in order to accommodate exploration and production equipment. Beard Oil Company (lease 60598) leases mineral rights on 240 acres of Forest land, and Caddis Resources, Inc. (lease 86835) leases mineral rights on 740 acres of Forest land. These leases will expire on June 30, 1995 and in FY 1996, respectively.

United Pipeline also retains an outstanding right-of-way for a gas pipeline that was in place prior to Forest Service land aquisitions. There are also several special use permits which are listed in Table 1.

Management of RCW habitat is governed by a court order. Management activities include removal of midstory vegetation within 200 feet of each cluster tree. There are currently 389 acres of active cluster sites and 300 acres of inactive sites.

Need.

Other wildernesses.

1. What is the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in Texas, as well as additional land in other near by states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

Upland Island Wilderness consists of 13,390 acres and is adjacent to the analysis area, on the west along FS 303. Turkey Hill Wilderness consists of 5,286 acres and is approximately 26 miles north of the analysis area. Both of these wildernesses are located on the Angelina National Forest.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Upland Island Wilderness received approximately 3000 Recreation Visitor Days (RVD's), about 11 percent of capacity. Of these, 500 RVD's involved overnight camping. The average size of visiting groups is 2.6 people. More than 56 percent of visitors to Upland Island Wilderness visit there more than twice per year. An estimated 27 percent of visitors

places for future hunting trips. A large percentage of visitors are under 16 years of age.

Turkey Hill Wilderness received an estimated 1,500 RVD's, about 14 percent of capacity, of which 500 involved overnight camping. Most of the use is hunter related. Users have not had any significant effects on the areas wilderness qualities or resources. A small increase in use over the next 10 to 20 years is anticipated.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent rate from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew at much faster rates (27 percent and 17 percent respectively, 1980-87). These population centers are about 100 miles (Houston) to 175 miles (Dallas) from the analysis area.

The analysis area is located in Angelina and Jasper counties. The population of Angelina county grew from 64,172 in 1980 to 69,920 in 1988. The population of Jasper County grew from 30,781 in 1980 to 32,014 in 1988. The population of San Augustine County, to the north of the analysis area, grew from 8,785 in 1980 to 9,174 in 1988. The population of the Deep East Texas Region, in which the analysis area is located, is expected to increase about 50 percent over the next 35 years.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so,where?

Many acres of National Forest land within reasonable distance of the analysis area are suitable and available for primitive recreation use.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

Yes. There are several active and inactive RCW clusters in this analysis area. The active clusters occupy 389 acres and the inactive clusters comprise 300 acres. There is a 200-foot boundary and a 1,200-meter foraging habitat zone around each RCW cluster. The RCW is protected under the Endangered Species Act, and its habitat is managed under direction of a court order.

The analysis area also supports several plant species identified as sensitive by the TNHP. Habitat for most of these plants can be maintained only by means of frequent burning.

2. Could their needs be provided for through means other than wilderness designation?

Yes. Wilderness designation would constrain or halt the management needed to meet the needs of the RCW and the sensitive plant communities.

3. Is there a need to provide a sanctuary for species that cannot survive in less than primitive surroundings?

suitable habitat conditions.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8, 1977)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area is on the Coastal Plain of eastern Texas. The dominant landforms are low ridge segments and ridge segments. Deep sandy soils predominate on gently sloping areas, while flat or undulating areas receive moisture from stream terraces.

The same landforms are typical of the Upland Island Wilderness area, which adjoins the analysis area on the west.

2. What is the area's ecosystem classification based on the Texas Natural Heritage Program Report (1990)? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area contains several series of sensitive plant communities within the longleaf pine forest type. These plant communities include the Longleaf Pine-Little Bluestem Series, Sphagnum-Beakrush Series, Sweetbay Magnolia Series, Blackjack Oak-Pine Series, and Little Bluestem-Nuttall's Rayless Goldenrod Series.

Some of these plant communities are unique to the analysis area. However, there is some overlap of these communities into Upland Island Wilderness and other adjacent Forest Service lands.

Table 1. Special Uses For Longleaf Ridge

Aerial Powerlines

Jasper-Newton Electric Co-op: ROW width 25ft.

- 4.0 miles along FS 302
- 0.4 miles along FS 309 to pvt
- 0.6 miles northeast from FS 303 to pvt
- ** 0.6 miles along FS 303
- 0.2 miles along FS 313
- ** 1.5 miles south from FS 302 along FS boundary
- 0.4 miles west from FS boundary to radio tower
- 0.6 miles along Angelina county road 4-9
- 0.5 miles along Angelina county road 4-11
- 2.6 miles along FS 347
- 1.2 miles along Angelina county road 22
- 3.0 miles along FS 333
- 3.4 miles along FS 306
- 1.3 miles along Angelina county road 21
- 0.6 miles along Angelina county road 23
- 0.4 miles between Angelina road 23 and V.O. Easley road

0.3 miles along Southwestern Timber Co. road 1 (Jasper county)
0.2 miles along Southwestern Timber Co. road 2 (Jasper county)
1.1 miles along FS 306E
0.8 miles along Jasper county road 3
0.3 miles along Hawk Development road (Jasper county)
0.6 miles between 255R and Hawk Development road
0.2 miles along FS 335 between FS 306 and Harveytown
0.4 miles within Letney campground
0.6 miles along FS 332
** 0.4 miles along Dallas Matthews road (Jasper county)
0.5 miles along FS 376
0.2 miles along Jasper county road 2
0.8 miles along 255R
0.2 across FS land just south of 255R
0.1 miles along Jasper county road 4

** lies along boundary of Longleaf Ridge area

There are approximately 26 miles (79 acres) of aerial powerlines within the boundary of Longleaf Ridge, and approximately 2.5 miles (7.6 acres) along the boundary.

Water Lines

Upper Jasper Water Authority: ROW width is 10ft.
1.1 miles between Hawk Development road and FS 306 (1.3 acres)
0.8 miles along Jasper county road 3 (0.97 acres)
3.2 miles along FS 306 (3.9 acres)
0.2 miles along FS 335 between FS 306 and Harveytown (0.24 acres)
0.3 miles along Southwestern Timber Co. road 1 (Jasper county) (0.36)
0.5 miles along D.M. Henderson road (Jasper county) (0.6 acres)
0.8 miles along V.O. Easley road (Jasper county) (0.97 acres)
0.6 miles along Angelina county road 23 (0.73 acres)
0.4 miles along FS 333 between FS 306 and FS 347 (0.48 acres)
2.5 miles along FS 347 (3.0 acres)
1.1 miles along Angelina county road 22 (1.3 acres)
1.3 miles along state highway 63 between Angelina county road 4-11 and FS 347 (1.6 acres)

Westwood Water Supply Corp: ROW width 10ft.
1.1 miles between Hawk Development road and FS 306 (1.3 acres)
0.6 miles along FS 306 (0.73 acres)
0.2 miles along Southwestern Timber Co. road 2 (Jasper county) (0.24)

Other Uses

AT&T Microwave Tower (2.73 acres)
Plum Ridge Missionary Baptist Church (1 acre)
Upper Jasper Water Authority Pumphouse (0.23 acres)
Westwood Water Supply Corp. Pumphouse (4.54 acres)
Westwood Community Sign (< 0.1 acres)

Pipelines

United Gas Pipeline: ROW width 50ft
(Outstanding right)
7.6 miles across forest service land (46 acres)

Telephone Lines

Southwestern Bell: Buried ROW width 10ft.
1.3 miles along Edward B. Mack road (Angelina county)
1.1 miles along Angelina county 22
0.4 miles along FS 333 between FS 347 and FS 306
3.2 miles along FS 306
0.8 miles along FS 333 between FS 306 and Sandy Creek Campground
0.8 miles along Angelina county road 21
0.7 miles along Angelina county road 23
0.6 miles along V.O. Easley road (Jasper county)
0.8 miles along D.M. Henderson road (Jasper county)
0.3 miles along Southwestern Timber Co. road 1 (Jasper county)
0.2 miles along Southwestern Timber Co. road 2 (Jasper county)
1.9 miles along both sides of FS 335

1.4 miles along FS 332
** 0.2 miles along Dallas Matthews road (Jasper county)
1.5 miles along 255R
0.2 miles along Jasper county road 2
0.1 miles along Jasper County road 4

** lies along boundary of Longleaf Ridge area

There are approximately 15.3 miles (18.5 acres) of telephone line within Longleaf Ridge area, and approximately 0.2 miles (0.2 acres) along the boundary.

Southwestern Bell: Aerial ROW width 25ft.
1.1 miles along FS 347 between FS 333 and Angelina county road 22
(3.3 acres)
Contel/Continental Telephone: Buried ROW width 10ft.

0.6 miles along FS 303 (0.7 acres)

Stark Tract

Sabine National Forest, Yellowpine Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area}

STARK TRACT: Gross area approximately 3,350 acres; net area approximately 3,350 acres.

Location and vicinity.

The analysis area is located in the extreme southeastern portion of the Yellowpine Ranger District of the Sabine National Forest, in Sabine and Newton counties, Texas. It is approximately three miles west of the Toledo Bend Reservoir dam, and is bounded on the north and east by the reservoir; on the south by the Sabine National Forest boundary; and on the west by private land.

Describe access to the analysis area, including roads and trails leading to the area.

Access is by Forest Service (FS) 196 and by Newton County Road 1421. Both of these roads originate at State Highway (SH) 255.

General description of the analysis area's geology.

The analysis area is in the western Gulf Coastal Plain and is underlain by the Catahoula geologic formation. This formation is a 25 to 36 million years old formation and consists of mudstone, tuffaceous sands, and fossil wood. Soils associated with the Catahoula formation are the Corrigan, Letney, and Kisatchie series.

General description of the analysis area's topography.

This part of the western Gulf Coastal Plain consists of floodplains, stream terraces, concave foot slopes, side slopes, and gently sloping ridgetops. The side slopes generally occur as inclined surfaces on broad interstream divides, with narrow floodplains and branchhead inclusions. The floodplains, the stream terraces, and some of the branchhead inclusions have been inundated by Toledo Bend Reservoir.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is forested with species typical of the western Gulf Coastal Plain. Southern yellow pine is the predominant cover type, with longleaf pine dominating the sandy hills and longleaf, loblolly, and shortleaf on the middle to lower slopes leading to Toledo Bend Reservoir.

The longleaf stands on the sandhills have understories of blackjack oak, bluejack oak, and post oak and a sparse cover of xerophytic forbs. Hairsedge, Gray's beakrush, little bluestem, slender bluestem, and piney-woods dropseed are common in the herb layer.

White oaks, red oaks, sweetgum, and black hickory are found in the overstory and midstory in the longleaf, loblolly, and shortleaf cover types on the middle to lower slopes. In these types, the understory consists of flowering dogwood, redbay, fringetree, and sassafras. Shrub species include coral bean, beauty-berry, and Elliot's blueberry.

predominant plant community in the analysis area.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The key attractions are Toledo Bend Reservoir and the dry, sandy hilltops covered with longleaf pine and associated species. The endangered red-cockaded woodpecker (RCW) existed here in the past, but all clusters within the analysis are now inactive.

Bald eagles perch and feed along the shore of Toledo Bend Reservoir, and it is likely that they use the shore within the analysis area. American alligator probably occurs along the shore of Toledo Bend within the analysis area. No other threatened, endangered, or sensitive species are known to be present, but no detailed inventory of the fauna has been completed.

The TNHP Committee has identified four natural plant communities and a number of sensitive plant species within the analysis area. Sensitive plants in the analysis area are scarlet catchfly, Mohlenbrock's umbrella sedge, bog coneflower, Carolina lily, and nodding nixie.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

The analysis area was acquired from private owners in the early 1970's. It appears that the land was cut over in the 1920's and that it regenerated naturally to the cover types that exist now. There is no evidence that the previous owners conducted intensive logging operations. If there was any harvesting, it consisted of very light thinning. Activities occurring since Forest Service acquisition include timber harvesting, reforestation,

southern pine beetle (SPB) suppression, soil and water restoration, prescribed burning on a three-year burning rotation, the construction of FS Road 196, and reconstruction of County Road 1421.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

There is little, if any, evidence of the major logging that took place during the early part of this century. There is some evidence of recent timber harvesting and reforestation, SPB suppression, and road construction. Most of the analysis area shows little evidence of disturbances other than vigorous prescribed burning, but the numerous woods roads along the sandy ridges show signs of heavy use by off-road vehicles (ORVs), particularly during hunting season.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural appearance?

The analysis area is not regaining a natural appearance because resource protection and management activities continue. The 1987 Forest Plan specifies that the analysis area is to be managed for multiple use, and the area will not regain natural appearance under such management.

4. Does the existing or attainable National Forest system ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

The existing National Forest System ownership is not contiguous with other National Forest land, and is an isolated area that is not inspected frequently. Therefore, enforcing

private land on two sides, there are opportunities for nonconforming access and use along many sections of the boundary. The government does not control the mineral rights and thus cannot prevent all mineral exploration and development inconsistent with wilderness conditions.

Lessees of the private minerals are planning a seismic line, exploration and development of three oil wells, and construction of a pipeline in the immediate future. They also plan to drill as many as 12 additional oil wells before the mineral ownership reverts to the U.S. government. The private mineral owners are assured of the right to explore for and develop their mineral interest. However, the Forest Service can include stipulations that protect the analysis area and require mitigation of any adverse effects on the surface or other resources.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No.

Improvements, structures, and nonconforming uses

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a. Airstrips or heliports: No.

b. Electronic installations: No.

c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): None.

d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.

e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: The U.S. does not own the minerals in the analysis area. The minerals are reserved, and exploration and development activities are being planned. However, all mineral ownership will revert to the U.S. by the year 2000.

f. Recreation improvements such as occupancy spots or minor hunting or outfitter camps: There are no developed recreational improvements within the analysis area. Primitive, dispersed camping sites used by hunters and fishermen are scattered throughout the analysis area.

g. Timber harvest areas where logging and prior road construction are or are not evident: The analysis area displays evidence of recent harvesting and road construction. It cannot be classified as heavily logged, but there have been regeneration cuts, intermediated cuts (thinnings), and SPB suppression by means of timber sale. Most of the analysis area was classified as General Forest area in the Final Land and Resource Management Plan (FLRMP) approved in May, 1987, and was scheduled to be evaluated for timber harvesting as outlined in Appendix K of the FLRMP. The only timber sale since government acquisition took place in 1984 and consisted of 142 acres of regeneration cutting and 479 acres of thinning. The sale was confined to the area that is served by FS 196.

h. Cultural treatments involving plantations or plantings: The 142 acres of regeneration referred to previously was site prepared by means of prescribed burning and was machine planted to longleaf pine.

i. Private inholdings in the area: No.

j. Dwellings on private inholdings: Not applicable.

k. Nonconforming structures and improvements: None known.

l. Ground-return telephone lines: None known.

improvement in 1985. This area is located approximately 0.25 miles north of the terminus of FS 196.

n. Roads: The analysis area has two improved roads, FS 196 and County Road 1421.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

No. County Road 1421 provides access to private land and cannot be terminated. Past timber management activities, watershed restoration efforts, and FS Road 196 could be mitigated through natural processes.

3. Are improvements in the analysis area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

The improvements noted previously are being maintained to meet long-term needs.

4. If there are timber harvest areas, has less than 20 percent of the analysis area been harvested within the the past 10 years?

Yes.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. The analysis analysis area contains approximately 3.2 miles (0.95 miles/1,000 acres) of improved roads (surfaced with gravel or bituminous material). There is also approximately 11 miles of unimproved road.

6. Are all existing roads under Forest Service jurisdiction?

No. Only 1.5 miles of the improved roads (0.44 miles/1,000 acres) is under Forest Service jurisdiction. The remaining 1.7 miles of road (0.5 miles/1,000 acres) is under Newton County jurisdiction.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

There are some opportunities for solitude and serenity. Developments on private land adjacent to Toledo Bend Reservoir are visible from the shore of the lake. Sights and sounds of activities on these developments would disturb solitude and serenity within the analysis area. A recent Recreation Opportunity Spectrum (ROS) inventory indicates that about 2,670 acres (or 80 percent) of the analysis area provides opportunities for semiprimitive recreation and thus for solitude and serenity.

Challenge.

Does the analysis area offer visitors the opportunity to experience, adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

access points is limited. Foot travel in the analysis area is not particularly arduous, but dense underbrush and hot, humid summer weather can challenge users.

Outdoor recreation opportunities.

Describe the analysis capability for providing primitive and unconfined types of recreation including:

a. Camping: There are numerous locations for primitive camping.
b. Hunting: The analysis area supports small game and deer.
c. Fishing: There are opportunities for fishing within the analysis area, but the adjacent Toledo Bend Reservoir provide excellent fishing opportunities.
d. Canoeing: The analysis area has no streams or rivers large enough to support this activity.
e. Boating: Same as for canoeing.
f. River rafting: Same as for canoeing.
g. Backpacking: There are opportunities for backpacking. However, the analysis area is not large enough nor difficult enough to offer much challenge to a seasoned backpacker.
h. Hiking: The analysis area is suitable for hikes of moderate distances.
i. Riding: The analysis area's sandy ridges are suitable sites for riding.
j. Photography: Opportunities for vista photography are poor in the analysis area's interior, but good along the shore of Toledo Bend Reservoir. Opportunities for plant and animal photography are good throughout the analysis area.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area provides opportunities for study and education in biology, geology, and dispersed recreation.

2. Is there an abundant and varied wildlife population?

The analysis area supports game and nongame animals were typical of western Coastal Plain forests. Accurate population figures are not available.

Manageability.

1.What are the characteristics of the analysis area including its ROS classification, adopted VQO, and present and planned uses?

ROS is roaded natural (for 20 percent of the analysis area), semiprimitive motorized (for 42 percent of the analysis area), and semiprimitive nonmotorized (for 38 percent of the analysis area). The area within (1/2 mile from FS 196) or the county road is classified roaded natural. The Visual Quality Objective (VQO) of the majority of the analysis area is maximum modification. Areas immediately adjacent to Toledo Bend Reservoir are classified as partial retention, and areas adjacent to FS 196 and the county road are classified as modification.

Future land use will continue to stress recreation and aesthetic values in association with residential and dispersed recreation uses. There are several private marinas and residential subdivisions in the immediate area. Under the 1987 Forest Plan, future land use is to stress multiple-use forest management with sensitivity to aesthetics, recreation, and biodiversity.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Development will continue on adjacent private land, but encroachments are not expected to be a serious problem.

3. Is is possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked, and the analysis area's boundary coincides with easily defined natural boundaries where it does not coincide with the National Forest boundary.

4. Do boundaries, where possible, conform with terrain or other features that constitute a barrier to prohibited use?

The boundary presents a barrier to prohibited use only where the boundary is the shoreline of Toledo Bend Reservoir.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

No. Sounds of traffic on roads adjacent to and within the analysis area, sound of boating activity on Toledo Bend Reservoir, and sounds from private developments on adjacent private land can be heard in the analysis area.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Roads provide public access at two points, and the lake provides additional access.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting and dispersed camping during the hunting season are the most frequent uses. The level of use is moderate.

b. Information on wildlife species, populations, and management needs: The analysis area supports game and nongame animals typical of the western Coastal Plain region. Deer is the featured species in most of the analysis area, but quail is featured in the sand hills, and RCW is also featured. Populations of species other than RCW are thought to be stable.

c. Water availability and use: Water suitable for human consumption is not available. Water for wildlife is abundant.

d. Livestock operations: None.

e. Timber: There are excellent sites for southern yellow pines and good sites for upland hardwoods. A Longleaf Pine Progeny Study Area (10 acres) and two superior longleaf trees are located within the analysis area. The analysis area has been managed intensively for timber. Road development is considered economically feasible and roads have been built.

Site indices range from the 80's to the 90's for southern yellow pines. Only three stands are hardwood forest types. On the upland hardwood sites, site index for hardwoods is 70.

The majority of stands in the analysis area are 40 to 65 years of age. There are about 142 acres of stands less than 10 years old and about 50 acres of stands more than 90 years old.

Federal ownership during the year 2000. The analysis area has high potential for oil and gas recovery, and mineral exploration and developments are being planned. Since the mineral rights are owned privately, the Forest Service must allow the construction and maintenance of access routes, drilling sites, and pipeline rights-of-way.

g. Cultural Resources: Much of the analysis area may have a high potential for the presence of archeological or historical sites or both (historic properties). The Sabine River provided ideal conditions for early settlement. Fertile bottomlands and abundant wildlife attracted and supported Native American inhabitants for more than 5,000 years. Numerous Paleo-Indian to Neo-Historic prehistoric sites have been found in the analysis area. Future surveys should reveal additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

There are several historic sites in the analysis area. The remains of old logging trams, or railways, are present throughout the analysis area. Historic farmsteads and cemeteries are present in the analysis area.

These sites and the objects and other physical evidence they contain are an important part of our cultural heritage. The National Forests and Grasslands in Texas (NFGT) is charged with the protection and management of these valuable historic properties by laws and regulations.

h. Authorized and potential land uses: There is a special use to Newton County for the county road right-of-way.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: The analysis area has been prescribed burned on a 3-year burning rotation for the last 12 years, and heavy fuel loads have been reduced. Maintaining the longleaf pine ecosystem will require continued frequent use of fire. The longleaf-bluestem ecosystem produces light, flashy fuels in a single growing season. The presence of such fuels, the remoteness of the analysis area, and the distance from suppression forces combine to create a high risk of wildfire.

Southern pine beetle (SPB) has been and will continue to be a problem.

2. What outputs are currently produced or could be produced in the future?

The analysis area is producing a proportionate share of the District's annual timber sale program and is expected to continue to do so. The analysis area will also continue to provide opportunities for dispersed recreation (primarily hunting and dispersed camping during hunting and fishing seasons) at a moderate level of use. After the year 2000, when all of the mineral rights have reverted to U.S. ownership, the analysis area will be available for mineral exploration and development.

3. Is the area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

No.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

Wilderness designation would not have immediate effects on minerals exploration and development because rights to all minerals will not revert to U.S. ownership until the year 2000. Wilderness designation would affect mineral exploration and development after the year 2000.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special developments to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. There are demands for dispersed recreation, minerals, and timber production. Designation of the analysis area as wilderness would reduce the amount of wood available to industry.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. Exploration for and development of reserved minerals will not be consistent with wilderness conditions. In additions, the presence of 1.7 miles of Newton County road is not consistent with wilderness.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes approximately 84,012 acres of designated wilderness in Texas and additional land in nearby states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Indian Mounds Wilderness Area (11,037 acres) is located approximately 12 air miles (40 miles by road) northeast of the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

Indian Mounds Wilderness Area received approximately 3,300 visitor days of average annual use. Most of this use is associated with hunting. Use is light and is not affecting the area negatively. Use has increased slightly since the wilderness was established in 1984.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew at much faster rate (27 percent and 17 percent respectively, 1980-87). These population centers are about 160 miles (Houston) and 270 miles (Dallas) from the analysis areas, and have a combined population of more than 5 million persons.

The population of the Deep East Texas region, which includes Newton County and the analysis area, increased by about 10 percent between 1980 and 1988. The region's population is expected to increase by about 50 percent over the next 35 years.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

National Forest land within a reasonable distance is suitable and available for primitive recreation use.

Habitat needs.

1. Are any biotic species in the analysis area competing directly with increasing public use and development?

There is no record of such competition. However, the area along the shoreline of the lake is suitable habitat for the bald eagle and the American alligator. If these species are present, they may compete with increased public use and development.

2. Could their needs be provided for through means other than wilderness designation?

Yes.

3. Is there a need to provide a sanctuary for species that cannot survive in less than primitive surroundings?

No. The nearby Indian Mounds Wilderness Area provides some habitat for the bald eagle; however, this species and the American alligator are heavily dependent upon Toledo Bend Reservoir for their livelihood. Any sanctuary for these species would have to include portions of this lake.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1977)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area consists of floodplains, stream terraces, concave foot slopes, side slopes, and gently sloping ridgetops. These landforms are not unique and are typical of the Upland Island and Indian Mounds Wilderness Areas.

2. What is the area's ecosystem classification? Does the analysis area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area represents a classic vegetational continuum with fire-maintained ecotones along an environmental gradient from upland xeric sandhill woodlands and barrens, dry hardwood sandy forest, and dry upland longleaf pine savannas downslope to broadleaf evergreen acid seep forests. The plant community most common in the analysis area is the TNHP Longleaf Pine-Little Bluestem Series. Other plant communities present include the Blackjack Oak-Pine Series, Sphagum-Beakrush Series, and Sweetbay Magnolia Series. This ecosystem is represented in existing wildernesses in Texas.

Turkey Hill

Angelina National Forest, Angelina Ranger District

Roadless Area Review and Evaluation

Description of Analysis Area

Roadless area name and number of acres.

TURKEY HILL: Gross area approximately 152 acres; net area approximately 152 acres.

Location and vicinity.

The analysis area in the northeastern portion of the Angelina National Forest. It is located along the east side of Farm-to-Market (FM) 705, approximately 2.5 miles south of State Highway (SH) 103 in San Augustine County, Texas. The site is bounded by private property on the north and south, by Ayish Bayou on the east, and by the Turkey Hill Wilderness on the west.

Describe access to the analysis area, including roads and trails leading to the area.

Access to the analysis area is by FM 705, and the county road that leads to Pisgah Cemetery.

General description of the analysis area's geology.

The analysis area is in the western Gulf Coastal Plain and is underlain by the Cook Mountain geologic formation and recent alluvium. The Cook Mountain formation is 36 to 58 million years old and consists of clays, marl, sands, glanconite, and megafossils. Soils are the Koury series and the Alazan-Bezner Complex.

General description of the analysis area's topography.

This part of the western Gulf Coastal Plain consists of floodplains, stream terraces, side slopes, and gently sloping ridgetops. The stream terraces are characterized by a hummocky surface on which the mounds are two to three feet higher than the depressions.

General description of the analysis area's vegetation, including the ecosystem type.

The ridges are forested with a mixture of pines and hardwoods, and the Ayish Bayou floodplain is forested entirely with hardwoods. Loblolly pine, red oaks, white oaks, and hickories occur on the upper slopes, while sweetgum, water tupelo, various oaks, beech, and hickory occur on the floodplain. The dominant plant community is the Texas Natural Heritage Program (TNHP) American Beech-White Oak Series.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

The analysis area lies along Ayish Bayou and presents opportunities for viewing wildlife such as white-tailed deer and various ducks. Sensitive plants such as bloodroot, Carolina lily, slender wake-robin, and southern lady's-slipper occur in the analysis area.

Area Inventory

Human Influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Acquisition of the National Forests in Texas was primarily under the authority of the Weeks Act. These lands were acquired from private landowners during the 1930's and early 1940's. Significant portions of these lands were acquired from timber companies. Most of the analysis area was cut over heavily during the early 1900's.

2. To what degree is the analysis area natural or natural appearing and free from disturbance?

Little evidence of turn-of-the-century logging and farming is visible. However, signs of more recent activity are evident. Stands on approximately 23 acres (15 percent of the analysis area) were thinned in 1990. Fifteen acres of hardwoods were shelterwood cut approximately 15 to 20 years ago. The shelterwood area has since been restocked through resprouting and reseeding from existing trees. The analysis area contains approximately 0.2 miles of graveled county road. Part of the analysis area was prescribed burned in 1987.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Apart from the county road and the shelterwood cut, the analysis area appears natural. The shelterwood area contains seed trees which were left to aid in regeneration of the stand. These trees are still present, and the regeneration is heavy and noticeable. Under current (1987 Forest Plan) management direction, the analysis area will continue to be managed for multiple use and will not regain a natural appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

The mineral rights within the analysis area were leased in the fall of 1991. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate minerals exploration and production. Therefore, perpetuation of wilderness conditions cannot be ensured.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No exotic species are known to be present in the analysis area.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present?

a. Airstrips or heliports: No.
b. Electronic installations: No.
c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.
d. Areas under current mineral lease that contain a "no surface occupancy" stipulation: No.
e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: Yes. (See previous discussion under #4.)
f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: Yes. The analysis area receives moderate use from hunters and has some undeveloped, dispersed camp sites.

There were once tramways throughout the forest; however, there is now no evidence of these in the analysis area. Old haul roads have been reseeded and are overgrown. A 15 to

20-year-old shelterwood cut of 15 acres is still evident. The cemetery road is evident.

h. Cultural treatments involving plantations or plantings: No.

i. Private inholdings in the area: No.

j. Dwellings on private inholdings: Not applicable.

k. Nonconforming structures and improvements: A San Augustine County Road that provides access to Pisgah Cemetery crosses part of the analysis area.

l. Ground-return telephone lines: No such lines are known to be present. However, there is an aerial powerline along the west boundary.

m. Watershed treatment areas: No.

n. Roads: The analysis area contains approximately 0.2 miles of graveled county road. Approximately 0.5 miles of surfaced FM 705 parallels the west boundary.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

The county road across the analysis area must be maintained to provide continued access to Pisgah Cemetery. The mineral rights have been leased, and surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate exploration and production equipment. The powerline must be maintained as specified in the special use permit.

3. Are improvements in the area being affected by the forces of nature rather than by humans, and are they disappearing or muted?

The county road and aerial powerline are being maintained for long-term service.

4. If there are timber harvest areas, has less than 20 percent of the area been harvested within the past 10 years?

Yes. All of the regeneration within the analysis area is more than 10 years old.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

No. The 152-acre analysis area contains 0.2 miles (1.31 miles/1,000 acres) of improved road.

6. Are all existing roads under Forest Service jurisdiction?

No. The only existing road is under San Augustine County jurisdiction.

Evaluation of Potential Wilderness

Capability.

Does the analysis area have the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

The analysis area provides limited opportunities for solitude and serenity. Public roads and activities on private land are visible from some places in the analysis area. Vehicle noise from FM 705 or the county road can be heard in parts of the analysis area. The

natural.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

The area offers few opportunities for these experiences and the experiences offered are similar to those available in Turkey Hill Wilderness. The terrain is relatively flat with some low ridges. The east side of Turkey Hill lies along Ayish Bayou, which could offer the visitor some opportunity for excitement, initiative, or self-reliance. Existing roads make access to the analysis area reasonably easy.

Outdoor recreation opportunities.

3. Describe the analysis area's capability for providing primitive and unconfined typed of recreation including:

a. Camping: Several locations are suitable for primitive camping.
b. Hunting: Small and large game species occur in the analysis area and can be hunted there.
c. Fishing: Both Ayish Bayou and Clear Branch provide opportunities for fishing.
d. Canoeing: Ayish Bayou and Clear Branch Creek provide opportunities for canoeing.
e. Boating: It is possible to operate small boats on Ayish Bayou.
f. River rafting: Limited opportunities are available on Ayish Bayou and Clear Branch Creek.
g. Backpacking: The analysis area's small size, the absence of a trail network, and the presence of obstructing undergrowth greatly limits opportunities for backpacking.
h. Hiking: Same as for backpacking.
i. Riding: Horseback riding opportunities do exist, but there are no developed trails.
j. Photography: There are opportunities for close-up photos. There are no opportunities for panoramic or scenic shots.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area provides opportunities for education and study in geology, archeology, biology, and dispersed recreation. The analysis area has been utilized by forestry students in class exercises.

2. Is there an abundant and varied wildlife population?

The analysis area supports a variety of game and nongame animals. Species are typical of those found in forests on the southern Coastal Plain.

Manageability.

1. What are the characteristics of the surrounding area including ROS classification, adopted Visual Quality Objective (VQO), and present and planned uses?

The ROS is roaded natural. Because of the aesthetic values along the roads that pass through and by Turkey Hill Wilderness, the Visual Quality Objective (VQO) is partial retention.

Under the 1987 Forest Plan, land use is to be multiple-use management stressing aesthetic qualities as well as recreational uses.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

Even though development may occur on private land around and near the boundary, encroachments are not expected to be a serious problem.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes. The current National Forest boundary is marked.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

Some portions of the boundary are located in areas that would be difficult to cross or access. The east boundary follows Ayish Bayou, which is accessible only by boat. There are areas where the prohibition against the use of motorized vehicles, such as all terrain vehicles (ATVs), would be difficult to administer. The north and south boundaries are adjacent to private land and follow tract boundaries, and the west boundary parallels FM 705. These boundaries follow arbitrary lines that do not conform with terrain or other features constituting natural or man-made barriers.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The boundaries provide minimal buffering because the analysis area is small and because private property and roads surround most of the analysis area. Sights and sounds of civilization on private developments north and south of the area and FM 705, which parallels the west boundary, would not be shielded. The east boundary is Ayish Bayou, which is generally a good buffer against the sites and sounds of civilization.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

Yes. FM 705 and the Pisgah Cemetery road provide access along the west boundary, while Ayish Bayou provides access along the east boundary.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: Hunting is currently the dominant use, while horseback riding and hiking are less popular. All of these activities would be compatible with wilderness.

b. Information on wildlife species, populations, and management needs: The analysis area contains various game and nongame species in southern Coastal Plain forests. The northern portion of the Angelina National Forest is being restocked with eastern turkey.

c. Water availability and use: The analysis area contains no source of potable water. Water for wildlife is readily available.

d. Livestock operations: None.

e. Timber: Even though there are some good sites with high quality timber, limited access and wet soils would make harvesting difficult. The upland portions of the analysis area are presently included in the Forest's base of lands suited for timber management. The other areas are not included in the base of lands classified as suited for timber management. Predominant forest cover types are loblolly-hardwood (14 percent), white oak-red oak-hickory (48 percent), bottomland hardwood (12 percent), and sweetgum-nuttall oak-willow (10 percent).

the hardwoods on the upper slopes and on the floodplain.

f. Minerals: The analysis area's mineral rights have been leased. No surface or subsurface exploration or development has been initiated. The potential for oil and gas occurrence is considered low.

g. Cultural resources: Much of the analysis contain archeological or historical sites (historic properties). The Ayish Bayou area provided ideal conditions for early settlement. Fertile bottomlands, abundant wildlife, and cool artesian springs attracted and supported Native American inhabitants for more than 5,000 years. Numerous Paleo-Indian to Neo-Historic prehistoric sites have been found in the analysis area. Future surveys will likely reveal additional sites, and evaluation of these sites should broaden our knowledge of the prehistoric inhabitants of the region.

No excavations have been conducted in the analysis area, but excavations have been conducted in areas to the north and south. These excavations have revealed physical evidence of early habitation.

These sites, and the objects and other physical evidence they contain, are an important part of our cultural heritage. The National Forests and Grasslands in Texas (NFGT) are charged with the protection and management of these valuable historic properties by laws and regulations.

h. Authorized and potential land uses: Deep East Texas Electric Co-op has a special-use permit for an aerial powerline along the east edge of FM 705.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: Because the analysis area receives protection from fire and because fire suppression efforts have been successful, there is a possibility of a fuel buildup. A schedule of prescribed burning has helped to control fuel loadings and reduce fire danger.

There is a potential for the southern pine beetle (SPB) to infest pines in the analysis area if the trees are stressed or damaged. However, because pine stocking is relatively low, the risk of infestation is considered low to moderate.

There are no private inholdings.

2. What outputs are currently produced or could be produced in the future?

Dispersed recreation activities--primarily hunting, hiking, and fishing--should continue at the present low to moderate level.

The area is expected to produce timber. Any decline in the acreage available for timber harvesting will result in a decline in timber production on the Angelina National Forest. Wild turkeys are being restocked in the general area. The analysis area could be managed so that turkey habitat would be improved.

The analysis area may contain exploitable minerals.

3. Is the analysis area located in such a way that the need for increased water production or additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

No. Wilderness designation would preclude wildlife habitat management practices that would improve wild turkey habitat; however, failure to employ these practices would not significantly harm turkey populations or habitat.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

No.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

Yes. The analysis area is expected to produce timber, for which there is a demonstrated demand.

8. Is the land committed through contractual agreements for use, purposes, or activities not in concert with wilderness requirements?

Yes. The mineral rights to the area have been leased and a special use permit has been issued for the powerline corridor.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wildernesses in the general vicinity?

The National Wilderness Preservation System includes 84,012 acres of designated wilderness in Texas, as well as additional wilderness in nearby states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

The Turkey Hill Wilderness (5,286 acres) adjoins the analysis area on the west. Vehicular access to the wilderness is by FM 705, which separates the analysis area from the wilderness, and by FS 307, which is off FM 705.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas?

An estimated 1,500 Recreation Visitor Days (RVD's), or about 14 percent of capacity, were recorded in Turkey Hill Wilderness in 1991. Of these RVD's, 500 involved overnight camping. Upland Island Wilderness received approximately 3,000 RVD's or about 11 percent of capacity. Again, 500 RVD's involved overnight camping. Most use of the two wildernesses is related to hunting. Wilderness use is expected to increase slightly over the next 10 to 20 years.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

The population of Texas grew 0.6 percent annually from 1980 to 1987. This slow increase is expected to continue. The large metropolitan areas such as Dallas and Houston grew much faster (27 percent and 17 percent respectively, 1980-87). These population centers

combined population of more than 5 million persons.

The population of Deep East Texas, which includes San Augustine County and the analysis area, increased about 10 percent between 1980 and 1988. The region's population is expected to increase about 50 percent over the next 35 years.

The population of San Augustine County has increased in size from 8,785 in 1980, to 9,174 in 1988. This is an increase of 4.43 percent. Adjacent Angelina and Jasper counties experienced population increases of 8.96 percent and 4.01 percent, respectively. Together, the Angelina and Jasper County populations were estimated to be 105,965 in 1990 (Albers 1990).

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Many areas in the Angelina National Forest, which is adjacent to the analysis area, are suitable for primitive recreation. The National Forests in Texas contain 82,348 acres of nonwilderness land that offer primitive recreation opportunities.

Habitat needs.

1. Are any species in the analysis area competing directly with increasing public use and development?

Yes. Four sensitive plant species (bloodroot, Carolina lily, slender wake-robin, and southern lady's-slipper) are found in the analysis area.

2. Could their needs be provided for through means other than wilderness designation?

Yes. Habitat for the sensitive species in the analysis area can be maintained without wilderness designation.

3. Is there a need to provide a sanctuary for species that cannot survive in less than primitive surroundings?

No. Conscious vegetation management and mitigation of disturbances can maintain suitable habitat conditions.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Guide (R-8 1972)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

The analysis area is on the Coastal Plain of eastern Texas. The analysis area consists of ridges (10 percent), slopes (40 percent), and floodplains (50 percent). These landforms are not unique, and similar features can be found in the nearby Turkey Hill Wilderness Area.

2. What is the area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

Turkey Hill is classified as an American Beech-White Oak Forest (Orzell 1990). The same type of ecosystem can be found in existing wilderness areas in Texas.

Winters Bayou

Roadless Area Review and Evaluation

Description of **Analysis Area**

Roadless area name and number of acres.

WINTERS BAYOU: Gross Area approximately 710 acres; net area approximately 710 acres.

Location and vicinity.

The analysis area is at the southern end of the San Jacinto Ranger District, Sam Houston National Forest. It is in San Jacinto County, about five miles northwest of Cleveland, Texas. It is near Montague Church, on Farm-to-Market (FM) 1725. Approximately 565 acres, or 80 percent of the analysis area, is managed as part of the 971-acre Winters Bayou Scenic Area. The analysis area is bounded by National Forest System land on the north and on part of the southern boundary. It adjoins private land along about half of its perimeter.

Describe access to the analysis area, including roads and trails leading to the area.

The Lone Star Hiking Trail begins at a trail head near Montague Church, and continues through Winters Bayou Scenic Area to a point on the American Petrofina pipeline. The trail crosses the west side of the analysis area. Portions of the south and east boundaries are private land lines. Direct access to the analysis area is from the northeast on Forest Development Road (FDR) 229.

General description of the analysis area's geology.

The analysis area is in the Gulf Coastal Plains physiographic province and is underlain by recent alluium, fluviatile terrace deposits, and the Bentley geologic formation. These formations are less than 2-1/2 million years old and consist of unconsolidated beds of clay, silt, sand, gravel, and organic matter. The primary soils occurring in the analysis area are the Hatliff, Dallardwille, and Choates Series.

General description of the analysis area's topography.

The analysis area is almost flat and is poorly drained. Landforms present include floodplains, stream and marine terraces, footslopes, and gently sloping ridgetops. About 60 percent of the analysis area is within the floodplain of Winters Bayou. The floodplain is often flooded for three to four days following heavy rain. The analysis area drains into the East Fork of the San Jacinto River.

General description of the analysis area's vegetation, including the ecosystem type.

The analysis area is part of the Southeastern Mixed Forest Ecological Region and is forested with species common in both bottomland and upland forest types. Water oak, bitter pecan, sycamore, river birch, magnolia, hickory, and species such as cabbage palmetto and switch cane are common in the floodplains. Midstory species include ironwood, holly, dogwood, and yaupon. Upland areas are mixed forest types with loblolly pine, white oak, red oak, hickory, and

beautyberry, yaupon, dogwood, and hophornbean. The most common plant community is the Texas Natural Heritage Program (TNHP) Swamp Chestnut Oak-Willow Oak Series.

Key attractions, if any, including sensitive wildlife and scenic landmarks.

Plant and animal communities common in the Gulf Coastal Plain, and specifically those common in the Big Thicket Ecosystem, are key attractions. Heron rookeries, alligators, wild pigs, and numerous bird and plant species are present. There are no known red-cockaded woodpecker (RCW) clusters in the analysis area, and no sensitive species are known to occur in the analysis area. The Lone Star Hiking Trail, a National Recreation Trail, makes the plant, wildlife, and visual resources more accessible and attractive.

Area Inventory

Human influence.

1. To what degree have humans and past and present human activity affected natural ecological processes and conditions?

Although much of the Forest land in the vicinity was harvested during the early 1900's, wet sites like Winters Bayou area were not. Neither were they suitable for farming. Southern pine beetle (SPB) activity has occurred and treatments have been performed in the analysis area. Livestock was allowed to graze in the analysis area recently, but grazing has had little effect on plant and animal associatons. TNHP recently classified the analysis area as degraded on the basis of tornado and beetle damage.

2. To what degree is the analysis area natural or natural appearing and free from disturbance

The analysis area appears natural throughout. The only man-caused disturbances are related to trail construction and maintenance, SPB treatment, powerline right-of-way maintenance, oil and gas exploration and production, and road construction and maintenance.

3. If the analysis area's ecological processes or natural appearance or both have been altered by past or present human activity, is the land regaining a natural, untrammeled appearance?

Land on the Coastal Plains recovers from natural and man-caused disturbances quickly. If Coastal Plain land is undisturbed for several years, vegetation reclaims roads, trails, and other disturbed areas. The TNHP stated that the analysis area should recover if left undisturbed. To the casual observer, most of the analysis area appears natural and untraveled.

Approximately 145 acres of the analysis area not included in the Winters Bayou Scenic Area are managed as General Forest. General Forest areas are managed for multiple uses and will not regain a natural appearance.

4. Does the existing or attainable National Forest System ownership pattern, both surface and subsurface, ensure perpetuation of identified wilderness values?

Surface ownership patterns would not preclude perpetuation of wilderness conditions.

until 1995. Surface occupancy, with mitigating measures implemented, must be allowed in order to accommodate mineral exploration and production where mineral rights are controlled privately. Recently, there has been some mineral exploration very near the analysis area. One group has recently proposed to drill a well in the analysis area.

Rights to minerals on the remaining one-third of the analysis area are in U.S. ownership. An application for lease of these rights has been received and is being processed. Surface occupancy, with mitigating measures and subject to terms of the lease, must also be allowed where rights are leased from the Federal government.

5. Is more than 15 percent of the analysis area in nonnative vegetation?

No.

Improvements, structures, and nonconforming uses.

1. Are any of the following types of areas, features, or nonconforming uses present? If so, where?

a. Airstrips or heliports: No.
b. Electronic installations: No.
c. Areas displaying evidence of historic mining at least 50 years old (Do not include areas of significant current mineral activity): No.
d. Areas under current mineral leases that contain "no surface occupancy" stipulation: There were none as of June, 1992. However, an application for lease of about 258 acres was received. About half of the area applied for is within the Scenic Area. The 1987 Forest Plan requires that leases of mineral rights in the Scenic Area contain "no surface occupancy" stipulations.
e. Areas under current mineral lease where the lessee has not exercised development and occupancy rights: No. See previous discussions.
f. Recreation improvements, such as occupancy spots or minor hunting or outfitter camps: No hunter camps or outfitter guide camps are present. The Lone Star Trail, a National Recreation Trail, passes through the western part of the analysis area. There is a metal bridge located where the trail crosses Winters Bayou.
g. Timber harvest areas where logging and prior road construction are or are not evident: Clearings and stumps resulting from SPB infestation treatments are visible in several places.
h. Cultural treatments involving plantations and timber stand improvement: There is no evidence of timber stand or wildlife habitat improvement.
i. Private inholdings in the analysis area: Not applicable.
j. Dwellings on private inholdings: Not applicable.
k. Nonconforming structures and improvements: None are present. One powerline crosses the western part of the analysis area. This powerline may be removed in the future.
l. Ground-return telephone lines: No.
m. Watershed treatment areas: No.
n. Roads: No.

2. Can existing nonconforming uses be mitigated effectively or terminated through removal or rapid natural deterioration?

The Lone Star Hiking Trail is consistent in design and purpose with wilderness management.

humans, and are they disappearing or muted?

Yes. Exceptions are the improvements previously listed.

4. If there are timber harvest areas, has less than 20 percent of the area been harvested within the past 10 years?

Yes. Other than treatment of scattered/small SPB spots, none of the analysis area has been harvested in the last 10 years.

5. Does the analysis area contain less than 1/2 mile of improved road for each 1,000 acres?

Yes. The analysis area contains no roads that are open for general public use.

6. Are all existing roads under Forest Service jurisdiction?

There are no Forest Service or other public roads in the analysis area. However, a drilling pad, an access road, and a well have been proposed.

Evaluation of Potential Wilderness

Capability.

Does the analysis area contain the basic characteristics that would make it suitable for wilderness designation without regard to its availability for or need as wilderness? Consider the following characteristics in analyzing the quality of the wilderness resource. If these characteristics are determined to be important, describe and refer to them.

Experimental benefits.

Does the analysis area provide the opportunity for solitude and serenity?

Opportunities for solitude and serenity are limited. Sights and sounds of activities on adjacent private and National Forest lands would interfere with solitude in much of this small analysis area.

Challenge.

Does the analysis area offer visitors the opportunity to experience adventure, excitement, challenge, initiative, or self-reliance? Is access easy or difficult?

Access is easy because the analysis area is flat and small. Travel within the analysis area can become somewhat difficult and challenging during wet periods because there are no foot bridges or elevated trails, in wet places. The excitement and sense of adventure that can be derived from viewing unique plants and wildlife are the primary benefits of travel within the analysis area.

Outdoor recreation opportunities.

Describe the analysis area's capability for providing primitive and unconfined types of recreation including:

a. Camping: Numerous locations are suitable for primitive camping.
b. Hunting: Hunting for deer, pigs, and squirrels is excellent.
c. Fishing: Winters Creek is a popular with local bank fishermen.

usually unsuitable in August and during periods of drought.

e. Boating: Only canoes and small flat-bottomed boats are practical on the Bayou.

f. River rafting: The frequency of portages would make rafting impractical.

g. Backpacking: The Lone Star Hiking Trail, which passes through the analysis area, is popular with backpackers. Wet sites, dense vegetation, the analysis area's small size, and the absence of other trails greatly limit other backpacking opportunities.

h. Hiking: There are excellent opportunities for hiking along the banks of Winters Creek and on the Lone Star Hiking Trail.

i. Riding: The Lone Star Hiking Trail is restricted to foot traffic only. Dense "Big Thicket" vegetation and frequent wet site conditions severely limit the opportunity for horse or mountain bike travel.

j. Photography: There are very few opportunities for vista photography, but there are excellent opportunities for many types of plant and animal photography.

Special features.

1. What is the area's capability to provide outdoor education and scientific study, both formal and informal, in a manner compatible with wilderness?

The analysis area presents opportunities for study and education is subjects such as zoology, botany, and dispersed recreation. The presence of bottomland forest and the

diversity of the analysis area presents special opportunities for studies of riparian vegetation, floodplain ecosystems, and neotropical migrant birds.

2. Is there an abundant and varied wildlife population?

Diversity and abundance of wildlife is the analysis area's best feature. Accurate population figures are not available for most species.

Manageability.

1. What are the characteristics of the surrounding area including ROS classification, adopted VQO, and present and planned uses?

Recreation Opportunity Spectrum (ROS) is semi-primitive, nonmotorized in six percent of the analysis area, and roaded-natural elsewhere. The Visual Quality Objective (VQO) for the analysis area is retention.

Present and planned use for the Scenic Area is semiprimitive, non-motorized with a VQO of retention.

With the exception of the travel zone on Highway 1725, the surrounding areas are General Forest. Along the highway, the forest management theme is recreation and protection of aesthetic values. In adjacent General Forest areas, visual quality objectives range from retention (along county roads) to maximum modification (in areas away from major travel corridors). The ROS mix for the general area is similar to that in the analysis area. The 1987 Forest Plan established a management regime that would perpetuate this condition.

2. Do boundary locations conflict with important existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures or activities or both in the wilderness?

significant demands on the analysis area. No conflicts would be expected.

3. Is it possible to readily and accurately describe, establish, and recognize boundaries on the ground?

Yes.

4. Do boundaries, conform with terrain or other features that constitute a barrier to prohibited use?

No. About half of the boundary adjoins private property. The other boundaries do not follow features that constitute barriers. Also, a powerline crosses the western part of the analysis area. Illegal off-road vehicle (ORV) use on such rights-of-way has long been a problem for the Forest. However, thick vegetation and wet site conditions generally discourage motorized vehicle use off roads, trails, and rights-of-way.

5. Do boundaries, to the extent practicable, shield the wilderness environment inside the boundary from the sights and sounds of civilization?

The analysis area adjoins the Scenic Area on the north, so sights and sounds of civilization would not be a serious problem on that side. However, the terrain features and private and National Forest System land to the east, south, and west would not exclude sights and sounds of civilization.

6. Do boundaries provide adequate opportunity for access and traveler transfer facilities?

At present, the Lone Star Trail and FDR 229 provide the only access to the analysis area.

Availability.

1. Describe other (nonwilderness) resource demands and uses. What current uses exist?

a. Recreation: The area is popular with bank fishermen, pig hunters, and deer hunters. The Lone Star Hiking Trail is used for hiking and associated dispersed recreation throughout the year.

b. Information on wildlife species, populations, and management needs: Many bird species, and large and small game and nongame mammals common in the Coastal Plain are found in the analysis area. Whitetail deer is the featured species. Many large, old trees in the analysis area are available for wildlife habitat.

c. Water availability and use: Swampy areas, perched water tables, and flooding are common. Winters Bayou is a perennial stream. Water is always available for wildlife. Water from the analysis area and adjacent National Forest land is important to the domestic water supply for metropolitan Houston. There are no sources of potable water in the analysis area.

d. Livestock operations: None.

e. Timber: Excellent sites for tree growth are found throughout the analysis area. Forest types are loblolly pine (33 percent), sweetgum-nutall oak (61 percent), and bottomland hardwood-yellow-pine (6 percent). Because much of the analysis area has Scenic Area status and because roading and logging conditions are difficult, the Forest Service has done little cutting (except as necessary for control of SPB) Timber stands 20 to 30 years old occupy about 18 percent of the analysis area. Stands 50 to 70 years old occupy 44 percent of the analysis area, and stands 70 to 90 years old occupy 38 percent of the analysis area. The 565 acres within the Winters Bayou Scenic Area is classified as unsuited for timber production. The remaining 145 acres are classified as suited for timber production and are included in the Forest's timber base. The 145-acre tract must produce timber if the Forest is to produce the scheduled amount of timber.

surrounding area. A proposal for a well to access reserved minerals in the analysis area was received very recently. No U.S.-owned minerals are leased at present, but an application for lease of the U.S. owned minerals has been received.

g. Cultural resources: Winters Creek is a tributary of the East Fork of the San Jacinto River, one of the four major rivers in the National Forests in Texas. The East Fork of the San Jacinto, and its tributaries, provided the environmental conditions and resources sought by aboriginal inhabitants. Recorded site 41SJ38 is located within the analysis area. It is likely that intensive surveys would find other artifactual remains. The analysis area has been designated as a cultural resource probability zone and must be investigated prior to land-disturbing activities.

Wilderness designation would not conflict with the current or planned management; however, the Antiquities Act of 1906, the National Historic Preservation Act of 1966, or the Archaeological Resource Protection Act of 1979 would have impact on this area's potential for any type management.

h. Authorized and potential land uses: A powerline right-of-way is authorized. Recently, the power company removed the substation on this line because use had decreased, and it is anticipated that the line itself will be removed as the oil and gas wells play out.

i. Management considerations including fire, insects and diseases, and presence of non-Federal lands: There are no inholdings; however, the analysis area adjoins several privately owned properties.

The incidence of wildfire and common forest diseases has been very low. SPB infestations are always a threat in east Texas, but the analysis area's forest has a large hardwood component, and the presence of this component provides some protection against significant harm to the ecosystem.

There have not been any recorded wildfires in the analysis area. Should a wildfire occur, the flat terrain and wet ground should make suppression relatively easy.

2. What outputs are currently produced or could be produced in the future?

The Sam Houston National Forest is an urban forest and must satisfy an ever-increasing demand for recreational opportunities. The demand for hunting, hiking, birding, wildlife viewing, fishing, and boating will continue to increase. The analysis area has excellent potential to meet part of this demand.

Timber outputs have been obtained primarily through cuttings designed to suppress outbreaks of SPB. A portion of the analysis area is classified as "not suited for timber production" because of its special status. Much of the analysis area is within the Winters Bayou floodplain and would not be available for timber production under the 1987 Forest Plan. The 145 acres outside the Scenic Area, but within the analysis area is included in the Forest's timber base and is needed to supply part of the timber required by the 1987 Forest Plan.

The privately owned minerals will revert to U.S. ownership in January, 1995. The Federally owned minerals are available for exploration and development. Leases of mineral rights in the Scenic Area permit surface occupancy only where there are valid existing rights to such occupancy.

additional onsite storage or both is so vital that installation or maintenance of improvements is an obvious and inevitable public necessity?

No. The Bureau of Reclamation studied the feasibility of constructing a reservoir in the San Jacinto River drainage to meet Houston's demand for water. An alternate site in Montgomery County was selected.

4. Would wilderness designation seriously restrict or prevent the application of wildlife management measures of considerable magnitude and importance?

No.

5. Is it a highly mineralized area of such strategic or economic importance and extent that restrictions or controls resulting from wilderness designation would not be in the public interest?

The area is not highly mineralized but is considered to have a high potential for oil and gas occurrence. Oil and gas exploration and production are occurring in the surrounding area.

6. Does the area contain natural phenomena of such unique or outstanding nature that general public access and special development to facilitate public enjoyment should be available?

No.

7. Is the land needed to meet clearly documented resource demands such as demands for timber, mineral production, or developed recreation?

There is an established demand for timber, minerals, and recreation from this general area. Establishment of the analysis area as wilderness would slightly reduce the amount of wood available to industry. If the analysis area is designated a wilderness, mineral production will decrease as existing rights expire and the land is withdrawn from mineral production.

8. Is the land committed through contractual agreements for use, purposed, or activities not in concert with wilderness requirements?

There were no Federal mineral leases as of June, 1992, but a portion of the analysis area is in the process of being leased for minerals. There is also a Special Use Permit for the powerline right-of-way.

Need.

Other wildernesses.

1. What are the locations, sizes, and types of other wilderness in the general vicinity?

The Little Lake Creek Wilderness in Sam Houston National Forest is one of five wilderness areas in the National Forests in Texas. Little Lake Creek Wilderness consists of 3,810 acres. Total wilderness area in Texas is 84,012 acres. There are other wilderness areas in nearby states. See Table 1 (found in the Introduction to the Evaluation of Roadless Areas) for more information about wilderness areas in Texas.

2. How far is it to the closest existing wilderness?

Little Lake Creek Wilderness is approximately 42 miles west of the analysis area.

3. What is the level of use in nearby wilderness? What are the trends in the use of these areas.?

Little Lake Creek Wilderness had an estimated 500 visitor days of recreational use in 1991. Use of Little Lake Creek Wilderness has been increasing slowly. There is increasing demand for recreational use in urban forests in general.

4. Is the population in and around these areas increasing or decreasing? How quickly is it increasing or decreasing?

expected to grow slowly in the future.

The population of metropolitan Dallas and Houston have grown much more rapidly--by 27 percent and 17 percent, respectively from 1980 to 1987. Houston lies about 50 miles southeast of the analysis area.

The population of Deep East Texas, which includes San Jacinto County and the analysis area, increased about 10 percent between 1980 and 1988. The population of Deep East Texas is expected to increase about 50 percent over the next 35 years.

The population of San Jacinto County, in which the analysis area lies, grew from 11,434 in 1980 to 15,169 in 1988 and is projected to increase to about 33,000 by 2025. Adjacent Harris County has 2.8 million inhabitants and is the third largest county in the United States.

Nonwilderness lands.

Are there opportunities for unconfined and primitive recreation on nonwilderness areas in the vicinity? If so, where?

Big Creek Scenic Area, an area known as the Big Woods, and portions of the Lone Star Hiking Trail near the San Jacinto River offer such opportunities. Generally, the Sam Houston National Forest is broken by roads and other facilities, and the frequency of use is high. Therefore, social encounters are frequent, and such encounters limit opportunities for primitive and unconfined recreation. The Forest contains 82,348 acres of nonwilderness land suitable for semiprimitive or primitive recreational use.

Habitat needs.

1. Are biotic species in the analysis area competing directly with increasing public use and development?

There are no known primary habitats of threatened, endangered, or sensitive species within the analysis area. The analysis area may include some foraging habitat for RCW. The

composition and spatial arrangement of vegetation in the analysis area generally does not meet the RCW's habitat requirements.

2. Could their needs be provided for through means other than wilderness designation?

Yes.

3. Is there a need to provide a sanctuary for biotic species that cannot survive in less than primitive surroundings?

None such species are known to be present. Studies of declining populations of neotropical migrant birds may reveal such a need.

Landform and ecosystem preservation.

1. What is the analysis area's landform type based on the Region 8 Soil Resource Inventory (R-8 1977)? Does the area represent a unique landform type that is not represented in any wilderness areas in the general vicinity?

This part of the western Gulf Coastal Plains consists of floodplains, stream and marine terraces, foot slopes, and gently sloping ridgetops. Approximately 60 percent of the analysis area is within the floodplain of Winters Bayou.

The analysis area does not contain or represent a unique landform. These landforms present are represented in existing wilderness areas in Texas.

2. What is the analysis area's ecosystem classification? Does the area represent a unique ecosystem that is not represented in any existing wilderness areas in the general vicinity?

The analysis area's ecosystem is a Texas Natural Heritage Program (TNHP) swamp chestnut oakwillow oak series. This plant community also occurs in the Upland Island Wilderness Area which is located about 70 miles northeast of the analysis area. The analysis area and the 5 designated wilderness areas in the Forest are part of the Southern Mixed Forest ecosystem.

Appendix E

Wild and Scenic Rivers

Introduction

This appendix presents evaluation of the eligibility of certain river and stream segments for inclusion in the National Wild and Scenic River System (NWSRS). The river and stream segments discussed are located in, adjacent to, the National Forests and Grasslands in Texas (NFGT).

This appendix is organized into five sections (I-V) as follows:

Section I Introduction

Section II Background and current management of river corridors.

Section III Wild and Scenic River (WSR) evaluation and designation process.

Section IV Evaluations, eligibility determinations, and potential classifications for 11 river and stream segments.

Section V Suitability study responsibilities and protection of the eligible river and stream segments pending legislative action.

USFS Summary for NWSRS Process

Forest Service Manual (FSM) 1924, through Forest Service Handbook (FSH) 1909.12 (Section 8.14), directs that "forest planning address all rivers designated by Congress for study, in the Nationwide River Inventory, or identified as potential Wild and Scenic Rivers by a National Forest, wholly or partially on National Forest System (NFS) land". The planning team should evaluate each river to verify that it satisfies the eligibility criteria presented in Sections 1(b) and 2(b) of the Act. The planning team is to document the finding of eligibility, or no eligibility, and the river's potential classification in the Forest Plan.

As described in FSH 1909.12 - Section 8, Wild and Scenic River evaluation is a three-stage process. The first stage is an assessment of eligibility. This consists of determining whether the river is free-flowing and whether the river possesses natural or cultural features that are judged to be outstandingly remarkable. The second stage is to determine the potential classification of the river; that is, whether it is wild, scenic, recreational, or a combination of the three. The third stage is to determine the suitability of the river as a component of the NWSRS.

A local determination that a river is eligible does not necessarily mean that it will be judged suitable when, in the final stages, it is evaluated from a national perspective. Eligibility evaluations are an initial step in a process that ultimately requires action by Congress to include a river in the NWSRS.

The Forest Service completed the eligibility and classification evaluations contained in this appendix. Suitability evaluations for each of the eligible rivers are to be performed by a combination of State and Federal agencies. Following the suitability evaluations, the State can

here are in accordance with the National Wild and Scenic Rivers Act of 1968 (the Act); in

response to the Nationwide Rivers Inventory (National Park Service, 1982); and the concerns of the American Rivers Conservation Council.

Table 1 lists the rivers and streams that were studied in detail for NWSRS eligibility.

Background and Current Management of River Segments

Nationwide Rivers Inventory

The Nationwide Rivers Inventory (NRI) (National Park Service 1982) identified two sections of the Neches River for potential designation as Wild and Scenic Rivers. This initial survey was performed in conjunction with local university personnel (Knotts 1978). The first river segment is 180 miles long and stretches from the north end of B.A. Steinhagen Lake upstream to Lake Palestine. The NRI survey identified outstandingly remarkable recreational, fish, and wildlife values. This river segment forms parts of the boundaries of the Davy Crockett and Angelina National Forests (AMS 1992). The upper part of the segment contains the Big Slough Wilderness. Big Slough is in a U.S. Forest Service (USFS) loop canoe trail. The NRI stated that the segment is an important recreation area and a high-quality recreational waterway, that public boat ramps, USFS campgrounds and numerous sand bars are available for recreational use, and that swimming conditions at sandy beaches are ideal.

Neches River Identified in NRI Process

The NRI inventoried and evaluated all rivers and river segments at least 25 miles long within the lower 48 States (except those already designated as WSR or those under formal study for inclusion in the NWSRS). Rivers and river segments less than 25 miles in length but known to have exceptional potential for recreational use were included. Eligibility was determined on the basis of:

1.the degree to which the river is free-flowing,
2.the degree to which the river and corridor are undeveloped, and
3.the outstanding natural and cultural characteristics of the river and its immediate environment.

Segments that do not meet these eligibility criteria were eliminated from consideration as potential WSR (National Park Service 1982). The Neches River meets the eligibility requirements and was included on the list of significant free-flowing rivers that resulted from the inventory. This listing contains the following narrative description of the Neches:

"This segment provides habitat for the red-cockaded woodpecker and american alligator, and wintering grounds for the bald eagle, federally listed endangered species *** This segment has good water quality, and heavy rainfall and numerous tributaries provide sufficient water for recreation use *** The river receives significant recreation use by canoeists and fishermen. The upper reaches contain the Big Slough area, which is designated a loop canoe trail by the Forest Service *** It is an area of a wide variety of vegetative types, and is highly scenic. Below Big Slough, the river is very remote and extremely scenic with forests of cypress, oak, sweetgum, and pine. It is an important recreation area, and a quality recreation waterway."

recreational, fish and wildlife values.

Description of the Neches River

The following description of this segment of the Neches River is taken from Texas Waterways (Texas Parks and Wildlife Department 1971). With very minor exceptions, this description is still valid today. That report also gives distances between major tributaries, between road crossings, and between access points. A Report on the Physical Characteristics of Rivers, Streams, and Bayous of Texas (Texas Parks and Wildlife Department 1971) gives more detailed information about individual pieces of this segment and about recreational opportunities.

Physical Location - Anderson, Cherokee, Houston, Angelina, Trinity, Polk, Tyler, and Jasper Counties in east Texas.

Length - 178 miles.

Width - Approximately 75 to 150 feet.

Water Quality - The water quality is good, but the river has the characteristic murkiness of east Texas rivers flowing over sand.

Water Flow - The section immediately below Palestine Dam flows only when water is released from the dam. However, heavy rainfall in this area and numerous creeks that feed the river quickly replenish the water supply. There is always sufficient water on the section below State Highway 21 for float trips.

General Land Use - Timber production, dairying, and farming.

Frequency of Road Crossings - There are 14 road crossings, of which 9 are State and U.S. highways and 5 are county roads or farm roads. Most sections of river between road crossings are long enough to provide meaningful outdoor recreation experiences. Road crossings become fewer and farther between on the lower portion of this river segment.

Extent of Development - There is virtually no development on this section because much of the adjacent land is managed by the USFS or owned by one of several large lumber companies. People on the river can see timber management activity in some places, but high steep banks would block such views in most places.

Existing Reservoirs - Lake Palestine is immediately upstream. However, abundant rainfall throughout the year and many creeks that feed the Neches insure that this section will always have an adequate flow of water. B.A. Steinhagen Reservoir is located immediately below this section.

Type of Terrain and Vegetation Character - Gently rolling hills covered with pine and hardwood forests. The trees in the upper part of the segment, where the Neches is fairly narrow, often form a canopy that shades the river. In the lower portion, the river becomes wide, but heavy vegetation and lack of development promote a feeling of isolation.

to the Trinity County-Polk County line flows along the east side of the Davy Crockett National Forest. The Big Slough designated wilderness, which is contained entirely within the National Forest, is an interesting feature. The Big Slough and Neches River form a loop that the U.S. Forest Service manages as a canoe trail. A 48-mile section of the segment flows beside the Angelina National Forest; a portion of which is the southern boundary of the Upland Island

Wilderness. This section of river is just above Highway 69 in Jasper County. One small waterfall is located just above the backwaters of B.A. Steinhagen Reservoir.

Location in Relation to Major Population Centers - The closest metropolitan areas are Lufkin (20 miles away), Tyler (50 miles away), Houston (100 miles away), Ft. Worth and Dallas (150 miles away), and Waco (125 miles away).

General Comments - The Neches River is one of the most scenic waterways in east Texas. It normally has sufficient water for recreational use for most of its length, and its lower section is essentially free-flowing despite the reservoir upstream. The area receives significant recreational use by canoeists and fishermen. The presence of Davy Crockett and Angelina National Forests adjacent to the river and unique features such as Big Slough and a waterfall give this section potential for Scenic River status.

In 1984, Big Slough on the Davy Crockett National Forest and Upland Island on the Angelina National Forest were designated as wilderness. The Neches forms part of the boundary of each of these. In addition, Longleaf Ridge on the Angelina National Forest and Alabama Creek on the Davy Crockett National Forest have been proposed for wilderness status. The Neches also forms part of the boundary of each of these areas. Texas Parks and Wildlife Department (TPWD) has recommended establishment of a Bouton Lake-Neches River Bottoms Special Interest Area along one portion of the river in the Angelina National Forest. The purpose of this proposal is to protect the plant community found there (Orzell 1991). The Texas Committee on Natural Resources has proposed that this same area be established as a research natural area called the Neches River Banks. Monitoring and evaluation under the current Forest Plan indicate that management activities have had little impact on the quality of the river. Designation of Big Slough as wilderness has affected the Forest Service's ability to maintain a passable canoe trail in Big Slough (AMS 1992).

Studies Identifying Potential Wild and Scenic Rivers

American Rivers

In 1989, American Rivers (Washington, DC) conducted a survey of protected rivers on National Forests to determine how many protected rivers have rare or highly significant biological values (Huntington and Echevereia 1991). State heritage programs were contacted for information about rare species. It was found that rare plants and animals on the portion of the Neches River adjacent to the Davy Crockett National Forest include the hairy-jointed meadow-parsnip, which is listed as critically imperiled in Texas (five or fewer occurrences), and the red-cockaded woodpecker which the U.S. Fish and Wildlife Service has listed endangered. Rare plants and animals on the portion of the Neches adjacent to the Angelina National Forest include the red-cockaded woodpecker, the swamp chestnut oak-willow oak series (rare or uncommon globally and rare or uncommon in Texas), the baldcypress-water tupelo series (rare or uncommon in Texas), and the slender gay-feather (imperiled in the State and rare or uncommon in the State, and the U.S. Fish and Wildlife

listed as threatened or endangered).

American Rivers (1991) prepared an Outstanding Rivers List for Texas. The list included the Angelina River, the Neches River, and the Sabine. Two segments of the Angelina River were listed because they had been considered for inclusion in a proposed State rivers system. The section of the Angelina River from Sam Rayburn Dam to B.A. Steinhagen Reservoir contains a small amount of Angelina National Forest land along McGee Bend (AMS 1992). Two segments of the Neches were listed because they had been listed in the Nationwide Rivers Inventory and

because they had been proposed for special State designation. The segment from B.A. Steinhagen upstream to Lake Palestine includes small acres of Davy Crockett National Forest land at Big Slough Wilderness, Alabama Creek Wildlife Management Area, Upland Island Wilderness, and a proposed Neches River Banks Research Natural Area (EIS Appendix G).

Texas Natural Heritage Program

The Texas Natural Heritage Program (TNHP) Inventory (Orzell 1991) included the site of Bouton Lake-Neches River Bottoms, which was classified as a loblolly pine-oak series. The TNHP report recommended that this be managed as a special interest area and considered for inclusion in the NWSRS. The same study recommended that McGee Bend (on the Angelina River south of Sam Rayburn Dam) be designated as a special interest area because it contains sensitive plants and communities.

Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (1973) proposed three river segments on or near National Forests as specially designated waterways. The river segements proposed were (1) the Angelina River from Douglass to Sam Rayburn Reservoir (66 miles) and from the Sam Rayburn Dam to B.A. Steinhagen Reservoir (24 miles), (2) the Neches River from Lake Palestine to B.A. Steinhagen Reservoir (178 miles), and (3) the Sabine River from Lake Tawakoni Dam to Joaquin (205 miles) and from Toledo Bend Dam to Orange (140 miles). Recreational and related values along these rivers were expected to become more important in the future (TPWD 1991).

Status of a Statewide Rivers Assessment by the State

The Texas Parks and Wildlife Department (TPWD) was contacted (B. Spain, personal communication, July 17, 1991) for information about the State's assessment of rivers. House Bill 1990 (Senate Bill 1205), which would have initiated establishment of a protected river system for Texas, did not pass. The bill included initial recommendations for protected rivers and would have called for a statewide assessment of rivers by TPWD. The assessment would have identified recreational, industrial, environmental, and other benefits to the public. TPWD is not actively studying rivers identified by the Nationwide Rivers Inventory and is not actively identifying rivers for potential Wild and Scenic River status.

The bill, which called for a Texas Protected River System, clearly stated that no rivers would be identified specifically for National Wild and Scenic River status. Some private landowners and industry oppose Wild and Scenic River designation. Industry has been very concerned about protection that could limit future industrial use of Texas rivers. Also, private landowners have become very concerned about State or Federal Government controls over their "rights" along rivers and streams. The State cannot identify or study rivers for federal designation without the

to Federal or State designation of rivers, the statewide rivers study is a low priority.

TPWD has stated that they will serve as the lead agency in a comprehensive rivers assessment for Texas. Although the rivers assessment is not a high priority at this time, the TPWD will continue to study rivers and to study endangered species in rivers (and elsewhere) as the budget allows.

Current Situation and Management

Following implementation of the 1987 Forest Land and Resource Management Plan, National Forest System (NFS) land within one-fourth mile of the Neches River were managed to protect the special qualities of the river, especially against effects of timber harvest activities. The 1987 Forest Plan was unclear about the appropriateness of other activities, and it did not state whether the Neches River or any other river or stream segment would be protected as a wild, scenic, or recreational river. However, protection was provided to ensure wild status.

The Neches River corridor is now being managed as a Special Interest Area under the current Forest Plan; no timber cutting is allowed on NFS land within the protected one-quarter mile corridor along the Neches.

The 1987 Forest Plan stated that, "The potential exists for designation of the Neches River as a segment of the National Wild and Scenic River System of Waterways. A few tracts of U.S. land within the Angelina and Davy Crockett National Forest lie adjacent to or near the river and often provide camping and access points for river users. A formal decision on any future designation for the Neches River hinges on initiation and completion of a study of the river by the State. In order to provide interim protection of public lands potentially important in such a designation, protected status is assigned to all National Forest lands within one-quarter of a mile of the Neches River. This status will continue until a study is completed, and a formal recommendation made by the State of Texas. At that time, the protected status of the affected tracts will be changed to be consistent with study recommendations. If a study is not completed prior to the next planning period, the protected status of the properties will be reconsidered."

The Neches River Corridor is a 1,165-acre "protective area" in the Angelina and Trinity Ranger Districts, and is one of six special management areas designated in the current Forest Plan. That Plan states that, "While under protected status, the lands are not available for timber management. Impacting activities necessary to protect U.S. land, and those in support of valid, existing rights may continue. Activities with no impact may continue without new limitations while in protected status. *** For the convenience of river users, the Forest Service will sign U.S. property on the river. Mineral management in the corridor will be the same as in designated scenic areas." Signing of potential wild, scenic, or recreational rivers is not directed in the FSM. Signing of designated wild, scenic, or recreational rivers is addressed in FSM 2354.42.

The 1987 Forest Plan did not consider any stream or river other than the Neches River for NWSRS designation because only the Neches was both identified on the Nationwide Rivers Inventory and adjacent to USFS land. Congress did not mandate study of any other rivers. Rivers identified as potential candidates by the State, such as the Angelina, could have been examined; however, this decision would be at the discretion of the Forest Supervisor (NWSRS).

The Forest Plan did not determine the eligibility of the Neches for a special designation and did not determine whether the river might be classified as wild, scenic, recreational, or a combination

is permitted), and the NFS is now managing the one-quarter mile corridor as a special interest area (Management Area 14 in the current Forest Plan). No other rivers were identified as potential candidates for WSR status.

Current Standards and Guidelines for Management of the Neches River Corridor

The Forest Plan refers to management requirements for achieving goals and objectives as standards and guidelines. Forest-wide standards and guidelines apply to all management areas, while some standards and guidelines apply only to individual management areas and are referred to as "management area standards and guidelines." Of the six special management areas, the Neches River Corridor is the only protected river area; all other special management areas are designated scenic areas. Management standards and guidelines for special management areas are

listed on page IV-86 of the 1987 Forest Plan. Those that apply to protected areas are listed below:

*Prepare area brochures.

*Eliminate grazing except in the Neches River Corridor.

*Boundaries will be marked in accordance with FSM 2321.23.

*Camping within areas is prohibited, except in the Neches River Corridor.

*Warm-water fishing is allowed.

*Prohibit the collection, removal, or other destruction of native plant species growing within the area.

*See Management Area 5 [General Forest Management Area] for cultural resource standards and guidelines.

*Make appropriate suppression response to all fires at all fire intensity levels, except where study shows a dependency upon fire for plant species survival.

*Evidence of overland vehicle travel for fire suppression and damages resulting will be obliterated or repaired in a manner that allows rapid recovery. Cost will be charged to the fire.

*Modifications of control for insect and disease activities, similar to those used to protect wilderness resources, will also be used for special interest areas.

*Prohibit off-road vehicle (ORV) use.

*Exclude all roads from the area except those supporting a valid existing right.

*Prohibit vegetative management or other practices not required to meet scenic area objectives.

*Harvest only the timber that might occur as the result of natural disaster (insect, fire, windstorm).

*Foot trails may be constructed if they enhance use or protect the natural setting.

*Manage for semi-primitive non-motorized.

*There will be no disposal of special area lands.

*Where 100 percent of the minerals are owned by the U.S., new leases of U.S. mineral rights will be issued, but use of motorized equipment in the area will be prohibited.

*Where less than 100 percent of the minerals are owned by the U.S, appropriate protective measures will be required in the event of proposals to explore and/or develop the minerals.

*Lease action and operating plans will continue appropriate surface protection stipulations.

*New special use authorizations will be limited to support of valid existing rights (access to private property) or may be issued if the proposal is minimally and no reasonable alternative exists.

*Where possible, and with the concurrence of the permittee, existing land-use authorizations will be terminated.

*See Management Area 5 for additional standards and guidelines covering minerals and geology, land uses, landlines, claims, and encroachments.

*Management direction for these areas will be reviewed at least every 5 years.

*Inventory, map, and manage all bogs, seeps, and springs located on the Forests and Grasslands.

Successes and Difficulties in Current Management

The **Neches Ranger District** includes the following tracts of USFS land along the western bank of the Neches River: (1) an approximately two-mile-long corridor along Neches Bluff (Compartment 20); (2) eight miles along Big Slough Wilderness (Compartment 21); and (3) about 1 mile of river corridor along Compartment 26.

The eastern bank of the Neches is owned privately. Parts of the western bank of the Neches are owned privately.

The Big Slough Wilderness includes the Big Slough Canoe Trail, an 8-mile loop. The Neches is popular for canoeing, but access is easy only at the Neches Bluff area. Access at Big Slough Wilderness requires carrying a canoe about one-quarter mile. The wilderness status of Big Slough, which prevents mechanical removal of logs and debris from the canoe trail, reduced recreational opportunities. To alleviate this problem, the District is considering the construction of a small ramp for boats and relocation of the Big Slough canoe route.

The Neches District reported no other difficulties in implementing the special interest area prescription which requires the establishment of a protective corridor one-quarter of a mile in width. The corridor is managed to protect these segments as potential wild, scenic, or recreational areas. The District has identified opportunities for waterfowl habitat enhancement along the Neches; however, the compatibility of this with current management direction has not yet been

fishermen.

The current Forest Plan states that the Forest Service will sign U.S. property on the river. The protective one-quarter mile corridor is marked (white paint on trees), but no signs are present. The river user would not see the boundary paint from the river.

The **Trinity Ranger District** includes land along 7 miles of the west bank of the Neches River. The Trinity District has received approval from the Forest Supervisor to go ahead with planning and environmental analysis for a green tree reservoir" project. This project involves installing water control devices to trap runoff flowing into the Neches River in order to enhance habitat for waterfowl and provide an overwintering area for migratory birds. Funds have been requested for water structures to be placed in some culverts and for other control structures, but most of these would be located outside the one-quarter mile protective corridor and would not be visible from the river. (In some places, convenience required that the corridor be more than one-quarter of a mile in width.)

Some of the long-term proposals for the green tree reservoir include a parking lot, hiking trail, observation foot bridge, developments for the handicapped, and other projects of the "Eyes on Wildlife" kind. No difficulties are foreseen in implementing the project within the one-quarter mile protective corridor because the project is not seen as detrimental to the wild or scenic values of the river. The Forest Service is considering the possibility that it might be able to manage the timber within this corridor to benefit recreation and wildlife.

Canoeist do not use the Trinity District section of the Neches extensively, but hunters use the protective corridor. The primary access points are via route 510A and 510B. Route 510A leads to Holly Bluff Campground. There are two tracts of private land (AMS 1992) inside the Alabama Creek Wildlife Management Area. The northernmost of these is within one-quarter mile of the river. There is a rehabilitation camp for wayward boys in this tract and boys who attend the camp often use the forest.

The one-quarter mile protective corridor is marked (trees are marked with white paint), and the U.S. property is marked where it meets the Neches River. The white paint that marks the protective corridor can be seen from each one that provides access to the protective corridor, but the meaning of this marking may not be clear to the typical river user.

The **Angelina Ranger District** includes three USFS tracts of land along the Neches River: (1) a 3-mile segment that forms the southern boundary of the Upland Island Wilderness; (2) a small segment south of Bouton Lake; and (3) a segment south of the Sawmill Hiking Trail (the second and third of these tracts are within Compartment 89).

The special interest area prescription, which requires a one-quarter mile protected corridor is not found to be impractical or difficult to implement. The prescription permits the removal of timber in the event of southern pine beetle (SPB) outbreaks. If the protective corridor did not exist, some timber sales and precommercial thinnings would have been proposed. In one instance, a 1,200-meter prescription for red-cockaded woodpecker (RCW) fell within the one-quarter mile corridor, but managing for the RCW and the protective corridor presented no difficulties.

the south side of the Neches, in the vicinity of Highway 69, and these include houses built along the river.

The river is most popular as a fishing area, and there is some canoe use. There is no direct, developed access to the Neches on Forest Service land, but there are unimproved trails. When the Neches is high, it is possible to put a canoe in at Bouton Lake, but trees would interfere with canoeing. The most direct access is at Highway 69, which cuts across the southwest corner of Upland Island Wilderness.

Signs along Highway 69 identify the Neches River. There are Forest Service signs along the boundary with Upland Island Wilderness, which borders the Neches to the north. The one-quarter mile protective boundary is not marked completely (trees are marked with paint), but the corridor is measured and marked when a timber sale occurs adjacent to the protective corridor. No markings are present along the river for the convenience of the river user.

Wild or Scenic River protection is an issue within the Forest Plan Revision. The issue was first raised in an appeal of the 1987 Forest Plan by the Texas Attorney General's Office. The Attorney General's appeal addressed the status of the entire area visible from the Neches River. Two additional Wild and Scenic River candidates, the Angelina and Sabine Rivers, were brought up during the October-November 1990 scoping period for the Revision of the Plan. It was

determined that the eligibility of potential river candidates would be evaluated. This evaluation includes all perennial rivers and streams in addition to the Neches, Angelina, and Sabine Rivers.

The Evaluation and Designation Process

The Act

The eligibility evaluation process is described in the FSH (which generally follows direction from the Act) as follows:

The Wild and Scenic Rivers Act of 1968 (P.L. 90-542, 81 Stat. 906, as amended: 16 U.S.C. 1271 (Note), 1271-1287, and all subsequent amendments thereof) establishes the National Wild and Scenic Rivers System, designates the rivers included in the System, establishes policy for managing designated rivers, and prescribes a process for designating additions to the system. The Act states "certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (including ecologic al values), shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

Potential Wild and Scenic Rivers and Private Land

The FSM (1924.03) states USFS policy regarding evaluation of potential Wild and Scenic Rivers. River studies should be completed as expeditiously as possible, while priority should be given to studying those rivers most threatened by adverse developments and use and those bordered by the greatest proportion of private land. River studies should be conducted in close cooperation with affected Federal and State agencies. Each study is to include a determination of possible State participation in the preservation and administration of the river, if the river is added to the System.

studying the river should rest either with another Federal agency or with the State, whichever has jurisdiction over the larger proportion of the land involved. In this case, use the following approach (FSH 1909.12, section 8.14):

1. The USFS should contact the other Federal agency to determine if or when it plans to study the river as part of its land management planning process. The USFS may invite the agency or State to participate in a joint study for the river.

2. The USFS and other Federal or State agencies should prepare a joint river study report, either as part of the Forest Plan/Environmental Impact Statement (EIS) or as a separate study report.

3. If the responsible agency or State declines to study the river, or if its study schedule does not coincide with forest planning, develop prescriptions in the Forest Plan that provide protection for the river and adjacent lands of the river segment(s) on NFS lands.

4. Where the river segment that extends into the National Forest would make a viable addition to the NWSR System without the remainder of the river, the USFS should proceed to assess the segment's suitability on its own merits.

The Chief's summary of USFS policy regarding private lands within Wild and Scenic River study corridors provides further information (Reply to 1920/2350, July 5, 1991):

While we are not opposed to including private lands in the river corridors that we recommend for designation, it is important to recognize the role of the States in protecting river values under the NWSRS. Most States have their own river protection legislation and active programs to manage river related activities. Along with the counties and incorporated communities, the States also have land use controls and regulatory powers which the Federal Government does not have. Under Section 2(a)(ii) of the Wild and Scenic Rivers Act, the States can recommend rivers for inclusion in the NWSRS, and then, if approved by the Secretary of the Interior, have the primary responsibility for management and protection of those rivers.

With this in mind, we urge you to continue working closely and cooperatively with the States toward completing river studies both within and outside of the National Forest boundaries. Where the river corridors are composed primarily of private or State lands, the States should be urged to take a major role in conducting the studies and in future management of the river corridors. The States should also take the initiative to recommend these river segments for inclusion in the NWSRS.

The FSH describes the process for identifying and evaluating potential additions to the NWSRS on NFS lands. The FSH also describes the three-step process of river assessment, which includes determination of eligibility, determination of potential classification, and determination of suitability. Eligibility and potential classification (wild, scenic, recreational, or a combination) must be determined in the Forest Plan. Suitability studies, which involve extensive public involvement and necessitate coordination with landowners, the State, and other agencies can be addressed at a later date.

Rivers are identified for study (for potential inclusion in the System) by several means including: (1) Federal statute that directs Federal agencies to study rivers; (2) identification for study by the

(NRI) developed by the National Park Service, U.S. Department of the Interior (1982); and (4) the land management planning process. Consideration should also be given to rivers identified in State river assessments, by other Federal or State agencies, or by private interests (FSH 1909.12, section 8.1).

Assessments for Potential Inclusion in the NWSRS

A river study assesses the eligibility of a river for designation as a unit of the NWSRS and evaluates the potential physical, biological, economic, and social effects of adding the river to the National System. The required contents of the study report are outlined in FSH 1909.12, section 8.33.

The assessment of a river's potential as a WSR should follow a three-step process:

1.**Determination of eligibility.**
2.Determination of potential classification (wild, scenic, or recreational).
3.Determination of suitability.

The FSH provides the following direction for consideration of potential Wild and Scenic Rivers in the land management planning process (FSH 1909.12, section 8.14).

Forest planning must address all rivers designated by Congress for study, in the NRI, or identified as a potential WSR by a National Forest, wholly or partially on NFS lands. The planning team should evaluate each river to verify that it meets the eligibility criteria specified in section 1(b) and 2(b) of the Act. Document the finding of eligibility or no eligibility, and the river's potential

classification in the Forest Plan (wild, scenic, recreational, or a combination thereof). Beyond this point, there is some latitude in treatment of eligible rivers. The preferred process is to proceed with determining suitability by completing a river study in the Draft Forest Plan. An alternative is to delay the suitability determination on eligible rivers until a subsequent separate study is carried out. If this latter alternative is used the Forest Plan must provide for protection of the river area until a decision is made as to the future use of the river and adjacent lands. Unless the study process would be unduly delayed, subsequent study of eligible rivers may be coordinated with a general Revision of the Forest Plan.

Determination of Eligibility

The determination of eligibility for WSR designation is part of the forest planning process. That process includes specialists' evaluation of identified rivers, consideration of public comments, and a determination of eligibility by the deciding officer. The eligibility study conducted in the Forest Plan is only an inventory of eligible rivers or river segments. If a river is found eligible, its outstanding values must be protected until it is found unsuitable. While coordination and involvement with other agencies is desirable, it is not required for determination of eligibility, as it is in the suitability phase.

The eligibility of a river for the National system is determined by applying the criteria in sections 1(b) and 2(b) of the WSR Act and the supplemental criteria in the United States Department of Agriculture (USDA)-United States Department of the Interior (USDI) Guidelines. Eligibility is based primarily on the study team's professional judgment as to whether the river has outstandingly remarkable values. Therefore, the basis for the judgment should be documented in

adjacent to Forest Service land must be determined to be eligible or ineligible in the Forest Plan. Eligibility studies for any other rivers designated in State or private studies are at the discretion of the Forest Supervisor. Determination of eligibility is only appropriate for rivers adjacent to National Forest land.

To be eligible, a river must be free-flowing and, with its adjacent land area, must possess one or more outstandingly remarkable values. To facilitate the determination of eligibility and the possible later determination of river classification, the study team should first divide the river into segments. In defining segment limits, consider such factors as obvious changes in land status or ownership, changes in river character (such as the presence of dams and reservoirs), significant changes in development, or the presence of important resource values (FSH 1909.12, section 8.21 and 8.21a).

The WSR Act defines "free-flowing" as existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence of low dams, diversion works, or other minor structures at the time any river is proposed for inclusion in the WSR system does not automatically disqualify it for designation, but future construction of such structures is not allowed. The fact that a river segment may flow between large impoundments will not necessarily preclude its designation. Such segments may qualify if conditions within the segment meet the eligibility criteria.

The determination that a river area has outstandingly remarkable values is a professional judgment on the part of the study team. Only one such value is needed for eligibility.

Section 8.32 of FSH 1909.12 provides direction on how to conclude and document studies where the study river is found to be ineligible for inclusion in the system. River studies not mandated by Congress may be discontinued upon a finding of ineligibility in the forest planning process or in a

subsequent Wild and Scenic River study. In forest planning, the eligibility assessment documentation will normally be in an appendix to the Plan or the EIS. In other cases, it should be documented in the planning records and an appropriate notification should be sent to interested parties.

Potential Classification

The potential classification of a river is based on the condition of the river and the adjacent land at the time of the study. Eligible river segments are classified as one of the following according to the extent of evidence of human activity:

1. **Wild rivers**--Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

2. **Scenic rivers**--Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

3. **Recreational rivers**--Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past. (16 U.S.C. Sec. 1273(b))

includes the river. For example, the prescription for the protection of a potential wild river will be more stringent than that protection for a recreational river. A prescription that provides for uses that would change the classification of a potential wild river" or scenic river, must be supported by an analysis of the alternatives.

FSH 1909.12, section 8.2 describes developments and activities that are permitted, restricted, or prohibited within the designated river corridor for each classification.

Suitability

The final step in the river assessment is determination of suitability. It is advantageous to determine suitability and make the decision in the Forest Plan. If a decision about a river for which the USFS has primary responsibility is deferred, the Forest Plan must establish a special management area requiring future evaluation. In order to provide realistic protection prescriptions, the Forest Plan must establish the probable classification (wild, scenic, recreational, or a combination thereof).

Some factors to consider in determining suitability are: the characteristics which make the area a worthy addition; the current status of land ownership and use in the area; the reasonable foreseeable potential uses of the land and water and how they would be affected if the area were included in the WSR System; the values that could be eliminated or diminished if the area is not protected as part of the System; public, State, and local governmental interest in designation of the river; estimated cost of acquiring necessary land; and other issues and concerns identified during the planning process.

It is during suitability studies that alternative management scenarios are considered. The suitability study process involves extensive public involvement and provides opportunity for public review. The suitability study includes whatever additional environmental analysis is needed in order to comply fully with the National Environmental Policy Act (NEPA). For rivers mostly in private ownership, it is best to coordinate suitability studies with the State.

NFGT Eligibility Process for Potential NWSRS Candidates

During April and May of 1992, the Forest Interdisciplinary (ID) Team developed a list of river and stream segments that could be considered in the eligibility study for candidate WSR status. The IDT developed a process and timetable for review of these segments according to USFS Handbook guidelines. It had been determined by the NFGT IDT that the National Park Service (NPS) and TPWD would be included in the initial phase of the eligibility assessment. They would also be consulted during and later be involved in the review of the EIS, which would include the eligibility information. Additional points for consideration were:

*36 CFR 219 - USFS planning regulations pertaining to wild and scenic river eligibility determination.

*Regulations state that primary landowners (USFS included) are responsible for initiating and overseeing the actions taken to determine eligibility of candidate rivers and streams.

*Once eligibility is established, the Forest Land and Resource Management Plan must provide protection and management in order to maintain the status of the segment in question.

The process and timetable were presented to a group of USFS resource specialists, National Park Service (NPS) representatives, and TPWD representatives at a meeting in Lufkin, Texas on June 8, 1992. Forty stream and river segments on the NFGT were to be considered. TPWD officials discussed the State's concerns and legislative situations to consider during the eligibility evaluation and subsequent public review of the EIS. Concerns related to private and State ownership of water (free-flowing and otherwise) were discussed. These concerns had been accentuated by pending management actions on the San Marcos River in central Texas. The principle conslusion was that NFGT needs to evaluate all rivers adjacent to or within its administrative jurisdiction. TPWD stated it would soon develop a group within the Resource Protection Branch to evaluate biology of river systems throughout the State. Coordination of this action with the needs of the NFGT Forest Plan Revision process was discussed.

The NPS personnel raised a number of concerns and considerations at this meeting. It was agreed to consider the east Texas and Louisiana area (West Gulf Coastal Plain) as the area of "regional significance." NPS suggested that NFGT review the Louisiana eligibility determination process so that the procedures followed in Texas would be consistent with thise employed in Lousisiana. The Texas and Louisiana properties would have the same or similar regional significance in terms of natural resource values. The NFGT study team assured the NPS representatives that the State and Federal agencies with responsibility for the resources to be evaluated during the eligibility study would be involved in the study, and that adequate coordination would be done. The team assured the NPS representatives that specific concerns would be addressed before and during the EIS review process.

The meeting produced the following recommendations:

*Eligibility of all perennial streams as rivers on or adjacent to the NFGT properties would be evaluated using a matrix devised by the ID Team.

*River of stream segments above or below NFGT properties would not be evaluated as part of the Forest Plan Revision process.

*A list of all river or stream segments identified as eligible would be sent to NPS and TPWD personnel for review.

*All final river or stream data and review material would be disclosed in the EIS for the Forest Plan Revision.

*Those river or stream segments considered eligible would be included within Management Area 7 & 8 of the Revised Forest Land and Resource Management Plan. The Plan for this management area would include appropriate standards and guidelines to protect and maintain these segments in the eligible status.

Table 2 lists the 40 river or stream segments of 26 rivers and streams that were originally considered. Exhibit 1 continues written descriptions that identify the locations of the 40 segments.

In July and August of 1992, USFS resource specialists gathered all known information on resources that were to be considered in the review process. Any significant features on or adjacent to the segments were documented and recorded. Segments that had identifiable significant features were reviewed in more detail by the IDT. Discussion between NFGT and the Kisatchie

two Forests agreed that the significance of natural features would be determined on the basis of those features' significance within the physiographic West Gulf Coastal Plain Region (See Plan Appendix A).

During September of 1992, the IDT continued closely evaluating the segments that appeared to have outstandingly significant features at the regional or national level. Data on flow rates, obstructions, reservoir influence, or other effects that might influence the eligibility of these segments for wild and scenic river status were assembled.

In October of 1992, information and a summary letter were drafted and sent to all cooperating agencies and organizations for a broader review. A scoping letter was mailed to cooperators and selected interested or affected individuals and organizations. The letter described the process up to that time. Others were asked to review the information and give the USFS any additional information they believed relevant. It was pointed out that, "These segments are not necessarily our final determination of eligibility; but based upon response(s), the USFS will proceed to make an eligibility determination for final review."

After response and IDT discussion, the number of river or stream segments to be considered further was reduced to eleven. The Forest Service entered into a Challenge Cost Share agreement under which Stephen F. Austin State University (SFASU) was to gather additional information about the eleven river and stream segments during the summer of 1993. It should be noted that SFASU (Knotts 1978) performed the original inventory used in the NRI by the NPS (1982). Involvement by SFASU provided additional expertise and helped prevent bias.

Eligibility Criteria

To be eligible for designation as a Wild and Scenic river, a river must be free-flowing and possess one or more outstandingly remarkable value. The values can be scenic, recreational, geological, botanical, wildlife, historical or cultural.

The rivers can score from 1 to 4 in each category. Scoring is as follows:

4Outstandingly remarkable with national significance.

3Outstandingly remarkable with regional significance.

2Locally significant with values that are common to the region.

1Locally common in the Forest with values common in the local area and region.

Outstandingly remarkable features must be river-related and have unique, rare, or exemplary aspects that are significant at the national or regional level. All rivers and streams evaluated here are located within or form boundaries of NFGT.

Scoring

Scenic **Values**

4 A river qualifies for a score of 4 if the area possesses landforms with unusual or outstanding topographic features or if vegetation, water, and color all contribute to create exemplary

or has unusual patterns or a high degree of diversity. The scenic quality of a river can be increased if the forest is broken by some man-made construction that is culturally significant. The river corridor as a whole will qualify if the scenery and visual attractions are highly diverse over the majority of the corridor.

3 For this score, the forest cover must be continuous and the landscape must have features that are outstanding within the region. Some features for consideration are landform, vegetation, water, and color.

2 Landscape qualities that are only locally significant will qualify a river for a score of 2. In addition, landscape features may be diverse butof kinds common throughout the region.

1 A river corridor will qualify for a low score (1) if it possesses scenic values that are common in the Forest and not outstanding.

Recreational Values

4 To qualify for a score of 4, a river must have outstandingly remarkable qualities that are significant enough to attract visitors from outside the geographic region or State. Recreational uses could include, but are not limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting, water play, and boating.

3 This score is awarded for river-related recreational opportunities that are unique to the region and that will attract visitors from outside the region and within the State. Recreational uses are not limited to those listed above.

2 Recreational opportunities should be locally significant but common throughout the region.

1 This score is awarded where recreational opportunities are locally common in the forest.

Geological Values

4 To score a 4, the river corridor must possess a rare or textbook example or one-of-a-kind geological feature. The river may also qualify if its geological features are exceptionally diverse.

3 The river corridor should possess geographic features that are unusual, significant, or rare in the region.

2 Geographic features may be significant within the forest but throughout the region.

1 For this score, the geomorphic formations on the river should be locally common in the forest and have no significant features.

Wildlife Values

4 Outstandingly remarkable values include wildlife populations that live in the river corridor because of the presence of the stream itself or the vegetation surrounding the steam. A river may also qualify for a score of 4 if the wildlife habitat in the area is nationally significant or extremely diverse. A river will automatically qualify for a 4 if the habitat in

(TES) species.

3 The river must provide quality habitat that is uncommon in the region or is extremely diverse.

2 Locally significant wildlife values indicate high-quality wildlife habitat that is common throughout the region.

1 Wildlife habitat is not significant in any way and is common throughout the forest.

Botanical and Ecological Values

4 Outstandingly remarkable values require that the forest be continuous with no man-made fragmentation. Plant species of national importance or the presence of TES species can qualify a river for a 4. The river also qualifies if the vegetation is diverse and no exotic or weed species are present.

3 The forest along the stream must be continuous and without any man-made fragmentation, and some uncommon or rare plant species should be present. Some exotic or weed species may be present, but controllable.

2 The forest along the river corridor should be mostly continuous with some fragmentation caused by human activity. Plant communities can be locally significant with some uncontrolled invasions by weed species.

1 The forest area may be highly fragmented or disturbed, and artificial plant communities may be present.

Cultural or Historical Values

4 Cultural or historic sites along the river may have unusual characteristics or have exceptional research or interpretive values of national significance. A river can also qualify for a score of 4 if cultural or historical sites in the area are on or meet the criteria for the National Register of Historic Places (NRHP).

3 Sites that are regionally significant and on the NRHP.

2 Sites meet the criteria the for NRHP and are locally significant. The sites may be of kinds that are unique to local area but common throughout region. Areas not yet evaluated for inclusion on the NRHP can receive a score of 2.

1 Sites that are ineligible for NRHP listing and are common in the Forest or State.

Evaluations of the 11 River and Stream Segments

During the summar of 1993, SFASU evaluated eleven river segments in or near National Forests in Texas for potential eligibility for inclusion in the Wild and Scenic Rivers System. Segments were canoed where possible, but low flow conditions made it necessary to monitor several from stream banks and road crossings. Stretches that were floated were Neches River Segments 1, 2, 3, and 4 and McGee Bend on the Angelina River. Segments that were observed from the bank and

Branch, and Tarkington Bayou. The evaluations were coordinated with NFGT and District personnel. Neches River segments 1 and 2 were floated with Steve Best (Neches Ranger District Biologist). Teri Jenkins (San Jacinto Ranger District Recreation Planner) inspected Winters Bayou, Henry Lake, and Tarkington Bayou with personnel from SFASU. Coordination regarding the Angelina Ranger District segments was completed through Catherine Albers.

The determination that a river segment passes an eligibility evaluation such as this does not necessarily mean that the segment will meet suitability standards and be added to the Wild and Scenic Rivers System. Table 3 summarizes the eligibility value ratings for each river or stream segment evaluated in the SFASU study.

Angelina National Forest

Attoyac - 6.5 miles. Proclamation boundary to Lagroulle Creek.

The segment of the Attoyac under consideration forms the boundary between Nacogdoches County and San Augustine County. Approximately 6.5 miles of the Attoyac is on National Forest lands. The only access to the Attoyac is at the point where State Highway (SH) 103 meets Sam Rayburn Reservoir.

Values of this segment of the Attoyac are scored as follows:

Scenic Value: 2

The Attoyac is moderately scenic within the USFS lands where there is little to no development. However, the remainder of the bayou is bordered by private lands on which intensive timber management practices may be employed.

Recreational Value: 3

The Attoyac presents many recreational possibilities. Local people use it for hunting, fishing, and boating activities. The Attoyac is navigable by canoe even during the dry summer months. During wet periods, especially in the winter, it floods to the extent that the original channel is difficult to find. This backwater effect resulting from high-water conditions on Sam Rayburn Reservoir is largely unpredictable.

Geological Values: 1

No outstanding or remarkable geological features are present.

Wildlife Values: 2

In places, the Attoyac runs through bottomland hardwoods that provide excellent habitat for deer, duck, and squirrel.

Botanical and Ecological Values: 2

The Attoyac flows almost entirely through floodplain and is surrounded by typical bottomland vegetation dominated by oaks, sweetgum, and other common trees.

Cultural or Historical Values: 3

A regionally significant site containing Paleo-Indian materials has been discovered in Compartment 103 of the Angelina National Forest and has been listed on the NRHP.

Eligibility Determination:

The Attoyac River is eligible for designation under the NWSRS Act. It is free-flowing and has outstandingly remarkable recreational value.

Classification Determination:

Because it satisfies the criteria specified in FSH 1909, Chapter 8, this segment of the river qualifies for inclusion in the System as a Recreational River.

Ayish Bayou - 9.5 miles. Proclamation boundary to Sandy Creek.

The Ayish Bayou is located in San Augustine County and forms part of the eastern boundary of the Angelina National Forest. NFS land borders the bayou for a total of approximately 3.5 miles. Access points are at SH 103 and Farm-to-Market (FM) 83, where the Ayish Bayou becomes the Sam Rayburn Reservoir.

Values of this segment of Ayish Bayou are scored as follows:

Scenic Value: 2

Ayish Bayou presents moderately diverse scenery of a kind common in the region. Man-made features (including clearcuts, power lines, and fences) are visible from the bayou and reduce scenic values.

Recreational Value: 2

Although the bayou holds water and flows in the summer months, it grows too shallow at FM 103 for any type of boating activity. Current recreational uses include hunting and fishing.

Geological Values: 1

The geology of Ayish Bayou is locally common in the forest.

Wildlife Values: 1

The immediate environment supports only wildlife that are locally common.

Botanical and Ecological Values: 1

Vegetation along the bayou is of the common wood southern bottomland hardwood type. Some exotics are present.

Cultural or Historical Values: 1

There are no known areas of historic, prehistoric, or culturally significance along the Ayish Bayou.

Eligibility Determination:

Ayish Bayou is ineligible for designation under the NWSRS Act because it does not exhibit any outstandingly remarkable scenic, recreational, geological, wildlife, botanical, ecological, cultural, or historical values. For this reason, Ayish Bayou will not be studied further for designation under the NWSRS Act.

Angelina River (McGee Bend) - 4.5 miles. Below Sam Rayburn Dam along original channel to diversion channel.

McGee bend is essentially a long backwater slough that drains the area below Sam Rayburn Dam. McGee Bend has a very slight current even when the dam is releasing water. The only access point is to the east of the outflow just below the dam, and it is very difficult.

Values of McGee Bend are scored as follows:

Scenic Value: 2

The scenery of McGee Bend is of a kind common in the region. McGee Bend is moderately polluted, and the pollution detracts from its scenic quality.

Recreational Value: 1

The bend provides excellent fishing, but there are no boat ramps on the bend itself. Canoeists and other boaters can only travel up the slough and return by the same route.

Geologic Values: 1

Few geological formations that are unusual in the region are present.

Wildlife Values: 1

The wildlife species are locally common.

Botanical and Ecological Values: 2

This area has been considered for possible designation as a Research Natural Area because of its botanical features. The TNHP identified the sensitive species slender wake-robin (Trillium gracile) in the area. They recommended that the area be managed as a Special Interest Area and that future management should emphasis retention of the area's relative isolation and should allow the trees to mature and become an old-growth, closed-canopy forest.

The SFASU reviewer found that there is some diversity in the largely undisturbed vegetation along the bend. Small grassy islands appear and the bend gradually becomes marshy towards its northern end, where the water is shallower.

Cultural or Historical Values: 1

No historic, prehistoric, or culturally significant sites along McGee Bend are listed on the NRHP.

Eligibility Determination:

The Angelina River (McGee Bend) segment is ineligible for designation under the NWSRS Act because it is not free-flowing and does not exhibit any outstandingly remarkable scenic, recreational, geological, wildlife, botanical, ecological, cultural, of historical values. For this reason, McGee Bend will not be studied further for designation under the NWSRS Act.

Neches River (Segment 3) - 44 miles. U.S. Highway 59 to U.S. Highway 69.

This segment of the river borders Polk, Angelina, Tyler, and Jasper Counties. It has no road crossings and is very isolated. It is from 75 to 150 feet wide and flows through through southern floodplain forest. Although enough water for recreational activities is available during all seasons some log jams and rocky shoal are present. Because this section is isolated and has sand bars that are suitable for overnight camping when water levels are low it is well fitted for recreational use. The most visible works of man include several pipeline crossings, two old railroad grades, and a primitive road that approaches the south side of the river in Tyler County. Much of this stretch of the river is surrounded by broad, flat floodplain that is frequently inundated during winter and spring. Of the segments of the Neches being considered for WSR designation, this is the longest without a developed road crossing.

Four-tenths of a mile of land on the north bank, just west of State Highway 69, is USFS managed. The remainder of the segment is privately owned. Much of the land along this segment of the river is owned by large timber companies. Logging activity is visible along some stretches of the river where companies are harvesting mature hardwood timber. Noise of logging activity was audible along much of the route during the driest part of the summer.

The average flow for the entire Neches River is 2,000 cubic feet per second. Although the water is very turbid, its quality is better than average. The water is of acceptable quality for direct human contact (as in water sports).

Values of Neches River (Segment 3) are scored as follows:

Scenic Value: 2

This river segment is above average in visual resources because it is remote and not crossed by roads. The presence of several pipeline crossings, occasional logging activities, and several areas of accumulated litter detracts from the otherwise pristine nature of the segment. Several old oxbow lakes and bayous add to the area's scenic values.

Recreational Value: 3

This segment of the river ties segments 2 and 4 together, and thus increases recreational opportunities for some users. It is much used for fishing, hunting, and water sports. Many consider it one of the few remaining remote areas for river bottomland hunting and fishing.

on private land adjacent to the river. Canoe use is low, it takes 2 days to canoe the segment and

because canoeists can camp only on sandbars. Emergency access is only by logging roads and pipelines.

Geological Values: 1

There are no outstanding geologic features along this stretch of the river. However, interesting but common minor features such as sandbars, rocky shoals, and cut-off oxbow lakes are present.

Wildlife Values: 2

Numerous bottomland and wetland wildlife species are found along this segment. Waterfowl are plentiful during the winter months. Adjacent sloughs and oxbows are excellent habitat for herons and egrets.

Botanical and Ecological Values: 1

Bottomland hardwood dominate the river corridor. A few inclusions of pine occur on higher ground.

Cultural or Historical Values: 1

The Fort Teran monument site is located along this segment of the river near U.S. Highway 69.

Eligibility Determination:

The Neches River (Segment 3) is eligible for designation under the NWSRS Act. It is free-flowing and has outstandingly remarkable recreational value.

Classification Determination:

Because it satisfies the criteria specified in FSH 1909, Chapter 8, this segment of the river qualifies for inclusion in the System as a Recreational River.

Neches River (Segment 4) - 25 miles. U.S. 69 to B.A. Steinhagen Reservoir.

This portion of the Neches River is 25 miles in length, stretching from U.S. Highway 69 to B.A. Steinhagen Reservoir. If one faces downstream, the land along most of the left bank is in the Angelina National Forest. Most of the right bank is privately owned.

Access to the Neches from U.S. Highway 69 is limited because the road leading from the highway to the river is in poor condition. However, access from Road 255 is excellent, with a semideveloped road leading from 255 to a well-maintained boat ramp.

Current recreational uses include boating, canoeing, and fishing. Because the river is wide and deep, it is well suited for such uses. The Neches corridor is also popular with hikers. Hikers use the Sawmill Hiking Trail, which parallels the river for approximately 3 miles. The segment forms the southern boundary of a portion of Upland Island Wilderness.

Values of this segment of the Neches River are scored as follows:

Scenic Value: 3

This portion of the Neches River is exceptionally scenic because the forest cover is continuous and there are no road crossings. Vegetation along this segment varies from forests of stately bottomland hardwoods to cypress swamp to upland longleaf pine ridges, clearly identifying the natural landforms characteristic of the region. Also, an old railroad bridge spans the river, creating a nostalgic atmosphere and enhancing the river's scenic value.

Recreational Value: 3

The river is used for canoeing, boating, and fishing. Hikers use the Sawmill Hiking Trail, which follows the river for approximately 3 miles. However, access to the river is limited because there are no road crossings. This section of the river forms the southern boundary for a portion of Upland Island Wilderness.

Geological Values: 2

The geological features along this segment are moderately diverse, ranging from large sandbars to steep, cliff-like slopes. Furthermore, the segment contains a small rocky waterfall, which is highly unusual in the region.

Wildlife Values: 2

A diversity of wildlife is present. Herons, egrets, and many other birds are along the river. Various fish and freshwater mussels are present also.

Botanical and Ecological Values: 2

The vegetation along the river corridor is mostly continuous hardwood forest. There are some areas of mixed pine-hardwood forest.

Cultural Historical Values: 3

Historic and prehistoric sites include two sawmill sites located adjacent to the river. One of these is the Old Aldridge Sawmill site, which is eligible for listing in the NRHP.

Eligibility Determination:

The Neches River (Segment 4) is eligible for designation under the NWSRS Act. It is free-flowing and exhibits outstandingly remarkable scenic, recreational, cultural, and historical values.

Classification Determination:

Because it satisfies the criteria specified in FSH 1909, Chapter 8, this segment of the river qualifies for inclusion in the System as a Recreational River.

Davy Crockett National Forest

Cochino Bayou - 4.75 miles. Forest Development Road (FDR) 582 to FDR 511.

The segment of Cochino Bayou under consideration is in Trinity and Houston Counties. The only intersecting roads within the segment are the aforementioned Forest Service roads. The bayou is

bordered by NFS land for a total of 3.3 miles. The bayou holds very little water during the summer months and has an average stream flow of 25 cubic feet per second.

Values of this segment of Cochino Bayou are scored as follows:

Scenic Value: 2

Because most of the bayou is within NFS land, the areas adjacent to the bayou are largely undeveloped. However, there has been indiscriminate dumping at road crossings, bridges, and culverts.

Recreational Value: 2

During the summer months, the bayou does not hold enough water to support any boating activity. In fact, there is little to no flow except after rains, and the bayou's water stands in isolated pools during most of the summer. Recreational activities include squirrel hunting and deer hunting.

Geological Values: 1

There are no outstanding or remarkable geological features along Cochino Bayou.

Wildlife Values: 1

Only locally common wildlife species are present.

Botanical and Ecological Values: 1

The vegetation along the bayou is locally common.

Cultural or Historical Values: 2

There are 17 Indian village sites in Compartment 52 of the Davy Crockett National Forest. It has not been determined whether these sites are eligible for listing on the NRHP. A Caddo Indian village site is located along the bayou, but it is on private land and therefore unavailable for study by the Forest Service.

Eligibility Determination:

Cochino Bayou is ineligible for designation under the NWSRS Act because it does not exhibit any outstandingly remarkable scenic, recreational, geological, wildlife, botanical, ecological, cultural, or historical values. For this reason, Cochino Bayou will not be studied further for designation under the NWSRS Act.

This segment of the Neches forms part of the boundary between Cherokee and Houston Counties and borders the Davy Crockett National Forest for approximately 9.65 miles. The Davy Crockett National Forest is west of the river. The river is free-flowing and very scenic. The river corridor is very varied. The Big Slough canoe loop in the Big Slough Wilderness area adds substantially to this segment's recreational potential.

Values of this river segment are scored as follows:

Scenic Value: 2

In areas, the Neches River is very scenic, has undisturbed vegetation, and gives a feeling of isolation and remoteness from civilization. In privately owned areas, however, the scenery is broken by pollution, camphouses, powerlines, pipelines, dead timber, and clearcuts.

Recreational Value: 3

Current recreational activities include canoeing, hiking, fishing, and hunting. This area is easily accessible and presents many opportunities for recreational use. The Big Slough canoe trail which is adjacent to the Neches could provide river-related recreational access to the Davy Crockett National Forest. However, log jams and brushy growth have largely blocked access to the canoe trail. It is hard to keep the canoe trail clear because the trail is in the Big Slough Wilderness, where motorized equipment cannot be used to clear away obstructions. Roads to the river are few.

Geological Values: 2

Geological features along the Neches are moderately diverse. They include sandy banks and rocky cliffs.

Wildlife Values: 1

Only locally common wildlife species are present.

Botanical and Ecological Values: 2

The vegetation along the Neches River corridor consists of typical bottomland species and a few invading exotics.

Cultural/Historic Values: 2

The segment includes an area that contains three prehistoric sites, one of which may be associated with a fish weir structure. These weir structures were apparently made by placing stones in the river. These sites require additional study before it can be determined whether they are eligible for listing in the NRHP.

Eligibility Determination:

The Neches River (Segment 1) is eligible for designation under the NWSRS Act. It is free-flowing and has outstandingly remarkable recreational value.

Classification Determination:

Because it satisfies the criteria specified in FSH 1909, Chapter 8, the Neches (Segment 1) qualifies for inclusion in the System as a Recreational River.

Neches River (Segment 2) - 42 miles. State Highway 7 to U.S. Highway 59.

This very scenic river segment bounds Houston, Angelina, Trinity, and Polk Counties. It has continuous bottomland hardwoods-cypress forest cover and bluffs with various pine species. There are only three road crossings in this 42 mile segment. Although the water is very turbid, the quality of the water is high enough for water-contact sports. The presence of camping facilities in

the Davy Crockett National Forest increases recreational opportunities along this segment of the river. However, the water level is reduced during the summer months, and this reduction interferes with some water-related activities.

There are access points at SH 7, SH 94, Holly Bluff campground, and U.S. Highway 59.

Values of this river segment are scored as follows:

Scenic Value: 3

With its continuous forest cover and only three road crossings, Segment 2 of the Neches is naturally remote and highly scenic. However, the remoteness is occasionally disturbed by the car noise from the highways and there is some solid waste pollution in areas. There is very little development along the river. Much of the land on this segment is in private ownership. Hunting and hunting clubs are the traditional land use.

Recreational Value: 2

Local people use the river for canoeing and fishing. However, the river moves slowly and log jams are numerous. There are only four boat ramps on this river segment (at SH 7, SH 94, U.S. 59, and Holly Bluff campground).

Geological Values: 1

Some small rocky cliffs are present in one area, but the segment has no other outstanding geological features.

Wildlife Values: 1

Only locally common wildlife species are present.

Botanical and Ecological Values: 3

The unbroken forest cover provides habitat for a diversity of species in a largely undisturbed environment. Many plant species are present because the area is at the transition from shortleaf-oak-hickory uplands in the north to longleaf pine-little bluestem communities on the rocky Catahoula Formation in the south. These upland communities and the extensive riparian forests along both sides of the river include many unusual plant species (Orzell 1991).

Cultural or Historical Values: 3

The campground of Holly Bluff is a historic site is eligible for listing in the NRHP. Some prehistoric sites are thought to exist along the river corridor. A prehistoric site, 41TN27, is located at Holly Bluff campground. Limited testing has revealed artifacts produced during approximately 6,000 years of human occupation. Another site, 41TN26, is located several miles south of Holly Bluff. This exhibits evidence of discrete occupations over a 4,000-year period. Both prehistoric sites could be eligible for listing in the National Register of Historic Places.

Eligibility Determination:

The Neches River (Segment 2) is eligible for designation under the NWSRS Act. It is free-flowing and exhibits outstandingly remarkable scenic, botanical, cultural, and historical values.

Classification Determination:

Because it satisfies the criteria specified in FSH 1909, Chapter 8, this segment of the river qualifies for inclusion in the System as a Recreational River.

Sam Houston National Forest

Henry Lake Branch - 10.5 miles. Proclamation boundary to proclamation boundary.

Henry Lake Branch runs through Henry Lake at the northern end of the segment and merges with Double Lake Branch within the Big Creek Scenic Area to form Big Creek at the south end of the segment. The segment under consideration is located within San Jacinto County and has an average flow rate of 3 cubic feet per second.

The stream can be accessed at FDR 220, FDR 217, and SH 150. Two pipelines intersect Henry Lake Branch.

Values of this river segment are scored as follows:

Scenic Value: 2

The last few miles of the segment flow through the Big Creek Scenic Area and have moderate scenic potential. segment, where it merges with Big Creek. Big Creek Scenic Area is considered an exceptional example of mesic hardwood forest. Except for bridges, there is little development. The bridge at FDR 220 is a low-water bridge, and creates an impoundment.

Recreational Value: 1

In summer, the flow of water is inadequate to support any kind of boating activity. No cutting or log removal is permitted within the Scenic Area, and the impossibility of clearing log jams would make boating very difficult even in the winter months.

Geological Values: 1

The river corridor's geological features are of kinds common in the Forest and region.

Wildlife Values: 1

Only locally common wildlife species are present.

Botanical and Ecological Values: 3

Fragmentation occur only at road and pipeline crossings, and the riparian forest is mostly continuous. Although there is a slight invasion of exotics at road crossings, the slender wake-robin (a sensitive plant) thrives. This area is considered an exceptional example of the Big Thicket environment and was originally designated as a scenic area for that reason.

Cultural or Historical Values: 1

No historic, prehistoric, or culturally significant sites are known to exist along Henry Lake Branch.

Eligibility Determination:

Henry Lake Branch is eligible for designation under the NWSRS Act. It is free-flowing and exhibits some outstandingly remarkable botanical or ecological values.

Classification Determination:

Because it satisfies the criteria in FSH 1909, Chapter 8, this segment of the stream qualifies for inclusion in the System as a Recreational River. Scenic Area designation has protected the character of Henry Lake Branch for many years, but WSR designation would provide protection and opportunities for improved management.

Tarkington Bayou - 10.25 miles. From FDR 221 to proclamation boundary.

The segment of Tarkington Bayou under consideration is approximately 10.25 miles long. Seven miles on one bank is on NFS land. The segment is located entirely within San Jacinto County. Tarkington Bayou has an average flow of 10 cubic feet per second.

There are access points at FDR 221, FM 2666, U.S. Highway 59, and the Lone Star Trail, which also crosses Tarkington Bayou within the segment.

Values of the segment are scored as follows:

Scenic Value: 2

The scenery of Tarkington Bayou is of a kind common in the region.

Recreational Value: 2

In summer, Tarkington Bayou holds too little water to support any boating or canoeing activity. Also, there are no established recreational sites along the segment. However, the Lone Star Trail,

100 miles away. Visitors come from as far away as Houston and the Dallas-Ft. Worth area.

Geological Values: 1

There are no outstanding or remarkable geological features in Tarkington Bayou.

Wildlife Values: 1

Only locally common wildlife species are present.

Botanical and Ecological Values: 1

The river corridor supports a riparian forest community of a type common in the region. There is also some invasion by exotics near road crossings.

Cultural or Historical Values: 1

There are no known historic, prehistoric, or culturally significant sites along the bayou.

Eligibility Determination:

Tarkington Bayou is ineligible for designation under the NWSRS Act because it does not exhibit any outstandingly remarkable scenic, recreational, geological, wildlife, botanical, ecological, cultural, or historical values. For this reason, Tarkington Bayou will not be studied further for designation under the NWSRS Act.

Winters Bayou - 26 miles. FM 1375 to East Fork of San Jacinto River.

The NFS segment of Winters Bayou under consideration is located within Montgomery and San Jacinto Counties. About 5.25 miles of the segment is bordered by USFS land. There are access points at FM 1375, FM 2778, SH 150, FDR 241, and FDR 274. The Lone Star Trail and three pipelines intersect the bayou.

The bayou's average flow rate is 76 cubic feet per second.

Values of the segment are scored as follows:

Scenic Value: 2

A portion of the bayou is adjacent to the Winters Bayou Scenic Area. The hardwood bottomland forest that is present is of a kind common in the region. However, much privately owned land along the bayou has been cleared for agricultural purposes. The bayou has both slow-moving deep pools and faster flowing areas.

Recreational Value: 3

can be łampered by fallen logs. Public use of natural stream corridors is high in this area, and many people use this segment for activities such as hiking, camping, fishing and swimming.

Geological Values: 1

The bayou has many sandbars and a sandy bottom with some rocks. Maximum width of the bayou is about 50 feet.

Wildlife Values: 2

Most of the wildlife species present are common in the forest, but such species as wood duck, bobcat, and American alligators occur along the bayou.

Botanical and Ecological Values: 2

The river corridor contains some individuals of dwarf palmetto (Sabal minor) estimated to be more than 400 years old. Many magnolias of impressive use are present. The TNHP describes this area's vegetation as a degraded bottomland forest. Most of the canopy trees exhibit severe tornado and southern pine beetle damage. The TNHP believes that the area will recover after many years.

Cultural or Historical Values: 1

The bayou contains no known historic, prehistoric, or culturally significant sites.

Eligibility Determination:

Winters Bayou is eligible for designation under the NWSRS Act. It is free-flowing and has outstandingly remarkable recreational value.

Classification Determination:

Because it satisfies the criteria in FSH 1909, Chapter 8, this segment of the stream qualifies for inclusion in the System as a Recreational River.

Summary of River or Stream Segments Eligible for Inclusion in NWSRS

In summary, the Neches River (Segments 1, 2, 3, and 4),the Attoyac River, Henry Lake Branch, and Winters Bayou are eligible for designation under the NWSRS Act. The potential classification for all segments is Recreational River (table 4).

Suitability Study Responsibilities and Protection Pending Legislative Action

The determination of suitability is the final step in the river assessment process. The suitability determination for these river segments is deferred and will be conducted in cooperation with the State, which has jurisdiction over and responsibility for the study and for recommending that Congress designate rivers as WSR's. The Revised Forest Plan will include provisions that will insure that future suitability determinations are not jeopardized. The Forest Plan will also

direction.

The TPWD (the State agency responsible for river management) is not actively studying rivers identified in the Nationwide Rivers Inventory or actively working to identify rivers for Wild and Scenic River designation. A failed bill that would have established a Texas Protected River System clearly stated that no rivers would be identified specifically for National Wild and Scenic River status. There is considerable opposition by private landowners and industry toward Wild and Scenic River designation. Industry has been very concerned about protection that would limit future industrial use of rivers in Texas. Also, private landowners are very concerned about the possibility that the State or Federal Government will tell them what they can do on their rivers. In order for the State to identify or study rivers for Federal designation, the National Park Service and other agencies would have to be involved. However, because there is intense opposition to Federal or State designation of rivers, the Statewide Rivers Study is not a high priority at this time.

The Forest Plan will include protective provisions that will insure the integrity of the eligible river segments. These segments will be monitored for changes or conditions that cause concerns during the life of the Plan (10 to 15 years) or until a suitability study determines whether they should be recommended for inclusion in the WSR system. At the end of the Forest Plan's life, or during the next revision of the Plan, these eligible segments will be reviewed and a decision will again be made on their future protection and management.

EXHIBIT 1

Narrative Summary of River and Stream Segments
Evaluated for Wild and Scenic River Eligibility
by National Forest and Grassland Units

Angelina National Forest

Angelina River Segment 1 - (1.7 miles). Northwest boundary of the forest to the Southern Pacific railroad right-of-way.

Segment 2 - (1.6 miles). Southern Pacific Railroad right-of-way to Sam Rayburn Reservoir.

Segment 3 (McGee Bend) - (4.5 miles). From below the east end of Sam Rayburn Dam along the original river channel to the intersection with the Angelina River diversion channel.

Segment 4 - (0.8 miles). Diversion channel segment from the west end of Sam Rayburn Dam downstream to the intersection with the McGee Bend loop.

Segment 5 - (7.1 miles). From the south end of the diversion channel downstream to the forest boundary.

Attoyac River (6.5 miles). From the forest boundary to Lagroulle Creek at Sam Rayburn Reservoir.

Ayish Bayou (9.5 miles). From the forest boundary south to Sandy Creek and Sam Rayburn Reservoir.

Neches River Segment 3-(44.0 miles). From U.S. Highway 59 to U.S. Highway 69.

Segment 4-(25.0 miles). From U.S. Highway 69 to B.A. Steinhagen Reservoir.

Davy Crockett National Forest

Hickory Creek Segment 1-(0.8 miles). From the forest boundary to Farm-to-Market (FM) 227.

Segment 2-(6.5 miles). FM 227 to Neches River.

Cochino Bayou Segment 1-(4.8 miles). Forest Development Road (FDR) 582 to FDR 511. The portion west of FDR 582 is considered intermittent and is not adjacent to NFS land.

Segment 2 - (3.0 miles). From FDR 511 east to the Neches River.

Piney Creek Segment 1 - (5.3 miles). From FM 358 to State Highway (SH) 94.

Segment 2 - (6.0 miles). From SH 94 south to FM 2262.

Segment 3 - (1.0 miles). From FM 2262 south to proclamation boundary. Portion north of FM 358 is considered intermittent

Caney Creek (3.0 miles). Begins approximately at FDR 522 C and goes to the Forest boundary.

Neches River Segment 1 - (32.0 miles). From SH 21 to SH 7.

Segment 2 - (42.0 miles). From SH 7 to U.S. Highway 59.

Sam Houston National Forest

Henry Lake Branch (10.5 miles). From the forest boundary to the forest boundary. Spring fed branch.

Tarkington Bayou (10.3 miles). From FDR 221 to the forest boundary.

Winters Bayou (26.0 miles). From FM 1375 southeast to the East Fork of the San Jacinto River.

East Fork San Jacinto River Segment 1 - (16.0 miles). From the road crossing at Maple Hill Church southeasterly to SH 150.

Segment 2 - (21.0 miles). From SH 150 southerly to the FS boundary.

Clear Creek (2.5 miles). From SH 150 to East Fork San Jacinto River.

Caney Creek (3.3 miles). From FM 1375 to Lake Conroe.

West Fork San Jacinto River (3.0 miles). From the forest boundary to Lake Conroe.

Harmon Creek (3.0 miles). From U.S. Highway 190 to the State Fish Hatchery.

Sabine National Forest

Big Sandy Creek (6.4 miles). From the forest boundary north and east to Toledo Bend Reservoir.

Sabine River (94.0 miles). From the north forest boundary downstream to the south forest boundary. Entirely impounded by Toledo Bend Reservoir.

LBJ National Grasslands

Pringle Creek (4.0 miles). From the forest boundary to Big Sandy Creek.

Segment 2 - (2.0 miles). From Cottonwood Lake to Denton Creek.

Rush Creek(3.0 miles). From the flood-control structure at the forest boundary to Denton Creek.

Caddo National Grasslands

Red River(0.3 miles). From the forest boundary to the forest boundary.

Coffee Mill Creek(4.0 miles). From the forest boundary to Lake Coffeemill.

Spoonamore Creek(3.0 miles). From Unit 2 on Bois D'Arc Unit to Coffeemill Lake.

Bois D'Arc Segment 1 - (3.8 miles). From the south forest boundary north to the end of the channelized stream bed at approximately the point of intersection of U.S. property and private land near State Road 919.

Segment 2 - (25.0 miles). From State Road 919 or the end of the channelized section to the north forest boundary.

North Sulphur River(6.5 miles). From forest to forest boundary.

Table 1. Rivers and streams considered for eligibility and potential classification

	Length Mi.	NFS land one bank Mi.	NFS land other bank Mi.	Free-flowing	Eli-gible	cla
Angelina NF						
Attoyac River	6.5	3.0	3.5	Yes	Yes	
Ayish Bayou	9.5	1.0	2.5	Yes	No	
Angelina River (McGee Bend) 4.5	4.0	0.0	No	No	None	
Neches River, Segment 3	44.0	0.4	0.0	Yes	Yes	
Neches River, Segment 4	25.0	8.8	0.0	Yes	Yes	
Davy Crockett NF						
Cochino Bayou	4.8	0.3	3.0	Yes	No	
Neches River, Segment 1	32.0	9.7	0.0	Yes	Yes	
Neches River, Segment 2	42.0	5.7	0.0	Yes	Yes	
Sam Houston NF						
Henry Lake Branch	10.5	0.0	5.0	Yes	Yes	
Tarkington Bayou	10.3	0.0	7.0	Yes	No	
Winters Bayou	26.0	2.3	3.0	Yes	Yes	

*Recreational

Table 2. Rivers/Streams Originally Considered

	Length Studies* Mi.	NFS land one evalu-bank Mi.	NFS land other bank Mi.	Free-flowing	
Angelina NF					
Angelina River, Seg. 1	1.7 AR,TPW	1.7	0.0	Yes	
Angelina River, Seg. 2	1.6 AR,TPW	1.0	0.6	No	
Angelina River, Seg. 3 (McGee Bend)	4.5 AR, TNH, TPW	4.0	0.0	No	
Angelina River, Seg. 4	0.8 AR,TPW	0.0	0.0	No	
Angelina River, Seg. 5	7.1 AR,TPW	1.9	0.0	Yes	
Attoyac River	6.5	3.0	3.5	Yes	Y
Ayish Bayou	9.5	1.0	2.5	Yes	Y
Neches River, Seg. 1 (3)	44.0 NRI,AR, TPW	0.4 Yes	0.0	Yes	
Neches River, Seg. 2 (4)	25.0 NRI,AR, TNH,TPW	8.8 Yes	0.0	Yes	
Davy Crockett NF					
Hickory Creek, Seg. 1	0.8	0.8	0.0	Yes	
Hickory Creek, Seg. 2	6.5	0.8	0.0	Yes	
Cochino Bayou, Seg. 1	4.8	0.3	3.0	Yes	Y
Cochino Bayou, Seg. 2	3.0	0.0	0.0	Yes	
Piney Creek, Seg. 1	5.3	0.0	2.0	Yes	
Piney Creek, Seg. 2	6.0	0.0	5.0	Yes	
Piney Creek, Seg. 3	1.0	0.0	1.0	Yes	
Caney Creek	5.3	0.0	2.0	Yes	
Neches River, Seg. 1 (1)	32.0 NRI,AR, TPW	9.7 Yes	0.0	Yes	
Neches River, Seg. 2 (2)	42.0 NRI,AR, TPW	5.7 Yes	0.0	Yes	

Henry Lake Branch	10.5	0.0	5.0	Yes	Y
Tarkington Branch	10.3	0.0	7.0	Yes	Y
Winters Bayou	26.0	2.3	3.0	Yes	Y
East Fork San Jacinto, Seg. 1 16.0 0.0	0.8	Yes			
East Fork San Jacinto, Seg. 2 21.0 3.0	4.0	Yes			
Clear Creek	2.5	0.0	1.8	Yes	
Caney Creek	3.3	0.0	3.0	Yes	
West Fork San Jacinto	3.0	0.5	2.2	Yes	
Harmon Creek	3.0	0.0	2.8	Yes	
Sabine NF					
Big Sandy Creek	6.4	2.7	4.8	Yes	
Sabine River	94.0	0.0	0.0	No	
	AR,TPW				
LBJ NG					
Pringle Creek	4.0	0.3	0.5	Yes	
Cottonwood Creek, Seg. 1	3.5	0.0	2.0	Yes	
Cottonwood Creek, Seg. 2	2.0	0.0	0.2	Yes	
Rush Creek	3.0	0.0	2.8	Yes	
Caddo NG					
Red River	0.3	0.3	0.0	Yes	
Coffee Mill Creek	4.0	0.0	2.0	Yes	
Spoonamore Creek	3.0	0.0	0.8	Yes	
Bois D'Arc Creek, Seg. 1	3.8	0.0	2.1	No	
Bois D'Arc Creek, Seg. 2	25.0	0.0	6.6	Yes	
North Sulphur River	6.5	0.3	0.0	No	

* Studies on which NRI selection was based

Table 3. Eligibility criteria value ratings for selected segments

	Scenic	Recrea-tional	Geo-logical	Wild-life	Botanical or eco-logical	Cultural or historical
Angelina NF						
Attoyac River	2	3	1	2	2	
Ayish Bayou	2	2	1	1	1	
Angelina River (McGee Bend) 2	1	1	1	2	1	
Neches River, Segment 3	2	3	1	2	1	
Neches River, Segment 4	3	3	2	2	2	
Davy Crockett NF						
Cochino Bayou	2	2	1	1	1	
Neches River, Segment 1	2	2	2	1	2	
Neches River, Segment 2	3	2	1	1	3	
Sam Houston NF						
Henry Lake Branch	2	2	1	1	3	
Tarkington Bayou	2	2	1	1	1	
Winters Bayou	2	3	1	2	2	

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Texas Parks and Wildlife Dept. 1971b. A Report on the Physical Characteristics of Rivers, Streams, and Bayous of Texas. XX pp.

Texas Parks and Wildlife Dept. 1973. Texas Waterway: A Feasibility Report on a System of Wild, Scenic and Recreational Waterways in Texas. 64 pp.

Texas.

Appendix F

Management Indicators

Introduction

Management indicator species (MIS) have been used by the USFS since initial implementation of the 1976 National Forest Management Act (NFMA). These MIS have been used to assess the effects of management on habitats and ecosystems. Recent changes have been directed in the USFS manual to change the term from "management indicator species", so that ecological communities, as well as species, can be used as indicators of forest health. The new terminology is now management indicators (MI).

Background

The 1987 Forest Plan identified nine MIS. These nine species by grouping are summarized as follows:

DEMAND SPECIES - Species that are commonly hunted, included: (1) white-tailed deer; (2) eastern wild turkey; (3) bobwhite quail; (4) gray squirrel; and (5) fox squirrel.

HABITAT SPECIFIC SPECIES - Species that reflected a habitat or successional stage of the forest included: (1) yellow breasted chat (early successional stages); (2) eastern bluebird (early successional stages); (3) Red-cockaded Woodpecker (mature upland pine forest); and (4) pileated woodpecker (mature forests).

ENDANGERED OR THREATENED SPECIES - Species listed by the USFWS as endangered or threatened. In the 1987 Plan only the red-cockaded woodpecker or RCW was identified in this category.

These MIS became an issue during litigation and continued during scoping for 1987 Plan revision process. Major points of the MIS issue involved concerns that selected MIS were too general or difficult to monitor. Monitoring and evaluation of the 1987 Plan also indicated that better definition of the monitoring direction for selected MIS was needed. The MIS paper within the NFGT AMS document (1992) proposed a complete review of the MIS selection process and perhaps add to the existing list to ensure all communities and recently identified endangered or threatened species were fully considered.

Since the 1987 Plan, direct population monitoring has been limited to endangered and threatened species and major game species, through cooperation with the Texas Parks and Wildlife Department. Models have been developed for some management indicators to evaluate habitat on certain areas of the forest; but these track capability rather than presence.

Management Indicator Development and Selection Process Summary

The USFS planning regulations clearly state the planning objective as it pertains to Fish and Wildlife resources. The current version planning regulations pertaining to Fish and Wildlife resources and direction for management indicators is found in the July 1, 1988 Code of Federal Regulations 36 CFR 219.19. The summary of this information can be found in Exhibit A. In brief these regulations state:

219.19 Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area....

(**a) and establish objectives for the maintenance and improvement of habitat of management indicator species....**

219.20(1) [Management indicator species],... vertebrate and/or invertebrate on the area, shall be identified for planning because they are believed to indicate the effects of management activities....and the reasons for their selection will be stated....

219.20(7) Critical habitat for threatened and endangered species will be identified, and measures will be prescribed to prevent the destruction or adverse modification of such habitat.....

In previous guidance, it is important to note that the emphasis was placed on key wildlife species, primarily game, T&E, or recreational oriented species. The current Federal Regulations 36 CFR 219.20 (1) further require that wildlife species being considered as Management Indicator Species (MIS) consider the following groupings:

a. Endangered and threatened plant and animal species identified on State and Federal lists...

b. Species with special habitat needs that may be influenced significantly by planned management programs; Species commonly hunted, fished for, or trapped.

c. Non-game species of special interest.

d. Additional plant or animal species whose population changes could indicate effects of forest management activities on other species of selected major biological communities or on water quality.

Federal Register Regulations also require that:

219.20 (6) Population trends of the management indicator species will be monitored and the relationships to habitat changes determined.

With only minor changes the current planning regulations pertaining to Management Indicator Species have changed very little since the approval of the 1987 NFGT Plan.

Proposed Changes to the Planning Regulations to Consider

The Federal Register proposed rules 6525, published on February 15, 1991 had specific changes that addressed the consideration, selection, management, and monitoring of Management Indicator Species. Much of this language can be reviewed in detail in Exhibit E of this document.

The two main points of this proposed regulation change that concern Management Indicator Species are reflected as:

(1) The change does not portray management indicators as ecological indicators;

(2) Expands management indicators to include biological communities and special habitats -- NOT JUST INDIVIDUAL SPECIES.

The major considerations different from the previous 36 CFR 219.20 (1) regulations are as follows:

Threatened and Endangered only appear to reflect federally endangered species.

Maintenance of viable populations and ensuring the conservation of sensitive species would require an assessment of potential impacts only for those species designated by the Forest Plan and occurring on the Regional Forester's Sensitive Species list. Not all other species whose long term persistence is not perceived to be at risk.

Protection of rare or unique biological communities would recognize communities and not just individual species.

Provide Habitat Capability for selected population levels of species whose viability is not at particular risk.

Identification and monitoring of Management Indicators--essential to the previous four points--requires monitoring "relative to the goals, objectives, standards and guidelines established in the Forest Plan." The key is to flexibility of what and how it is monitored. This means population numbers or habitat conditions could be monitored---This allows the SPECIES or the COMMUNITY to be monitored.

The overall thrust of the planning regulation change in reference to management indicators indicates the need to look at the entire community and ecosystem response to management practices. The importance of this change is so significant that the Forest Service Manual (FSM 2600) has been amended as of July, 1991 to reflect these needed changes for the management indicators in the planning process.

Forest Service Manual Regulations for Management Indicators

The current FSM direction for Management Indicators was amended on July 19, 1991. The new direction reflects the changes that were identified in the proposed planning regulation changes the previous February. FSM 2621 pertaining to the definition, selection, conservation strategies, habitat capability analysis, standards, guidelines, objectives, monitoring, and evaluation can be found in it's entirety in Exhibit C of this document. The following guidance pertaining to the selection process is as follows:

2621.1 Selection of Management Indicators.

Select management indicators for a forest plan or project that best represent the issues, concerns, and opportunities to support recovery of Federally-listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses. Management indicators representing overall objectives for wildlife, fish, and plants may include species, groups of species with similar habitat relationships, or habitats that are of high concern.

In selecting management indicators, meet the following requirements:

1. Involve State wildlife and fish agencies, other Federal agencies, and appropriate experts from universities and private organizations.

2. Select Federally-listed endangered or threatened species as management indicators if the forest or project plan potentially impacts those species, or if opportunities exist to enhance recovery efforts. Consider for selection all sensitive species in the plan or project area (FSM 2672). Also, consider for selection those species in demand for recreational, commercial, or subsistence use; and indicators representing special habitats, habitat components, or plant and animal communities.

3. Select ecological indicators (species or groups) only if scientific evidence exists confirming that measurable changes in these species or groups would indicate trends in the abundance of other species or conditions of biological communities they are selected to represent.

4. Document, in the permanent planning records for a forest plan or project-level plan, the rationale, assumptions, and procedures used in selecting management indicators.

5. Document, within the forest or project plan, how management indicators collectively address issues, concerns, and opportunities for meeting overall wildlife and fish, including endangered, threatened, and sensitive species goals for the plan or project area.

Since 1987, many more PETS species exist on the NFGT. The many vertebrate species considered in the 1987 Forest Plan will have to be reconsidered, as well as the additional plant and animal species that occur on the Regional Forester's Sensitive Species list. A summary of the mammal, bird, reptile, amphibian, and fish species considered in the 1987 Forest Plan is in Exhibit D.

Selection Process for 1994 Plan Revision

To ensure all major forest habitats and associated species were considered in this process, a thorough review and selection methodology was directed. Species as well as assemblages were considered as potential management indicators. In order to fully validate the MI review and selection process, an additional review of available habitats and conditions was developed. This development of habitat criteria utilized and paralleled the developing USFS Ecological Classification System (Plan Appendix A) and Plant Community Characterization (EIS Appendix H).

From the ECS and plant community information it was determined that the NFGT was composed of five old-growth forest and wildlife habitat types or working groups identified as : (1) Xeric and Dry-Mesic Oak Pine Forests; (2) Upland Longleaf Pine Forests; (3) River Flood Plains, Streamsides, and Bottomland Hardwood Forests; (4) Mesic Hardwood Forest (Beech-Magnolia); and (5) Bay Forest (Plan Appendix I). The Upland Longleaf Forest group can be subdivided into 3 subcommunities: (2a) Beech-Magnolia; (2b) Bay Forest; and (2c) Oak Barrens (EIS Appendix - H).

viable populations of existing native and desired non-native vertebrate species in the planning area." The National Forest Management Act further requires each Forest to identify management indicator species (MIS) through the planning process and to establish objectives to maintain and improve the habitats of these indicator species.

Step 1

The first step in the MI selection process was to develop a long list of plant and animal species and their habitat associations that occur on the NFGT. This step ensured no species, group,

assemblage, or guild was left out of the decision process. A group of USFS specialists was formed to develop this long list of species and communities. The list development included the review of all vertebrate, invertebrate, vascular and non-vascular plant species (both terrestrial and aquatic) that could potentially occur on the NFGT. This review included published literature, contacts with many natural resource professionals, and USFS records. The following references were the basis for this development:

Reference Material for Long List

1) Chaney, A.H., 1982. Key to the Vertebrates of Texas. Caesar Kleberg Institute, Texas A&I University, Kingsville, Texas.
Listed 139 mammals, 202 reptiles, 67 amphibians, and 173 freshwater fish.

2) Dixon, J.R., 1987. Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas.
Listed 204 species (283 Taxa, sub-species, etc.).

3) Hamel, P.B., 1992. Land Manager's Guide to the Birds of the South. The Nature Conservancy and USFS, TNC, Chapel Hill, North Carolina.

4) Hatch, S.L., N.G. Kancheepuram, and L.E. Brown, 1990. Checklist of the Vascular Plants of Texas. Texas Agricultural Experimental Station, Texas A&M University, College Station, Texas.
Listed 4,834 species of vascular plants.

5) Hubbs, C., R.J. Edwards, and G.P. Garrett, 1991. An Annotated Checklist of the Freshwater Fishes of Texas, The Keys to Identification of Species. Texas Journal of Science, Suppl. Vol 43, #4.
Listed 247 species of Freshwater Fish.

6) Neck, R.W., 1984. Restricted and Declining Nonmarine Molluscs of Texas. Technical Series #34, Texas Parks and Wildlife, Austin, Texas.

7) Nixon, E.S. and J.G. Kell, 1991. Ferns and Herbaceous Flowering Plants of East Texas. In Draft Stephen F. Austin University, Nacogdoches, Texas.
Listed 34 non-flowering, 640 monocots, 1195 dicots, and 346 woody species.

8) Schmidley, D.J., 1983. Texas Mammals East of the Balcones Fault Zone. Texas A&M University Press, College Station, Texas.
Listed 162 species (139 of which are Terrestrial).

9) Sciscenti, J.V., 1975. Environmental/Cultural Resources Within the Trinity River Basin. U.S. Army Corps of Engineers, Fort Worth, Texas.
Listed over 1000 Invertebrates.

10) Williams, J.D., M.L. Warren, K.S. Cummings, J.L. Harris, and R.J. Neves, 1992. Conservation Statues of Freshwater Mussels of the U.S. and Canada. Fisheries Vol 18, #9.

The long list is a compendium of information from these documents and is contained in the process records files of the NFGT MI working group. This long list and the information and literature on which it was derived was the basis for further refinement of the MI process.

The long list was further scrutinized to determine viability concerns for species occurring or potentially occurring on NFGT. From the long list 139 species and 9 plant communities were identified as a viability concern. These species and communities are found in Plan Appendix D. This viability concern indicates that the range or population status of these species or communities could be at risk; and that closer scrutiny of management oriented alternatives of the NFGT Plan revision should be considered. The other species and communities, as reviewed, are not considered dependent on NFGT lands for population viability.

Step 2

The long list and the list of 139 species and 9 communities was then compared to the original list of animal species that was developed for the 1987 Plan. Since the 1987 Plan MIS process did not identify plant species, this area of the review process received added scrutiny. The long list of species was then reduced by the USFS group to a listing of species that were: A) directly known to occur on the NFGT; B) species which where appeared to be viability concerns; C) species that could potentially occur on the NFGT; and D) those that would be affected directly or indirectly by management actions of the NFGT.

These lists were submitted to biologists, botanists, ecologists, and other scientists to identify any errors, omissions, or recommendations. Several working group meetings were held in 1992 and 1993 to review and discuss these species and plant community lists. One recommendation that was virtually unanimous, directed the cross-referencing of species that were habitat or community specific. It was decided to use the USFS R8 Plant Community Characterization to standardize terminology (EIS Appendix I) and utilize the developing ECS (Plan Appendix A) descriptions to identify range - habitat relationships.

The fauna and flora that occur within communities of the National Forest and Grasslands of Texas can be classified into two general groups: (1) habitat generalist, and (2)habitat specialist. The habitat specialist because of their specific habitat requirements are good indicators of effects of management activities. A species list of native habitat specialists was generated with the rationale that habitat specialist are most likely to be affected by management activities occurring on the National Forests in Texas.

Step 3

In addition to the nine MIS species identified in the 1987 Plan, a new list was generated to supplement these species. The list is composed of several Federally listed species, Regional

will indicate the degree to which fauna and flora goals are being met and whether or not adjustment of the Forest Plan is necessary.

Altogether 57 species, communities, or habitat conditions have been selected as MI to represent the habitat needs for the fauna and flora present on the National Forests and Grasslands of Texas (Exhibit E). The MI are considered representative of other species with similar habitat requirements for life and reproduction. By managing for viable populations of MI and their associated habitat, viability risks for other species found in the same habitat are reduced.

These species by habitat groups as follows were selected as MIS for the NFGT. The selection of these species used the following criteria:

1. Species is included in the Federal, State or Regional list. A neo-tropical bird (identified as easily monitored and an ecological indicator).

2. Species with special habitat needs that may be influenced significantly by planned management programs.

3. Species whose population changes are believed to indicate effects of management activities on other species of a major biological community or on water quality.

4. Represent a particular component of an ecosystem or special habitat in short supply.

5. Are sensitive to changes in their habitat.

6. React to change in a manner that is easily detectable and measurable.

The list contains species and groups of species that can indicate either habitat or ecological conditions or both. In some cases, the difference is the level or scale of measurement. The affected environments selected represent those components of the environments that are critical to an ecosystem, those in short supply, or those that are highly susceptible to change when management is applied. Six species are listed because of public demands huntable wildlife. These species supply the measurement for commodity wildlife that is to be maintained.

Step 4

Between the DEIS and Plan, coordination between NFGT personnel, USFS research personnel, Texas Parks and Wildlife biologists and U.S. Fish and Wildlife Service biologists identified refinements in the Management Indicator Species and Communities list that was proposed in the DEIS. Additional comments from the public were also incorporated, discussed and infused into the MIS review & list during this process. Some of the comments received and discussion points included the following:

<u>The number of MIS and monitoring effort is too ambitious.</u>

Use of species specific MI's appears to go against EM.

MIS should emphasize habitat monitoring NOT species.

frequently burned longleaf pine.

Develop clearer direction for snag development by seral stage and forest type; existing direction is arbitrary.

These issues were all incorporated into the final MIS table that will be utilized by the NFGT. As monitoring of these species, habitats and procedures develops during Plan implementation, revisions of the MIS table may be needed. Any MIS revision will be fully documented in the annual Monitoring and Evaluation process and Plan amendments proposed as needed.

EXHIBIT A

USFS Planning Regulations (1988) for MI's

USFS PLANNING REGULATIONS 36 CFR 219.19 FISH AND WILDLIFE

**** 219.19 Fish and wildlife resource.**

Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.

(a) Each alternative shall establish objectives for the maintenance and improvement of habitat for management indicator species selected under paragraph (g)(1) of this section, to the degree consistent with overall multiple use objectives of the alternative. To meet this goal, management planning for the fish and wildlife resource shall meet the requirements set forth in paragraphs (a)(1) through (a)(7) of this section.

**** 219.20**

(1) In order to estimate the effects of each alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities. In the selection of management indicator species, the following categories shall be represented where appropriate:

Endangered and threatened plant and animal species identified on State and Federal lists for the planning area;

Species with special habitat needs that may be influenced significantly by planned management programs species commonly hunted, fished, or trapped;

Additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality.

On the basis of available scientific information, the interdisciplinary team shall estimate the effects of changes in vegetation type, timber age classes, community composition, rotation age, and yearlong suitability of habitat related to mobility of management indicator species. Where appropriate, measures to mitigate adverse effects shall be prescribed.

(2) Planning alternatives shall be stated and evaluated in terms of both amount and quality of habitat and of animal population trends of the management indicator species.

(3) Biologists from State fish and wildlife agencies and other Federal agencies shall be consulted in order to coordinate planning for fish and wildlife, including opportunities for the reintroduction of extirpated species.

(4) Access and dispersal problems of hunting, fishing, and other visitor uses shall be considered.

(5) The effects of pest and fire management on fish and wildlife populations shall be considered.

(6) Population trends of the management indicator species will be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with State fish and wildlife agencies, to the extent practicable.

(7) Habitat determined to be critical for threatened and endangered species shall be identified, and measures shall be prescribed to prevent the destruction or adverse modification of such habitat. Objectives shall be determined for threatened and endangered species that shall provide for, where possible, their removal from listing as threatened and endangered species through appropriate conservation measures, including the designation of special areas to meet the protection and management needs of such species.

EXHIBIT B

Proposed Planning Regulations for MI's

Federal Register/Vol. 56, No. 32/Friday, February 15, 1991/Proposed Rules 6525

Section 219.40 Integrated resource management.

This section would contain specific requirements for resource management. The provisions of this section are responsive to requirements of NFMA and do not attempt to encompass all of the laws, regulations, and Executive orders under which National Forests are managed. Integration of all such requirements would be beyond the reasonable scope of any one regulation and are unnecessary to repeat since compliance is already mandatory.

In contrast to the existing regulation which contained individual sections for each resource, all resource direction is integrated into one section. This in part is intended to reaffirm a strong

planning. Although such a restructuring is somewhat symbolic in nature, it represents an endorsement of these fundamental concepts and their important role in forest planning.

The opening paragraph would describe the purpose of this section as providing for an integrated, ecosystem approach to management and ensuring environmental protection and maintenance of the long-term productivity of the land. Paragraph (a) would direct that plans provide for integrated management and coordination of all resource uses and values on a multiple-use sustained-yield basis. It would provide a listing of various uses and values to be considered, in addition to providing for various support needs such as development and maintenance of infrastructure and land ownership.

These two paragraphs would establish the foundation for a fully integrated forest plan which provides direction for all resource uses and values. These provisions, in conjunction with the requirements of *219.33(a), would assure that plans will address all resource uses and values through establishment of forest-wide multiple use goals and objectives, forest-wide standards and guidelines, and management area prescriptions. As a result forest plans would describe how all resources will be managed to achieve a desired future condition of the forest in addition to establishing standards and guidelines for environmental protection to assure the long-term productivity and sustainability of resources while the goals and objectives are being achieved.

In contrast to the existing regulation, this section does not define goals and objectives for specific resources nor prescribe requirements for how each resource will be evaluated during revision or amendment. Although direction of this nature may have been appropriate for guiding

development of initial forest plans, it is not as relevant when revision is "need for change" based rather than a "zero" based effort. Any adjustments needed to the goals and objectives of a forest plan would be evident through monitoring and evaluation and included when identifying the "need to change" a forest plan as part of the revision process (**219.36(c)(1)). Similarly, the type and degree of analysis needed for evaluating each resource will vary depending on what aspects of the forest plan have been identified as needing change.

Where analytical guidance is appropriate for various resource evaluations, appropriate directives will be issued in the Forest Service directives system.

Paragraph (b) describes how the diversity provision of NFMA (Sec.6(g)(3)(B)) will be achieved. This paragraph provides for diversity by defining four key resource requirements; conservation of threatened and endangered species, maintenance of viable populations by identifying and ensuring the conservation of sensitive species, protection of rare or unique biological communities, and providing the habitat capability to support populations of species at selected levels for commercial, recreational, scientific, subsistence, or aesthetic values. A fifth procedural provision supports these four resource requirements by requiring that management indicators be selected and monitored. Management indicators would include species or communities reflective of the four associated resource requirements.

*The first requirement, conservation of threatened or endangered species, based on provisions of the Endangered Species Act of 1973.

*The second requirement, maintenance of viable populations by identifying and ensuring the conservation of sensitive species, would require an assessment of potential impacts to species viability only for sensitive species. This is intended to focus viability evaluations

term persistence is not perceived to be at risk. Sensitive species would be designated in the forest plan by the Regional Forester for each forest planning area.

*The third requirement, protection of rare or unique biological communities, would recognize that diversity is reflected by communities and not just individual species.

*The fourth requirement, providing habitat capability for selected population levels of various species, is designed so that the forest plan determines the desired population levels of those species whose viability is not at particular risk. This determination would occur within the context of forest-wide multiple-use goals and objectives.

*The fifth requirement, identification and monitoring of management indicators, is an essential procedural provision in support of the previous four resource requirements. By requiring monitoring of management indicators, there is a systematic means of assessing the achievement of the four resource requirements. By requiring monitoring "relative to the goals, objectives, and standards and guidelines established in the forest plan", flexibility is provided as to what is being monitored and how it is monitored. Depending upon how the goals, objectives, and standards and guidelines in the forest plan are described, either population numbers or habitat conditions could be monitored. This is intended to allow monitoring requirements to be suited to the nature of the species or community in question.

The concept of management indicators in this paragraph varies from the concept of management indicator species as described in the existing regulation (**219.19(a)(1)). First, this section does not portray management indicators to be ecological indicators. The concept of ecological indicators assumes that changes to an individual species provides a valid reflection of changes to

the welfare of a group of associated species. As evidenced by the "Keystone Report" ("Biological Diversity on Federal Lands--Report of a Keystone Policy Dialogue") and as discussed in a report of the Critique of Land Management Planning, "National Forest Planning Under RPA/NFMA: What Needs Fixing?" (Volume 11, p.33-35), there is diminishing scientific support for this concept. Secondly, this paragraph expands management indicators to include biological communities and special habitats rather than being limited to only individual species. This recognizes the important role of biological communities in providing diversity and the ecological contributions of various structural elements within those communities.

EXHIBIT C

FSM 2621 Regulations

2620.5 Definitions.

1. Management Indicators. Plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent.

range of ecological tolerance. Such indicators are selected for emphasis and monitored during forest plan implementation because their presence and relative abundance serve as a barometer of ecological conditions within a management unit.

2621 MANAGEMENT INDICATORS

2621.1 Selection of Management Indicators.

Select management indicators for a forest plan or project that best represent the issues, concerns, and opportunities to support recovery of Federally-listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses. Management indicators representing overall objectives for wildlife, fish, and plants may include species, groups of species with similar habitat relationships, or habitats that are of high concern.

In selecting management indicators, meet the following requirements:

1. Involve State wildlife and fish agencies, other Federal agencies, and appropriate experts from universities and private organizations.

2. Select Federally-listed endangered or threatened species as management indicators if the forest or project plan potentially impacts those species, or if opportunities exist to enhance recovery efforts. Consider for selection all sensitive species in the plan or project area (FSM 2672). Also, consider for selection those species in demand for recreational, commercial, or subsistence use; and indicators representing special habitats, habitat components, or plant and animal communities.

3. Select ecological indicators (species or groups) only if scientific evidence exists confirming that measurable changes in these species or groups would indicate trends in the abundance of other species or conditions of biological communities they are selected to represent.

4. Document, in the permanent planning records for a forest plan or project-level plan, the rationale, assumptions, and procedures used in selecting management indicators.

5. Document, within the forest or project plan, how management indicators collectively address issues, concerns, and opportunities for meeting overall wildlife and fish, including endangered, threatened, and sensitive species goals for the plan or project area.

2621.2 Determination of Conservation Strategies.

To preclude trends toward endangerment that would result in the need for Federal listing, units must develop conservation strategies for those sensitive species whose continued existence may be negatively affected by the forest plan or a proposed project. To devise conservation strategies, first conduct biological assessments of identified sensitive species. In each assessment, meet these requirements:

1. Base the assessment on the current geographic range of the species and the area affected by the plan or project. If the entire range of the species is contained within the plan or project area, limit the area of analysis to the immediate plan or project area. If the geographic range of the species is beyond the plan or project area, expand the area of analysis accordingly.

2. Identify and consider, as appropriate for the species and area, factors that may affect the continued downward trend of the population, including such factors as: distribution of habitats, genetics, demographics, habitat fragmentation, and risk associated with catastrophic events.

3. Display findings under the various management alternatives considered in the plan or project (including the no-action alternative).

Biological assessments may also be needed for endangered or threatened species for which recovery plans are not available. See FSM 2670 for direction on biological assessments for endangered and threatened species.

2621.3 Analysis of Habitat Capability.

In analyzing proposed actions, conduct habitat analyses to determine the cumulative effects of each alternative on management indicators selected in the plan or project area. Follow these guidelines for the analyses:

1. Define analysis areas of sufficient size to allow adequate evaluation of the cumulative effects on management indicators.

2. Use models, coefficients, and other components of the Wildlife and Fish Habitat Relationships System (FSM 2603, para. 6) to quantify conditions, trends, and responses of management indicators to each management alternative being considered, and the desired future condition.

3. Include in the analysis all management activities proposed for the current planning period, their interactions and collective effects on the distribution and abundance of habitat in space and time, on vegetation succession, and on natural disturbance regimes.

2621.4 Determination of Standards, Guidelines, and Objectives.

The forest plan must identify habitat components required by management indicators; determine goals and objectives for management indicators; specify standards, guidelines, and prescriptions needed to meet management requirements, goals, and objectives for management indicators. Prescribe mitigation measures, as appropriate, to ensure that requirements, goals, and objectives for each management indicator will be sufficiently met during plan implementation at the project level.

2621.5 Monitoring and Evaluation of Management Indicators.

Conduct monitoring of plans and projects to determine whether standards, guidelines, and management prescriptions for management indicators are being met and are effective in achieving expected results. Use monitoring and evaluation to guide adjustments in management and to revise or refine habitat relationships information and analysis tools used in planning. Follow direction in FSM 1922.7 and FSH 1909.12, chapter 6, in conducting monitoring and evaluation of management indicators.

Involve Research Stations, universities, and other research entities in monitoring to ensure that appropriate sampling methods are employed and statistically valid results are obtained.

2622 BIOLOGICAL DIVERSITY REQUIREMENTS.

2622.0 Authority.

In the USDA Decision of Review of Administrative Appeals of the Beaverhead National Forest Land and Resource Management Plan of August 17, 1989, the Office of the Secretary interpreted the requirements of 36 CFR 219.19 and DR 9500-4 (sec. 2620.1) to require that plans should identify or be amended to identify known sensitive species and provide forest standards and guidelines that ensure conservation when an activity or project is proposed that would affect the habitat of a sensitive species. A forest plan must address biological diversity through consideration of the distribution and abundance of plant and animal species, and communities to meet overall multiple-use objectives.

1. Management direction in a forest plan shall contribute to the recovery of Federally listed threatened or endangered species (Endangered Species Act, 36 CFR 219.19).

2. Management of habitat provides for the maintenance of viable populations of existing native and desired non-native, wildlife, fish (36 CFR 219.19), and plant species (USDA Regulation 9500-4) generally well distributed throughout their current geographic range (sec. 2620.01).

3. Management of those plant and animal communities identified in Regional Guides or Forest Plans as issues that warrant special measures achieves overall multiple-use objectives (36 CFR 219.8, 219.12(b), 219.27).

4. Management direction in a forest plan shall include objectives for selected management indicators (36 CFR 219.19). Specify the following for plant and animal species, communities, and/or special habitats identified as major Forest Plan issues or as management indicators in the plan:

a. Standards and guidelines for protection, viability, recovery, or restoration as appropriate to meet overall multiple-use objectives (36 CFR 219.27);

b. The expected future conditions in terms of distribution and abundance of populations or habitats to meet overall multiple-use objectives (36 CFR 219.11; 219.26);

c. The schedule for monitoring and evaluation of standards, guidelines, and objectives for plant and animal species, communities (36 CFR 219.27); and

d. The discussion of any proposed type conversions. If any conversion results in a reduction in diversity, explanation must be provided as to why the conversion is necessary to achieve multiple use objectives (36 CFR 219.27).

2623 QUANTIFYING OUTPUTS AND VALUES.

In all forest plans and project level plans, express habitat objectives, outputs, and effects in quantitative terms using the following data elements:

and cumulative effects. Report habitat capability as the net change in potential numbers of animals (or biomass of fish) that can be supported within the area of evaluation.

2. Acres and Structures. Express planned or completed habitat improvements as the number of acres treated or structures installed. Accompany these reports with the outputs (changes in habitat capability for the management indicators) expected to result from the improvements.

3. Recovery Tasks. Establish objectives and report accomplishments for endangered or threatened species as the Forest Service share of recovery tasks achieved pursuant to species recovery plans in coordination with the States and the U.S. Fish and Wildlife Service (FSM 2671.1 and 2671.4) or in accordance with Forest Service conservation strategies.

4. Economic Value. Conduct economic analyses in compliance with guidelines in FSM 1970 and FSH 1909.17 (Economic and Social Analysis Handbook). For projects producing recreational outputs (user days), value these outputs based on prices established in Appendix E of the 1990 Renewable Resource Program (RPA). For proposals producing outputs of commercial value, such as anadromous fish, use market-clearing prices established in the 1990 RPA Program or local dockside values adjusted according to the methods in Appendix E of the 1990 Program.

2624 SIKES ACT PLANNING.

2624.01 Authority.

The Sikes Act as amended (74 Stat. 1052; 88 Stat. 1369) 16 U.S.C. 670g) requires that the Secretaries of Agriculture, Defense and the Interior develop comprehensive plans for management and improvement of wildlife, fish, and threatened and endangered species habitat on lands under their control in cooperation with State wildlife and fisheries agencies.

2624.1 Integration With Forest Planning.

Meet requirements of the Sikes Act through the Forest planning process. Coordinate management and improvement of wildlife, fish, and endangered and threatened species habitat through implementation of Forest plans. Implement Sikes Act schedules as 5-year operating plans for accomplishing wildlife and fisheries goals identified in Forest plans. Link these operating plans with the program planning and budgeting process. Ensure Sikes Act agreements are consistent with Forest plans.

2625 INVENTORY AND DATA MANAGEMENT.

Avoid collecting unnecessary information. Be sure that collection, storage, or manipulation of data on wildlife, fish, and their habitats is needed to meet specific information needs and objectives. To the extent possible, obtain and manage information as follows to achieve integration with existing systems and to prevent collection and storage of non-essential data:

1. Identify the specific data items required to support habitat evaluations for management indicators within the plan or project area. Obtain these data from existing sources such as vegetation inventories, timber or soil surveys, or integrated resource databases. Collect additional field data if required items are not available or if field verification of existing data is needed.

or to meet legal requirements for endangered and threatened species in plans and projects. Seek data first from existing sources such as State Heritage Databases or records of the U.S. Fish and Wildlife Service or State wildlife and fish agencies. Conduct field surveys as necessary to verify **or** supplement available information.

3. Coordinate collection of all of new data with Forest, Regional, and National information management programs (FSM 1390) including the Wildlife and Fish Habitat Relationships System (FS-2600-WLF).

4. Ensure that data acquisition and management occur in coordination with the Service-wide integrated data environment standards and implementation of geographic information systems (FSM 1390).

5. Retain resource data, surveys, and inventories until superseded by new information on the same area.

EXHIBIT D

Species and Communities of the NFGT

MAMMALS

The mammals of the National Forests and Grasslands are identified and discussed separately.

Mammals of the Forest

Some 161 species of mammals have been recorded in Texas (Davis 1978); of these, six are introduced and have become established in the wild. Four species are classified as extirpated, including the bison, gray wolf, grizzly bear, and the red wolf. The extirpated red wolf's range recently included the pineywoods of East Texas. Another large mammal, the Louisiana black bear, has not been a resident of east Texas for many years; however recently reports of black bear have been documented. Eighteen of the species recorded in Texas are marine species found in the coastal waters of the state. Of the remaining 132 species, 90 are considered not to be endemic to the pineywoods or are not dependent on forested habitats.

42 Forty-two mammalian species are found on the planning area and are dependent on forested habitats.

A species habitat matrix was constructed for these 42 species from information contained in The Mammals of Texas (Davis 1973).

Mammals of the Grasslands

Of the l6l species of mammals recorded in Texas, 50 are known from one or both of the Texas National Grasslands. There are 33 species common to both Grasslands. The LBJ has another eight species not found on the Caddo, for a total of 41 species. The Caddo has nine species not found on the LBJ for a total of 42 species.

Caddo species, seven are considered not to be dependent on the Caddo habitat.

35 Thirty five mammalian species are found on each Grasslands planning area and are dependent on these habitats.

Species habitat matrices were constructed for the 35 LBJ species and the 35 Caddo species which are dependent upon National Grassland habitat.

BIRDS

The birds of the National Forests and Grasslands are identified and discussed separately.

Birds of the Forest

Some 550 species of birds including those that are now believed extinct or extirpated and those that are accidental or hypothetical in occurrence have been recorded in Texas (Peterson 1963). Texas can claim diversity by virtue of size alone, but even more significant than size in determining its rich avifauna is the state's location on the North American continent. Not only does East meet West, biologically, in the state, but also North meets South and many birds from the northern plains meet Mexican types. A large percentage of those North American birds that spend the winter in the tropics pass through Texas on their migrations, greatly augmenting a large winter and a large resident population. Almost 400 miles of coastline and numerous large inland reservoirs provide favorable conditions for those species with an affinity for large open bodies of water or aquatic habitats.

Of the 550 species recorded, five: the Eskimo curlew, passenger pigeon, Carolina parakeet, ivory-billed woodpecker, and Bachman's warbler, are either extinct or extirpated. Three species: the trumpeter swan, California condor and sharp-tailed grouse formerly lived in or visited Texas but no longer do so. Fifty-five species, those that have been recorded in the State but whose occurrence in the State are unexpected, are classified as accidental or hypothetical.

Of the 487 species remaining, 303 have been recorded in the pineywoods of east Texas (Fisher and Wolf 1979; Peterson 1963). A number of those species recorded in east Texas, approximately 135, can be classified as not being dependent on forested habitats or not occurring on the National Forests in Texas. The remaining 163 species are those that are known or suspected to occur on the planning area and are dependent on forested habitats. Of the 303 species of east Texas birds, 116 are known or suspected to breed in the region, 96 of which are known or suspected to breed on the planning area and are dependent on forested habitats.

A bird checklist of the region (Fisher and Wolf 1979) shows the fluctuation in numbers of species throughout the year: Spring (March-May) - 261 species, Summer (June-July) - 132 species, Fall

(August-November) - 267 species, Winter (December-February) - 162 species. This shows that the summer and winter resident populations are bolstered during the spring and fall migrations. East Texas forested habitats, even though they may not be essential breeding or wintering habitat, provide many of those species in transit with temporary refuge, resting, and feeding areas.

107 One Hundred seven bird species are found on the Forest planning area and are dependent on these habitats.

shown in the habitat matrix included in the Appendix. The matrix was constructed primarily from information contained in Bird-Habitat Associations on Southeastern Forest Lands (Legrand and Hamel 1980), Relative Abundance of Breeding Birds in Forest Stands in the Southeast (Dickson, Conner and Williamson 1980), Forest Habitats for Birds of the Northeast (Degraaf, et. al. 1981), Process Record for Selection of Management Indicator Species, National Forests in Alabama (Hedrick, 1981), A Guide to Field Identification of Birds of North America (Robbins, Bruun and Zim 1966), and A Field Guide to the Birds of Texas (Peterson 1963).

Birds of the Grasslands

Of the some 550 species of birds recorded in Texas, 273 are known or expected to occur on one or both of the Texas National Grasslands. There are 249 species common to both of the Grasslands. The LBJ has another 14 species, not found on the Caddo, for a total of 263 species. The Caddo has 10 species not found on the LBJ, for a total of 259 species.

Of the 263 LBJ species, 118 are considered not to be dependent on the LBJ Grassland habitat. Of the 259 Caddo species, 119 are considered not to be dependent on the Caddo Grassland habitat.

Of the 119 "not dependent" Caddo species, 82 are considered associates of water, 37 are associated with other habitats.

Of the 118 "not dependent" LBJ species, 80 are considered associates of water and 38 with other habitats.

145 One Hundred fourty five bird species are found on each Grasslands planning area and are dependent on these habitats.

Species habitat matrices were constructed for the 145 LBJ species and the 140 Caddo species.

REPTILES AND AMPHIBIANS

The reptiles and amphibians of the National Forests and Grasslands are identified and discussed separately.

Reptiles and amphibians of the Forests

Some 148 species and subspecies of reptiles and 62 species and subspecies of amphibians have been recorded in Texas east of the 100th meridian (Conant 1958). Of these, 59 reptiles and 30 amphibians are endemic to the pineywoods of East Texas. These include 19 reptiles and eight amphibians that are most closely associated with aquatic habitats.

6140 reptiles and 21 amphibians are known to occur on the planning area and are dependent on forested habitats.

Habitat matrices were constructed for these 61 Forest species.

Reptiles and amphibians of the Grasslands

that have been recorded in the eastern half of Texas, 70 reptiles and 22 amphibians are endemic to one or both of the Texas National Grasslands.

There are 37 reptiles and nine amphibians common to the Grasslands. The LBJ has another 17 reptiles and seven amphibians not found on the Caddo, for a total of 54 reptiles and 16 amphibians. The Caddo has 16 reptiles and six amphibians not found on the LBJ, for a total of 53 reptiles and 15 amphibians.

Ten of the 54 LBJ reptiles and 2 of the 16 amphibians are considered to be not dependent upon the LBJ Grasslands habitat. Eighteen of the 53 Caddo reptiles and 5 of the 15 Caddo amphibians are considered not to be dependent upon grasslands habitat.

58/45 Fifty eight species (LBJ) and forty five (CADDO) species found on each Grasslands planning area and are dependent on these habitats.

Species habitat matrices were constructed for the 44 LBJ reptiles and 14 amphibians and the 35 Caddo reptiles and 10 amphibians.

FISHES

The fishes of the National Forests and Grasslands are identified and discussed separately.

Fishes of the Forests

Some 218 species of fish have been recorded in the freshwater of Texas (Hubbs 1972; Eddy 1969). Of these, at least 11 species were introduced into the state and have successfully become established. Another 48 species are those that typically inhabit brackish or salt water and enter only the coastal streams. Of the remaining 159 species, 112 have ranges that include the waters of the pineywoods of East Texas (Hubbs 1972).

89 Eighty nine fish species are found on the Forest planning area that are dependent on associated aquatic habitats.

Of the 112 East Texas species, 89 are known or suspected to exist on or immediately adjacent to the lands of at least one of the four Texas National Forest (Seehorn, undated).

Fishes of the Grasslands

Of the 218 species of fish recorded in the freshwaters of Texas, 77 are known or suspected to occur on one or both of the Texas National Grasslands. There are 44 species common to both of the Grasslands. The LBJ has another eight species not found on the Caddo, for a total of 52 species. The Caddo has 25 species not found on the LBJ, for a total of 69 species.

52 fifty two fish species are found on LBJ Grasslands planning area and are dependent on associated aquatic habitats.

69 Sixty nine fish species are found on Caddo Grasslands planning area and are dependent on associated aquatic habitats.

EXHIBIT D

NFGT Short List of Species - Communities

NATIONAL FOREST & GRASSLAND MAMMALS

Common Name	**Scientific Name**
Opossum	Didelphis virginiana
Eastern Mole	Scalopus aquaticus
Short-tailed Shrew	Blarina brevicauda
Least Shrew	Cryptotis parva
Georgia Bat	Pipistrellus subflavus
Big Brown Bat	Eptesicus fuscus
Hoary Bat	Lasiurus cinereus
Red Bat	Lasiurus borealis
Seminole Bat	Lasiurus seminolus
Evening Bat	Nycticeius humeralis
Rafinesque's Big-eared Bat	Plecotus rafinesquii
Florida Free-tailed Bat	Tadarida cynocephala
Raccoon	Procyon lotor
Long-tailed Weasel	Mustela frenata
Mink	Mustela vison
River Otter	Lutra canadensis
Eastern Spotted Skunk	Spilogale putorius
Striped Skunk	Mephitis mephitis
Hog-nosed Skunk	Conepateus mesoleucus telemestes
Red Fox	Vulpes vulpes
Gray Fox	Urocyon cinereoargenteus
Coyote	Canis latrans
Bobcat	Felis rufus
Eastern Gray Squirrel	Sciurus carolinensis
Fox Squirrel	Sciurus niger
Eastern Flying Squirrel	Glaucomys volans
Plains Pocket Gopher	Geomys breviceps
Hispid Pocket Mouse	Perognathus hispidus
Beaver	Castor canadensis
Fulvous Harvest Mouse	Reithrodontomys fulvescens
Dwarf Harvest Mouse	Reithrodontomys humulis merriami
Deer Mouse	Peromyscus maniculatus ozarkiarum
White-footed Mouse	Peromyscus leucopus
Cotton Mouse	Peromyscus gossypinus
Golden Mouse	Ochrotomys nuttalli
Northern Rice Rat	Oryzomys palustrus
Hispid Cotton Rat	Sigmodon hispidus
Florida Wood Rat	Neotoma floridana rubida
Wood Rat	Neotoma floridana attwateri
Pine Vole	Microtus pinetorum
Eastern Cottontail	Sylvilagus floridanus

White-tailed Deer	Odocoileus virginianus
Nine-banded Armadillo	Dasypus novemcinctus
Guano Bat	Tadarida mexicana
Mexican Free-tailed Bat	Tadarida brasiliensis
Thirteen-lined Ground Squirr)	Spermophilus tridecemlineatus
Plains Harvest Mouse	Reithrondontomys montanus
Pygmy Mouse	Baiomys taylori
Texas Mouse	Peromyscus attwateri
Muskrat	Ondatra zibethicus
Blacktail Jackrabbit	Lepus californicus

NATIONAL FOREST & GRASSLAND BIRDS

Common Name	**Scientific Name**
Double-crested Cormorant	Phalacrocorax auritus
Anhinga	Anhinga anhinga
Great Blue Heron	Ardea herodias
Green Heron	Butorides striatus
Little Blue Heron	Egretta caerulea
Cattle Egret	Bubulcus ibis
Great Egret	Casmerodius albus
Snowy Egret	Egretta thula
Louisiana Heron	Egretta tricolor
Yellow-crowned Night Heron	Nycticorax violaceus
Wood Stork	Mycteria americana
White Ibis	Eudocimus albus
Wood Duck	Aix sponsa
Hooded Merganser	Lophodytes cucullatus
Turkey Vulture	Cathartes aura
Black Vulture	Coragyps atratus
Swallow-tailed Kite	Elanoides forficatus
Mississippi Kite	Ictinia mississippiensis
Sharp-shinned Hawk	Accipiter striatus
Cooper's Hawk	Accipiter cooperii
Red-tailed Hawk	Buteo jamaicensis
Red-shouldered Hawk	Buteo lineatus
Broad-winged Hawk	Buteo platypterus
Rough-legged Hawk	Buteo lagopus
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
Osprey	Pandion Haliaetus
American Kestrel	Falco sparverius
Northern Bobwhite Quail	Colinus Virginianus
Turkey	Meleagris gallopavo
Killdeer	Charadrius vociferus
American Woodcock	Scolopax minor
Mourning Dove	Zenaida macroura
Common Ground Dove	Columbina passerina
Yellow-billed Cuckoo	Coccyzus americanus

Greater Roadrunner	Geococcyx californianus
Barn Owl	Tyto alba
Eastern Screech Owl	Otus asio
Great Horned Owl	Bubo virginianus
Barred Owl	Strix varia
Short-eared Owl	Asio flammeus
Chuck-will's widow	Caprimulgus carolinensis
Whip-poor-will	Caprimulgus vociferus
Ruby-throated Hummingbird	Archilochus colubris
Belted Kingfisher	Magaceryle alcyon
Common Flicker	Colaptes auratus
Pileated Woodpecker	Dryocopus pileatus
Red-bellied Woodpecker	Melanerpes carolinus
Red-headed Woodpecker	Melanerpes erythrocephalus
Hairy Woodpecker	Picoides villosus
Downy Woodpecker	Picoides pubescens
Red-cockaded Woodpecker	Picoides borealis
Eastern Kingbird	Tyrannus tyrannus
Western Kingbird	Tyrannus verticalis
Scissor-tailed Flycatcher	Tyrannus forficatus
Great Crested Flycatcher	Myiarchus crinitus
Eastern Phobe	Sayornis phoebe
Yellow-bellied Flycatcher	Empidonax flaviventris
Acadian Flycatcher	Empidonax virescens
Willow Flycatcher	Empidonax traillii
Least Flycatcher	Empidonax minimus
Eastern Wood-Pewee	Contopus virens
Olive-sided Flycatcher	Contopus borealis
Blue Jay	Cyanocitta cristata
American Crow	Corvus brachyrhynchos
Carolina Chickadee	Parus carolinensis
Tufted Titmouse	Parus bicolor
White-breasted Nuthatch	Sitta carolinensis
Red-breasted Nuthatch	Sitta canadensis
Brown-headed Nuthatch	Sitta pusilla
Brown Creeper	Certhia americana
House Wren	Troglodytes aedon
Winter Wren	Troglodytes troglodytes
Carolina Wren	Thryothorus ludovicianus
Northern Mockingbird	Mimus polyglottos
Gray Catbird	Dumetella carolinensis
Brown Thrasher	Toxostoma rufum
American Robin	Turdus migratorius
Wood Thrush	Hylocichla mustelina
Hermit Thrush	Catharus guttatus
Swainson's Thrush	Catharus ustulatus
Gray-cheeked Thrush	Catharus minimus
Veery	Catharus fuscescens
Eastern Bluebird	Sialia sialis

Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Cedar Waxwing	Bombycilla cedrorum
Loggerhead Shrike	Lanius ludovicianus
White-eyed Vireo	Vireo griseus
Bell's Vireo	Vireo bellii
Yellow-throated Vireo	Vireo flavifrons
Solitary Vireo	Vireo solitarius
Red-eyed Vireo	Vireo olivaceus
Philadephia Vireo	Vireo philadelphicus
Warbling Vireo	Vireo gilvus
Black-and white Warbler	Mniotilta varia
Prothonotary Warbler	Protonotaria citrea
Swainson's Warbler	Limnothlypis swainsonii
Worm-eating Warbler	Helmitheros vermivorus
Golden-winged Warbler	Vermivora chrysoptera
Blue-winged Warbler	Vermivora pinus
Tennessee Warbler	Vermivora peregrina
Orange-crowned Warbler	Vermivora celata
Nashville Warbler	Vermivora ruficapilla
Northern Parula	Parula americana
Yellow Warbler	Dendroica petechia
Magnolia Warbler	Dendroica magnolia
Black-throated Blue Warbler	Dendroica caerulescens
Yellow-rumped Warbler	Dendroica coronata
Black-throated Green Warbler	Dendroica virens
Cerulean Warbler	Dendroica cerulea
Blackburnian Warbler	Dendroica fusca
Yellow-throated Warbler	Dendroica dominica
Chestnut-sided Warbler	Dendroica pensylvanica
Bay-breasted Warbler	Dendroica castanea
Blackpoll Warbler	Dendroica striata
Pine Warbler	Dendroica pinus
Prairie Warbler	Dendroica discolor
Palm Warbler	Dendroica palmarum
Ovenbird	Seiurus aurocapillus
Northern Waterthrush	Seiurus noveboracensis
Louisiana Waterthrush	Seiurus motacilla
Kentucky Warbler	Oporornis formosus
Mourning Warbler	Oporornis philadelphia
Common Yellowthroat	Geothlypis trichas
Yellow-breasted Chat	Icteria virens
Hooded Warbler	Wilsonia citrina
Wilson's Warbler	Wilsonia pusilla
Canada Warbler	Wilsonia canadensis
American Redstart	Setophaga ruticilla
Bobolink	Dolichonyx oryzivorus
Eastern Meadowlark	Sturnella magna
Western Meadowlark	Sturnella neglecta

Red-winged Blackbird	Agelaius phoeniceus
Rusty Blackbird	Euphagus carolinus
Common Grackle	Quiscalus quiscula
Brown-headed Cowbird	Molothrus ater
Scarlet Tanager	Piranga olivacea
Summer Tanager	Piranga rubra
Northern Cardinal	Cardinalis cardinalis
Rose-breasted Grosbeak	Pheucticus ludovicianus
Blue Grosbeak	Guiraca caerulea
Indigo Bunting	Passerina cyanea
Painted Bunting	Passerina ciris
Dickcissel	Spiza americana
Evening Grosbeak	Coccothraustes vespertinus
Purple Finch	Carpodacus purpureus
Pine Siskin	Carduelis pinus
American Goldfinch	Carduelis tristis
Rufous-sided Towhee	Pipilo erythrophthalmus
Savannah Sparrow	Passerculus sandwichensis
Grasshopper Sparrow	Ammordramus savannarum
LeConte's Sparrow	Ammodramus leconteii
Henslow's Sparrow	Ammodramus henslowii
Vesper Sparrow	Pooecetes gramineus
Lark Sparrow	Chondestes grammacus
Bachman's Sparrow	Aimophila aestivalis
Dark-eyed Junco	Junco hyemalis
Chipping Sparrow	Spizella passerina
Clay-colored Sparrow	Spizella pallida
Field Sparrow	Spizella pusilla
Harris' Sparrow	Zonotrichia querula
White-crowned Sparrow	Zonotrichia leucophrys
White-throated Sparrow	Zonotrichia albicollis
Fox Sparrow	Passerella iliaca
Lincoln's sparrow	Melospiza lincolnii
Swamp Sparrow	Melospiza georgiana
Song Sparrow	Melospiza melodia
Northern Goshawk	Accipiter gentilis
Marsh Hawk (Northern Harrier)	Circus cyaneus
Ferruginous Hawk	Buteo regalis
Harlan's Hawk	Buteo jamaicensis
Swainson's Hawk	Buteo swainsoni
Merlin	Falco columbarius
Burrowing Owl	Athene cunicularia
Saw-whet Owl	Aegolius acadicus
Long-eared Owl	Asio otus
Short-eared Owl	Asio flammeus
Common Nighthawk	Chordeiles minor
Chimney Swift	Chaetura pelagica
Black-chinned Hummingbird	Archilochus alexandri
Yellow-bellied Sapsucker	Sphyrapicus varius

Horned Lark	Eremophila alpestris
Barn Swallow	Hirundo rustica
Cliff Swallow	Hirundo pyrrhonota
Bank Swallow	Riparia riparia
Rough-winged Swallow	Stelgidopteryx serripennis
Purple Martin	Progne subis
Bewick's Wren	Thryomanes bewickii
Mountain Bluebird	Sialia currucoides
Water Pipit	Anthus spinoletta
Sprague's Pipit	Anthus spragueii
Starling	Sturnus vulgaris
Black-capped Vireo	Vireo atricapillus
Brewer's Blackbird	Euphagus cyanocephalus
Orchard Oriole	Icterus spurius
Northern Oriole	Icterus galbula
Lesser Goldfinch	Carduelis psaltria
Dickcissel	Spiza americana
Rufous-crowned Sparrow	Aimophila ruficeps
Tree Sparrow	Spizella arborea
McCown's Longspur	Calcarius mccownii
Chestnut-collared Longspur	Calcarius ornatus
Smith's Longspur	Calcarius pictus
Upland Sandpiper	Bartramia longicauda

NATIONAL FOREST & GRASSLAND AMPHIBIANS

Common Name	**Scientific Name**
Mole Salamander	Ambystoma talpoideum
Spotted Salamander	Ambystoma maculatum
Small-mouthed Salamander	Ambystoma texanum
Marbled Salamander	Ambystoma opacum
Eastern Tiger Salamander	Ambystoma tigrinum tigrinum
Southern Dusky Salamander	Desmognathus auriculatus
Ouachita Red-backed Salamand)	Plethodon cinereus serratus
Dwarf Salamander	Eurycea quadridigitata
Hurter's Spadefoot Toad	Scaphiopus holbrooki hurteri
Fowler's Toad	Bufo woodhousei fowleri
Woodhouse's Toad	Bufo woodhousei woodhousei
Northern Spring Peeper	Hyla crucifer crucifer
Southern Gray Treefrog	Hyla versicolor chrysoscelis
Squirrel Treefrog	Hyla squirella
Green Treefrog	Hyla cinerea
Eastern Narrow-mouthed Toad	Gastrophryne carolinensis
Northern Cricket Frog	Acris crepitans crepitans
Blanchards Cricket Frog	Acris crepitans blanchardi
Upland Chorus Frog	Pseudacris triseriata feriarum
Southern Leopard Frog	Rana sphenocephala
Pickerel Frog	Rana palustris

Barred Tiger Salamander	Ambystoma tigrinum mavortium
Couch's Spadefoot	Scaphiopus couchi
Texas Toad	Bufo speciosus
Red-spotted Toad	Bufo punctatus
Eastern Green Toad	Bufo debilis debilis
GreatPlains NarrowmouthedToad	Gastrophryne olivacea
Strecker's Chorus Frog	Pseudacris streckeri
Spotted Chorus Frog	Pseudacris clarki

NATIONAL FOREST & GRASSLAND REPTILES

Common Name	**Scientific Name**
American Alligator	Alligator mississippiensis
Three-toed Box Turtle	Terrapene carolina triunguis
Green Anole	Anolis carolinensis carolinensis
Northern Fence Lizard	Sceloporus undulatus hyacinthinus
Texas Horned Lizard	Phrynosoma cornutum
Ground Skink	Scincella lateralis
Five-lined Skink	Eumeces fasciatus
Broad-headed Shink	Eumeces laticeps
Southern Coal Skink	Eumeces anthracinus pluvialis
Six-lined Racerunner	Cnemidophorus sexlineatus sexlineatus
Western Slender Glass Lizard	Ophisaurus attenuatus attenuatus
Rough Earth Snake	Virginia striatula
Western Smooth Earth Snake	Virginia valeriae elegans
Northern Red-bellied Snake	Storeria occipitomaculata occipitomaculata
Texas Brown Snake	Storeria dekayi texana
Midland Brown Snake	Storeria dekayi wrightorum
Glossy Water Snake	Natrix rigida
Diamond Backed Water Snake	Nerodia rhombifera rhombifera
Broad Banded Water Snake	Nerodia fasciata confluens
Blotched Water Snake	Nerodia erythrogaster transversa
Yellow-bellied Water Snake	Nerodia erythrogaster flavigaster
Green Water Snake	Nerodia cyclopion
Eastern Garter Snake	Thamnophis sirtalis sirtalis
Western Ribbon Snake	Thamnophis proximus proximus
Western Mud Snake	Farancia abacura reinwardti
Eastern Hognose Snake	Heterodon platyrhinos
Mississippi Ringneck Snake	Diadophis punctatus stictogenys
Buttermilk Snake	Clouber constrictor anthicus
Eastern Yellow-bellied Racer	Coluber constrictor flaviventris
Eastern Coachwhip	Masticophis flagellum flagellum
Rough Green Snake	Opheodrys aestivus
Louisiana Pine Snake	Pituophis melanoleucus ruthveni
Texas Rat Snake	Elaphe obsoleta lindheimeri
Northern Scarlet Snake	Cemophora coccinea copei

Prairie Kingsnake	Lampropeltis calligaster calligaster
Speckled Kingsnake	Lampropeltis getulus holbrooki
Flat-headed Snake	Tantilla gracilis
Texas Coral Snake	Micrurus fulvius tenere
Southern Copperhead	Agkistrodon contortrix contortrix
Western Pygmy Rattlesnake	Sistrurus miliarius streckeri
Canebrake Rattlesnake	Crotalus horridus atricaudatus
Timber Rattlesnake	Crotalus horridus horridus
Western Diamondback Rattlesnake	Crotalus atrox
Ornate Box Turtle	Terrapene ornata ornata
Collard Lizard	Crotaphytus collaris
Texas Spiny Lizard	Sceloporus olivaceus
Eastern Earless Lizard	Holbrookia maculata perspicua
Southern Prairie Lizard	Sceloporus undulatus garmani
Southern Prairie Skink	Eumeces septentrionalis obtusirostris
Great Plains Skink	Eumeces obsoletus
Spotted Whiptail	Cnemidophorus gularis gularis
Plains Blind Snake	Leptotyphlops dulcis dulcis
Texas Garter Snake	Thamnophis sirtalis annectens
Texas Lined Snake	Tropidoclonion lineatum texanum
Central Lined Snake	Tropidoclonion lineatum annectens
Dusty Hognose Snake	Heterodon nasicus gloydi
Prairie Ringneck Snake	Diadophis punctatus arnyi
Western Coachwhip	Masticophis flagellum testaceus
Great Plains Rat Snake	Elaphe quttata emoryi
Bullsnake	Pituophis melanoleucus sayi
Texas Long-nosed Snake	Rhinocheilus lecontei tessellatus
Great Plains Ground Snake	Sonora episcopa episcopa
Texas Night Snake	Hypsiglena torquata texana
Broad-banded Copperhead	Agkistrodon contortrix laticinctus
Western Massasauga	Sistrurus catenatus tergeminus

NATIONAL FOREST FISHES

Common Name	**Scientific Name**
Brook Lamprey	Ichthyomyzon gagei
Paddlefish	Poluodon spathula
Alligator Gar	Lepisosteus spatula
Shortnose Gar	Lepisosteus platostomus
Spotted Gar	Lepisosteus oculatus
Longnose Gar	Lepisosteus osseus
Bowfin	Amia calva
Skipjack Herring	Alosa chrysochloris
Threadfin Shad	Dorosoma petenense
Gizzard Shad	Dorosoma cepedianum
Redfin Pickerel (Grass pick)	Esox americanus
Chain Pickerel	Esox niger
Golden Shiner	Notemigonus crysoleucas

Speckled Chub	Hybopeis aestivalis
Suckermouth Minnow	Phenacobius mirabilis
Emerald Shiner	Notropis atherinoides
Ribbon Shiner	Notropis fumeus
Redfin Shiner	Notropis umbratilis
Ironcolor Shiner	Notropis chalybaeus
Weed Shiner	Notropis texanus
Pallid Shiner	Notropis amnis
Blacktail Shiner	Notropis venustus
Red Shiner	Notropis lutrensis
Blackspot Shiner	Notropis atrocaudalis
Mimic Shiner	Notropis volucellus
Ghost Shiner	Notropis buchanani
Taillight Shiner	Notropis maculatus
Silvery Minnow	Hybognathus nuchalis
Cypress Minnow	Hybognathus hayi
Bullhead Minnow	Pimephalis vigilax
Stoneroller	Campostoma anomalum
Blue Sucker	Cycleptus elongatus
Smallmouth Buffalo	Ictiobus bubalus
River Carpsucker	Carpiodes carpio
Gray Redhorse	Moxostoma congestum
Blacktail Redhorse	Moxostoma poecilurum
Spotted Sucker	Moxostoma melanopa
Lake Chubsucker	Erimyzon sucetta
Creek Chubsucker	Erimyzon oblongus
Channel catfish	Ictalurus punctatus
Blue Catfish	Ictalurus furctus
Black Bullhead	Ictalurus melas
Yellow Bullhead	Ictalurus natalis
Flathead Catfish	Pylodictis olivaris
Tadpole Madtom	Notorus gyrinus
American Eel	Anguilla rostrata
Pirate Perch	Aphredoderus sayanus
Atlantic Needlefish	Strongylura marina
Golden Topminnow	Fundulus chrysotus
Starhead Topminnow	Fundulus notti
Blackstrip Topminnow	Zygonectes notatus
Blackspotted Topminnow	Zygonectes olivaceus
Mosquitofish	Gambusia affinis
Brook Silverside	Labidesthes sicculus
White Bass	Morone chrysops
Yellow Bass	Morone mississippiensis
Spotted Bass	Micropterus punctulatus
Largemouth Bass	Micropterus salmoides
Warmouth	Lepomis gulosus
Green Sunfish	Lepomis cyanellus
Bantam Sunfish	Lepomis symmetricus
Spotted Sunfish	Lepomis punctatus

Bluegill	Lepomis macrochirus
Orangespotted Sunfish	Lepomis humilis
Redbreast Sunfish	Lepomis auritus
Longear Sunfish	Lepomis megalotis
Dollar Sunfish	Lepomis marginatus
White Crappie	Pomoxis annularis
Black Crappie	Pomoxis nigromaculatus
Flier	Centrarchus macropterus
Banded Pygmy Sunfish	Elassoma zonatum
Sauger	Stizostedion canadense
Dusky Darter	Percina sciera
River Darter	Percina shumardi
Logperch	Percina caprodes
Big Scale Logperch	Percina macrolepida
Scaly Sand Darter	Ammocrypta vivax
Western Sand Darter	Ammocrypta clara
Bluntnose Darter	Etheostoma chlorosomum
Harlequin Darter	Etheostoma histris
Slough Darter	Etheostoma gracile
Swamp Darter	Etheostoma fusiforme
Mud Darter	Etheostoma asprigene
Goldstripe Darter	Etheostoma parvipinne
Cypress Darter	Etheostoma proeliare
Redfin Darter	Etheostoma whipplei
Creole Darter	Etheostoma colletti
Speckled Darter	Etheostoma stigmacum
Freshwater Drum	Aplodinotus grunniens
Striped Mullet	Mugil cephalus

FRESHWATER MUSSELS (UNIONIDAE) OF NFGT

Common Name	**Scientific Name**
Amblema plicata plicata	Threeridge
Amblema plicata perplicata	Roundlake
Anodonta grandis	Giant Floater
Anodonta imbecillis	Paper Pondshell
Anodonta suborbiculata	Flat floater
Arcidens confragosus	Rock Pocketbook
Arkansia wheeleri	Oauchita Rock Pocketbook
Corbicula fluminea	Asiatic clam
Cyrtonaias tampicoensis	Tampico Pearlymussel
Ellipsara lineolata	Yellow lance
Elliptio dilatata	Spike mussel
Fusconaia askewi	Texas pigtoe
Fusconaia flav	Wabash pigtoe
Fusconaia lananensis	Triangle pigtoe
Glebula rotundata	Round pearlshell
Lampsilis bracteata	Texas fatmucket

Megalonias nervosa	Round washboard
Obliquana reflexa	Threeehorn wartyback
Obovaria jacksoniana	Southern hickorynut
Plectomerus dombeyanus	Bank climber
Pleurobema riddelli	Louisiana pigtoe
Potamilus amphichaenus	Texas heelsplitter
Ligumia subrostrata	Pondmussel
Leptodea fragilis	Fragile papershell
Lampsilis teres	Yellow sandshell
Lampsilis hydiana	Louisiana fatmucket*
Lampsilis Satur	Sandbank pocketbook
Lampsilis cardium	Plain pocketbook
Plectomerus dombeyanus	Bankclimber
Potamilus ohiensis	Pink papershell
Potamilus purpuratus	Bleufer
Ptychobranchus occidentalis	Ouachita kidneyshell
Pyganodon grandis	Giant Floater
Quadrula apiculata	Southern mapleleaf
Quadrula nodulata	Wartyback
Quadrula pustulosa mortoni	Western pimpleback
Quadrula p. pustulosa	Pimpleback
Quadrula quadrula	Mapleleaf
Quadrula houstonensis	Smooth pimpleback
Quincuncina mitchelli	False spike
Strophitus subvexus	Southern creekmussel
Strophitus undulatus	Squawfoot
Toxolasma parvus	Lilliput
Toxolasma texasensis	Texas lilliput
Tritigonia verrucosa	Pistolgrip
Truncilla donaciformis	Fawnsfoot
Truncilla macrodon	Macrodon
Truncilla truncata	Deertoe
Uniomerus declivus	Tapered pondhorn
Uniomerus tetralasmus	Pondhorn
Utlerbackia imbecillis	paper pondshell
Villosa lienosa	Little spectaclecase

TABLE V-2-FOREST & GRASSLAND MANAGEMENT INDICATORS WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

Appendix G

Research Natural Area Evaluation

Introduction

A Research Natural Area (RNA) is "a physical or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention. However, under unusual circumstances, deliberate manipulation may be utilized to maintain the unique feature that the Research Natural Area was established to protect" (Federal Committee on Ecological Reserves, 1977 Forest Service Manual (FSM) 4063.05, Amend. 4000-90-1). Research Natural Areas are part of a national network of ecological areas designated in perpetuity for research or to maintain biological diversity or both on National Forest System lands (FSM 4063, Amend. 4000-90-1).

The United States Forest Service (USFS) designed the RNA system to provide examples of ecological areas for long-term research investigations and baseline information on the diverse array of natural ecological systems across North America. Strict guidance was and is provided for the evaluation, selection, and establishment of RNA's. These guidelines are as follows:

Evaluation and Establishment of RNA

Forest planning must include evaluation of potential RNA's:

"Forest planning shall provide for the establishment of Research Natural Areas (RNA's). Planning shall make provisions for the identification of examples of important forest, shrubland, grassland, alpine, aquatic, and geologic types that have special or unique characteristics of scientific interest and importance and that are needed to complete the national network of RNA's...types needed for the network shall be identified..." (36 CFR 219.25)

The objectives of establishing RNA's are to (FSM 4063.01, Amend. 4000-90-1):

* Preserve a wide spectrum of pristine representative areas that typify important...natural situations that have special or unique characteristics of scientific interest and importance, that in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity.
* Preserve and maintain genetic diversity.
* Protect against serious environmental disruptions.
* Serve as reference areas for the study of succession.
* Provide on site and extension educational activities.
* Serve as baseline areas for measuring long-term ecological changes.
* Serve as control areas for comparing results from manipulative research.
* Monitor effects of resource management techniques and practices."

Forest Service Manual 4063 (Amend. 4000-90-1) contains direction and criteria for selection of RNA's:

"Research Natural Areas must be large enough to provide essentially unmodified conditions within their interiors. In the West, 300 acres...of land is generally considered the minimum size.

special vegetative, aquatic, or geologic situations. Incorporate enough acres to ensure unmodified

conditions within their interiors and to protect the features and/or qualities for which the Research Natural Area is to be established."

"Locate those Research Natural Areas that best represent the ecological conditions needed to complete the natural area system in areas where conflicting uses are minimal. Wherever possible, select proposed areas that show no evidence of major disturbance by humans...for the past 50 years. Where possible, select entire small drainages..."

"In the selection of representative areas, a pristine condition is the goal. However, when candidate areas in a pristine condition are unavailable, then areas that reflect the pristine condition as closely as possible may be selected."

Review and Establishment Procedures

The establishment process begins with evaluation of candidate areas. This is a joint effort of the Forest and the Southern Forest Experiment Station. Appropriate staff from these units are assigned to head the review team and invite individuals who can provide expertise or useful input to join the team. This team then examines and evaluates the candidate areas for suitability as RNA's or as other specially designated areas and documents the findings.

Since the designation of an area as an RNA is a land allocation decision, the candidate areas are analyzed during the forest planning process. If the review team's evaluation and the Forest planning analysis find an area to be appropriate for RNA status, an Establishment Record is prepared, usually by a USFS research station scientist. The Establishment Record is evaluated by the Southern Research Natural Area Committee and the Washington Office. If the reviews are favorable, the Establishment Record is given to the Chief of the Forest Service for final approval of designation.

In the above example, the environmental analysis process and National Environmental Policy Act (NEPA) documentation proceed concurrently with the development of the Forest Plan. If candidate areas are reviewed for RNA eligibility after a Forest Plan has been approved, a separate environmental analysis with NEPA documentation is required. After completing the analysis, the forest will prepare an Environmental Assessment, a combined Decision Notice and Designation Order (DN/DO), and a Finding of No Significant Impact (FONSI). The DN/DO will contain wording to amend the Forest Plan. If the Chief agrees with the forest's findings, he signs the DN/DO, thereby completing the National Environmental Policy Act (NEPA), RNA designation, and Plan amendment processes with one decision.

RNA Candidate Areas in the Plan Revision

Mill Creek Cove was evaluated for designation as an RNA during preparation of the 1987 Forest Plan. Questions about an existing RNA, the Cross Timbers RNA, were also addressed. When the Forest Plan was approved, several parties appealed. One issue raised in the appeals was whether the Plan violated the National Forest Management Act (NFMA) because it did not designate RNA's. Deputy Chief David Unger responded to this issue in a letter dated April 1, 1989:

"...it is important to distinguish between things that must be considered during planning and things a Forest Plan must ultimately contain. The ... regulation ... does not require that every Forest Plan

that examples of each category must be provided on each unit for which a Forest Plan is developed. Rather, examples... that are needed to complete the National network of RNA's will be established throughout the National Forest System."

Proposals for the designation of four additional RNA's on the National Forests & Grasslands in Texas (NFGT) were received soon after the current Forest Plan was approved in 1987. These proposed RNA's were Mill Creek Cove RNA, Boykin Springs Longleaf RNA, Trout Creek RNA, and Neches River Banks RNA. Three more RNA proposals surfaced during the Revision process. During the initial RNA committee discussions, Mr. Edward C. Fritz, Chair of the Forest Task Force of the Texas Committee on Natural Resources (TCONR),reminded committee leader Ron Haugen that his proposal for an RNA at McGee Bend had not been discussed. It was discovered that the McGee Bend proposal was received by the forest in 1989 and had not been filed as an RNA proposal. It was decided to include this proposal in further review of the RNA candidates. The Texas Organization for Endangered Species (TOES) proposed two RNA candidates in a March, 1992 letter to NFGT. These areas are Upper Colorow Creek and Catahoula Barrens.

The forest also discovered problems with the Cross Timbers RNA, an existing RNA on the LBJ National Grassland. These problems related to confusion over a boundary location and to possible conflicting uses.

The review committee evaluated all seven of the candidate areas and the Cross Timbers RNA in 1992. The committee's findings were documented and passed on to the Southern Research Natural Area Committee (SRNAC) and the Forest Supervisor for further consideration. Areas determined to be potentially suitable for RNA or other special status will be considered in the Land Mangement Planning (LMP) planning process. The preferred alternative stated in the LMP will identify proposed RNA's to be recommended to the Chief of the USFS for inclusion in the RNA system. The seven candidate areas and the Cross Timbers RNA are discussed in more detail later in this summary and in Exhibits 1-8.

Only six general comments relative to RNA's were received during the scoping process. The Notice of Intent published in the Federal Register on October 23, 1990, which solicited scoping input for the Revision, limited the scope of the Revision as follows:

"The scope of the Revision does not include the following where previously made decisions will continue to apply: ....(b) allocations of existing Scenic, Protective, and Research Natural Areas..."

Scoping comments and the proposals for consideration of the seven areas for designation as RNA's are detailed in the LMP process records in the office of the Supervisor of NFGT. Summaries of these comments and proposals follow.

Proposed Mill Creek Cove RNA

The Mill Creek Cove area was considered for designation as an RNA in the environmental analysis for the 1987 Forest Plan. This area was evaluated by forest and research personnel but was not recommended for RNA status because the beech-magnolia stand was not judged to be a high-quality representative of this type. No better examples of this type are known to occur on the NFGT. This area was established as a scenic area and not an RNA in the 1987 Forest Plan.

establishment of a Mill Creek Cove RNA to represent Society of American Foresters (SAF) cover type 82 Southeastern U.S. (SEUS) Community Class Beech-Magnolia Forest or Texas Natural Heritage Program (TNHP) series American Beech-Southern Magnolia. SAF cover type 82 was not identified in the 1984 Regional Guide for the South as a potential RNA candidate in Texas, but this cover type is not presently represented in the national RNA system.

After much discussion, Forest Supervisor Lannan agreed in 1989 that Mill Creek Cove would be reevaluated for designation as an RNA by a review team after TNHP submitted their report with RNA recommendations. The TNHP report, which was finalized in 1991, recommended the area for RNA status. Formal committee review of Mill Creek was held on January 21, 1992, and the committee's findings are summarized in Exhibit 1.

The RNA committee recommended that a Mill Creek RNA be established in the LMP Revision process.

Proposed Boykin Springs Longleaf RNA

In its letter of August 11, 1988, the TPWD also proposed the establishment of a Boykin Springs Longleaf RNA. The Boykin Springs area contains approximately 350 acres of upland longleaf pine savanna (SAF Cover Type 70). At the time of the proposal, the national RNA network included only 32 acres of this type. The Boykin Springs area has an exceptionally diverse herbaceous layer. At least 170 understory species are present, and these include several rare or sensitive plants. In addition, the area contains two active red-cockaded woodpecker (RCW) clusters and habitat for other nearby RCW clusters. It also contains roads, trails, and other evidence of man's impact on this ecosystem.

The NFGT deferred action on this proposal until a final proposal was received from the State. In 1991 the Texas Natural Heritage Program Inventory of National Forests and Grasslands in Texas report recommended establishment of the site as an RNA.

Formal committee review of the Boykin Springs proposal was held on January 22, 1992. The committee's findings are summarized in Exhibit 2. The RNA committee recommended that a Boykin Springs Longleaf RNA be established in the LMP Revision process. SRNAC suggested that the Forest consider the area for some special designation that might be compatible with more intensive RCW management than would be permitted if under RNA status.

Proposed Trout Creek RNA

In December, 1988, Mr. Edward C. Fritz, Chair of the Forest Task Force of the TCONR, nominated the Trout Creek area on the Angelina National Forest as a RNA. The Southern Forest Experiment Station responded to Mr. Fritz by letter in December 1988. This letter explained the evaluation and establishment procedures for RNA's and suggested that this particular area would be unsuitable because of past cutting and stated that the final eligibility determination would be made by a review committee. This letter also mentioned the TNHP survey and stated that the Forest would be dealing with RNA proposals after the final report was received.

TNHP inventoried the Trout Creek area and found three SEUS ecological communities: (1) Western Gulf Coastal Plain Upland Longleaf Pine Forest; (2) Coastal Plain Hillside Herbaceous

Upland Longleaf Pine Forest community, which occupies most of the area, was found to be moderately disturbed. The other two communities were lightly to moderately disturbed.

The review team found that the area included 12 RCW clusters that would require special management to ensure maintenance of the population. Certain RCW management activities may be contrary to RNA guidelines and philosophy. The area is currently grazed and receives heavy use by horseback riders and ORV enthusiasts. The findings by TNHP supported the Southern Forest Experiment Station's assessment that the area might not be suitable as an RNA. The RNA review committee formally evaluated the Trout Creek area on January 22, 1992. The committee's

findings are summarized in Exhibit 3. The RNA committee determined that the area does not meet the criteria for RNA status and recommended that the area be considered for designation as a special interest area in the LMP revision. SRNAC concurred the committee's findings.

Proposed Neches River Banks RNA

In April, 1991, Edward Fritz nominated the Neches River Banks area on the Angelina National Forest as a RNA.

Much of the proposed RNA is within one-quarter of a mile of the Neches River. This riverside corridor, which is designated as Management Area 14, is being managed under a Special Interest Area prescription under the current Forest Plan. This prescription protects the riverside corridor (timber harvesting is not permitted). At least six natural lakes occur within this area, and these may add to the area's natural value.

About 185 acres of this 1,120-acre proposed RNA is included in one of the sites discussed in the TNHP inventory report. The TNHP classified this site, Bouton Lake-Neches River Bottoms, as a Loblolly Pine-Oak Series (SEUS Loblolly Pine-Shortleaf Pine-Oak Forest Community Class or SAF Cover Types 82, 86, and 76) in lightly modified condition. This particular community type is represented in the national RNA system. The TNHP report recommended that this area be managed as a Special Interest Area and that it be considered for inclusion in the National Wild and Scenic River System. The area's status was reviewed by the RNA committee on January 23, 1992. The committee's findings are summarized in Exhibit 4. The RNA review committee recommended that the area be considered for RNA status in the LMP revision, and SRNAC concurred.

Proposed McGee Bend RNA

In July 1989, Edward Fritz, nominated the 1,200-acre McGee Bend area (Compartment 82) of the Angelina National Forest as an RNA. No action was taken on the nomination for 2 years. Mr. Fritz inquired about the status of the McGee Bend nomination in an August, 1991 letter to the Southern Forest Experiment Station, adding that McGee Bend was included in the recently completed TNHP inventory. The Station responded that since the NFGT was revising the Forest Plan, additional RNA proposals would be considered as part of the revision effort.

During the initial meeting of the RNA review committee for Boykin Springs, Neches River Banks, Mill Creek Cove, and Trout Creek, Mr. Fritz again inquired about the status of McGee Bend. It was decided at that time that RNA coordinator Ron Haugen would review the record for McGee Bend and schedule a subsequent meeting of the committee to review the nomination.

Dam in a natural bend of the Angelina River. It is a relatively remote hardwood, pine-hardwood forest on a stream terrace sloping gradually into the alluvial floodplain. The TNHP recommended that the area be managed as a Special Interest Area, with special emphasis on retaining its wilderness-like qualities, and on allowing the mature forest to become old growth.

The RNA review committee evaluated McGee Bend on April 16, 1992. The committee's findings are summarized in Exhibit 5. The committee noted three concerns: (1) the area contained an appreciable amount of exotic slash pine, which should not be present in an RNA; (2) the roads and powerline right-of-way might detract from the character of the featured plant community; and (3) the creation of artificial water levels in the former river channel constitute significant alteration by humans. In response, the committee chair proposed to SRNAC that a smaller area be given RNA

status. The reduced area would consist mainly of the hardwood areas along the river floodplain and would exclude the exotics and developed areas. Mr. Fritz, acting on behalf of TCONR, disagreed with this recommendation and submitted a second recommendation for a 963-acre area that included all of compartment 82 with the exception of stand 8. SRNAC concurred with the committee chair's proposal that the natural area be reduced to approximately 375 acres.

Proposed Upper Colorow Creek RNA

On April 21, 1992, TOES recommended Colorow Creek on the Sabine National Forest for RNA status. TOES cited the TNHP report as the basis for this recommendation. The RNA committee chairman established a committee and scheduled the initial review of the area for July 1, 1992.

The TNHP report describes the 306-acre area as a mesic American beech-white oak forest with features unmatched elsewhere on NFGT. TNHP recommendations included establishment as a botanical area, with management to ensure protection from excessive visitor use. The findings of the committee are summarized in Exhibit 6.

The RNA review committee found stretches of exposed rock and a land bridge unique and significant. These features accentuate the relatively steep-sided ravine and ridge top system of the area. The presence of the exposed rock and the land bridge, and the relatively undisturbed nature of the vegetation associated with the steep ravine environment, prompted the RNA committee to recommend RNA status. The team suggested that this area could be an excellent reference area for genetic diversity and natural plant succession if managed as an RNA.

Proposed Catahoula Barrens RNA

On April 21, 1992, TOES recommended three segments of the Catahoula Barrens on the Angelina National Forest for RNA status. TOES cited the TNHP report as the basis for this recommendation. The RNA committee chair established a committee and scheduled the initial review of the area for July 2, 1992.

The three parcels of Catahoula Barrens consist of the 359-acre Black Branch Barrens; the 59-acre Buck Branch Barrens; and the 166-acre Rocky Branch Barrens. The areas are natural prairie-like openings typified by shallow, nutrient-poor soils, acidic that are high in aluminum. Many of the plants in the barrens are restricted to these specialized habitats in Texas, and include the endangered Navasota ladies'-tresses (Spiranthes parksii). The committee summary and findings are in Exhibit 7.

RNA status. The goup did recommend that management of this area be directed to the unique botanical characteristics. Restoration of these natural prairie-like systems to some semblance of the historic or presettlement conditions should be considered.

Proposed Cross Timbers RNA Management Recommendations

Cross Timbers Summary

Initial review of the management situation on the Cross Timbers RNA for the Forest Plan Revision revealed discrepancies in descriptions of boundaries and management objectives. The Cross Timbers RNA was designated by Chief McGuire on June 8, 1977. The Establishment Report had been approved by Supervisor Courtenay on July 8, 1975. The Establishment Report

consisted mainly of a description of the area, with very little direction concerning objectives or management practices.

Discrepancies in descriptions of boundaries were noticed after the designation order was signed. One map in the official folder showed the western, southern, and eastern boundaries following the edge of the mesa, and another indicated an expanded boundary along Forest Development Roads (FDR) 900 and 900-A. The narrative in the Establishment Report clearly describes the boundary as following the two roads. This is the official boundary. This discrepancy has caused problems because the area between the road and the edge of the mesa has a history of dispersed recreational use. This use has been and will continue to be very difficult to control.

Management practices prior to U.S. ownership have resulted in problem erosion within the RNA. Watershed restoration, primarily in the form of check dams, had been undertaken prior to RNA establishment, and some of these structures need rehabilitation.

There is dispersed recreational use (camping and target shooting) between the mesa rim and the road.

Cross Timbers RNA Evaluation

The soils and vegetation in the area represent two major vegetation zones, the Western Cross Timbers and the Grand Prairie. Fire could be used to restore and maintain native prairie grasses. The committee concluded that while the RNA represents the original vegetation conditions, some changes have resulted from protection from fire.

Several draws in the RNA have been eroded, and about a half dozen check dams have been constructed to control this problem. These check dams require periodic maintenance, often with heavy equipment. Because frequent or extensive use of such equipment in RNA's is undesirable, the committee determined that decisions on future erosion control should be made on a case-by-case basis with an emphasis on using nonmechanized methods.

The consensus was that the Cross Timbers RNA contains examples of the Cross Timbers and Grand Prairie vegetation zones that should be featured in RNA. The following recommendations were made:

Cross Timbers RNA Evaluation

(1)Adjust the RNA boundary to exclude dispersed recreation areas.

(2)The management prescription for the RNA in the Forest Plan should contain range management practices that keep livestock use to a minimum.

(3)The management direction in the Forest Plan should call for periodic monitoring of the check dams. If maintenance or rehabilitation is needed, the least intensive methods should be employed. The Forest RNA Coordinator should be consulted for guidance.

(4)The use of prescribed fire is recommended.

(5)The Forest Coordinator should request funds to complete a boundary survey.

(6)The Forest Coordinator and the Station Scientist should to rewrite the Establishment Report to list specific objectives and management strategies to accomplish RNA objectives. The committee agreed on the following objectives, as a minimum: (1) Maintain native prairie grasses; (2) encourage reestablishment of the oak savanna; and 3) maintain the wooded oak draws. These objectives should be put in the management prescription for the Forest Plan's management area covering this RNA.

Research Natural Areas - Exhibit 1

Mill Creek Cove RNA Candidate Information

Candidate Name: Mill Creek Cove **Date of Report(s):** 2/5/92
Forest: Sabine National Forest **District:** Yellowpine
Forest Coordinator: Ron Haugen **Assigned Scientist:** Margaret Devall
Candidate Proposed by: Texas Parks and Wildlife, Texas Committee on Natural Resources, and Texas Natural Heritage Program

Acres: 225 (approx.) **Hectares:** 90 (approx.)

Land Class: 310, 500, 820

Major Cover Types: Beech-Magnolia (SAF 82) Loblolly Pine-Hardwood

Unique Feature: This is a relatively undisturbed area of old-growth Beech-Magnolia.

T & E Species/Sensitive Species: No Federally listed T&E species. See TNHP Report for State Sensitive Species.

Description/Comments (include land ownership concerns):
The area consists of two peninsulas of old-growth beech-magnolia forest on the western shore of Toledo Bend Reservoir. The area has been described as the highest-quality example of this community in the West Gulf region (TNHP). Because access from the west is limited by adjacent private property, the area receives little public use. Disturbances in the area are very minor and small. There is a small private inholding near the end of the northern peninsula. See TNHP report for details.

List of Review Team Membership:	**Meeting Dates:**	
Margaret Devall	Bob Smiley	1/21/92
Ron Haugen	Elray Nixon	
Rob Evans	Ned Fritz	
Larry Shelton	Ike McWhorter	
Sue Langevin		

List of Interested Publics Not Part of Review Team: Lone Star Chapter of the Sierra Club and adjacent landowners.

Describe Current and Past Use/Management Activities: Mill Creek Cove (southern peninsula) was designated as a Scenic Area in the current Forest Plan. There are regenerated clearcuts (7 and 20 years old) on adjacent National Forest lands. Adjacent private land is in developed pasture, pine plantations, and home sites. There is no evidence of timber harvest within the proposed boundaries. Sabine River Authority controls Toledo Bend water levels. The Forest Service has no control over lake use or shoreline access to this area, but lake use and shoreline access do not present problems at this time.

Review Team's Recommendation: Review team recommends RNA status and recommends acquisition of small private inholding.

magnolia; serve as reference area for study of succession; and serve as baseline for measuring long-term ecological changes.

Cooperators to Pursue and Their Anticipated Role: Rice University and Texas Academy of Science might cooperate with FS in continuing research.

Research Natural Areas - Exhibit 2

Boykin Springs RNA Candidate Information

Candidate Name: Boykin Springs **Date of Report:** 2/5/92
Forest: Angelina National Forest **District:** Angelina
Forest Coordinator: Ron Haugen **Assigned Scientist:** Margaret Devall
Candidate Proposed by: Texas Parks & Wildlife

Acres: 380 (approx.) **Hectares:** 152 (approx.)
Land Class: 500, 801, 802 **Major Cover Types:** Longleaf pine (SAF 70)

Unique Feature: Old-growth, longleaf pine-little bluestem community maintained by fire; (considered to be the best example in the western Gulf Region); several hillside seepage bogs.

T&E Species/Sensitive Species: Red-cockaded woodpecker. See TNHP Report for State Sensitive Species.

Description/Comments (include land ownership concerns): This is a large, relatively undisturbed area of mature longleaf pine-little bluestem. Because of frequent use of light prescribed fire, the site exhibits open, park-like, savanna conditions. The area is nearly surrounded by roads and is close to the Boykin Springs campground. Recreational use in the proposed area, and in the surrounding general forest, is heavy. All-terrain vehicles (ATV) trails are common. There are three RCW clusters in the proposed area and two of these are currently active. Part of the area is in an active grazing allotment.

List of Review Team Membership:		**Meeting Dates:**	
Margaret Devall		Larry Shelton	1/22/92
Ron Haugen		Ike McWhorter	
Rob Evans		Sue Langevin	
Jerry Larson		Dave Diamond	
Dick Rosemier		Bill Carr	
Alfredo Sanchez	Ned Fritz		

List of Interested Publics Not Part of Review Team: ATV Riders Association, special use permittees, grazing permittee, and Lone Star/Sierra Club.

Describe Current and Past Use/Management Activities: The area was commercially thinned about 20 years ago. The effects of this are not apparent at this time. No other significant timber harvest has occurred recently. Frequent light prescribed burns have occurred. Removal of midstory in RCW clusters was accomplished two years ago. About half of the area is grazed lightly. The Dist. Auto Tour includes one stop featuring this area. The District plans to develop a handicap access trail into the area to permit viewing of a RCW cavity tree. ATV use is common in the area and in the surrounding Forest. This general area has been one of the more popular recreational areas on this Dist.

unique features. Review team acknowledges conflicts with other uses which must be resolved.

Probable Objective for the Area: Preservation of unique old-growth longleaf stand. Preservation and maintenance of genetic diversity. Provision of onsite and extension educational activities. Monitoring of effects of resource management techniques and practices.

Cooperators to Pursue and Their Anticipated Role: Texas Parks & Wildlife, The Nature Conservancy, U.S. Fish & Wildlife Service, Rice University, Stephen F. Austin State University might cooperate with Forest Service in research and might provide guidance in RCW habitat.

Research Natural Areas - Exhibit 3

Trout Creek RNA Candidate Information

Candidate Name: Trout Creek **Date of Report:** 2/5/92
Forest: Angelina National Forest **District:** Angelina
Forest Coordinator: Ron Haugen **Assigned Scientist:** Margaret Devall
Candidate Proposed By: Texas Committee on Natural Resources, Lone Star Chapter of the Sierra Club

Acres: 6,400 (approx.) **Hectares:** 2,560 (approx.)
Land Class: 500, 800, 801, 820
Major Cover Types: Longleaf Pine (SAF 70), Loblolly Pine, Slash Pine

Unique Feature: Large tract of longleaf pine; intact restoreable longleaf ecosystem. Hillside seepage bogs; hardwood stringers along stream courses.

T&E Species/Sensitive Species: Red-cockaded woodpecker. See TNHP Report for State Sensitive Species.

Description Comments (include land ownership concerns): This is a large tract of intensively managed National Forest lands on the Angelina Ranger District in an area known locally as Longleaf Ridge. Historical records show that this area was dominated by longleaf pine in the past. Now many stands contain a mixture of pine species and some stands were planted to slash, which is not native. The District is working to restore longleaf on all appropriate sites. The area has 12 RCW clusters; 3 of which are active. The area is criss-crossed by recreational trails. ATV use is extensive and horseback trails are popular. The entire area is well-roaded. A private inholding that was acquired was to have been developed for housing. Road rights-of-ways were cleared prior to acquisition by the Forest Service. See TNHP report for details.

List of Review Team Membership:		**Meeting Dates:**	
Margaret Devall		Larry Shelton	1/22/92
Ron Haugen		Ike McWhorter	
Rob Evans		Sue Langevin	
Jerry Larson		Dave Diamond	
Dick Rosemier		Bill Carr	
Alfredo Sanchez	Ned Fritz		

List of Interested Publics Not Part of Review Team: Special use permittees, ATV Riders Association, Horseback Riders Club, grazing permittee, and Lone Star Chapter of Sierra Club.

apparent, including clearcuts, seed-tree cuts, and commercial thinning. Five stands have been regenerated and are less than 20 years old. Court-ordered RCW thinning has occurred on much of the area in the last two to three years. Recreational use is common and includes use of ATV and horse trails. Roads have been improved in conjunction with timber sales. The entire area is expected to be designated as a Habitat Management Area for RCW.

Review Team's Recommendation: Review team finds that the Trout Creek area does not meet the criteria for RNA designation. Committee suggests that the Forest act to have the Trout Creek area designated as a Special Interest Area.

Probable Objective for the Area: Restoration of functional longleaf ecosystem

Cooperators to Pursue and Their Anticipated Role: Texas Parks & Wildlife, The Nature Conservancy, and U.S. Fish & Wildlife Service. Their role would be to suggest techniques for restoring longleaf to its original dominance and for providing for needs of RCW.

Research Natural Areas - Exhibit 4

Neches River Banks RNA Candidate Information

Candidate Name: Neches River Banks **Date of Report:** 2/5/92
Forest: Angelina National Forest **District:** Angelina
Forest Coordinator: Ron Haugen **Assigned Scientist:** Margaret Devall
Candidate Proposed by: Texas Committee on Natural Resources

Acres: 510 (approx.) **Hectares:** 204 (approx.)
Land Class: 500, 820
Major Cover Types: Bottomland Hardwood and Loblolly Pine-Hardwood (SAF 82)

Unique Feature: Relatively undisturbed stands dominated by large, old-growth bottomland hardwoods and pine, including several baldcypress sloughs.

T&E Species/Sensitive Species: No Federally listed T&E species. See TNHP Report for State Sensitive Species.

Description/Comments (include land ownership concerns): The proposed area consists of a 4-mile-long and one-fourth mile wide band of loblolly pine and bottomland hardwoods along the north banks of the Neches River. Wild & Scenic River designation has been proposed for this same stretch of river. The candidate area is separated into two noncontiguous parts of private land. The Sawmill Hiking Trail runs along the Neches River for nearly the entire length of the area. This trail receives moderate use throughout much of the year. The Old Aldridge Sawmill site lies adjacent to the eastern part of the proposed area. This site contains the ruins of an early 1900's sawmill.

List of Review Team Membership:	**Meeting Dates:**	
Margaret Devall	Larry Shelton	1/23/92
Ron Haugen	Ike McWhorter	
Rob Evans	Sue Langevin	
Jerry Larson	Dave Diamond	
Dick Rosemier	Bill Carr	
Alfredo Sanchez		
Ned Fritz		

adjacent landowners.

Describe Current and Past Use/Management Activities: Bouton Lake Recreation Area lies at the western end of the proposed area. Old Aldridge Sawmill site is adjacent to the eastern portion. Sawmill Hiking Trail runs along almost entire length of the entire length of the proposed area and receives moderate use. District auto tour has one stop featuring Aldridge Sawmill Site. Regenerated clearcuts are adjacent to about 1/2 of area. Area is divided into two separate parts by private

property. Area shows no signs of timber management within the last 50 years.

Review Team's Recommendation: Review team recommends RNA Status, while acknowledging the possible conflict with the Sawmill Hiking Trail. The team also recommends acquisition of a private tract east of Bouton Lake.

Probable Objective for the Area: Preserve relatively undisturbed area of bottomland hardwood forest covers; preserve and maintain genetic diversity; serve as reference area for study of succession; and serve as baseline area for measuring long-term ecological changes.

Cooperators to Pursue and Their Anticipated Role: Rice University and Texas Academy of Science for continuing research.

Research Natural Areas - Exhibit 5

McGee Bend RNA Candidate Information

Candidate Name: McGee Bend **Date of Report**: 6/8/92
Forest: Angelina National Forest **District**: Angelina
Forest Coordinator: Ron Haugen **Assigned Scientist**: Margaret Devall
Candidate Proposed by: Texas Committee on Natural Resources

Acres: 400 **Hectares**: 160

Land Class: 500, 820

Major Cover Types: Bottomland hardwood, Loblolly pine hardwood (SAF 82)

Unique Feature: Old-growth bottomland hardwoods, with areas of pine and hardwood mixtures; several baldcypress sloughs.

T&E Species/Sensitive Species: No Federally listed T&E species. See TNHP Report for State Sensitive Species.

Description/Comments (include land ownership concerns): The candidate area consists of a band of bottomland hardwoods and pine-hardwood forest cover along what was formerly the Angelina River channel. The construction of the dam for Sam Rayburn Reservoir diverted the river to the west of McGee Bend. There are pine plantations outside the candidate area. Some of these plantations are of slash pine, which is not native to East Texas.

List of Review Team Membership:	**Meeting Dates**:	
Margaret Devall	Steve Clarke	4/16/92
Ron Haugen	Ned Fritz	
Sue Grace	Larry Shelton	
Jerry Larson	Jim Garrison	

Tom Zimmerman
Dave Drummond

List of Interested Publics Not Part of Review Team: Lone Star Chapter of the Sierra Club and adjacent landowners.

Describe Current and Past Use/Management Activities: The candidate area shows no signs of management within the last 50 years. Because access is relatively poor, recreational use is limited. Hunting pressure is moderate. The pine stands adjacent to the candidate area were thinned

approximately 20 years ago. Southern pine beetle infestations are becoming more frequent in these pine stands.

Review Team's Recommendation: The review team recommends RNA status for the hardwood area adjacent to the former Angelina River channel.

Probable Objective for the Area: Preserve relatively undisturbed area of bottomland hardwood forest coverage. Preserve and maintain genetic diversity. Serve as baseline area for measuring long-term ecological changes.

Cooperators to Pursue and Their Anticipated Role: Rice University and Texas Academy of Science, for continuing research.

Research Natural Areas - Exhibit 6
Upper Colorow Creek RNA Candidate Information

Candidate Name: Upper Colorow Creek **Date or Report:** 7/6/92
Forest: Sabine National Forest **District:** Tenaha
District: Tenaha **Assigned Scientist:** Margaret Devall
Forest Coordinator: Ron Haugen
Candidate Proposed by: Texas Organization for Endangered Species (TOES)

Acres: 360 (approx.) **Hectares:** 144 (approx.)

Land Class: 804, 500

Major Cover Types: Loblolly Pine Hardwood (SAF 82); White Oak, Black Oak, Northern Red Oak (SAF 52); and Beech Magnolia.

Unique Feature: This is a relatively undisturbed area with some apparently relict vegetation. The upper stretches of Colorow Creek display interesting geological features, including significant stretches of exposed rock and a land bridge.

T&E Species/Sensitive Species: No Federally listed T&E species. See TNHP report for State Sensitive Species.

Description/Comments (include land ownership concerns):

This is a large, relatively undisturbed area of mature loblolly pine-hardwood forest cover. Tree species composition varies throughout, with pine dominating in some areas, white oak and other upland hardwoods dominating in other areas, and beech-magnolia forest cover prominent in isolated areas. Recreational use appears to be limited to deer and squirrel hunting. Terrain consists of fairly steep-sided ravines with flat ridgetops. See TNHP report for more details.

Margaret Devall 7/1/92
Ron Haugen
Rob Evans
Bill Carr
Lynn McDonald

List of Interested Publics Not Part of Review Team: Texas Organization for Endangered Species and Texas Nature Conservancy, TOES.

Describe Current and Past Use/Management Activities: There is little evidence of significant

management activities. Scattered tree stumps indicate that there may have been a commercial thinning in the recent past. On several ridgetops, there are small, naturally regenerated mixed stands resulting from salvage of southern pine beetle spots approximately 6-10 years ago. Management activities apparently have not altered the area significantly.

Review Team's Recommendation: The review team recommends RNA status.

Probable Objective for the Area: Serve as reference area for study of succession and preserve and maintain genetic diversity.

Cooperators to Pursue and Their Anticipated Role: Stephen F. Austin State University, Texas Nature Conservancy, Texas Natural Heritage Program, Southern Forest Experiment Station, and TOES could cooperate in continuing research.

Research Natural Areas - Exhibit 7

Proposed Catahoula Barrens RNA Candidate Information

Candidate Name: Catahoula Barrens (three areas) **Date of Report:** 7/6/92
Forest: Angelina National Forest **District:** Angelina
Forest Coordinator: Ron Haugen **Assigned Scientist:** Margaret Devall
Candidate Proposed by: Texas Organization for Endangered Species (TOES)

Acres: 359, 12, 265 (approx.) **Hectares:** 144, 5, 106 (approx.)

Land Class: 500, 824

Major Cover Types: Longleaf pine-scrub oak (SAF 71) and Loblolly pine-hardwood (SAF 82).

Unique Feature: Catahoula formation barrens-woodlands complex.

T&E Species/Sensitive Species: Red-cockaded woodpecker. See TNHP report for State sensitive species.

Description/Comments (include land ownership concerns): The candidate area consists of three separate areas: the Black Branch Barrens, Buck Branch Barrens, and Rocky Branch Barrens, which are collectively referred to as the Catahoula Barrens. The shallow, nutrient-poor soils are adverse to woody plant growth and have produced a barrens-woodlands complex. Low-quality pines and hardwoods are found, together with scattered natural, prairie-like openings. See TNHP report for more details.

List of Review Team Membership: **Meeting Dates:**
Margaret Devall 7/2/92

Rob Evans
Bill Carr
Jerry Larson
Alfredo Sanchez
Glenn Donnahoe

List of Interested Publics Not Part of Review Team: Texas Nature Conservancy, TOES.

Describe Current and Past Use/Management Activities: Commercial timber has been logged off much of these areas. Regeneration cuts were made on the Black Branch area as recently as 1970 and 1982. Rocky Branch was regeneration cut in 1972, and now supports a stand that

includes seed trees. Unfavorable soils have generally caused attempts to regenerate pines and produce timber to fail. Each of the barrens contains low-level roads or abandoned roads or both. There is some evidence of ATV use.

Review Team's Recommendation: Because there have been significant disturbances, the review team does not recommend RNA status. However, the Catahoula Barrens have unique characteristics, and the team recommends that the candidate area be classified as a Botanical Area.

Probable Objective for the Area: Restore the areas to their presettlement conditions (Catahoula formation barrens-woodlands complex).

Cooperators to Pursue and Their Anticipated Role: Stephen F. Austin State University, Texas A&M University, Texas Nature Conservancy, and Texas Natural Heritage Program to determine presettlement conditions and to propose management strategies for achieving and maintaining these conditions.

Research Natural Areas - Exhibit 8

Evaluation and Information of Existing Crosstimbers RNA

Candidate Name: Cross Timbers **Date of Report:** 2/25/93
Forest: Caddo/LBJ National Grasslands **District:** LBJ National Grasslands
Forest Coordinator: Ron Haugen **Assigned Scientist:** Margaret Devall
Candidate Proposed by: This is an existing RNA.

Acres: 370 **Hectares:** 148

Land Class: 330

Major Cover Types: Western Cross Timbers and Grand Prairie.

Unique Feature: Relatively undisturbed example of these two cover types.

T&E Species/Sensitive Species: See TNHP Report for State Sensitive Species.

Description/Comments (include land ownership concerns): This is a large, relatively undisturbed area consisting of transition between the Grand Prairie and Western Cross Timbers vegetative zones. The current evaluation was conducted to further define management objectives for this RNA. The evaluators also looked at a possible boundary adjustment to eliminate management conflicts.

List of Review Team Membership: **Meeting Dates:**

Ron Haugen
Karl Stoneking
Ron Bertsch
Ben Harbour
Joel Shepard
Ike McWhorter

List of Interested Publics Not Part of Review Team: Grazing permittee.

Describe Current and Past Use/Management Activities: The area has been under passive RNA management since 1975. Dispersed recreational use has occurred within the RNA along the mesa rim since designation. There has been some confusion about the exact location of the southern boundary.

Review Team's Recommendation: Review team recommends adjusting the boundary as shown f
on the attached maps and also recommends rewriting the Establishment Report to provide more detailed management guidance.

Probable Objective for the Area: Preserve an example of the Grand Prairie and Western Cross Timbers and serve as a baseline area for measuring long-term ecological changes.

Cooperators to Pursue and Their Anticipated Role: Not identified at this time.

Appendix H

Vegetation and Natural Plant Communities

Introduction

Ecosystems may be the most basic units of nature (Tansley 1935), but vegetation is one of the best indicators of the total environment (Daubenmire 1976). Unfortunately, our ability to utilize vegetation as a tool for understanding the environment is limited by problems as basic as the difficulty of identifying individual species. Consider that east Texas understory plants alone constitute an "extremely complex association of forbs and brush species" (Correll and Johnston 1970). Even identification of the economically important pine trees, for which the "pineywoods" are named has been subject to great difficulty and confusion (Collier 1964). Adding complexity to the study of east Texas vegetation is the number of exotic and introduced species (Correll and Johnston 1970), the wide range of morphological variants, or phenotypes expressed in the area (Ajilvsgi 1979), the degree of human induced modifications in vegetation (Nixon 1985), and the variety of current and past climatic conditions (Jurney and others 1989; Ajilvsgi 1979; Kral 1966). Finally, no system of vegetation classification has been adopted universally, and the various systems in use employ somewhat different nomenclature. For example, the same area of east Texas forest could be designated as dry uplands (Nixon 1985; Ward 1984), upland longleaf pine savanna (Bridges and Orzell 1989), pine uplands (Gow 1904), upland pine forest (Marks and Harcombe 1981), longleaf pine-little bluestem series (Diamond and others 1987), natural pine-hardwood woodland (Fountain and Risner 1988), or southern evergreen forest (Braun 1950).

SPATIAL VARIABILITY

The plant communities in and around the NFGT vary in composition and occurrence along many environmental gradients. Even when broadly defined, these communities are not evenly distributed across NFGT administrative units. For example, some communities are restricted to the National Grasslands and others to the National Forests. Although "forest" communities are found on the grasslands, these communities are dominated either by species that are generally absent from the National Forests (Ashe's juniper) or by species that generally occur in subdominant or midstory positions in east Texas forests (post oak). For a more detailed summary of plant communities found on the NF's and the NG's see table 1.

There are many subtle variations in vegetation from Forest to Forest and from Grassland to Grassland. These range from changes in the relative abundance or frequency of a species to the presence or absence of particular species or communities. For example, American beech (Fagus grandifolia) communities occur on all NF's in Texas except the DCNF. Moreover, beech communities on one forest (SNF) have a rich vernal understory flora that is absent from those on all other districts.

The east Texas pineywoods have been subdivided on the basis of the predominant pine species for more than 100 years (Collier 1964). Mohr (1987) and Bray (1906) were among the first to publish such classifications. They noted three primary, spatially distinct, forest regions: a shortleaf belt throughout much of northeast Texas; a longleaf belt in the southeast; and a loblolly belt, which was restricted to the southwest. These classifications implied that one species predominated in each region and that the remaining pine species occurred only as minor components. In addition, the vegetation typical of each pine belt differed in broad structure and appearance (Bray 1906; Tharp 1939).

These distribution patterns are the result of a complex set of interrelationships among social, physical, and biological systems. In many cases, the causes of these relationships are unknown. In order to develop basic information about these relationships, the FS has developed a hierarchical framework of ecological units. This system integrates associations of ecological factors at various geographic scales and, most importantly, identifies critical factors at each scale. This system is not yet fully developed, but existing work provides a framework for understanding the spatial dimension of plant communities. For a description of these ecological units see Plan Appendix A.

TEMPORAL VARIABILITY

It is widely recognized that contemporary vegetation can be unrepresentative of vegetation that existed formerly and a poor indicator of potential vegetation (Braun 1950; Dyksterhuis 1948; Foster and others 1992). The management significance of this fact was recognized by Zon (1906), who stated that "a forester who mistakes . . . temporary forest growth for the original natural types, thus failing to understand the natural evolution of the forest, will always have nature against him."

HISTORICAL PATTERNS

Typically, information about the original forests of east Texas is found in early diaries, journals, and survey records. This information is not quantifiable by today's research standards. Many of these observations apply only to very limited geographic areas. Ordinarily, though, early settlers found upland landscapes of almost pure stands of "southern yellow pine." They sometimes found dense hardwood stands in creek and river bottoms, or even canebrakes that made crossings difficult (see accounts in Truett and Lay 1984, and Walker and Baker 1983).

Early settlement, agriculture, and land-use patterns have produced lasting changes in the pineywoods vegetation (Collier 1964; Keller 1974). They have blurred the differences between natural pine forest and pine-oak forest. Today we tend to classify all of east Texas as "pineywoods," "mixed hardwood-loblolly" (Arnold 1978), or "pine-hardwood forest" (Frye and others 1987), but the difference between the open, parklike stands of longleaf and the other forest types was distinct originally (Bray 1906; Foster and others 1917; Loughbridge 1880; Tharp 1939).

LONGLEAF PINE

Although the smallest of the original pine belts, the longleaf region was probably the largest expanse of almost pure pine communities in the State (Bray 1906). The value of the longleaf belt was not overlooked by those who were lucky enough to view that resource: "The longleaf pine...forms miles of dense forest of the cleanest, most uniform, and symmetrical body of pine to be found on the continent" (Bailey 1905). Hardwoods were probably less common in this region than in the shortleaf and loblolly regions. Although hardwood stems and clumps did occur with some frequency in presettlement longleaf stands (Harcombe and others 1994; Myers 1990; Schafale and Harcombe 1983) their abundance today is closely related to long periods of fire suppression or periodic winter burning practices (Boyer 1980; Bridges and Orzell 1989; Garren 1943).

Longleaf pine forests throughout Texas and the Southeast often had prairie-like under stories (Bartram 1766; Bray 1906; Tharp 1939). These conditions were maintained by lightning fires,

invasion and generally favored reproduction of longleaf pine over that of other pines. Several studies have confirmed the importance of frequent burning to eliminate hardwood and shrub invaders (Bruce 1947; Grano 1970; Harrington & Stephenson 1955; Heyword 1939; Lewis and

Harshbarger 1976; Rebertus and others 1989; Streng and others 1994; Waldrop and others 1987). Longleaf pines have physical characteristics that confer a great degree of fire resistance (McCune 1988). Heyward (1939) observed that even longleaf seedlings tolerate fire "to a degree unequalled by any other indigenous tree species". These characteristics virtually assure longleaf a competitive advantage where fire is frequent. It has even been suggested that these characteristics actually facilitate fire (Mutch 1970; Platt and others 1988; Wells and Shunk 1928). Because the entire life cycle of longleaf is closely linked to fire and because longleaf's need for frequent fires is almost legendary (Myers 1990) the longleaf forest has been called "the forest that fire made" (Greene 1931).

Important groundcover dominants of longleaf forests, including bluestems (Schizachyrium scoparium and Andropogon spp.), appear to increase after fires (Bruce 1947, Hodgkins 1958; Lemon 1949; Lewis and Harshbarger 1976). If such increases occur they may be related to shifts in abundance triggered by flowering and potential reproductive increases (Streng and others, 1994). Associated with these fire adapted grasses are many herbs, specialized orchids, carnivorous plants, and rare and endemic plant species (Bridges and Orzell 1989; Hardin and White 1989). One sometimes finds more than 30 species per square meter (Frost and others 1986) or 50 or more species in several square meters (Clewell 1986) in these frequently burned understories. Species richness values in these communities are among the highest in North America (Frost and others 1986). Fire is essential to maintain these species-rich understories (Walker and Peet 1983; Wells and Shunk 1928), and most of the characteristic species disappear after short periods of fire exclusion (Frost and others 1986). Vegetation changes that result from fire exclusion may also displace species of wildlife and invertebrates (Vogl 1973).

The incredible decline of longleaf pine communities is very well documented (Croker 1987; Means and Grow 1985; Tebo 1985; Wahlenberg 1946). Across the Southeast, only 3 percent of historic longleaf land still supports longleaf (Myers 1990). In Texas, longleaf forests once occupied at least 5,000 square miles (Bray 1906; Loughbridge 1880; Sargent 1884). The greater part of these forests had been cut by 1917 (Foster and others 1917). However, an estimated 25,900 acres (in large tracts) persisted uncut into the late 1930's (Cruikshank and Eldredge 1939). More recently, longleaf made up a plurality of stocking on only 34.7 thousand acres (McWilliams and Lord 1988). Of this, almost 32,000 acres are in NF's (USFS 1994). Because areas of longleaf forest habitat have been lost and because much remaining habitat has been degraded (especially through alteration of fire regimes), longleaf forests have more threatened and endangered biota than do temperate or tropical rainforests (Simberloff in press 1994).

LOBLOLLY PINE

The original loblolly belt occupied approximately 6,000 to 7,000 square miles in southeast Texas (Bray 1906). This apparently natural occurrence of a large loblolly pine region may be unique in the Southeast. There is no corresponding loblolly region in Louisiana (Brown 1944; Delcourt 1976) or Florida (Myers 1990). The causal factors in the development of this belt are unknown.

The southeast Texas loblolly belt may be the "Big Thicket" of east Texas (Collier 1964). Forests in this area are thought to have been quite dense and junglelike, and a significant barrier to overland travel (Parks and Cory 1938). This description contrasts markedly with descriptions of

to deep sands (Zon 1904). More typically, loblolly seemed to grow in association with hardwood. Zon (1904) wrote that "the half swampy flats grow a jungle of hardwood with some loblolly and that oaks are especially abundant and of excellent growth throughout the area."

These latter descriptions are fairly typical of loblolly pine communities today. Of three recognized cover types containing loblolly, one explicitly includes hardwoods (USFS type 82), while the remaining USFS types (80 and 81) are considered successionally temporary (Crow 1980) or transient, and expected to gradually revert to an upland oak climax in the absence of fire or other disturbance. These descriptions imply fire regimes very different from those typically ascribed to longleaf or shortleaf forests. Fire is certainly an important ecological factor in these Loblolly forests. As the SAF descriptions recognize, fire retards succession from loblolly-dominated overstories to ones dominated by hardwood species (Crow 1980; Mann 1980). However, loblolly is not a fire-resistant species (McCune 1988), and fire frequency associated with occurrence is lower than that associated with the occurrence of most other southern pines (Landers 1989).

Schafale and Harcombe (1983) found evidence that a part of the original loblolly belt in Hardin County was mixed forest. They did not find evidence of a disturbance regime that would have accounted for the abundance of pine in the area, however. Some historical records indicate that portions of the loblolly belt may be more affected by infrequent inshore hurricanes than by fire (Collier 1964).

Today, loblolly is the most important species throughout much of the remaining forested area within the original loblolly belt (Thomlinson 1993). Loblolly is also dominant throughout the area originally classified as longleaf belt, and it now shares dominance in the former shortleaf pine region (McWilliams and Lord 1988). The increase of loblolly in these areas apparently began with massive waves of logging of the original types. Loblolly pine has "frequent and prolific seeding, rapid growth from the start, and comparative freedom from damage by hogs" (Zon 1904), in addition to greater seed dispersal distance and earlier reproductive age than longleaf pine (Landers 1989). These characteristics virtually assured that loblolly would replace longleaf on cutover land in a pattern also observed in North Carolina (Wells 1932; Zon 1904). Loblolly, also called old-field pine, has also invaded some natural shortleaf sites (Martin and Smith 1991; McWilliams and Lord 1988).

SHORTLEAF PINE

The original shortleaf pine belt was the most extensive pine region in Texas, extending throughout much of northeast Texas (Bray 1906). Logging occurred earlier than in the other pine types, and virgin shortleaf was probably cleared before appreciable logging took place in other regions (Foster and others 1917). By the early 1900's, most of the area where shortleaf pine formed compact forests over many hundreds of square miles had been removed (Bray 1906). This area was more suitable for agriculture than were other pine regions. Earlier settlement and more complete agricultural clearing have relegated tree production to lower priority in northeast Texas (Collier 1964; Maxwell and Martin 1970).

Because the shortleaf forests were removed early and often completely, we have little knowledge of their character. It is believed that pure pine stands did occur, but that pine more often grew in association with hardwoods (and especially with upland oaks and hickories) (Foster and others

(Martin and Smith 1991; Sullivan and Nixon 1971). It is possible that many areas once supported relatively pure shortleaf-bluestem communities.

In some places, the pine component present today may be greater than that present in presettlement times (Keller 1974). In one portion of the shortleaf belt this is apparently the result of timber management practices (Bruseth and Moir 1987). Although shortleaf grows and develops rapidly, the site index for this species rarely exceeds that for loblolly pine (Walker and Wiant 1966). Loblolly's very rapid growth is one reason why loblolly is now so important throughout northeast

Texas (McWilliams and Lord 1988). On the other hand, shortleaf is rather drought tolerant and is less seriously damaged by ice and sleet storms than is loblolly or longleaf. These characteristics probably explain why the native range of shortleaf extends farther north than those of loblolly and longleaf (Walker and Wiant 1966).

Shortleaf is adapted to survive relatively frequent fires. It can sprout prolifically after burns when young and is almost unaffected by growing-season headfires when its diameter breast height (d.b.h.) is greater than 4 inches (Walker and Wiant 1966). In a typical shortleaf fire regime, fire may be of moderate intensity and reoccur approximately every 10 years (Landers 1989). Shortleaf appears to require fire for reproduction. Litter accumulates and exposure of mineral soil declines with increased time since burning. These factors contribute to decreased seed germination, which drops to almost 0 percent after 3 years (Ferguson 1958).

HARDWOODS

Presettlement forest composition varied greatly with east Texas location and plant community (Keller 1974). Not all areas were pine-dominated grasslands. Hardwoods were important components of both shortleaf and loblolly forests. If these forests were to persist "undisturbed" the relative importance of hardwoods would certainly increase. It has been said that "no serious ecologist entertains the concept of a pine climax in the Coastal Plain" (Quarterman and Keever 1962). This idea follows from many observations that natural succession on mesic sites tends to favor hardwood development over pine development in the Southeast (Blair and Burnett 1976; Garren 1943; McLeod 1972; Quarterman and Keever 1962).

One distinctive upland region, the Redlands, was originally dominated by hardwoods (Chambers 1941; Gow 1904; Hilgard 1884; Johnson 1931; Roberts 1893). Cruikshank and Eldredge (1939) considered that the Redlands exhibited the best development of upland hardwood forest in east Texas. This area is rather limited in size, occupying a narrow east-west band. Because the area's loamy soils are productive, much of this ground was cultivated long ago (Johnson 1931; Roberts 1881). Cultivation obliterated evidence of historical vegetation relationships. Several authors described a scrubby forest of oaks (southern red, post, and blackjack), hickories, elms, and other hardwoods (Austin 1821; Roberts 1881), and even a "thick coat of grass" (Roberts 1893). Roberts (1881) considered this area to be the lower edge or extension of the "blackjack belt". Hilgard (1884) recognized " redlands" in Louisiana as part of the "oak-uplands region" and described the usual timber growth as oak and hickory that was almost always associated with shortleaf pine.

Other important hardwood-dominated communities were found along major drainages dissecting uplands in the pine belts described above. Bottomland forests (and associated riparian vegetation) previously occupies more than 16 million acres in Texas (Frye 1987). Bottomland vegetation has been altered extensively over long periods of settlement. By the early part of this century, many

when an extensive, detailed assessment of the status and quality of bottomland hardwood vegetation in Texas was completed, less than 6 million acres of such vegetation remained. More than 63 percent of the original forested bottoms have been lost, largely as a result of development of reservoirs on major watersheds (Frye 1987).

Some presettlement forests in east Texas were dominated by mesic species such as American beech and southern magnolia. Roberts described a magnolia belt approximately 20 miles wide running westward from the Sabine River. This area "was overgrown with a magnificent forest of mammoth white oaks, beech, sugar-tree, elm, water-oak and magnolia . . . presenting, even upon ridges, the appearance of a rich bottom, adjoining a river" (Roberts 1881).

American beech, southern magnolia, white oak, and loblolly pine may have been originally more common and widespread components of the Big Thicket community (McLeod 1972). The relative abundance and actual distribution of these species may never be known, but hardwood species have declined as a result of extensive girdling practices (McLeod 1972; Mize 1993). These practices may partially explain the increased abundance of pine on some sites in east Texas (Keller 1974). This shift in forest composition appears inconsistent with the tendency of natural succession on mesic sites across the southeast to favor hardwoods over pines (Blair & Burnett 1976; Garren 1943; McLeod 1972; Quarterman and Keever 1962). Although beech and magnolias have been described as dominant in late successional forests (Braun 1950; Delcourt and Delcourt 1974, 1977; Nixon and others 1978), it has also been suggested that their conspicuousness has led observers to ascribe exaggerated importance values to them (Quarterman and Keever 1962). Seedlings and saplings of these species are often poorly represented (Blaisdell and others 1974; Harcombe and Marks 1978; Kurz 1944; Nixon and others 1980).

DISTURBANCE FACTORS

Both managers and researchers recognize that fire can mold landscapes. Fire was and is a very strong influence on the woodland, savanna, and prairie environments of east and north Texas (Jordan 1973).

Many variables affect fire regime and its effects on vegetation. In grasslands, temporal and spatial variations in climate, differential effects of fire on woody and other plant species, topographic influences on fire frequency, and burning by aboriginal peoples are important (Anderson 1990). Many of these same factors are also important in forested environments.

Plant communities typical of both forests and grasslands are associated with high natural fire frequencies, and many plant communities may have evolved in the presence of fire over long periods (Mutch 1970). Natural fires are usually ignited by summer lightning, which is very common in the southern United States (Komerak 1964; Orville 1991). In many cases the effects of lightning fire regimes may have been obscured by human activities (Delcourt 1976). For approximately 50 years, wildland fire policy has been to suppress lightning fires or to conduct burns primarily during the winter or both. This policy has been described as a "giant uncontrolled experiment" with unforeseen results (Platt 1993). In the long-needled pine types (like longleaf), wildland fire policy has reduced open, herbaceous-dominated cover and created a variety of forest health problems that affect our ability to ensure ecosystem sustainability (USFS 1993). Nevertheless, lightning fires have probably been frequent enough to have lasting effects on plant and animal communities (Komerak 1964).

Growing season fires tend to have greater ecological significance than those occurring during the winter dormant season. Actively photosynthesizing plants have low carbohydrate reserves and thus have increased susceptibility injury or death (Ferguson 1957; Waldrop and others 1987). In comparison with burns in the dormant season, growing-season burns topkill a higher percentage of stems, topkill larger stems, reduce resprouting, and increase complete kill (Robbins and Myers 1989). Fire frequency often interacts with seasonality to create unexpected vegetation patterns. For example, periodic winter, periodic summer, annual winter, and biennial summer burning treatments caused understory hardwood stems to proliferate to levels greater than in an unburned control (Waldrop and others 1987).

Wind, ice, drought, hurricanes, and insect and disease outbreaks also affected presettlement forests of east Texas. Among these factors, outbreaks of southern pine beetle (Dendroctonus frontalis), are probably the most widespread and important. Occurrence of this native pest was first documented in southern forests in the 1750's (Thatcher 1980). SPB populations reach epidemic

level periodically. At these population levels SPB can damage pine timber severely. Unfortunately, there has been little study of SPB effects on plant communities or on the vast majority of southern tree species (Leuschner 1980). It is known that various factors influence the dynamics of SPB populations. Of particular importance are tree species composition at stand and landscape levels, the spatial distribution of trees, and site factors. For example, it is well known that certain overstory species, especially longleaf pine, are resistant to SPB attacks (Belanger 1980) and that stands with hardwood components inhibit SPB spread (Belanger 1980). The presence of many longleaf pines or hardwoods or both tends to decrease the likelihood of SPB outbreak and subsequent spread.

EXISTING PLANT COMMUNITIES

Although the USFS routinely collects vegetation data during silvicultural examinations, not all vegetational strata are inventoried. Areas of similar overstory composition are classified as "stands" in a system which follows the forest cover descriptions of the Society of American Foresters; at least 15 forest types are documented on the NFGT (USFS 1994). The first comprehensive plant community inventory work on the NFGT was completed by the Texas Natural Heritage Program (TNHP) in 1990. This inventory, which focused on late-seral areas, identified 17 exemplary plant communities on the NFGT (Orzell 1990). Four of these plant communities occur exclusively on the Grasslands and are characteristic of prairie or woodland savannas. The other 13 exemplary communities are more typical of traditional pineywoods habitat, and most are closely related to communities occurring north or east of Texas. Three additional plant communities may occur on NFGT.

The 20 community series of interest are listed in table 1, where they are classified Allard (1990). These community series are then described twice, first as by NFGT and then as by TNHP (Diamond and others 1987).

Table 1. Major Vegetation Systems of the National Forests
and Grasslands in Texas

PALUSTRINE

Forested Wetlands

Floodplain Forest
Overcup Oak Series
Water Oak - Willow Oak Series
Swamp Chestnut Oak - Willow Oak Series
Pecan - Sugarberry Series
Sugarberry - Elm Series

Shrub Wetland

Seepage Slope - Sweetbay Magnolia Series

Herbaceous wetland

Hillside Bog - Sphagnum-Beakrush Series

TERRESTRIAL

Forests

Upland Dry-Mesic Forest- Loblolly Pine-Oak Series
Mesic Forests
American Beech-White Oak Series
American Beech-So. Magnolia Series

Woodlands or Savannas

Midwestern Oak Woodland - Post Oak - Blackjack Oak Series
- Post Oak - Black Hickory Series
- Shortleaf Pine - Oak Series
Southern Pine-Oak Woodland - Bluejack Oak - Pine Series
- Longleaf Pine - Little Bluestem Series
Western Juniper Woodland - Ashe's Juniper Oak Series
Western Upland Oak Woodland - Texas Oak Series

Glades (Mixed Physiognomy)

Sandstone Glade - Little Bluestem - Nuttall's Goldenrod Series

Grasslands or Terrestrial Herbaceous Vegetation

Tallgrass Prairie - Little Bluestem - Indiangrass Series

Palustrine - Forested Wetlands

Baldcypress - Water Tupelo Series (Cypress swamp)

This community is often dense-canopied, and is dominated by baldcypress (taxodium distichum) and water tupelo (Nyssa aquatica). The understory is often sparse, but abundant microhabitats exist. These include buttressed trunks, root growths (including "knees"), and floating logs. Standing water is present for much of the year. Vines and epiphytes are common. Individual trees can reach the age of 1,000 years.

VEGETATION:

DOMINANTS: Baldcypress (Taxodium distichum), water tupelo Nyssa aquatica), green ash (Fraxinus pennsylvanica), red maple (Acer rubrum), water-elm (Planera aquatica), common lizardtail (Saururus cernuus).

Overstory: Almost exclusively baldcypress or water tupelo or both, but the properties each make up is variable. Common overstory associates (essentially subcanopy elements) may include red maple ashes water locust (Gleditsia aquatica), swamp tuples (Nyssa sylvatica var. biflora), and a few others. Spanish moss (Tillandsia usneoides) is often draped conspicuously in overstory trees.

Midstory: May include swamp-privet (Forestiera acuminata), Carolina ash (F. caroliniana), water-elm, black willow (Salix nigra), regenerating overstory species, and a few others.

Understory: May include Virginia sweetspire (Itea virginica), button-bush (Cephalanthus occidentalis), hollies (Ilex spp.), and other woody plants. Various herbs and ferns may be present on stumps, logs, and exposed root masses, but herbaceous understory is generally minimal because inundation periods are long. Herb species may include caric-sedges (Carex spp.), umbrella-sedges (Cyperus spp.), rushes (Juncus spp.), smallspike false nettle (Boehmeria cylindrica), cardinal flower (Lobelia cardinalis), smartweeds (Polygonum spp.), lance-leaved waterwillow (Justicia ovata), St. John's worts (Hypericum spp.), and a few others. Various floating and submerged aquatic plants are often present. A diverse epiphytic cryptogam flora (mosses, liverworts, lichens) may be present on tree trunks and limbs. Many of these probably are habitat or site specific or both, but relatively little is known about the ecology of most cryptogams.

SPECIAL-INTEREST PLANTS:

Triphora trianthophora (may be present on logs, stumps, exposed root masses, and swamp edges).

PHASES OR VARIATION:

Little variation in overall species composition, but considerable variation in percentage cover of baldcypress and water tupelo depending on site characteristics including land-use history, timing and depth of flooding, and nutrient availability.

IMPORTANT HABITAT ATTRIBUTES:

Old trees (age >300 years) present
Trees of multiple age, size, and form classes present
Snags and downed woody material common
Hydrologic regime intact

POTENTIAL PLANT INDICATORS:

Taxodium distichum -- baldcypress
Nyssa aquatica -- water tupelo
N. sylvatica -- blackgum
Cephalanthus occidentalis -- buttonbush
Chiodecton sanguinea (?)

Floodplain Forests

Floodplain forests most typically occur in well-defined terraces along rivers and larger streams. In their natural state they are uneven-aged and with regeneration of most component tree species is confined principally to canopy gaps. Flood events, especially those of long duration, may induce widespread mortality of trees and shrubs. Although oaks are usually dominant, the woody species most common in floodplain forests in southeast Texas are green ash (Fraxinus pennsylvanica), possumhaw (Ilex decidua), overcup oak (Quercus lyrata), American elm (Ulmus americana), sugarberry (Celtis laevigata), common persimmon (Diospyros virginiana), water hickory (Carya aquatica), sweetgum (Liquidambar styraciflua), cedar elm (Ulmus crassifolia), water oak (Q. nigra), swamp privet (Forestirea acuminata), hawthorns (Crataegus spp.), and water-elm (Planera aquatica).

PHASES OR VARIATION:

The composition of these forests varies considerably depending upon topographical, geographical, and historical factors. Some of this variation will be reflected in the following series.

OVERCUP OAK SERIES
(Quercus lyrata)

This phase may succeed the baldcypress - water tupelo series (and possibly other series) in backwater areas, including oxbows, as sedimentation progresses.

VEGETATION:

DOMINANTS: Overcup oak, water hickory (Carya aquatica), green ash (Fraxinus pennsylvanica), American elm, (Ulmus americana) (Celtis laevigata), red maple (Acer rubrum), buttonbush (Cephalanthus occidentalis), peppervine (Ampelopsis arborea).

Overstory: Overcup oak, water hickory, green ash, American elm, sugarberry, and red maple.

Other spp. may include willow oak (Q. phellos), common persimmon (Diospyros virginiana), water-elm (Planera aquatica), cedar elm (V. crassifolia), Nuttalls oak, (Q. nuttallii) waterlocust (Gleditsia aquatica), baldcypress (Taxudium distichum), roughleaf dogwood (Cornus drummondii), swamp-privet (Forestieraacuminata), winged elm (U. alata), American buckwheat vine (Brunnichia ovata), common trumpet creeper (Campsis radicans), Alabama supplejack (Berchemia scandens), Carolina snailseed (Cocculus carolinus), riverbank grape (Vitis riparia), lance-leaved waterwillow (Justicia ovata).

(Quercus nigra - Q. phellos)

This series is often quite similar in species composition to forests on the adjacent slopes (just above the floodplain). Hardwoods, many of which reach old ages, are dominant.

VEGETATION:

DOMINANTS: Willow oak, laurel oak (Q. laurifolia), water oak, Nuttalls oak (Q. nuttalli), sweetgum, hornbeam, possumhaw (Ilex decidua), Virginia sweetspire (Itea virginica), Alabama supplejack (Buchemia scandens), grapes (Vitis spp.), common greenbrier (Smilax rotundifolia).

Overstory: Commonly supports a diversity of hardwoods including white oak (Q. alba), swamp chestnut oak (Q. michauxii), water oak, laurel oak, cherrybark oak (Q. pagodifolia Delta post oak (Stellata var. paludosa), willow oak, Shumard oak (Quercus shumardii), American beech (Fagus grandifolia), southern magnolia (Magnolia grandiflora), sweetbay (M. virginiana), swamp blackgum (Nyssa sylvatica), sweetgum, sycamore (Platanus occidentalis), red maple (Acer rubrum), Florida maple (A. barbatum), chalk maple (A. leucoderme), river birch (Betula nigra), winged elm (Ulmus alata), slippery elm (U. ruba), white ash (Fraxinus americana), Carolina ash (Fraxinus caroliniana), pignut hickory (Carya glabra), bitternut hickory (C. cordiformis), shagbark hickory (Carolina ovata), basswood (Tilia caroliniana), yellow popla (Lirirodendron tulipifera), red mulberry (Morus rubra), and others. The forest usually contains loblolly pine (Pinus tacda) and may support shortleaf pine (P. echinata).

Midstory: Includes regenerating overstory species and may support a variety of small trees and shrubs including American hornbean (Carpinus caroliniana), eastern hophornbean (Ostrya virginiana), blueberries (Vaccinium spp.), pawpaw (Asimina triloba), arrowwood (Viburnum dentatum), Virginia sweetspire (Itea virginica), maple-leaf viburnum (V. acerifolium), American snowbell (Styrax americana), bigleaf snowbell (S. grandifolins), two-wing silverbell (Halesia diptera), sweetleaf (Symplocos tinctoria), fringetree (Chionanthus virginicus), parsley hawthorn (Crataegus marshallii), hawthorns (Crataegus spp.), possumhaw (Ilex decidua), American elder (Sambucus canadensis), and others. Vines that may be present include greenbriers (Smilax spp.), Alabama supplejack (Berchemia saandens) wild grape (Vitis spp.), common trumpetcreeper (Campsis radicans), poison-oak (Toxicodendron radicans), croosvine (Bignonia capreolata), American star jasmine (Trachelospermum difforme), Virginia creeper (Parthenocissus quinquefolia), and wood-vamp (Decumaria barbara).

Understory: Herbaceous cover is often minimal because of flooding and canopy shade but may include a broad diversity of species. Patches of giant-cane (Arundinaria gigantea) are common. The forest may include species from adjacent nonflooded or rarelyflooded forests, especially near the annual flooded-nonflooded boundary and on elevated areas within the flood zone. Herb species encountered may include basket selaginella Selaginella apoda), ladyfern (Athyrium filix-femina), Christmasfern (Polystichum acrostichoides), broad beechfern (Thelypteris hexagonoptera), broadleaf woodoats (Chasmanthium latifolium), woodoats (Chasmanthium spp.), common lizard tail (Saururus cernuus), partridge-berry (Mitchella repens), St. Johns worts (Hypericum spp.) golden alexanders (Zizia aurea), cardinal flower (Lobelia cardinalis), lance-leaved waterwillow (Justicia ovata), panicums (Panicum spp.), umbrella-sedges (Cyperus spp.), caric-sedges (Carex spp.), rushes (Juncus spp.), smallspike false-nettle (Boehmeria cylindrica), waterprimroses (Ludwigia spp.), smartweeds (Polygonum spp.), and a variety of others. The

of these are probably habitat or site specific or both, but relatively little is known about their ecology.

SPECIAL-INTEREST PLANTS:

KNOWN to occur on NF TX

Amsonia glaberrima
Triphora trianthophora
Prenanthes barbata
Solidago auriculata (calcareous)
Taenidia integerrima (calcareous)
Erythronium rostratum
Xanthorhiza simplicissima

KNOWN to occur elsewhere in Texas

Amsonia ludoviciana

SWAMP CHESTNUT OAK - WILLOW OAK SERIES
(Quercus michauxii - Q.Phellos)

Generally very similar to water oak-willow oak series, with water oak (Q. nigra) of lesser importance. This type occurs primarily on ridges of first bottom and thus is rarely flooded. This floodplain forest variants is often located farthest from the river and may adjoin the lower-slope upland communities.

VEGETATION:

DOMINANTS: Swamp chestnut oak, cherrybark oak (Q. falcata var. pagodifolia) paw paw (Asimina triloba), American hornbeam (Carpinus caroliniana), dwarft palmetto (Sabal minor), Alabama supplejack (Berchemia scandens), Virginia creeper (Parthenocissus quinquefolia), muscadine grape (Vitis rotundifolia), sedges (Carex spp.), poison-ivy (Toxicodendron).

Overstory: Swamp chestnut oak, laurel oak, (Q. laurifolia) water oak (Q.nigra), willow oak (Q. phellos), Shumard oak, cherrybark oak, southern red oak, white oak, sweetgum, white ash (Fraxinus americana), green ash (F. pennsylvanica), mockernut hickory (Carya tomentosa), bitternut hickory (C. cordiformis), nutmeg hickory (C. myristiciformis), shellbark hickory (C. laciniosa), swamp tupelo (Nyssa sylvatica var. biflora), American elm (Ulmus americana), water hickory (C. aguatica), shagbark hickory (C. ovata), southern magnolia (Magnolia grandiflora), yellow-poplar (Liriodendron tulipifera), American beech (Fagus grandifolia), loblolly pine (Pinus taeda).

Midstory: Possumhaw (Ilex decidua), American holly (I. opaca), flowering dogwood (Cornus florida), dwarf palmetto (Sabal minor), American snowbell (Styraz americames), devils-walkingstick (Aralia spinosa), eastern redbud (Cercis canadensis).

Understory: Giant-cane (Arundinaria gigantea), broadleaf woodoats (Chasmanthium latifolium), woodoats (C. laxum), violets (Viola spp.), smallspike false nettle (Boehmeria cylindrica).

PECAN - SUGARBERRY SERIES
(Carya illinoensis - Celtis reticulata)

In our area, this type occurs only in the Grassland system (sometimes adjacent to Ashes juniper-oak series).

VEGETATION:

Important species may include netleaf hackberry, cedar elm (Ulmus crassifolia), bur oak (Quercus macrocarpa), American elm (V. americana), Texas live oak (Q. fusiformis), Texas oak (virginiana var./Q. shumardii var. Texana), black walnut (Juglans nigra), boxelder (Acer negundo), and ashes (Fraxinus spp.).

SUGARBERRY - ELM SERIES
(Celtis - Ulmus)

This type was not found on NF land during the Natural Heritage survey, but it may occur in the Grasslands. The series exhibits much variation and probably grades into water oak-willow oak series to the east.

VEGETATION:

The following species may be important: cedar elm (V. crassifolia), American elm, (U. americana), pecan (Carya illinoensis), ashes (Fraxinus berlandierana, F. pennsylvanica, F. texensis), Texas oak, bur oak (Q. macrocarpa), chinkapin oak (Q. muehlenbergii), and sycamore (Platanus occidentalis).

Shrub Wetland
Sweetbay Magnolia Series (Seepage Slope)

(Magnolia virginiana)

This community, locally known to as "baygall," often appears as a dense evergreen shrub thicket. These areas are generally larger than hillside bogs and may occur adjacent to them. The water table is generally close to the surface for long periods, and deep standing pools are common. This series can develop along wet creek bottoms. Open water, woody growth forms (including cypress knees, and buttressed trunks) and organic knolls contribute important habitat diversity.

VEGETATION:

DOMINANTS: Sweetbay, swamp tupelo (Nyssa sylvatica var. biflora), laurel oak (Quercus laurifolia), large gallberry (Ilex coriacea), red bay (Persea borbonia), Carolina ash (Fraxinus caroliniana).

Overstory: True overstory is generally lacking when this type develops hillside bogs, where fire has been suppressed but may include sweetbay, swamp tupelo, American holly (Ilex opaca), and red maple (Acer rubrum).

In stream bottoms where fire occurs rarely, the overstory becomes more developed. Sweetbay and swamp tupelo typically dominate, but the overstory may also contain American holly, red maple, laurel oak, southern magnolia (Magnolia grandiflora), loblolly pine (Pinus taeda), baldcypress (Taxodium distichum), and others.

Midstory: The midstory always includes numerous shrub species, many of which are evergreen, and may include large gallberry, southern bayberry (Myrica cerifera), evergreen bayberry (Myrica heterophylla), redbay (Persea borbonia), hazel alder (Alnus serrulata), poison-sumac (Toxicodendron vernix), possumhaw viburnum (Viburnum nudum), red choke-berry (Aronia arbutifolia), he-huckleberry (Lyonia ligustrina), Texas azalea (Rhododendron oblongifolium), and others. Laurel greenbrier (Smilax laurifolia) is usually quite conspicuous, climbing into and overtopping shrubs and small trees.

Understory: Typically includes a number of ferns, especially in stream bottoms. cinnamon fern (Osmunda cinnamomea), royal fern (Osmunda regalis var. spectabilis), chainfern (Woodwardia areolata), sensitive fern (Onoclea sensibilis), and Virginia chainfern (Woodwardia virginica) may be present. Sphagnum moss beds may be abundant, and other mosses and liverworts may be common. Various herbaceous species characteristic of hillside bogs may occur sporadically in openings, on edges, and suppressed in the understory. Other herbaceous species may include fingerorchids (Platanthera spp.), flatsedges (Cyperus spp.), and caric-sedges (Carex spp.). There is often increased structural development along streams. More woody debris (stumps and logs), root masses, and tree trunks, may be present, and these may provide microhabitat for mosses and liverworts.

SPECIAL-INTEREST PLANTS:

KNOWN to occur on NF TX

Apteria aphylla
Burmannia biflora
Bartonia texana
Mayaca fluviatilis

Prenanthes barbata
Carex styloflexa
Lilium michauxii
Rudbeckia scabrifolia

PHASES OR VARIATION:

Composition and development vary with topography, geography, disturbance history, and other factors. Variation occurs along north-south, and topographic gradients. Some areas are completely surrounded by longleaf pine (Pinus palustris) forests, but others are entirely outside the longleaf range. Within the longleaf range, this series is often located on wetter ground adjacent to herbaceous bogs. The two series may exchange locations depending upon fire frequency.

IMPORTANT HABITAT ATTRIBUTES:

Free from mechanical disturbance
Ecotones and surrounding habitat in natural condition

POTENTIAL PLANT INDICATORS:

Ilex coriacea -- large gallberry
Alnus serrulata -- hazel alder
Osmunda spp. -- cinnamon ferns
Sphagnum spp. -- sphagnum mosses
Myrica heterophylla -- evergreen bayberry
Vaccinium -- corymbosum-Elliott's blueberry
Toxicodendron vernix -- poison sumac
Smilax laurifolia -- lanrel greenbrier

Herbaceous Wetland}
Sphagnum - Beakrush Series (Hillside Bog)

(Spagnum - Rhynchospora)

These communities consist of predominantly graminoid cover, butwetland shrubs and occasional trees may be scattered about. More than 100 plant species may be found in a single bog (MacRoberts and MacRoberts 1988; Nixon and Ward 1986), and many of these species are exclusive to this habitat. Carnivorous flora are represented well. Subsurface water percolation and frequent fires from surrounding uplands are important factors maintaining these habitats.

VEGETATION:

DOMINANTS: Beakrushes esp. R. oligantha, R. gra- cilenta, R. elliottii, R. glomerata), bushy bluestem (Andropogon glomeratus), evergreen bayberry (Myrica heterophylla), pitcherplant (Sarracenia alata), laurel greenbrier (Smilax laurifolia), nutrush (Scleria reticularis).

Overstory: Generally lacking in frequently burned bogs. Sweetbay (Magnolia virginiana) may attain large size, and longleaf pines (Pinus palustris) may be present, especially on the periphery.

HERBACEOUS PLANTS: Usually dominated by sedges, grasses, and beakrushes. Pitcherplants and various species are usually present. Major graminoids include cutover muhly (Muhlenbergia

expansa), panicums (Panicum spp.), threeawn grasses (Aristida spp.), silky scale grasses (Anthaenantia spp.), Rhynchospora latifolia and numerous other beakrushes, several yellow-eye-grasses (Xyris spp.), pipeworts (Eriocaulon spp., Lachnocaulon spp.), nutrushes (Scleria spp.), and umbrellagrasses (Fuirena spp.). Primary forbs include meadow beauties (Rhexia spp.), milkworts (Polygala spp.), blazing-star (Liatris pycnostachya), coresopsis tickseed (Coreopsis linifolia), simple-leaf (Eeryngo integrifolium), thorough-worts (Eupatorium spp.), and Chaptalia tomentosa. Additional carnivorous plants are sundews (Drosera spp.), small butterwort (Pinguicula pumila), and bladderworts (Utricularia spp.). Various orchids, especially Calopogon, Pogonia, and Platanthera spp., are often conspicuous. Clubmosses (Lycopodium spp.) are usually common and sphagnum moss (Spagnum spp.) is typically abundant beneath other herb cover.

WOODY PLANTS: (see also Sweetbay Magnolia series). The following woody plants readily invade bogs and may come to dominate them without fire: large gallberry (Ilex coriacea), southern bayberry (Myrica cerifera), evergreen bayberry (Myrica heterophylla), redbay (Persea borbonia), poison sumac (Toxicodendron vernix), possumhaw viburnum (Viburnum nudum), red

virginiana), swamp tupelo (Nyssa sylvatica var. biflora), and red maple (Acer rubrum). Longleaf pine (Pinus palustris) may occur as scattered trees.

SPECIAL-INTEREST PLANTS:

KNOWN to occur in NF TX bogs:

Lycopodium cernuum
Platanthera integra
Rhynchospora macra
Eriocaulon texense
Xyris drummondii
Xyris scabrifolia
Rudbeckia scabrifolia
Rudbeckia subtomentosa
Calopogon tuberosus
Pogonia ophioglossoides

May occur in NF TX bogs:
Lachnocaulon digynum
Eulophia ecristata
Sabatia macrophylla

PHASES OR VARIATION:

There are different kinds of hillside bogs. These range from seasonally moist areas along slopes with relatively few bog-associated species to bogs that are wet throughout the year and support a large array of bog-associated herbaceous species. The of development of a seep depends will be primarily on five influences on water flow: (1) upslope surface and subsurface soil characteristics that govern soil infiltration and saturated flow rates, (2) size of the recharge area, (3) vegetation present in both recharge and seepage areas, (4) local topography, and (5) depth, gradient, and extent of the underlying impermeable layer (Platt and others 1990).

Woody plants may include hillside bogs as fire frequency decreases. Historically, such development was probably uncommon because surface fires occurred frequently in the surrounding

longleaf pine forests. As fire frequency increases, some wooded areas may regain to the open character of the hillside bog.

IMPORTANT HABITAT ATTRIBUTES:

No evidence of mechanical disturbance within bog or recharge area
Continuous herbaceous ground cover
Adjacent habitat in relatively natural condition
Open aspect (essentially free from shrub, hardwood, and pine invasion)
Fires frequent, but ignited in surrounding uplands

POTENTIAL PLANT INDICATORS:

Sarracenia alata -- yellow pitcher plant
Xyris sp. -- yellow-eye-grasses
Pogonia ophioglossoides -- rose pogonia
Platanthera ciliaris -- yellow fingerorchid
Lycopodium spp. -- clubmosses
Rhexia spp. -- meadow beauties
Rhynchospora spp. -- beakrushes
Eryngium integrifolium -- simple-leaf eryngo
Eriocaulon spp. -- pipeworts
Drosera spp. -- sundews
Chaptalia tomentosa
Coreopsis linifolia -- coreopsis

Terrestrial

Mesic Forests

Terrestrial Forests

These forests often occur on slopes in areas between uplands and stream bottoms, often in association with the Sabine uplift. These forests are in relatively natural condition, are mostly uneven-aged, and have many large trees. The forest may have a three-layered appearance with an essentially closed canopy and with scattered snags and small gaps. An open, parklike condition develops with age, but a variety of shrubs and regenerating trees are found even in parklike areas. Herbaceous cover is generally sparse. Typically, much downed woody material and thick hardwood leaf litter are present.

Although mature hardwood-dominated forests support relatively few herbaceous understory plant species, mesic, hardwood-dominated forests with closed canopies create special understory conditions that seem necessary for many herbaceous "rich woods" species. Those conditions include: (1) absence of or great reduction in direct sunlight, but much diffuse light, (2) modified ambient air temperature (reduced on warm or hot days), (3) increased ambient air humidity, (4) reduced direct physical effects of wind and rain, and (5) a deep, actively decaying leaf litter layer that produces a fertile, humus-rich topsoil.

VEGETATION:

Overstory: White oak (Quercus alba), American beech (Fagus grandifolia), southern magnolia (Magnolia grandiflora), swamp chestnut oak (Q. michau- xii), cherrybark oak (Q. pagodifolia), black oak (Q. velutina), water oak (Q. nigra), loblolly pine (Pinus taeda), American holly (Ilex opaca), mockernut hickory (Carya tomentosa), bitternut hickory (C. cordiformis), shagbark hickory (C. ovata), black gum (Nyssa sylvatica), sweetgum (Liquidambar styraciflua), yellow-poplar (Liriodendron tulipifera), red maple (Acer rubrum), Florida maple (A. barbatum), winged elm (Ulmus alata), and others. The resurrection fern (Polypodium polypodioides) is common on hardwoods.

Midstory: Contains regenerating overstory species, and a variety of shrub species, and may include American hornbeam (Carpinus caroliniana), chalk maple (A. leucoderme), eastern hophornbeam (Ostrya virginiana), flowering dogwood (Cornus florida), bigleaf snowbell (Styrax grandifolius), witch-hazel (Hamamelis virginiana), southern arrow-wood (Viburnum dentatum),

(Symplocos tinctoria), brook enonymus (Euonymus americanus), fringetree (Chionanthus virginicus), Carolina buckthorn (Rhamnus caroliniana), parsley hawthorn (Crataegus marshallii), arrow-wood (Viburnum acerifolium), rusty blackhaw (V. rufidulum), downy serviceberry (Amelanchier arborea), azalea (Rhododendron canescens), Carolina holly (Ilex ambigua), American beautyberry (Callicarpa americana), southeastern coralbean (Erythrina herbacea), and others. Vines commonly present include grapes (Vitis spp.), greenbriers (Smilax spp.), Virginia creeper (Parthenocissus quinquefolia), cross vine (Bignonia capreolata), poison-oak (Toxicodendron radicans), Alabama supplejack (Berchemia scandens), and trumpet honeysuckle (Lonicera sempervirens).

Understory: In addition to regenerating overstory and midstory species, usually supports a variety of "rich woods" herbaceous species. These may include Christmasfern (Polystichum acrostichoides), wouthern ladyfern (Athyrium filix-femina var. asplenoides), broadfern fern (Thelypteris hexagonoptera), grapeferns (Botrychium spp.), rattlesnake root (Pre- nanthes altissima), woodland pinkroot (Spigelia marilandica), goldenrods (Solidago spp.), beechdrops (Epifagus virginiana), woods bedstraw (Galium circaezans), bare-stem tickclover (Desmodium nudiflorum), great solomon's seal (Polygonatum biflorum), blue hound's tongue (Cynoglossum virginianum), sanicles (Sanicula spp.), Jack-in-the-pulpit (Arisaema triphyllum), Walter violet (Viola walteri), partridge-berry (Mitchella repens), trilliums (Trillium gracile), mayapple (Podophyllum peltatum), carrion flower (Smilax herbacea), Dutchman's pipes (Aristilochia spp.), sweet-william phlox (Phlox divaricata), cranefly orchid (Tipularia discolor), Carolina lily (Lilium michanxii), giant cane (Arundinaria gigantea), and twoflower melic (Melica mutica).

There is usually a rich assemblage of lichens, mosses, and liverworts on soil, fallen logs, stumps, shrubs, and trees. Many of these probably are habitat or site-specific, but relatively little is known about the ecology of most.

SPECIAL-INTEREST PLANTS:

KNOWN to occur on NF TX

Brachyelytrum erectum
Cypripedium kentuckiense
Dentoria laciniatea
Erythronium rostratum
Isotria verticillata
Lilium michauxii
Lithospermum tuberosum
Prenanthes barbata
Sanguinaria canadensis
Taenidia integerrima
Thaspium barbinode

Thaspium trifoliatum
Triphora trianthophora
Trillium gracile
Uvularia perfoliata

KNOWN to occur outside NF TX

Cheilanthes lanosa
Monotropa hypopithys
Maianthemum racemosum ssp. amplexicanle

IMPORTANT HABITAT ATTRIBUTES:

Trees of various ages, sizes, and forms present
Specimens more than 200 years old present.
Snags, cavities, canopy gaps, and downed wood common
Hardwood species dominant (loblolly pine only a minor associate)
Well developed litter layer
Multilayered structure

POTENTIAL PLANT INDICATORS:

Fagus grandifolia -- American beech
Quercus alba -- white oak
Magnolia grandiflora -- southern magnolia
Acer barbatum
Ilex opaca -- American holly
Ostrya virginiana -- eastern hophornbeam
Styrax grandifolius -- bigleaf snowbell
Vaccinium -- Elliott's blueberry
Symplocos tinctoria -- sweetleaf
Trillium spp. -- trilliums
Viola walteri -- Walter violet
Sanicula spp. -- sanicles
Tipularia discolor -- cranefly orchid
Epifagus virginiana -- Virginia beechdrops
Polypodium polypodioides -- resurrection fern
Tillandsia usneoides -- Spanish moss

OTHER COMMENTS:

These mesic hardwood communities are very similar to some loblolly pine - oak forests, but are typically more mesic, with less loblolly pine and more consistent hardwood components. Two variations that have been recognized are as follows:

PHASES OR VARIATION:

AMERICAN BEECH - SOUTHERN MAGNOLIA SERIES
(Fagus grandifolia - Magnolia grandiflora)

This primarily hardwood-dominated series generally occurs on mesic slopes or in shallow creek bottoms. American beech and southern magnolia attain large sizes and make up much of the basal area of these forests. Loblolly pine (Pinus taeda) is often present. Its importance depends of site history.

AMERICAN BEECH - WHITE OAK SERIES
(Fagus grandifolia - Quercus alba)

This series occupies ravines and ridges within creek bottoms, especially on steep slopes. Southern magnolia (Magnolia grandiflora) is generally absent, and calciphilic species are more common.

Upland Dry-Mesic Forest

LOBLOLLY PINE - OAK SERIES
(Pinus taeda - Quercus)

A highly variable community. In mature and relatively natural condition, loblolly-oak forests are mostly uneven-aged and moderately to densely stocked with various hardwoods, with loblolly pine as a primary associate. Older individual trees may reach large sizes. There may be scattered canopy gaps and snags. Where overstory trees form a closed canopy, an open, parklike understory often develops. However, a variety of shrubs and small trees are often present. The cover of understory herbaceous plants can be sparse, however in some areas wood oats may be abundant. Downed woody material in the form of fallen logs and limbs is often conspicuous, floor and hardwood leaf litter forms a thick carpet in practically all cases.

VEGETATION:

Overstory: Some commonly observed species include white oak (Q. alba), loblolly pine, American beech (Fagus grandifolia), southern red oak (Q. falcata), post oak (Q. stellata), southern magnolia (Magnolia grandiflora), swamp chestnut oak (Q. michauxii), black oak (Q. velutina), water oak (Q. nigra), laurel oak (Q. laurifolia), cherrybark oak (Q. falcata var. pagodifolia blackjack oak (Q. marilandica), American holly (Ilex opaca), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), blackgum (Nyssa sylvatica), mockernut hickory (Carya tomentosa), black hickory (C. texana), bitternut hickory (C. cordiformis), winged elm (Ulmus alata), shortleaf pine (P. echinata), and others. The epiphytes mistletoe (Phoradendron spp.), Spanish moss (Tillandsia usneoides), and resurrection fern (Polypodium polypodioides) may be common on hardwoods.

Midstory: In addition to regenerating overstory species, the community may contain a variety of shrub species such as American hornbeam (Carpinus carolinina), eastern hophornbeam (Ostrya virginiana), flowering dogwood (Cornus florida), bigleaf snowbell (Styrax grandifolius), witch-hazel (Hamamelis virginiana), brook euonymus (Euonomys americanus), southern arrow-wood (Viburnum dentatum), arrow-wood (V. acerifolium), rusty blackhaw (V. rufidulum), blueberries (Vaccinium spp., including V.amoenum, and V. corymbosum), sweetleaf (Symplocos tinctoria), fringetree (Chionanthus virginicus), Carolina buckthorn (Rhamnus caroliniana), parsley hawthorn

arborea), azalea (Rhododendron canescens), Carolina holly (I. ambigua), American beautyberry

(Callicarpa americana), southeastern coralbean (Erythrina herbacea), and others. Vines commonly present include grapes (Vitis spp.), greenbriers (Smilax spp.), Virginia creeper (Parthenocissus quinquefolia), poison oak (Toxicodendron radicans), Alabama supplejack (Berchemia scandens), and trumpet honeysuckle (Lonicera sempervirens).

Understory: In addition to regenerating overstory and midstory species, usually supports a variety of herbaceous species. However, ground cover is typically sparse. Herbaceous species present may include Christmasfern (Polystichum acrostichoides), ladyfern (Athyrium filix-femina), broad beechfern (Thelypteris hexagonoptera), grapeferns (Botrychium spp.), rattlesnake root (Prenanthes altissima), woodland pinkroot (Spigelia marilandica), goldenrods (Solidago spp.), poor Robins plantain (Erigeron pulchellus), Virginia beechdrops (Epifagus virginiana), violets (Viola spp.), woods bedstraw (Galium circaezans), woods vetch (Vicia alba), bare-stem tickclover (Desmodium nudiflorum), great Solomon's seal (Polygonatum biflorum), blue hound's tongue (Cynoglossum virginianum), sanicles (Sanicula spp.), Jack-in-the-pulpit (Arisaema triphyllum), partridge-berry (Mitchella repens), trilliums (Trillium spp.), mayapple (Podophyllum peltatum), carrion flower (Smilax herbacea), Dutchman's pipes (Aristolochia spp.), sweet William phlox (Phlox divaricata), cranefly orchid (Tipularia discolor), Carolina lily (Lilium carolinianum), woodoats (Chasmanthium spp.), and twoflower melic (Melica mutica).

There is usually a rich assemblage of lichens, mosses, and liverworts on soil, fallen logs, stumps, shrubs, and trees. Many of these probably are habitat or site-specific, but relatively little is known about the ecology of most.

SPECIAL-INTEREST PLANTS:

KNOWN to occur In NF TX

Amsonia glaberrima
Cypripedium kentuckiense
Erythronium rostratum
Hexalectris spicata
Prenanthes barbata
Trillium gracile
Triphora trianthophora

KNOWN to occur elsewhere in Texas

Dodecatheon meadia
Monotropa hypopithys
Maianthemum racemosum spp. amplexicanle
Cheilanthes lanosa (on sandstone rocks of Catahoula Formation)
Quercus boyntonii stellata var. margaretta

IMPORTANT HABITAT ATTRIBUTES:

Large variety of hardwood species present in overstory along with loblolly pine
Trees of various age, size, and forms present
Multilayered canopy, with numerous gaps
Snags and downed wood common

POTENTIAL PLANT INDICATORS:

Pinus taeda -- loblolly pine

Quercus alba -- white oak
Quercus michauxii -- swamp chestnut oak
Ilex opaca -- American holly
Hamamelis virginiana -- witch hazel
Styrax grandifolius -- bigleaf snowbell
Trillium spp. -- trilliums
Viola walteri -- Walter violet
Sanicula spp. -- sanicles
Ferns

PHASES OR VARIATION:

Most commonly on middle and lower slopes between uplands and stream bottoms, but also occurs on ridges and upper slopes in areas topographically isolated from fire-prone uplands.

Cover percentages of component species are highly variable depending on topographic position, and consequent moisture regime. Drier phases tends to be dominated by southern red oak, white oak, post oak, loblolly pine, water oak, blackjack oak, blackgum, sweetgum, mockernut hickory, black hickory, and shortleaf pine. Mesic phases tend to be dominated by white oak American beech, loblolly pine, southern magnolia sweetgum, water oak, swamp chestnut oak and red maple. Understory associates vary significantly within these moisture regimes.

OTHER COMMENTS:

Very similar to and often adjacent to beech-white oak forests. Perhaps the most notable difference is the greater variability of loblolly-oak forest in relative composition and cover percentages of component species. This greater variability is the consequence of the greater variety of topographic positions in which the loblolly pine-oak community occurs.

Midwestern Oak Woodland

SHORTLEAF PINE - OAK SERIES
(Pinus echinata - Quercus)

Terrestrial Woodlands and Savannas

Relatively mature, natural examples of this forest are open-canopied, mostly uneven aged, and moderately to fairly densely stocked with shortleaf pine and hardwoods of variable size. Various shrubs and regenerating overstory species may be in the midstory and understory,especially where fire has been infrequent or absent. Herbaceous ground cover, important in natural upland examples of this series, may exist only as remnant grassy patches where fire has not occurred.

Overstory: The most important species in the presettlement forest probably included shortleaf pine post oak (Q. stellata), blackjack oak (Q. marilandica), and southern red oak (Q. falcata). Overstory species in existing examples of the series may also include black oak (Q. velutina), white oak (Q. alba), common persimmon (Diospyros virginiana), winged elm (Ulmus alata), black

cherry (Prunus serotina), blackgum (Nyssa sylvatica), mockernut hickory (Carya tomentosa), and black hickory (C. texana). Many of these species have probably increased in size and abundance becasue of reduced fire frequency.

These fire-suppressed forests often contain loblolly pine (P. taeda), sweetgum (Liquidambar styraciflua), and red maple (Acer rubrum). The epiphytes mistletoe (Phoradendron spp.), Spanish moss (Tillandsia usneoides), and resurrection fern (Polypodium polypodioides) may be common on hardwoods.

Midstory: In addition to regenerating overstory species, the midstory contains a diversity of shrubs including blueberries (Vaccinium spp., including V. arboreum, V. corymbosum, and V. stamineum), yaupon (Ilex vomitoria), flowering dogwood (Cornus florida), gum bumelia (Bumelia lanuginosa), rusty blackhaw (Viburnum rufidulum), southern arrow-wood (V. dentatum), parsley hawthorn (Crataegus marshallii), other hawthorns (Crataegus spp.), red buckeye (Aesculus pavia), American beautyberry (Callicarpa americana), fringetree (Chionanthus virginicus), Mexican plum (Prunus mexicana), shining sumac (Rhus copallina), and others. Vines commonly present include grapes (Vitis spp.), Virginia creeper (Parthenocissus quinquefolia), greenbriers (Smilax spp.), yellow jessamine (Gelsemium sempervirens), and poison-oak (Toxicodendron radicans).

Understory: Often contains a variety of grasses, composites, legumes, and other forbs, but is not nearly as rich as in longleaf pine (P. palustris) forests. Species present may include little bluestem (Schizachyrium scoparium), bluestems (Andropogon spp.), woodoats (Chasmanthium spp.), panicums (Panicum spp.), threeawn grasses (Aristida spp.), paspalum grasses (Paspalum spp.). tickclovers (Desmodium spp.), wild indigos (Baptisia spp.), bushclovers (Lespedeza spp.), hoarypeas (Tephrosia spp.), butterfly pea (Centrosema virginianum), prairie senna chamaerista (fasciculata), largeleaf pussytoes (Antennaria parlinii ssp. fallox), asters (Aster spp.), Gronovins hawkweed (Hieracium gronovii), sunflowers (Helianthus spp.), gayfeathers (Liatris spp.), goldenrods (Solidago spp.), Missouri ironweed (Vernonia missurica), partridge-berry (Mitchella repens), milkweeds (Asclepias spp.), and others.

There is usually a rich assemblage of lichens, mosses, and liverworts on soil, fallen logs, stumps, shrubs, and trees. Many of these probably are habitat or site-specific, but relatively little is known about the ecology of most.

SPECIAL-INTEREST PLANTS:

KNOWN to occur on NF TX

Tetragonotheca ludoviciana
Cyperus grayioides

KNOWN to occur elsewhere in Texas

Crataegus warneri
Leavenworthia texana
Lesquerella pallida
Mirabilis collina
Trillium texanum
Coreopsis intermedia

IMPORTANT HABITAT ATTRIBUTES:

Canopy (primarily shortleaf pine) moderately open
Large, shortleaf pine and hardwoods more than 150 years old are present
Areas are large enough to maintain habitat integrity
Surrounding habitat in natural condition
Evidence of frequent fires (herbaceous understory, few fire-tender species)

POTENTIAL PLANT INDICATORS:

Pinus echinata -- shortleaf pine
Quercus stellata -- post oak
Quercus falcata -- southern red oak
Carya tomentosa -- mockernut hickory
Carya texana -- black hickory
Callicarpa americana -- American beautyberry
Baptisia spp. -- wild indigo species

PHASES OR VARIATION:

As noted above, this series can vary depending upon disturbance history. Poorly understood but probably important variation exists depending upon topographic and geographic position. This series occurs primarily on middle upper slopes within the longeaf pine (P. palustris) range (with more species typical of mesic hardwood forests), and on uplands and sideslopes outside the native longleaf pine range. Associated species in all areas vary with soil moisture, texture, and pH and with slope position. In general, drier sites support more shortleaf pine.

OTHER COMMENTS:

Fire limits hardwood development, but it also favors certain species by excluding more fire-tender hardwoods such as American beech, sweetgum, and white oak. In the total absence of fire, post oak, southern red oak, and blackjack oak tend to be replaced by white oak, sweetgum, various other hardwoods, and loblolly pine.

Ecotones between shortleaf pine-oak woodlands and upland longleaf pine - little bluestem forests were probably variable.

POST OAK - BLACKJACK OAK SERIES
(Quercus Stellata - Q. Marilandica)

understory. Continuous overgrazing and infrequent fire have caused oaks to thicken and the high-quality grasses to thin. (Ressel 1989).

Dead plant material and bare ground are common. Canopy closure varies with soils and disturbance history.

VEGETATION:

Overstory: The dominants in this type are invariably some combination of post oak and blackjack oak, which often compose from 15 to 50 percent of the areas. Occasional individual netleaf hackberry (Celtis reticulata), American elm (Ulmus americana), and eastern redcedar

(Juniperus virginiana) are usually present. Eastern redcedar, although not usually dominant, is often important, especially on fire-suppressed sites.

Understory: A variety of tallgrass, midgrass, and forb species similar to those found in the little bluestem-indiangrass series are understory elements. Other species may include coralberry (Symphoricarpos orbiculatus), poison oak (Toxicodendron radicans), pricklypear (Opuntia humifusa), largeleaf pussytoes (Antennaria parlinii ssp. falcax), hairy sunflower (Helianthus hirsutus), goldenrod (Solidgo spp.), sedges(Carex spp.), broadleaf woodoats (Chasmanthium latifolium), catclaw sensitive briar (Schrankia nuttallii, saw greenbrier (Smilax bona-nox), Virginia creeper (Parthenocissus quinquefolia).

SPECIAL INTEREST PLANTS:

KNOWN to occur on NF TX

Cyperus grayioides
Gratiola flava
Schoenolirion wrightii
Spiranthes parksii
Tetragonotheca ludoviciana

KNOWN to occur elsewhere in Texas

Abronia macrocarpa
Coreopsis intermedia
Crataegus warneri
Dalea reverchonii
Hymenopappus carrizoanus
Polygonella parksii

SOUTHERN PINE SAVANNA

LONGLEAF PINE - LITTLE BLUESTEM SERIES
(Pinus palustris - Schizachyrium scoparium)

Where in relatively natural condition (burning must occur frequently), pine stands are open and almost pure. Open canopies and frequent fires favor the development of thick grass cover and limit hardwood and shrub species to slope positions, wet depressions, and creek and river bottoms.

dense in some areas and much more open in others. Many hardwoods have become established under altered fire regimes and are more common in today's forests. Deliberate retention of hardwoods for wildlife purposes has also increased the hardwood component in these forests. In high-quality examples of this series, the herbaceous ground high-quality occurrences, the herbaceous ground cover of native grasses and forbs is diverse and continuous.

Frequent light surface fires are essential to the perpetuation of this community type. Without fire, open longleaf forests are readily invaded by other pines [notably loblolly (P. taeda) and shortleaf], and many types of hardwoods and shrubs. These invaders eventually supplant both the rich herb layer and the longleaf pines themselves. The great majority of hardwoods, shrubs, and other pines native to the general area could not tolerate frequent lightning-generated growing-season surface fires and were thus restricted to less frequently burned areas. A few species of hardwoods endured the frequent fires but were largely confined to the ground cover as continually resprouting stems.

The frequent fires and the open character of the forests combined to encourage a tremendous diversity of prairie-like herbaceous vegetation to develop in the ground layer. Both historical accounts and recent research indicate clearly that the natural character of the forest is generally uneven aged, with regenerating even-aged patches (each typically only a few hundred square feet in area) of various ages embedded within the matrix of older trees. Trees older than 100 years are usually the best seed producers, and individual trees may approach 500 years in age.

Natural mortality of adult longleaf pines usually results from lightning or windthrow. Both causes generally kill more than 150 years old, and the mortality rate increases with age (Platt and others 1988).

VEGETATION:

Overstory: Where in relatively natural condition and frequently burned, the forest is almost pure longleaf pine, perhaps with some shortleaf or loblolly. A variety of other species are often present today. These include post oak (Q. stellata), southern red oak (Q. falcata), blackjack oak (Q. marilandica), bluejack oak (Q. incana), upland laurel oak (Q. laurifolia), water oak (Q. nigra), mockernut hickory (Carya tomentosa), black hickory (C. texana), sweet gum (Liquidambar styraciflua), blackgum (Nyssa sylvatica), black cherry (Prunus serotina), and others.

Midstory: Primary shrubs include yaupon (Ilex vomitoria), sweetgum, blueberries (Vaccinium spp.), American beautyberry (Callicarpa americana), southern bayberry (Myrica cerifera), and shining sumac (Rhus copallina).

Understory: Very rich, dominated by grasses, composites, legumes, and a wide assortment of other forbs.

Grasses: Usually dominated by little bluestem and Andropogon spp., including A.gerardii, A.virginicus, A.ternarius, and A. gyrans, but other primary grasses include slender bluestem (Schizachyrium), yellow indian grass (Sorghastrum nutans), threeawn grasses (Aristida spp.), lovegrasses (Eragrostis spp.); panicums (Panicum spp.), Florida paspalum (Paspalum floridanum), drop- seeds (Sporobolus spp.), bearded skeletongrass (Gymnopogon ambiguus), and bristlegrasses (Setaria spp.).

(Pityopsis graminifolia), elephantfoots (Elephantopus spp.), Eupatorium spp., cudweeds (Gnaphalium spp.), lance coreopsis (Coreopsis lanceolata), pale echinacea (Echinacea pallida), coneflowers (Rudbeckia spp.), gayfeathers (Liatris spp.), rosinweeds (Silphium spp.), goldenrods (Solidago spp.), ironweeds (Vernonia-spp.), and others.

Legumes: Legumes may include tickleclovers (Desmodium spp.), bushclovers (Lespedeza spp.), wild indigos (Baptisia spp.), partridge-peas (Cassia spp.), hoary peas (Tephrosia spp.), crotalarias (Crotalaria spp.), pencilflower (Stylosanthes biflora), snoutbeans (Rhy- nchosia spp.), butterfly pea (Centrosema virginianum), and milkpeas (Galactia spp.).

Others: Other forbs frequently present include rose-gentians (Sabatia spp.), evening primroses (Oenothera spp.), ruellias (Ruellia spp.), milkworts (Polygala spp.), butterfly milkweed (Asclepias tuberosa), other milkweeds (Asclepias spp.), blue sage (Salvia azurea), common goldstar (Hypoxis hirsuta), downy phlox (Phlox spp. pilosa), gerardia (Agalinis spp.), meadow beauties (Rhexia spp.), and flowering spurge (Euphorbia corollata). Large colonies of bracken-fern (Pteridium spp.) are often conspicuous. Fruticose ground lichens may be common in dryer areas.

SPECIAL-INTEREST PLANTS:

KNOWN to occur on NF TX

Agrimonia incisa
Silene subciliata
Amorpha canescens
Galactia erecta
Liatris tenuis
Selaginella arenicola ssp. riddelli

Other spp. listed for bluejack oak - pine series may be found)

KNOWN to occur elsewhere in Texas

Cheilanthes lanosa (on sandstone boulders)
Eulophia ecristata
Gaillardia aestivalis var. winkleri
Phlox nivalis ssp. texensis

PHASES OR VARIATION:

There are distinct phases of upland longleaf pine forest, depending primarily on topographically, and soils. Generally the phases grade from xeric types on steep topography and extremely well-drained deep sands to moderately dry or moderately mesic types on gently rolling or fairly dissected topography and well-drained sandy loams to mesic types on gently rolling topography and sandy loams and silt loams. In each of these basic phases there are distinct assemblages of associated plant species in the ground cover, apparently as a result of associated moisture regimes.

IMPORTANT HABITAT ATTRIBUTES:

Continuous cover of herbaceous vegetation
Evidence of frequent fire (few shrubs and trees other than longleaf pine)
Trees of many age, size, and form classes
Trees older than 200 years well represented
Patches of regeneration common
Snags and downed wood fairly common
Natural ecotones with surrounding and inclusional habitats

POTENTIAL PLANT INDICATORS:

Pinus palustris -- longleaf pine
Schizachyrium scoparium --little bluestem
Andropogon gerardii -- big bluestem
Andropogon gyrans -- Elliott bluestem
Tripsacum dactyloides -- eastern gammagrass
Liatris spp. -- gayfeathers
Echinacea pallida -- Pale echinacea
Baptisia spp. --wild indigos
Rudbeckia spp. -- conefloweres

Tephrosia spp. -- hoary pea
Rhynchosia spp. -- snoutbeans

OTHER COMMENTS:

The extent of this community type has been reduced by more than 90 percent since presettlement times.

Southern Pine - Oak Woodland

BLUEJACK OAK - PINE SERIES
(Quercus incana - Pinus)

This series occurs primarily on extremely well-drained ridgetops and upper slopes on deep sands but may also be found on low, relatively flat stream terraces with deep sands. It may appear as thick shrubby scrub woodland, often with stunted trees because of xeric site conditions. Small openings may be scattered about. Scrub oaks make up the only overstory, but scattered pine are present. This condition probably results from past logging of pines as component scrub oaks were probably not of commercial value. The herbaceous ground cover is usually sparse and discontinuous, and much sand is exposed. Fruticose ground lichens are very conspicuous and may form large patches.

Examples on xeric hilltops and upper slopes do not appear as thick and scrubby, but are generally more open and may have a mixed pine overstory of variable but usually low to intermediate stocking. On these sites the understory usually contains few herbaceous plants, and ground lichens, although common, may be less abundant. Fire frequency is an important factor in the development and dynamics of this series.

and surely are a major cause of the sparseness of the herb layer in sunny settings that would normally support a thick growth of herbaceous plants. Trees can grow exceedingly slowly on these sites.

VEGETATION:

Overstory: Open woodlands with low overstory density and basal area. Bluejack oak, post oak (Q.stellata), southern red oak (Q.falcata var. falcata), black hickory (Carya texana), shortleaf pine (P. echinata), longleaf pine (P. palustris)

Midstory: Usually contains numberous oaks of species listed above (resprouting after fire is common). May also include; laurel oak (Q. laurifolia), sand post oak (Q. stellata var. margaretta), blackjack oak (Q. marilandica), tree sparkleberry (Vaccinium arboreum), and flowering dogwood (Cornus florida).

Understory: Herb layer cover is generally sparse. much sand is exposed and many specialized drought-tolerant species are present. Species often present include prickly pear (Opuntia humifusa), Texas bullnettle (Cnidoscolus texanus), Florida snakecotton (Froelichia floridana var. floridana), threeawn grasses (Aristida spp., especially A.desmantha), milkweeds (Asclepias spp.), bluestems (Andropogon spp.), noseburns (Tragia spp.), panicums (Panicum spp.), purple sandgrass (Triplasis purpurea), sarsaparilla vine (Smilax pumila), spiderworts (Tradescantia spp.), post oak grape (Vitis aestivalis-lincecumii), heartleaf euphorbia (Euphorbia cordifolia), bigpod bonamia (Stylisma pickeringii var. pattersonii), Georgia sunrose (Helianthemum georgianum),

Carolina groomwell (Lithospermum caroliniense), poison-oak (Rhus toxicodendron), and numerous State-rare species (see PETS). Fruticose ground lichens, and especially Cladonia lichens, may occur in profusion.

SPECIAL-INTEREST PLANTS:

KNOWN to occur on NF TX

Cyperus grayioides
Eriogonum longifolium
E. multiflorum
Paronychia drummondii
Penstemon murrayanus
Polanisia erosa
Polygonella americana
P. polygama
Selaginella arenicola var. riddellii
Tetragonotheca ludoviciana
Zornia bracteata
Pediomelum subulatum

KNOWN to occur elsewhere in Texas

Coreopsis intermedia
Mirabilis collina

Xeric oak species abundant with only scattered pines
Trees of many ages, sizes, and forms present
Areas of exposed sand numerous
Ground cover lichens abundant

POTENTIAL INDICATOR SPECIES:

Quercus incana -- bluejack oak
Vaccinium arboreum -- tree sparkleberry
Q. stellata var. margaretta -- sand post oak
Carya texana -- black hickory
Stillingia sylvatica -- Queen's delight
Aristida desmantha -- curly threeawn
Gymnopogon ambiguus -- bearded skeltongrass
Berlandiera betonicifolia -- hairy greeneyes
Tradescantia reverchonii -- Reverchon spiderwort
Helianthemum georgianum -- Georgia sunrose
Stylisma pickeringii var pattersonii -- bigpod bonamia
Froelichia floridana -- Florida snakecotton
Polypremum procumbens -- juniperleaf

PHASES OR VARIATION:

The xeric hilltop variant grades into xeric-phase upland longleaf pine forest and the two are very similar if not actually the same thing.

LITTLE BLUESTEM-NUTTALL'S RAYLESS GOLDENROD SERIES

(Schizachyrium scoparinm-Bigelowia nuttallii)

Terrestrial Mixed Physiognomy

This predominantly herbaceous community occurs as inclusions in a woodland complex of oak forests, which in turn are inclusional in pine-dominated forests. The shallow soils and associated Catahoula geology produce conditions limiting to woody plant growth and provide specialized habitat for a variety of herbaceous species. These open, irregularly shaped, sparsely vegetated, prairie-like communities are generally surrounded by oak forests with scattered, stunted trees. Eroded soil is often eroded soil exposures, rock outcrops and lichen growth are common.

VEGETATION:

Overstory: Generally lacking, but scattered individuals trees or clumps of trees or both may be present. May include longleaf pine (Pinus palustris), shortleaf pine (P. echinata), loblolly pine (P. taeda), post oak (Quercus stellata), and blackjack oak (Q. marilandica).

usually occurs as scattered clumps. Species may include privet forestiera (Forestiera ligustrina), parsley hawthorn (Crataegus marshallii), littlehip hawthorn (C. spathulata), tree sparkleberry (Vaccinium arboreum), yaupon (Ilex vomitoria), and possumhaw (Ilex decidua).

Understory:

DOMINANTS: slender bigelowia threeawn (Aristida longespica), little bluestem, narrowleaf rushfoil (Crotonopsis linearis), and Silveus dropseed (Sporobolus silveanus) (Marietta and Nixon, 1984).

Other important species include rosette grass (Dichanthelium aciculare), common goldstar (Hypoxis hirsuta), narrowleaf pin weed (Lechea tenuifolia), globe beakrush (Rhynchospora globularis), and tenpetal anemone (Anemone berlandieri). Also includes many species that occur only infrequently, are sporadically distributed, or are restricted to Catahoula exposures (Orzell, 1991). Drummond sandwort (Minuartia drummondii), Barbara's-buttons (Marshallia caespitosa), common leastdaisy (Chaetopappa asteroides), San Saba pin weed (Lechea san-sabeana), Nuttall milkvetch (Astragalus nuttallianus var. nuttallianus), western dwarf dandelion (Krigia occidentalis), Texas saxifrage (Saxifraga texana), smooth phacelia (Phacelia glabra), prairie flameflower (Talinum parviflorum), and Texas sunnybell (Schoenolirion wrightii).

SPECIAL INTEREST PLANTS:

Saxifraga texana
Gratiola flava
Liatris tenuis
Phacelia glabra
Schoenolirion wrightii

Talinum parviflorum
Selaginella arenicola var. riddellii
Sporobolis silveanus

IMPORTANT HABITAT ATTRIBUTES:

Open aspect
Essentially treeless
Mosses and lichens common
Herbaceous groundcover dominant with interspersed soil exposures
No evidence of recent mechanical disturbance
Varying degress of erosion evident
Adjacent habitat in essentially natural condition
Natural ecotones found between surrounding habitats

POTENTIAL INDICATOR SPECIES:

Bigelowia nuttalli -- slender bigelowia
Schizachyrium scoparium -- little bluestem
Silphium laciniatum -- compass-plant
Cladonia spp. -- Cladonia mosses

These areas are generally smaller than 100 acres and isolated from one another. The surrounding landscape was historically open longleaf pine forest. The effects of logging and altered fire regimes are evidenced in all known examples, possibly contributing to increased erosion and definitely altering species composition and forest structure.

Tallgrass Prairie

LITTLE BLUESTEM - INDIANGRASS SERIES
(Schizachyrium scoparium - Sorghastrum nutans)

Terrestrial Grassland

Natural grasslands occur when soils, climate, and disturbance factors interact to perpetuate this dynamic ecosystem. They generally occur where rainfall is intermediate between that of desert lands and that of forest lands. Grasses are the dominant plants, and forbs are often important. Both trees and shrubs also occur in grasslands as scattered individuals or clumps or in belts or groups along streams and watercourses. Human and human-related activity such as cultivation, overgrazing, and control or elimination of fire has often changed the vegetation of this ecosystem. Human activity has generally caused an increase in the distribution and density of brush and tree species on natural grasslands including the National Grasslands in Texas.

The Cross Timbers and prairie regions of north Texas were selected for settlement because they offered both open prairie and timer in nearby bottoms. However, the grassland areas of north Texas slowly changed as a result of fire control and agriculture. Early historical of the eastern and western Cross Timbers describe a canopy of post oak (Quercus stellata) and blackjack (Q. marilandica) with a dense undergrowth of oak saplings, woody vines, and greenbriers (Smilax spp.). The contrast between the prairies and Cross Timbers was a prominent landmark for Native

Americans and for early explorers. The Spaniars described the Cross Timbers "as a guide even to the most inexperienced as it is constantly on the right as one proceeds north from the Brazoa."

Present-day plant communities of the National Grasslands are usually dominated by grasses or consist of post oak savanna or riparian forests. The Caddo Grasslands have somewhat denser post oak savanna (eastern Cross Timbers) with brushy upland prairies that extend into the deciduous forest of the Red River Valley. Most of the LBJ National Grasslands are within the western Cross Timbers. The surface geology of environmental zone consists of weathered sandstones and shales. Differential erosion has produced rolling and hilly topography, and the landscape is more broken to the west.

The Ladonia Unit of the Caddo Grasslands and as small areas on the LBJ falls within the Blackland Prairie. Most soils of the Blackland Prairie are dark calcareous clays derived from the underlying clay, marl, shale, chalky limestone and other bedrock. Low permability of Blackland clay soils has inhibited tree growth except along the many streams. The Blackland Prairie has been called a part of the Tallgrass Prairie, the Coastal Prairie, and the True Prairie.

This series is and upland tallgrass grassland that once occurred extensively in Texas. Present-day distribution is greatly diminished, and many remaining examples have been altered by land management.

VEGETATION:

Consists primarily of grasses (approximately 90 percent wiefht), with several conspicuous for species and only very little woody plant growth.

Grasses: Little bluestem, yellow indiangrass, big bluestem (Andropogon gerardii), and switchgrass (Panicum virgatum) are dominant under natural conditions. Other short to midgrass species may be found, especially as grazing pressure increases. These can include dropseeds (Sporobolus spp.), silver bluestem (Bothriocloa laguroides ssp. torreyana), hairy grama (Bouteloua hirsuta), white tridens (Tridens albescens), buffalograss (Buchloe dactyloides), wildryes (Elymus spp.), Texas winter-grass (Stipa leucotricha), sideoats grama (Bouteloua curtipendula), seep Muhly (Muhlenbergia reverchonii), Texas cupgrass (Eriochloa sericea), and Florida paspalum (Paspalum floridanum).

Forbs may include Engelmann daisy (Engelmannia pinnatifida), Maximilian sunflower (Helianthus maximiliani), gauras (Guara spp.), health aster (Aster ericoides), gayfeathers (Liatris spp.), and black-eyed Susan.

SPECIAL-INTEREST PLANTS:

Dalea tenuis

IMPORTANT HABITAT ATTRIBUTES:

Open in aspect
Tree and shrub species of limited development and present only in limited areas
Continuous layer of herbaceous vegetation present

No exotic plant species and minimal populations of native weeds
Minimal erosion, soil free from mechanical soil disturbance
Dominant plant species (listed above) well represented

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Appendix I

Biological Assessment and USFWS Biological Opinion

This appendix includes a cover letter from the Regional Forester requesting a biological opinion on the biological assessment prepared for the National Forests and Grasslands in Texas (NFGT), the completed Biological Assessment for NFGT Plan, and the USFWS Response and Biological Opinion.

Summary

The Biological Assessment and corresponding Biological Opinion from the USFWS identify the "Determination of Affect Statements" that are applicable for twelve threatened or endangered species that occur or could occur within the NFGT planning area. Included within the Biological Opinion are "Reasonable and Prudent Measures" directed by the USFWS for NFGT to incorporate as standards in the Revised Plan implementation process.

THIS IS A COVER PAGE FOR THE BIOLOGICAL ASSESSMENT AND USFWS BIOLOGICAL OPINION. THE ACTUAL DOCUMENTS WILL HAVE TO BE REVIEWED HARD COPY FROM YOUR EIS.

Appendix J

Silvicultural Systems and Associated Regeneration Methods

Introduction

Silviculture has been defined as the art of producing and tending a forest; as the application of knowledge of silvics in the treatment of a forest; and as the theory and practice of controlling forest establishment, composition, structure, and growth (Spurr and Barnes 1980). Silvicultural practice consists of the various treatments that may be applied to forest stands to maintain and enhance their utility for any purpose. The duties of the forester are to analyze the natural and social factors bearing on each stand and then devise and apply the treatments that will produce the desired results. A **silvicultural system** is the planned program of silvicultural treatment over the whole life of a stand (Smith 1986). **Regeneration methods** are the treatments applied to the stand and site during the period of regeneration or stand establishment.

This appendix describes three silvicultural systems for managing forest stands--the even-aged, two-aged, and uneven-aged systems--and their associated regeneration methods.

Even-aged System

Even-aged management consists of regeneration methods that produce stands of trees in which the main canopy level is dominated by trees of essentially the same age or at least in the same 10-year age class. A stand is considered even-aged if the difference between the ages of the oldest and youngest trees in the main canopy level does not exceed 20 percent of the rotation length. Even-aged stands may have a few randomly-distributed older individual trees, clumps of older trees, or small gaps filled with younger trees if these inclusions do not significantly affect the even-aged structure.

An even-aged stand of one species usually has a canopy top of quite uniform height. Stand boundaries are usually distinct. An even-aged stand usually has the same general appearance when viewed from different points. A forest of even-aged stands with a more-or-less balanced distribution of age classes is said to be **all-aged**. Its component stands are of various heights.

A rotation is the number of years between successive regeneration cuts. The rotation includes a period for harvesting the mature stand and for establishing the new stand (usually 5-years in the National Forests in Texas). During the course of a rotation there may be one or more thinnings prior to the final regeneration harvest to maintain health and vigor in the stand.

Forest managers determine rotation lengths by considering management objectives, the growth habits of the species being managed, and the productive capacity of the land.

The principle regeneration methods used in even-aged management are clearcutting, clearcutting with reserves, seed-tree, seed-tree with reserves, and shelterwood.

Clearcutting involves removal of all main-canopy trees in one cutting operation. Regeneration can originate naturally or artificially, and sometimes is assisted by site preparation treatments that allow the new trees to become established and survive. Typically, regeneration is obtained by planting seedlings.

acres in size. There is usually more site disturbance and more removal of vegetation than with

other methods. More sunlight reaches the forest floor than with any of the other regeneration methods. Clearcutting has been used successfully to regenerate loblolly, longleaf, and shortleaf pine on many sites. New stands produced by clearcutting are even-aged.

Clearcutting with reserves is a variation in which a few reserve trees are left in the clearcut area. The reserve trees are left for reasons other than to provide seed. Wildlife den trees, nesting trees, and survey monument trees are examples of reserve trees.

The use of clearcutting has been limited by direction in the Chief's 1330-1 letter dated June 4, 1992 and by the National Forest Management Act (NFMA) at 16 United States Code 1604 (g)(3)(F)(1). In keeping with this direction, the amount of clearcutting does not vary significantly among the alternatives in this Environmental Impact Statement (EIS). Clearcutting will be used only where it is the best means of producing a specific desired result.

The **seed-tree** method of regeneration involves removal of most main-canopy trees in one cutting, a small number of seed trees are left singly or in small groups (typically 6 to 12 square feet of basal area per acre). The method is feasible only where well distributed dominant and codominant trees of seed-bearing size are present and where soils do not cause the trees to be shallow-rooted and susceptible to windthrow. The establishment of essentially even-aged regeneration under the seed trees is encouraged, and regeneration is sometimes assisted by the application of site preparation treatments. The seed trees are usually removed after the seedlings are securely established, usually within 2 to 5 years. The quality and spacing of seed trees strongly affect the success of regeneration. The number of seed trees to be left depends on tree height, quantity and frequency of seed production, seed dispersal characteristics, prevailing wind direction, and seedbed characteristics.

The seed-tree method has been successfully used to regenerate loblolly and shortleaf pine in even-aged stands.

The **seed-tree with reserves** regeneration method retains some or all of the seed trees after regeneration has become established. The reserve seed trees may be left indefinitely or removed during a later harvest.

The **shelterwood** method of regeneration involves removal of the main-canopy trees in a series of cuttings (usually two or three) over a relatively short portion of the rotation. The method is practical only where well-distributed dominant and codominant trees of seed-bearing size (usually 20 to 30 square feet of basal area per acre) are present on soils that do not cause the trees to be shallow-rooted are susceptible to windthrow. The establishment of essentially even-aged regeneration under the seed trees is encouraged and is sometimes assisted by site preparation treatments. Leaving more canopy trees provides more shelter and helps suppress competing vegetation. The sheltering effect gives the method its name and distinguishes it ecologically from the seed-tree method. Once adequate reproduction is well established and the need for shelter is past, a portion or all of the shelterwood is usually removed so that the reproduction can develop as rapidly as possible. The shelterwood can be removed all at once or in a series of harvests.

The shelterwood method has been used successfully to regenerate loblolly, shortleaf, and longleaf pine.

Two-aged System

Two-aged silviculture (also called **shelterwood with reserves**) is a system that produces a stand of trees that contains two age classes for long periods or for most of the rotation. The difference in age between the ages of the oldest and youngest trees is greater than 20 percent of the rotation. Each canopy class is basically even-aged, and the trees in the older class are usually the parents of those in the younger class. Because some trees in younger age class grow in the shade cast by trees in the older age class, the trees in the younger age class can vary considerably in height. The tallest trees are in the most open areas.

Two-aged stands of one species usually have an irregular canopy for a long period. Stand boundaries may or may not be distinct depending on growth and development of the younger age class and the number of parent trees present in each stand.

The shelterwood with reserves method of regeneration is largely untested for loblolly and shortleaf pine. Studies suggest that longleaf pine stands containing two or more age classes will fall far short of fully utilizing the productive capacity of sites (Boyer 1993). In east Texas, Louisiana-Pacific Corporation has used a variation of the two-aged method to regenerate loblolly pine stands with some success.

Uneven-aged System

Uneven-aged management is defined by 36 Code of Federal Regulations (CFR) 219.3 as "the application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection."

A forest stand is considered to be uneven-aged when three or more distinct tree age or diameter classes are maintained.

Both the single-tree selection and group selection cutting methods involve cutting mature and immature trees singly or in groups. This provides space and light that enables new regeneration to become established and grow. These methods are also used to regulate stand composition and to maintain a desired diameter or age distribution. A perfectly balanced uneven-aged stand would have trees of each age or size class from seedlings to trees of rotation age or maximum tree size, with each age or size class occupying an equal area. Structure in the merchantable component of the stand (usually six-inch and larger diameter classes) is best maintained by the BDQ (basal area, maximum diameter, constant ratio of trees in successive diameter classes) method (Farrar 1984; Farrar and Murphy 1989).

In community types found in Texas, regeneration cutting and stand thinnings usually occur in each area every 5 to 10 years. The frequency of the entry is a function of management intensity, species silvics, and each area's productive capacity.

Prescribed burning has limited use in southern pine stands managed under the uneven-aged system.

Single tree selection involves the removal of individual trees from all merchantable diameter classes [usually 6-inch diameter breast height (DBH) and larger] at relatively short intervals (3 to 15 years). Regeneration is established in the spaces left by the harvested trees. The goal is to maintain a specified number of trees per acre in each diameter class. The single-tree selection method is best adapted to tolerant, late-successional species, but has been used successfully to regenerate loblolly and shortleaf pine in uneven-aged stands in which hardwood competition was controlled on a regular basis (Baker 1987). This method is not appropriate for regeneration of longleaf pine because longleaf pine is very intolerant to competition. (RCW EIS).

Because most loblolly and shortleaf stands in the National Forests in Texas are even-aged, the initial entry into the stand is heavy thinning to a residual basal area of approximately 45 to 60 square feet per acre. All subsequent entries into the stand are for the purpose of obtaining regeneration. The stand is allowed to grow to approximately 75 square feet of basal area per acre before the next entry occurs. Reproduction is considered inadequate if fewer than 100 seedlings per acre are growing at least 6 inches in height per year.

Loblolly and shortleaf pine are intolerant species (that is, pine seedlings and saplings will not survive or grow well in shade). To ensure that adequate sunlight reaches developing pine reproduction, it is necessary to control competing vegetation by hand, mechanical, or chemical means. Entries into a stand occur about once every 5 to 10 years.

Group selection involves removal of trees (usually the oldest or largest ones) in scattered patches at relatively short intervals (about every 10 years) to encourage the continuous establishment of regeneration and maintenance of a balanced uneven-aged stand (Smith 1986; Farrar 1984). A balanced uneven-aged stand managed by group selection is made up of small, essentially even-aged groups of trees. Each size class, from seedlings to large trees, occupies approximately the same number of acres in each stand. Group size ranges from about 0.25 to about 2 acres.

Group selection should regenerate uneven-aged stands of loblolly, shortleaf, and longleaf pine successfully on some sites (Baker 1987). Use of group selection to regenerate longleaf pine on medium-quality sites has been tested for about 15 years. Farrar and Boyer (1991) state that "A selection system may not work well for longleaf pine on very poor, dry, sandy sites, wet flatwood sites with dense palmetto understories, or very good mesic sites, because prescribed burning for competition control and/or seedbed preparation may be difficult to achieve."

One begins group selection in an even-aged longleaf stand, by thinning the stand heavily enough so that longleaf seedlings can become established in parts of the stand. In about 10 years, openings of from 0.5 to 2 acres can be made where adequate numbers of seedlings are present. During the next cutting cycle, additional openings are created where adequate regeneration exists (existing openings can be enlarged or new ones be made).

To begin group selection in an even-aged loblolly or shortleaf stand, one creates openings from 0.5 to 2 acres in size in parts of the stand. Regeneration is obtained from seed from the surrounding trees. The young pine trees may need to be released from hardwood and shrub competition within 5 years. Height growth of most of the surviving pine seedlings and saplings is 20 to 50 percent less than that of trees grown in large openings.

Management Requirements

A silvicultural system is not chosen at random. It is applied as an answer to a specific set of circumstances. Management objectives are primary factors in selecting a silvicultural system.

Many factors affect the reproduction and growth of individual species and individual trees. These factors are related to species silvics, the relationship the tree has with nearby trees and other plants, and the condition of the physical environment in which the trees grows. Some of these factors can be manipulated to provide the best conditions for the individual species or group of species being managed.

Several other factors are important mainly at the time of regeneration. They strongly influence the selection of a silvicultural system and regeneration method. These factors include soil temperature, evaporative stress, amount of exposed soil, and soil moisture availability.

The biological characteristics of all of the trees in the forest determine the range of management treatments that can be prescribed successfully. One of the more important characteristics is tolerance to shade. Species that are more tolerant to shade are better adapted to regenerate under a forest canopy and will eventually dominate the site. Conditions conducive to regeneration of light-demanding species are created by natural disturbances or practices that manipulate the amount of light. Regeneration cutting methods should be selected to provide for the light requirements of the species desired.

Tolerance to Shade

"Shade tolerance" describes the light conditions required by tree species. Shade-tolerant species can reproduce and grow to normal size under the shade of competing trees or other plants. Species that require full sunlight for successful growth and reproduction are termed "intolerant." Some species can withstand varying degrees of shade and are considered "intermediate." Relative shade tolerance ratings for the major tree species present in the National Forests in Texas are as follows. (Agriculture Handbook 654).

SPECIES	TOLERANCE
Coniferous	
Longleaf pine	Very intolerant
Loblolly pine	Intolerant
Shortleaf pine	
Cypress	Intermediate
Hardwood	
Sweetgum	Intolerant
Black cherry	
Cherrybark oak	
Nuttall oak	
Post oak	
Water oak	
Willow oak	
Sycamore	

Walnut	
Blackgum	Moderately intolerant
Black oak	
Overcup oak	
Swanp chestnut oak	
Southern red oak	

SPECIES	**TOLERANCE**
Hardwood Continued	
White oak	Intermediate
American elm	Moderately tolerant
Hickory	
Hophornbeam	
Magnolia	
Red maple	
Cedar elm	Tolerant
Winged elm	
American Hophornbean	
Green ash	
Eastern redbud	
Blackjack oak	
Bluejack oak	
Sugarberry	
American beech	Very tolerant
Flowering dogwood	
American holly	

Single-tree selection cutting allows only a minimal amount of direct sunlight to reach the forest floor. This regeneration method is best suited for management of shade-tolerant trees. When single-tree selection cutting is applied to stands of intolerant species, the intolerants are eventually replaced by more tolerant species (Roach 1972).

Group selection cutting is best suited for management of intermediate and intolerant species. Creation of small openings in the forest produces the light and other conditions these species require. Numbers of intolerant trees that regenerate in groups will, however, decrease in proportion to numbers of more shade-tolerant species as a result of shading by border trees.

Many species, including some that are intolerant to shade, germinate and become established better in partial shade than in full sunlight but survive and grow best in direct light once established. Shelterwood cutting provides both sets of conditions--partial shade after the seed cut and full sunlight after the final overstory removal. Shelterwood cutting can also be used when large numbers of seed trees are needed to regenerate species that do not produce large numbers of seed. It can also be useful where seed are heavy and do not disperse well. Longleaf pine produces small quantities of seed and has inconsistent crops, and oaks have heavy seed (Crocker and Boyer 1975).

Clearcutting is most suitable for regeneration of intolerant species that become established and grow best in full sunlight. Most intermediate and some tolerant species will regenerate in full sunlight that becomes available after clearcutting (Barrett 1980).

Seed-tree cutting is used where natural regeneration of light-seeded species is the objective. The seed-tree method can be appropriate for regeneration of intolerant species if the seed trees are removed after the seedlings become established.

Species Requirements

Loblolly and Shortleaf Pines

Loblolly and shortleaf pines occur naturally in fairly pure stands and in mixtures over large areas of the National Forests in Texas. The two species have somewhat different site requirements: loblolly prefers soils that are moist, and shortleaf prefers soils that are better-drained to droughty. However, the two species requirements for regeneration and growth are very similar.

Both species are intolerant to shade and are more easily established and grow best in full sunlight. Both even-aged and uneven-aged management systems have been used successfully in natural regeneration and growth of loblolly and shortleaf pines (Brender 1973; Farrar and others 1984; Reynolds 1969; Wahlenberg 1960; Wenger and Trousdell 1958). Clearcut, seed-tree, shelterwood, or selection harvest methods may be used to obtain natural reproduction if competition from understory hardwoods is controlled and the cutting coincides with a good seed crop (Barber and Burns 1977).

Short cutting cycles and vigorous hardwood control are keys to managing uneven-aged pine stands. Cutting cycles range from 3 to 15 years depending on stand basal area growth and residual basal area after each cutting. Uneven-aged management system relies on natural regeneration. Logging disturbance is relied on to prepare seed beds (the ground surface) for seedling establishment. After seedlings are established, they compete for nutrients, moisture, and sunlight. Undesireable competing vegetation must be controlled. If the more shade-tolerant hardwoods that compete with pines are not controlled, they eventually predominate (Barber and Burns 1977).

In the even-aged system, natural regeneration is most easily achieved through seed-tree cutting. When seed trees remain after a harvest, foresters monitor the flower production and cone crop to determine when an adequate seed crop can be expected. Treatments that expose soils for seed reception can be timed to coincide with seed fall.

Clearcutting is usually followed by planting or direct seeding (the spreading of seed by hand or mechanical means) to start a new forest. When seeds fall from mature trees and are stored in the forest floor until they can sprout, clearcutting can result in natural establishment of regeneration.

Longleaf Pine

Longleaf occurs naturally in fairly pure stands and in mixture with loblolly or shortleaf or both. On drier sites it is associated with post oak, blackjack oak, and southern red oak. It is managed much like loblolly and shortleaf pine. However, longleaf pine is very intolerant to shade. The seedlings are also highly susceptible to root competition (Croker and Boyer 1975). Per acre seed production peaks at stand densities between 30 and 40 square feet of basal area per acre (Boyer 1979).

Longleaf pine seeds require contact with mineral soil to germinate. The seeds have large wings and cannot penetrate ground cover easily. Seedbed preparation must remove vegetation and litter. Longleaf pine is a poor seed producer in comparison with other southern pines. Seed crops adequate to stock a stand occur about every 4 to 7 years. Approximately 70 percent of the

grown trees with large crowns and area at least 15 inches in diameter at breast height.

Only the shelterwood cutting method is suitable for natural regeneration of longleaf pine (Croker and Boyer 1975). Planting and direct seeding are successful. Throughout its range, longleaf pine in shelterwood stands produces seed crops adequate for natural regeneration. On average,

longleaf in shelterwood stands produces about 1,000 seeds per acre once every 4 to 5 years (Croker and Boyer, 1975).

Upland Hardwoods

The upland hardwoods occur mainly as components of the red oak-white oak-hickory and post oak-black oak cover types. These two groups grow in limited areas, mostly on lower slopes, at branch heads, and along minor streams. The upland hardwoods in these areas include southern red oak, black oak, blackjack oak, white oak, post oak, and various hickories.

These hardwoods are largely intolerant or intermediate in tolerance to shade. Both even-aged and uneven-aged management have been successful in these forest types.

Regeneration of these hardwood forests after a harvesting depends on the presence of advanced regeneration (young trees that came up before the mature trees were cut). Seedlings that sprout from acorns and nuts cannot immediately compete with other plants after a harvest. A seedling's root system grows for years, and a seedling's top dies back and resprouts a number of times, before the new tree is fully established (Tryon and Powell 1984). If adequate numbers of young trees are present or if enough sprouting stumps are produced, a harvest cut gives rise to a new hardwood forest. The mature forest may be harvested by clearcutting or by an uneven-aged method.

If not enough young trees are present to insure that a new hardwood forest will develop, shelterwood cutting may be appropriate. However, further research is needed before firm recommendations can be made in this situation. New seedling establishment will depend on the occurrence and size of acorn crops. In order to be effective, shelterwood cutting must both reduce the number of tall trees and control the midstory trees. Once enough young trees are established, the large trees must be removed so that the younger forest can grow satisfactorily.

Bottomland Hardwoods

Almost all of the bottomland hardwoods acreage in Texas is in the sweetgum-Nuttall oak-willow oak or swamp chestnut oak-cherrybark oak forest type. The species that make up the managed component of these stands are cherrybark oak, Nuttall oak, water oak, willow oak, overcup oak, swamp chestnut oak, green ash, blackgum, sweetgum, and American elm. These species are found in most stands, and a wide variety of other species being present.

Most of these species are intolerant to intermediate in shade tolerance. Forests are regenerated by sprouting of stumps and sprouting of young trees when the mature forest is harvested, as with upland hardwoods.

Natural oak regeneration in bottomlands has been inconsistent. Most regeneration failures have been attributed to lack of advance oak reproduction. Generally, advance oak reproduction of sufficient size and in sufficient numbers must be secured before the final harvest cut to successfully regenerate oaks on bottomland sites. The key is to create favorable light conditions on the forest floor prior to final harvest. Bottomland oak reproduction does not survive and grow

pretreatment reproduction evaluation is necessary when bottomland oaks are to be regenerated. When sufficient advance oak reproduction and sprout potential are present, a complete harvest or clearcut of all stems usually regenerates the stand to oak.

In theory, shelterwood methods should nurture oak reproduction if oak seed sources are present. In practice however, a heavy shelterwood cutting that creates gaps in the overstory usually favors reproduction of faster-growing intolerant species over oak reproduction, and lighter shelterwood cutting actually encourages the growth of undesirable tolerant species already established in the

midstory and understory. Most attempts to regenerate bottomland oaks by shelterwood methods have failed. Single-tree selection favors the growth and establishment of shade-tolerant species and thus is not recommended for regeneration of bottomland oaks. Group selection can be used to regenerate bottomland oaks if the openings are large enough to admit sufficient light to the forest floor to encourage the establishment and development of oak reproduction.

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