United States
Department of
Agriculture

Forest
Service

April 2015

Environmental Assessment

C-63 Project

National Forests and Grasslands in Texas
Angelina National Forest
Angelina County, Texas

For Information Contact: Kimpton Cooper
Angelina National Forests
(936) 897-1068 or (409) 787-3870
http://www.fs.fed.us/r8/texas/planning/nepa_index.shtml

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Table of Contents

1.0 Purpose and Need for Action ……..... 1
1.1 The Proposed Action…… 1
1.2 Need for the Proposed Action…….……. 2
1.2.1 Improving Habitat for RCW……... 2
1.2.2 Restoring Longleaf Pine Ecosystem…….…….. 3
1.2.3 Wildlife Habitat Improvement…….…….. 3
1.2.4 Reducing Southern Pine Beetle Hazard.…… 3
1.2.5 Roads…….. 4
1.2.6 Non Native Invasive Plant Species…… 5
1.2.7 Desired vs. Existing Conditions…… 5
1.3 Relevant Planning Documents……..…... 7
1.3.1 Relationship to National Direction……. 7
1.3.2 Relationship to Other Laws and Regulations……. 7
1.3.3 Forest Service Authority and Responsibility……. 8
1.4 Public Involvement……..… 9
1.4.1 Significant Issues…… 10
1.4.2 Other Issues…… 10
1.5 Decision to be Made ……..... 10

2.0 Alternatives, Including the Proposed Action 11
2.1 Introduction ……..... 11
2.2 Alternatives Considered in Detail……..….. 11
2.2.1 Alternative 1 – No Action……..…….. 11
2.2.2 Alternative 2 – Scoped Action ……...……..…... 11
2.2.3 Alternative 3 – Proposed Action……..……... 14
2.2.4 Alternative 4 – No Herbicide…….. 18
2.3 Management Requirements, Design Criteria, and Monitoring..... 18
2.3.1 Management Requirements…….……..... 18
2.3.2 Design Criteria.…….……..…… 18
2.3.3 Monitoring..... 20

3.0 Affected Environment & Environmental Consequences..... 23
3.1 Introduction……..…… 23
3.1.1 Analysis Tools Used……..…… 23
3.1.2 Specialist Reports Submitted...……. 24
3.1.3 Affected Environment…….……...…… 24
3.2 Soils ……..…..... 24
3.2.1 Affected Environment……..…….. 24
3.2.2 Environmental Consequences……..... 25
3.3 Water..... 29
3.3.1 Affected Environment……..…….. 29
3.3.2 Environmental Consequences……..... 34
3.4 Air……..…….. 35

3.4.1 Affected Environment ……..…..... 35
3.4.2 Environmental Consequences……..…….. 35
3.5 Threatened, Endangered, and Sensitive Species……..... 36
3.5.1 Threatened and Endangered Species ……..… 36
3.5.1.1 Mammals - Affected Environment and Environmental Consequences……..…… 36
3.5.1.2 Birds - Affected Environment and Environmental Consequences…….. ……. 38
3.5.2 Forest Service Sensitive Species……..…… 41
3.5.2.1 Mammals – Affected Environment and Environmental Consequences……...…….. 41
3.5.2.2 Birds – Affected Environment and Environmental Consequences……. 42
3.5.2.3 Reptiles – Affected Environment and Environmental Consequences……..……... 44
3.5.2.4 Insects – Affected Environment and Environmental Consequences……..……... 46
3.5.2.5 Fish, Crayfish, and Mollusk – Affected Environment and Environmental Consequences…… 47
3.5.2.6 Plants – Affected Environment and Environmental Consequences……. 50
3.6 Management Indicator Species……..……. 51
3.7 Climate Change……... 63
3.8 Vegetation…….……. 64
3.8.1 Affected Environment …….…….. 64
3.8.1.1 Old Growth……. 65
3.8.1.2 Non Native Invasive Species…….. 66
3.8.2 Environmental Consequences……..…….. 66
3.9 Heritage Resources……..…... 67
3.10 Visual Quality……..... 68
3.10.1 Affected Environment……... 68
3.10.2 Environmental Consequences……... 68
3.11 Recreation……..... 69
3.11.1 Affected Environment……..…. 69
3.11.2 Environmental Consequences……..…. 70
3.12 Herbicide Risk Assessments……. 70
3.12.1 Affected Environment……... 70
3.12.2 Environmental Consequences……... 74
3.13 Economics..... 75
3.13.1 Environmental Consequences……. 75

4.0 Preparers and Consultation with Agencies, Organizations, and Persons ……..……..…….. 79
4.1 Preparers and Contributors to Analysis……..……. 79
4.2 Consultation with Other Agencies, Organizations, and Persons……. 80

5.0 Literature Cited ……... 81

TABLES **Page**

Table 1.1. Southern Pine Beetle Hazard Rating …….……..……... 4
Table 1.2. Desired vs. Existing Conditions …….…… 5

Table 2.1. Alt 2 Thinning Stands……..……..…….. 11
Table 2.2. Alt 2 Longleaf Restoration Stands...……..…….. 12
Table 2.3. Alt 2 Road Analysis Summary…...…….…… 13
Table 2.4. Alt 3 Thinning Stands…..……..... 15
Table 2.5. Alt 3 Longleaf Restoration Stands……... 16
Table 2.6. Alt 3 Road Analysis Summary…… 16
Table 2.7. Summary of Action…….... 21
Table 2.8. Evaluation of Alternatives as They Relate to Issues and Objectives... 22

Table 3.1. Soil Names, Acres, and Characteristics for Areas Proposed for Treatments……. 25
Table 3.2. Predicted Soil Loss…… 26
Table 3.3. Watershed Activities on Forest Service Land…….. 32
Table 3.4. Percent Sediment Increase for Each Alternative…….. 33
Table 3.5. Threatened, Endangered, and Sensitive Species or Their Habitat within the Vicinity of the Project Area and Analyzed……..... 36
Table 3.6. Comparison of Alternative By The Amount and Quality of RCW habitat Improvement……. 40
Table 3.7. Habitat Type with Representing Management Indicator Species….. 52
Table 3.8. Pine Forest treated by stand type……..…….. 64
Table 3.9 Age Class Distribution…….……. 65
Table 3.10. Non Native Invasive Pant Species…….…… 66
Table 3.11. Overview of HQ for Workers…… 72
Table 3.12. Overview of HQ For General Public..…….. 73
Table 3.13. Comparison of Estimated Costs and Returns……... 76

FIGURES Page

Fig. 1.1. Vicinity Map ……..……. 1

Fig. 3.1. Watershed. …….…… 30
Fig. 3.2. Trends in estimated whitetail deer population in resource management Units Containing USFS Lands ……. 54

Fig 3.3. Spring Turkey Harvest in Angelina, Houston, Jasper, Nacogdoches, Newton, Sabine, San Augustine, Shelby, San Jacinto, Trinity, Montgomery and Walker Counties (National Forest Counties) from 1997-2011…….. 56
Fig 3.4. Changes in yellow-breasted chat populations across the species' range, based upon Breeding Bird Survey data (1966-2003). ……. 58

FIGURES Page

Fig 3.5. Number of yellow-breasted chats (YBCH) found in all forest stands during point counts on the NFGT…… 58
Fig 3.6. Changes in pileated woodpecker populations across the species' range, based upon Breeding Bird Survey data…….. 60
Fig 3.7. Numbers of pileated woodpeckers (PIWP) found in all forest stands during point counts on the NFGT, 1998-2011…… 61
Fig 3.8. Average number of snags at each sample point……. 62

APPENDICES

Appendix A - Maps

Appendix B - Biological Evaluation (when available)

Appendix C - PETS

Appendix D - MIS

Appendix E - Watershed Result

Appendix F - Pesticide Use Proposal

Appendix G - Comments (when available)

1.0 Purpose of and Need for Action

1.1 The Proposed Action

The Angelina National Forest proposes to improve habitat for the endangered red-cockaded woodpecker (RCW) and restore longleaf pine communities in compartment 63 (C-63). The proposed project involves thinning pine stands, longleaf pine regeneration, and non-native invasive plant species (NNIPS) control. Within stands being thinned, overstory hardwoods would be retained. Habitat improvements for RCW would include midstory removal of hardwoods in the thinned pine stands. No hardwood inclusions or overstory hardwoods would be removed. Herbicides would be applied to aid longleaf seedling survival. Other actions proposed include creating wildlife openings and road maintenances and closures on National Forest System Roads (NFSR). These activities should help meet the objectives in the 1996 Revised Land and Resource Management Plan for the National Forests and Grasslands in Texas (NFGT) as amended (the *Plan*).

This compartment was scoped as part of the larger Sandy Creek Project (compartments 63, 73 – 75 and 78). Some of the projects proposed in the scoping letter do not occur in compartment 63 and will not be addressed. This includes bat towers, osprey platforms, day-lighting and duck boxes. This environmental assessment (EA) addresses compartment 63 of the Sandy Creek Project.

Compartment 63 is south of Sam Rayburn Reservoir, approximately 9 miles southeast of Zavalla off Highway 63. It is located in Angelina County, Texas. From Zavalla, the area can be accessed by Pouland Rd., State Highway (SH) 63, and Farm-to-Market Road (FM) 2743. From Jasper, SH 63 and Hopkinson Road could access this area. The following vicinity map shows the location of compartment 63. A larger copy of this map is in Appendix A.

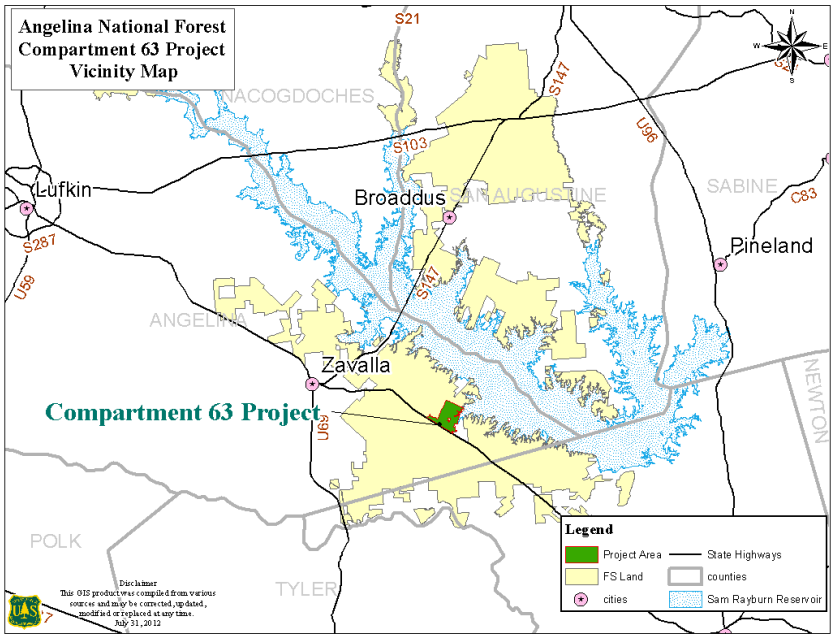


Figure 1.1 Vicinity Map of Compartment 63 Project.

1.2 Need for the Proposed Action

The *Plan* allocates land across the NFGT into management areas (MAs). A management area is a selected grouping of national forest lands with similar land and resource characteristics and with similar management goals and objectives. Proposed projects should move the areas towards meeting these goals and objectives, which are referred to as desired future conditions. The project area consists of Management Area (MA) 2 – Red-cockaded Woodpecker Emphasis, MA 4 – Streamside Management Zones, and MA 6 – Longleaf Ridge Special Area (1996 Revised Land and Resource Management Plan for the NFGT as amended *Plan*, p 96-134, 145-161, and 168-179).

The Angelina/Sabine District Interdisciplinary Team (ID Team) identified the need for the proposed action by comparing the *Plan's* desired future conditions (DFC) to the existing conditions in C- 63. This compartment was inventoried by the Angelina/Sabine District Prescription Forester in 2010. Red-cockaded woodpeckers are listed as an endangered species and inventories are taken annually across the National Forests and Grasslands in Texas (NFGT). Based on the stand inventory and woodpecker inventories, habitat improvements are needed to improve/maintain quality habitat for the species. With these needs in mind, collaboration with the public has led to the development of the proposed action.

A collaboration meeting was held with the public, Texas Conservation Alliance, Texas Fish and Wildlife Department, US Fish and Wildlife Service specialists, and Forest Service specialists to discuss projects to improve habitat conditions in C-63 in June of 2011. Discussions during these meetings and field trips, and further discussions led to the proposed action.

1.2.1 Improving Habitat for RCW

The desired future condition for MA 2 is open longleaf pine forests with understory vegetation dominated by perennial prairie grasses (the *Plan*, p. 97-98). The U.S. Fish and Wildlife 2003 Second Revision Red-cockaded Woodpecker Recovery Plan (RCW Recovery Plan) recognizes that the fitness of woodpecker groups increases if they have quality foraging habitat. The RCW Recovery Plan defines quality habitat as substantial amounts of foraging areas that are burned regularly, have some large old pines, low densities of small and medium pines, sparse or no hardwood midstory, and have a bunchgrass and forb groundcover (RCW Recovery Plan, p. 188). The quality of foraging habitat is reduced by the presence of midstory hardwoods. Cavity trees must be in open stands with little hardwood midstory and few overstory hardwoods. Effective midstory control is a prerequisite to the management, conservation, and recovery of red-cockaded woodpeckers throughout their range (RCW Recovery Plan, p. 38).

Monitoring of the NFGT between 1989 and 2011 indicates that active RCW clusters have increased by 106 percent. Annual monitoring data suggest that RCW populations are increasing and the viability is fairly secure across the NFGT (Monitoring and Evaluation Report, 2011. http://www.fs.usda.gov/detail/texas/landmanagement/planning/?cid=stelprdb5209614). This increase in population could be attributed to the significant increase in the prescribed burning program since 2004. Prescribed burning is a key component in maintaining quality RCW habitat.

Compartment 63 has been prescribed burned on a two to three year rotation since 1987 except 1997 to 2004 when NFGT was in litigation. Therefore, little to no burning was implemented on the Forest. This project area was most recently prescribed burned in 2012. This area is proposed to be prescribed burned on a one-to-three year rotation in the future.

There are currently no active RCW clusters within C-63. However, the nearest RCW cluster is within 3 miles of this compartment. Thinning the pine stands to create open park-like conditions and continuing to prescribe burn should create favorable habitat and foraging area.

Prescribed burning and treatment of non-native invasive plant species within the project area have been analyzed in separate documents. This EA is tiered to those documents and their effects will be addressed in the cumulative effects analysis.

1.2.2 Restoring Longleaf Pine Ecosystems

Compartment 63 is within MA 6 - Longleaf Ridge as well as MA 2 – RCW Emphasis. Both Management Areas emphasize restoring longleaf pine ecosystem. Based on the recent inventory of C-63, loblolly pine is predominate pine species present.

According to the Ecological Classification System for the National Forests and Adjacent Areas of the West Gulf Coastal Plain (Turner et al., 2007), shortleaf and longleaf pine are the pine species most likely to have been growing in C-63 before the turn of the century. The loblolly pine present is the result of planting during the early 1900's following harvest of the virgin timber stands prior to Forest Service acquisition. Planting and suppression of fire probably accounts for the loblolly presence in the area. One of the goals of this project is to decrease the number of loblolly pine in C- 63 while providing mature pine trees and open habitat to increase red-cockaded woodpecker populations. Two strategies are proposed in this project. First is replacing loblolly pine stands with longleaf pine. Second is retaining existing healthy and vigorous longleaf pine while thinning pine stands.

1.2.3 Wildlife Habitat Improvement

1.2.3.1 Permanent Wildlife Opening

This proposal includes establishing and maintaining permanent wildlife openings for wildlife species according to The *Plan* (p.84). Existing openings where a group of trees may have been killed from either a prescribed fire or a natural event, such as beetle attack or drought, may be converted to permanent wildlife openings. Logging decks may also be converted into wildlife openings after the timber harvesting operations are completed. Maintaining and vegetating these openings would provide a wide variety of herbaceous vegetation and prairie like habitat for game or nongame wildlife species. Species such as the Eastern wild turkey depend on similar communities for nesting and brooding while other species forage in these areas.

1.2.4 Reducing Southern Pine Beetle Hazard

Southern pine beetles (SPB) are one of the most destructive pests in the southern United States. Southern pine beetle outbreaks are episodic and generally grow to epidemic proportions on an average ten-year cycle. The last epidemic in East Texas occurred in between 1992 to 1994. One of the most common risk factors related to SPB infestation is slow radial growth, which is related to high stand density and tree age (Belanger, 1996). Reducing the square feet of basal area (BA) in dense pine stands not

only removes the smaller, slow-growing trees most susceptible to SPB infestations; it also reduces competition and increases residual tree growth (Belanger, 1996).

To identify areas where expanding and destructive SPB infestations are most likely to occur, a ranking system for East Texas was used that classifies the susceptibility of host stands to SPB (Mason et.al., 1985). Primary factors considered include the density of the stand BA, average stand height, and landform. Table 1.1 shows the stand characteristics and hazard rating for the pine stands in the project area.

Table 1.1 Southern Pine Beetle Hazard Rating

Compartment 63					
Stand	Height	Age	Pine Sqft BA	Landform	SPB Hazard
1	94	66	97	Ridge	Med
2	71	32	97	Ridge	Med
3	77	29	126	Ridge	Med
4	73	28	107	Side Slope	Med
5	94	119	33	Bottom	Med
6	89	39	74	Side Slope	Med
7	97	67	43	Bottom	Med
8	96	68	106	Ridge	Med
9	88	78	86	Ridge	Med
10	92	33	152	Side Slope	High
11	106	66	50	Ridge	Low
12	85	31	160	Bottom	High
13	54	18	88	Ridge	Low
14	46	11	43	Ridge	Low
15	92	63	175	Ridge	Med
16	62	21	37	Ridge	Low
17	88	43	27	Side Slope	Low
18	66	28	10	Bottom	Low
19	84	28	24	Side Slope	Low

Approximately 2 percent of the area proposed for treatments has a high SPB hazard, approximately 94 percent has a medium hazard rating, and approximately 4 percent of the area has a low SPB hazard. Stands with SPB hazard rating of medium and high would be thinned retaining 70 BA.

Trees growing very slowly appear to be more susceptible to SPB than faster growing trees. Several factors may attribute to slow growth rates: water availability, soil quality, and tree density. The higher the stand density, the greater the competition for water and soil resources by trees. This is reflected in the rate of growth of the pine trees. Thinning the stands would reduce the number of trees competing for resources and maintain or increase tree vigor improving the trees resistance to SPB attacks.

1.2.5 Roads

Within MA 2 and MA 6, the *Plan* requires appropriate maintenance and operational management of National Forest System Roads (NFSRs) to accommodate commodity production, other access needs, safety, and resource protection (the *Plan*, p. 104 & p. 176). Within the Compartment 63 Project area, several roads to be used for access require maintenance and improvements. These improvements would involve blading, spot gravel, ditch restoration, and reconstruction of specific roads to prevent degradation of the road system. Temporary roads used during the project would be obliterated and revegetated as part of the project work, following use.

National Forest System Roads shown on the Motor Vehicle Usage Maps (MVUM) are available for the public to use. Several interior NFSRs that are not on the MVUM are proposed to be either closed and gated for administrative use only or closed with bermed. Other roads, such as temporary roads, are proposed to be closed and bermed following project implementation. These proposals for closure or decommissioning are from recommendations on a recent roads

analysis completed by the district engineer. It was determined these roads were not essential to the Forest Service's goal of providing transportation systems throughout the forest.

1.2.6 Non Native Invasive Plant Species

One of the goals outlined by the Chief of the Forest Service is to reduce/remove non-native invasive plant species (NNIPS) from the forest. Tallow tree and Japanese climbing fern are two examples of rapidly expanding NNIPS on the forest which are present in Compartment 63 along with tree of heaven and Chinese privet. Following the guidelines established in the existing NNIPS EA, they would be eradicated. This EA would be tier from NNIPS EA signed in 2008. All phases of work proposed in C-63 would be monitored for NNIPS infestations and practices would be implemented to prevent the spread of NNIPS.

1.2.7 Desired vs. Existing Conditions

The following table summarizes this chapter's discussion and compares desired future conditions to the existing conditions of the biological and physical components of the environment in the project area. Comparing the existing to the desired conditions highlights opportunities for change that exist in the project area. The ID Team developed the proposed action through collaboration efforts with the public and other state and federal agencies specifically to address the opportunities for management identified by this comparison.

Table 1.2 Desired vs. Existing Conditions

Desired Future Condition	Existing Condition	Needs	Management Opportunities
1. Quality RCW habitat characterized by open pine stands with understories dominated by prairie grasses (the *Plan*, p. 97, 110). Scattered overstory hardwoods present but outside a 50-ft zone around each RCW cluster.	The density of pine trees is above recommended levels for good RCW habitat in many stands in C-63. In some pine stands, hardwood trees in the midstory are only slowly being controlled by fire or not being affected at all.	Need to reduce pine BA to meet RCW Recovery Plan guidelines. Need to reduce the number of midstory trees.	Thin overstocked pine stands. Reduce the number of midstory trees.
2. Restore native longleaf pine ecosystem (the *Plan*, p. 169).	With fire suppression and planting, loblolly pines are abundant throughout the project area which outcompete longleaf pine.	Begin restoring longleaf pine.	a). Regenerate 199 acres of loblolly plantations to longleaf. b). Maintain regular prescribed fire intervals.
3. Increases in RCW populations after this area become	It is difficult and time consuming for RCW to create new cavities	Facilitate the expansion and growth of RCW	Install artificial inserts.

Desired Future Condition	Existing Condition	Needs	Management Opportunities
inhabitable by RCW.	(RCW Recovery Plan, pp. 32-34).	populations by increasing the number of cavities available.	
4. Manage for a healthy, productive, and sustainable forest (the *Plan*, p. 47-48). Minimize losses to insects and diseases (the *Plan*, 48). Maintain tree vigor and reduce SPB hazard (the *Plan*, p. 65, 119).	Approximately 96% of the treatment area has a moderate to high SPB hazard rating (94% moderate, 2% high).	Decrease the SPB hazard to the pine forests in this compartment.	Thin overstocked pine stands to maintain vigor and reduce pine susceptibility to SPB.
5. Interest in creating food plots to improve habitat for eastern wild turkey.	Pine and hardwood forest with opening created from prescribed fire. No permanent food plot maintenance i.e. seeding, fertilizing and mowing.	Provide open areas, establish herbaceous vegetation, maintain through mowing and periodic seeding and fertilizing	During harvest operations, expand existing openings to 4 to 10 acres. Maintain long term.
6. Safe road system for timber harvesting and limited administrative use. (the *Plan*, p. 99). Improving and maintaining existing roads on MVUM	Roads associated with the stands to be thinned are deteriorating.	Restore road surfaces to the extent that safe driving conditions exist.	Recondition and reconstruct roads within the project area to the level needed for the timber sale.
7. a). Closed unused road systems and temp roads (the *Plan*, p. 176) b). Listed road system with the correct Management Level (ML) (the *Plan*, p. 62).	a). Infra Data System is not updated. b). Temp roads from old timber sales still open. c). Roads are listed under the wrong ML.	a). Decreasing unauthorized traffic on road systems. b). Identify the appropriate ML	a). Install berms and gates b). Update the Infra data system and ML
8. Reduce or eliminate non-native invasive plant	Non-native invasive plant species are present in Compartment 63.	Identify and eradicate NNIPS.	Treat known species, monitor project areas for

Desired Future Condition	Existing Condition	Needs	Management Opportunities
species (NNIPS: one of 4 goals of the Forest Service).	Any of the proposed activities would expose mineral soil making ir easier for these species to reproduce.		any infestations.

1.3 Relevant Planning Documents

1.3.1 Relationship to National Direction

Treatments described for this project are designed to be consistent with the standards and guidelines of the *Plan*. Treatments and environmental effects are typical of those projected for implementation in the *Plan* and analyzed in the Final Environmental Impact Statement for the Revised Land and Resource Management Plan (FEIS, USDA Forest Service, 1996). The proposed actions would occur in MA 2 – Red-cockaded Woodpecker Emphasis, MA 4 – Streamside Management Zones, and MA 6 – Longleaf Ridge Special Area (the *Plan*, p. 96-134, 145-161, & 168-179).

Vegetation treatments are consistent with vegetation management options in the Record of Decision for the Final Environmental Impact Statement for Vegetation Management in the Coastal Plain/Piedmont (USDA Forest Service, 1989). A botanical report from the Forest Botanist was submitted for this analysis. This EA tiers to the Non-Native Invasive Plant Species (NNIPS) EA that has been signed and covers the treatment of invasive species on the NFGT (NNIPS EA, 2008) and the Angelina National Forest-wide Fuel Reduction EA covers the prescribed burning forest-wide (2003).

Treatments in this project also reflect the direction provided by the U.S. Fish and Wildlife Service in the Red-cockaded Woodpecker (*Picoides borealis*) Recovery Plan, Second Revision (2003). This plan details the habitat requirements necessary to maintain and increase populations of the endangered RCW.

According to FSM 7712.1 – Roads Analysis, units are to use an authorized science-based roads analysis process, such as that described in the Miscellaneous Report FS-643 titled *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System* (USDA Forest Service, 1999). A roads analysis report is required if new roads are being constructed or if existing roads are changed or closed. A forest-scale road analysis report was completed for the Angelina National Forest in November 2003. This included public State, County, and maintenance level 3, 4, and 5 Forest Service roads. A road analysis report on Level 1 and 2 Forest Service roads is required and has been completed for this project by the District Engineer. This document tiers to this road analysis report (July 2012).

1.3.2 Relationship to Other Laws and Regulations

This environmental assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the project's foreseeable environmental effects for consideration in determining whether or not to prepare an Environmental Impact Statement. Reports cited in this EA and additional project documentation can be obtained from the project planning record

located at the Angelina District Office for the Angelina and Sabine National Forests.

1.3.3 Forest Service Authority and Responsibility

There is clear congressional and administrative intent for the Forest Service to manage lands to provide habitat for threatened, endangered, and sensitive species.

- The Organic Administration Act (1897) gives the Forest Service the responsibility "to regulate occupancy and use and to preserve the forests therein from destruction" (16 USC (United States Code) §551). It also provided for the establishment of forest reserves "to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions for water flows and to furnish a continuous supply of timber for the use and necessities of citizens of the United States…" (16 USC §475).

- The Multiple-Use Sustained Yield Act of 1960 stated the Forest Services' authority to manage the National Forests and Grasslands "for outdoor recreation, range, timber, watershed, and wildlife, and fish purposes (16 USC §528)." The law does this without limiting the Forest Service's broad discretion in determining appropriate resource emphasis or levels of use of the lands.

- The National Historic Preservation Act of 1966 provides for preserving, restoring, and maintaining the historic and cultural environment of the Nation (16 USC §470).

- Congress enacted the National Environmental Policy Act (1969) "…to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, enrich the understanding of ecological systems and resources important to the Nation …" (42 USC §4321).

- The Endangered Species Act of 1973 requires Federal agencies to "…carry out programs for the conservation of endangered species and threatened species (16 USC §1536(a) (1)).

- The National Forest Management Act (1976) requires National Forests to be managed in a sustainable manner that preserves their biological diversity and maintains self-sustaining populations of species and their habitat. They should be managed according to land and resource management plans that provide for multiple-use and sustained yields (16 USC §1660).

1.4 Public Involvement

This proposal was developed through collaboration between the public, state, and federal agencies. A collaborative meeting was held on June 22, 2011 at the Angelina National Forest (ANF) office. Those in attendance included representatives from the Texas Conservation Alliance (TCA), Texas Parks and Wildlife Department (TPWD), U.S. Fish and Wildlife Service (USFWS), National Forests and Grasslands in Texas (NFGT) specialists, and Angelina and Sabine National Forests staff. The purpose of the meeting was to obtain initial ideas from the public on potential treatments for the area while keeping in mind the main purpose of the project would be improving RCW habitat and longleaf restoration. Subjects discussed included commercially thinning pine stands, potential RCW clusters, midstory reduction, longleaf restoration, and hardwood inclusions. These

discussions were followed up by a field visit to look at areas with overstocked pine stands, potential longleaf regeneration sites, and stands with hardwood midstory densities exceeding recommendations set forth in the RCW Recovery Plan.

During the public meeting and field visits, representatives from Texas Conservation Alliance and United State Fish and Wildlife Service raised their concerns about the density of hardwoods components retained after treatments. The representative from TCA had a concern with the hardwood species components removed during the midstory treatment within stands proposed for thinning and the longleaf conversion in stand 6. He identified valuable hardwood species on the northern portion of stand 6 near Caney Creek and suggested we retain this hardwood component to maintain species diversity within that stand. Both representatives from TCA and USFWS came to a mutual agreement defining favorable hardwood species to be retained.

After the field trips, TCA submitted a detailed letter to the District Ranger on June 28, 2011 stating additional comments and concerns with the project.

The following proposed treatments associated with the proposed action and alternatives were developed during the collaborative process.

Streamside Management Zones (Hardwood trees):
There is a concern about maintaining an adequate hardwood component within the pine forests which covers a majority of the compartment. Through collaboration, the following measures would be implemented. A maximum of five hardwood trees per acre would be left in the midstory. Hardwood inclusions within pine stands would not be removed. No overstory hardwood trees would be removed. This should preserve the bluejack oak inclusions that are typically found in association with longleaf pine within the longleaf ridge ecosystem.

Thinning Treatments:
Because one of the main objectives of this project is to improve RCW habitat, there were several comments made stressing the importance of reducing basal area in pine stands to those consistent with the RCW Recovery Plan. Therefore thinning older stands to 70 square feet of basal area (BA) and younger stands to 60 BA was included in alternatives 2 and 3. Previously, the district had been using an 80/70 BA thinning regime respectively. A second issue was raised about creating a homogeneous landscape by applying thinning to a specific basal area equally across all treatment stands.

Longleaf Regeneration Treatments:
The goal to re-establish longleaf pine must be balanced with the need to provide adequate foraging habitat for the RCW within MA 6. Foraging habitat for the RCW includes primarily pine stands that are over 30 years of age with at least 40 BA of pine trees. Existing loblolly pine plantations (stands 2, 3, 4, and 14 identified on maps in appendix A) are too young at this time to provide suitable habitat for RCW. Therefore, these stands could be regenerated with longleaf pine without causing immediate reductions in foraging habitat. Any existing longleaf trees would be left on site.

Site preparation would include chopping or mulching (depending on site condition after the timber harvest) and prescribed burning. Containerized longleaf seedlings would then be planted. These seedlings would be

released using hand tools, herbicide, and/or fire.

Herbicide Use:
Herbicides may be used for longleaf seedling release, and NNIPS reduction.

1.4.1 Significant Issues

Significant issues are unresolved conflicts or disputes regarding effects of the Proposed Action that, because of their extent, duration, or intensity, are used to formulate alternatives to the Proposed Action, prescribe mitigation measures, and/or serve as the focus for a comparison of environmental effects between alternatives. Maintaining hardwood species diversity were the main issues with this project. After several meetings and discussions, it appears the proposed action would address most concerns of the people interested in this project. Issues were resolved and incorporated into the design of the modified proposed action.

1.4.2 Other Issues

The following three issues are considered non-significant and will not be discussed further in this document:

1. Management activities impacts to parklands, prime farmlands, roadless, jurisdictional wetlands, wilderness, municipal watersheds, or wild and scenic rivers. None of these areas would be impacted from proposed management activities described in this EA.

2. Management actions impacts to civil rights and minority groups. None of the proposed activities would treat or impact any groups differently from any other groups.

3. No federal, state, or local laws would be violated with implementation of proposed treatments described in this EA. The *Plan* standards would be implemented for all treatments.

1.5 Decision to be Made

The District Ranger must decide whether or not to improve RCW habitat by thinning pine stands, begin the process to restore longleaf pine to this ecosystem, and reduce/eradicate non-native invasive plant species in compartment 63. If the project area becomes inhabited with RCW, he must decide whether or not to install RCW cavity inserts and reduce the midstory. He must also decide whether or not to maintain existing Forest Service roads, close interior roads, and use temporary roads to access the proposed project.

The District Ranger must also determine if the selected alternative would or would not be a major Federal action, significantly affecting the quality of the human environment. If he determines that this project would not significantly affect the quality of the human environment, then he can prepare and sign a FONSI (Finding of No Significant Impact), and the project would proceed. If the District Ranger determines that the selected alternative would significantly affect the quality of the human environment, then an EIS (Environmental Impact Statement) and a ROD (Record of Decision) must be prepared and signed before the project may proceed.

2.0 Alternatives Including the Proposed Action

2.1 Introduction

Alternative 1 is the No Action Alternative. It may not meet the purpose and need but provides a baseline for comparison to the action alternatives and is required by law. Alternative 2 is the Scoped Action that was developed from the collaborative meetings with the public and sent out for scoping. Alternative 3 is the Proposed Action. It is the modified action of Alternative 2. Alternative 4 is the No Herbicide alternative.

2.2 Alternatives Considered in Detail

2.2.1 Alternative 1 (No Action)

The proposed activities would not be implemented under this alternative. Stands would be subject to change only through natural processes such as insect attacks, wildfires, drought, wind damage, and/or hail damage. There would be no improvements made to habitat for the endangered red-cockaded woodpecker (RCW), longleaf pine restoration may or may not occur naturally, but would entail a long time period to become established; road surfaces would not be rehabilitated, and non-essential roads would not be closed to limit the amount of disturbance experienced. This alternative would not be consistent with the *Plan* over the long term as it would not meet the goals and objectives nor provide the desired future condition for MA 2 and MA 6, as described in the *Plan* and in Amendment #7 to the *Plan*.

2.2.2 Alternative 2 – (Scoped Action)

Thinning: Approximately 942 acres are proposed for commercial thinning. Older stands (greater than 30 years) would be thinned to 70 square feet of basal area (BA). Younger stands (less than 30 years) would be thinned to an average of 60 BA. These thinnings would retain longleaf pine over shortleaf, loblolly, and slash pine, in that order as determined by on-the-ground conditions. Retention priority would be 1) relic trees, 2) other potential cavity trees, 3) trees greater than 10 inches diameter at 4.5 feet from ground level (Diameter Breast Height, (DBH)), and 4) trees less than 10 inches DBH. Stands to be thinned are detailed in Table 2.1.

Table 2.1 Alt 2 Thinning Stands

Compartment	Stand	Approx. Acres	Age	Forest Type	Pine Sqft BA	Hwd Sqft BA	Proposed Actions
63	1	448	66	loblolly	97	24	thin to 70 BA
63	3	84	29	loblolly	126	10	thin to 60 BA
63	8	58	68	loblolly	106	22	thin to 70 BA
63	9	318	78	loblolly	86	7	thin to 70 BA
*63	10	19	33	loblolly	152	3	thin to 60 BA
63	15	15	63	loblolly	175	5	thin to 70 BA

*Although stand 10 is older than 30 years of age, it would be thin to 60 BA.

Stand 9 is a loblolly stand with residual longleaf pine. Timber markers would take special care of these longleaf pines by providing additional space (than normal) while thinning around them inducing the crowns to enlarge. The assumption is that a tree with a large crown would produce more cones. Although producing a high number of cones is a genetic trait in longleaf pine, all longleaf would receive this treatment.

Longleaf Restoration: Approximately 169 acres of loblolly pine (*Pinus taeda*) plantations would be restored to longleaf pine (*Pinus palustris*). Any existing longleaf pine would remain on site and retaining overstory hardwoods and clumps. Site preparation may include shearing, chopping, and/or mulching followed by a prescribed burn. If shearing is prescribed, a feller buncher or chainsaw equipment would be used instead of a blade to reduce the amount of soil disturbance. The type of site prep would depend on what is left after the harvest. Containerized longleaf seedlings would be hand-planted. Once the seedlings are planted, they would be prescribed burned to control brownspot (*Scirrhia acicola*) disease and released as needed. The release would be accomplished using handtools (e.g. chainsaws or weed eaters with attached circular blades), or by herbicide application. The type of herbicide used would be dependent on the species competing with the longleaf. Typically this is sweetgum (Liquidambar styraciflua) and this is controlled with triclopyr. Triclopyr is a selective herbicide with the ability of controlling certain undesirable woody and herbaceous weeds without harming others (e.g. little bluestem (*Schizachyrium scoparium*) grasses). The herbicide application rate would be ≤ 2.0 lbs/ac. of active ingredient. The herbicide treatment would be applied late spring to early fall after trees have completed a full flush or before starting fall color change, by directed foliar spray. An additional prescribed burn may follow after the release to further control understory species (CUS burn). The stands to be treated are detailed in Table 2.2.

Table 2.2 Alt 2 Longleaf Restoration Stands.

Compartment	Stand	Approx. Acres	Age	Forest Type	Pine Sqft BA	Hwd Sqft BA	Proposed Actions
63	2	39	32	loblolly	97	8	longleaf restoration
63	4	34	28	loblolly	107	3	longleaf restoration
63	6	54	39	loblolly	74	18	longleaf restoration
63	14	42	11	loblolly	43	0	longleaf restoration

Streamside Management Zones: Buffers of a minimum of approximately 50 feet would be delineated on either side of perennial and intermittent streams. This distance would be increased in cases where topological or vegetative changes warrant another logical location. Buffers around ephemeral drains would be based on slope and soil type as defined in the *Plan, p. 152*. Within streamside zones, no vegetation removal would occur during the timber harvest, longleaf regeneration, or midstory reduction activities. Designated stream crossings may be crossed perpendicular to the stream by logging equipment at the discretion of the Timber Sale Administrator, as outlined in

the *Plan, p. 158*. Site prep equipment may use the same corridor during site preparation.

Roads: The following roads were identified as needing reconstruction and /or other work before logging commences (see Table 2.3). Approximately 1.1 miles of road would need work prior to logging. The Road Analysis Summary table below summarizes the future use of roads in the project area following treatment. Several roads would be closed with bermed following harvesting activities. Maps showing the locations of these roads are in Appendix A.

Table 2.3 Alt 2 Road Analysis Summary.

Road #	Existing Level of Use	Management Level	Length (miles)	Needed For Project	Work Needed to Bring to Standard	Future Level of Use
NFSR 3012	NONE	2	0.3	Yes	Resurfacing	Existing berm, reclose with berm after timber sale
NFSR 3072/ State End	MVUM	3	0.3	Yes	Blading, Spot gravel, Mow	Open/MVUM
NFSR 3093	NONE	2	0.3	Yes	Resurfacing	-
[c] NFSR 3106	NONE	N/A	0.22	No	None	Decommission
NFSR 354/ Lois	MVUM	3	2.64	Yes	None	Open/MVUM
[a] NFSR 354B/ Swank	NONE	2	0.9	Yes	None	ML1
[a] NFSR 354C/ Olson	NONE	2	0.4	Yes	None	ML1
NFSR 354D/ Hays	NONE	2	0.2	Yes	Resurfacing	Close with berm after timber sale
Angelina-Guidrey Road	MVUM	County	-	Yes	Blading, Spot gravel, Mow	Open/MVUM
[b] ANG-24	NONE	County	-	No	Resurfacing	-
FM 2743	MVUM	State	-	Yes	None	Open/MVUM
State Highway 63	MVUM	State	-	Yes	None	Open/MVUM

[a] = Not an actual road, but easement for powerline
[b] = From Guidrey Road to Hopsonville Road, the road is a powerline easement
[c] = This road does not exist on the ground.

Maintenance would involve any or all of the following: blading, rock/gravel spot treatments, clearing ditches and culverts, and fill. Spot graveling are localized treatments and not treatments along the entire length of the road. Reconstruction would involve maintenance and reshaping of the road surface and ditches. Where needed, areas of exposed soils along the road sides would be seeded with native and/or

nonpersistant seed mixture, mulched and/or fertilized.

Approximately 2.2 miles of temporary roads would be built for access to individual stands. Temporary roads would be obliterated after use by adding waterbars where needed, installing road closures (i.e. berms), tilling, seeding, and fertilizing. No new permanent roads would be constructed. All proposed temporary roads would be surveyed by an archeologist; however, if these roads become unsuitable the timber harvest, additional survey would be required.

Wildlife Habitat Improvement

Wildlife Openings: There are approximately 10 acres of existing openings throughout the project area. These existing openings may or may not be suitable for logging decks during timber sales but logging decks may be converted to permanent wildlife openings after the timber operations.

All wildlife openings would be maintained by mowing and prescribed burning. They would be planted periodically with noninvasive plants to improve wildlife forage and cover. The openings may require treatment with handtools on occasion if woody vegetation grows too dense and large.

Non-Native Invasive Plant Species: The project area would be monitored for infestations of non-native invasive plant species during and following implementation of the proposed activities. Monitoring would conform to that which is being conducted as part of the 2008 Non Native Invasive Plant Species (NNIPS) Environmental Assessment (EA) which was signed by previous Forest Supervisor, Fred Salinas, and the *Plan* direction. Any NNIPS discovered would be removed following direction in the NNIPS EA. Inventories for new infestations as a result of the proposed activities would be conducted during the growing season by qualified invasive species botany personnel on the NFGT.

RCW Management: Habitat within future and existing RCW clusters would be maintained following standards and guidelines in the *Plan* (p. 110-116), and the RCW Recovery Plan (p. 178-180). Maintenance would include removal of all hardwood and pine midstory within a 50 ft. radius of cavity trees. Cluster maintenance would be accomplished by installing inserts and mowing.

No known active RCW clusters are located in Compartment 63. If a cluster is discovered in this compartment before any of the proposed work occurs, guidelines in the Plan and the 2003 RCW Recovery plan would be implemented. This would include no work occurring during the RCW nesting period which is from April 1 through July 31(Errata #3. http://www.fs.usda.gov/detail/texas/landmanagement/planning/?cid=stelprdb5209352). Work could commence once nestlings have fledged in the summer as determined by the district wildlife biologists.

The *Plan* sets the start of nesting season as March 1. Based on ongoing monitoring, nesting season actually has been starting after April 1. The RCW Recovery Plan sets April 1 as the start of nesting season.

2.2.3 Alternative 3 – (Proposed Action)

This alternative is the modification of Alternative 2 (Scoped Action). Stand 3 was scoped as a commercial thin stand. As a loblolly stand, it would be harvested and planted with longleaf pine. Stand 6 would not be included in any harvesting treatment

since the existing conditions are suitable for RCW habitat. The other proposed actions listed would accomplish similar goals and improvements as discussed in the Scoped Action alternative.

Thinning: Approximately 858 acres are proposed for commercial thinning. Older stands (greater than 30 years) would be thinned to 70 square feet of basal area (BA). These thinnings would retain longleaf pine over shortleaf, loblolly, and slash pine, in that order as determined by on-the-ground conditions. Retention priority would be 1) relic trees, 2) other potential cavity trees, 3) trees greater than 10 inches diameter at 4.5 feet from ground level (Diameter Breast Height, (DBH)), and 4) trees less than 10 inches DBH. Stands to be thinned are detailed in Table 2.4.

Stand 9 is a loblolly stand with residual longleaf pine. Timber markers would take special care of these longleaf pines by providing more space than normal while thinning around them inducing the crowns to enlarge. The assumption is that a tree with a large crown would produce more cones. Although producing a high number of cones is a genetic trait in longleaf pine, all longleaf would receive this treatment.

Table 2.4 Alt 3Thinning Stands

Compartment	Stand	Approx. Acres	Age	Forest Type	Pine Sqft BA	Hwd Sqft BA	Proposed Actions
63	1	448	66	loblolly	97	24	thin to 70 BA
63	8	58	68	loblolly	106	22	thin to 70 BA
63	9	318	78	loblolly	86	7	thin to 70 BA
63	10	19	33	loblolly	152	3	thin to 70 BA
63	15	15	63	loblolly	175	5	thin to 70 BA

Longleaf Restoration: The alternative proposes to harvest approximately 199 acres of existing loblolly pine (*Pinus taeda*) stands and plant with longleaf pine (*Pinus palustris*). Any existing longleaf pine would remain on site and retaining overstory hardwoods and clumps. Site preparation may include shearing, chopping, and/or mulching followed by a prescribed burn. If shearing is prescribed, a feller buncher or chainsaw equipment would be used instead of a blade to reduce the amount of soil disturbance. The type of site prep would be dependent on what is left after the harvest. Containerized longleaf seedlings would be hand-planted. Once the seedlings are planted, they would be prescribed burned to control brownspot (*Scirrhia acicola*) disease and released as needed. The release would be accomplished using handtools (e.g. chainsaws or weed eaters with attached circular blades), or by herbicide application. The type of herbicide used would be dependent on the species competing with the longleaf. Typically this is sweetgum (*Liquidambar styraciflua*) and this is controlled with triclopyr. Triclopyr is a selective herbicide with the ability of controlling certain undesirable woody and herbaceous weeds without harming others (e.g. little bluestem (*Schizachyrium scoparium*) grasses). The herbicide

application rate would be ≤ 2.0 lbs/ac. of Triclopyr's active ingredient. The herbicide treatment would be applied late spring to early fall after trees have completed a full flush or before starting fall color change, by directed foliar spray. An additional prescribed burn may follow after the release to further control understory species (CUS burn). These stands are detailed in Table 2.5.

Table 2.5 Alt 3 Longleaf Restoration Stands.

Compartment	Stand	Approx. Acres	Age	Forest Type	Pine Sqft BA	Hwd Sqft BA	Proposed Actions
63	2	39	32	Loblolly	97	8	Longleaf restoration
63	3	84	29	Loblolly	126	10	Longleaf restoration
63	4	34	28	Loblolly	107	3	Longleaf restoration
63	14	42	11	Loblolly	43	0	Longleaf restoration

Streamside Management Zones: Buffers of a minimum of approximately 50 feet would be delineated on either side of perennial and intermittent streams. This distance would increase in cases where topological or vegetative changes warrant another logical location. Buffers around ephemeral drains would be based on slope and soil type as defined in the *Plan, p. 152*. Within streamside zones, no vegetation removal would occur during the timber harvest, longleaf regeneration, or midstory reduction activities. Designated stream crossings may be crossed perpendicular to the stream by logging equipment at the discretion of the Timber Sale Administrator, as outlined in the *Plan, p. 158*. Site prep equipment may use the same corridor for site preparation.

Roads: The following roads were identified as needing reconstruction and /or other work before logging commences (see Table 2.3). Approximately 1.1 miles of road would need work prior to logging. Road Analysis Summary table below summarizes the future use of roads in the project area following treatment. Several roads will be closed with bermed following harvesting activities.

Table 2.6 Alt 3 Road Analysis Summary.

Road #	Existing Level of Use	Management Level	Length (miles)	Needed For Project	Work Needed to Bring to Standard	Future Level of Use
NFSR 3012	NONE	2	0.3	Yes	Resurfacing	Existing berm, reclose with berm after timber sale
NFSR 3072/ State End	MVUM	3	0.3	Yes	Blading, Spot gravel, Mow	Open/MVUM
NFSR 3093	NONE	2	0.3	Yes	Resurfacing	
[c] NFSR 3106	NONE	N/A	0.22	No	None	Decommission

Road #	Existing Level of Use	Management Level	Length (miles)	Needed For Project	Work Needed to Bring to Standard	Future Level of Use
NFSR 354/ Lois	MVUM	3	2.64	Yes	None	Open/MVUM
[a] NFSR 354B/ Swank	NONE	2	0.9	Yes	None	ML1
[a] NFSR 354C/ Olson	NONE	2	0.4	Yes	None	ML1
NFSR 354D/ Hays	NONE	2	0.2	Yes	Resurfacing	Close with berm after timber sale
Angelina-Guidrey Road	MVUM	County	-	Yes	Blading, Spot gravel, Mow	Open/MVUM
[b] ANG-24	NONE	County	-	No	Resurfacing	-
FM 2743	MVUM	State	-	Yes	None	Open/MVUM
State Highway 63	MVUM	State	-	Yes	None	Open/MVUM

[a] = Not an actual road, but easement for powerline
[b] = From Guidrey Road to Hopsonville Road, the road is a powerline easement
[c] = This road does not exist in the field

Maintenance would involve any or all of the following: blading, rock/gravel spot treatments, clearing ditches and culverts, and fill. Spot graveling are localized treatments not treatments along the entire length of the road. Reconstruction would involve maintenance and reshaping of the road surface and ditches. Where needed, areas of exposed soils along the road sides would be seeded with native and/or nonpersistant seed mixture, mulched and/or fertilized.

Approximately 2.2 miles of temporary roads would be built for access to individual stands. Temporary roads would be obliterated after use by adding waterbars where needed, installing road closures (i.e. berms), seeding, and fertilizing. No new permanent roads would be constructed. All proposed temporary roads would be surveyed by an archeologist; however, if these roads become unsuitable during the timber harvest, additional survey would be required.

Wildlife Habitat Improvement

Wildlife Openings: There are approximately 10 acres of existing openings throughout the project area where a group of trees may have been killed from either a natural event such as beetle attack or a prescribed fire. These existing openings may or may not be suitable for logging decks during timber sales but logging decks may be converted to permanent wildlife openings after the timber operations.

All wildlife openings would be maintained by mowing and prescribed burning, and they could be planted periodically with noninvasive plants to improve wildlife forage and cover. Some openings may require treatment with handtools on occasion if vegetation is too dense and large. The maintained openings would provide open grassy habitat and would improve Eastern wild turkey nesting and brood habitat.

Non-Native Invasive Plant Species: The project area would be monitored for infestations of non-native invasive plant species during and following implementation of the proposed activities. Monitoring would conform to that which is being conducted as part of the 2008 Non Native Invasive Plant Species (NNIPS) Environmental Assessment (EA) which was signed by previous Forest Supervisor, Fred Salinas, and the *Plan* direction. Any NNIPS discovered would be removed following direction in the NNIPS EA. Inventories for new infestations as a result of the proposed activities would be conducted during the growing season by qualified invasive species botany personnel on the NFGT.

RCW Management: Habitat within future and existing RCW clusters would be maintained following standards and guidelines in the *Plan* (p. 110-116), and the RCW Recovery Plan (p. 178-180). Maintenance would include removal of all hardwood and pine midstory within a 50 ft. radius of cavity trees. Cluster maintenance would be accomplished by installing inserts, mowing, chainsaws, and/or hand tools.

At this point, no active RCW clusters are located in these stands. If active RCW clusters were found, the District Biologist would be notified. Midstory removal and installing RCW insert would be implemented but work would not occur within the cluster until the nesting season, typically April through July, of potential breeding pairs was over or after fledging of the young. The *Plan* sets the start of nesting season March 1. Based on ongoing monitoring, nesting season actually has been starting after April 1. The RCW Recovery Plan sets April 1 as the start of nesting season (Errata #3. http://www.fs.usda.gov/detail/texas/landmanagement/planning/?cid=stelprdb5209352.)

2.2.4 Alternative 4 - (Alternative 3 without Herbicides)

This alternative is identical to Alternative 3, except that no herbicides would be used to release longleaf seedlings. The release work would be accomplished using handtools (e.g. power saws or weed eaters with attached circular blades).

2.3 Management Requirements, Design Criteria, and Monitoring

2.3.1 Management Requirements

Specific management requirements that apply are found in Chapter IV of the *Plan*, under forest-wide standards and guidelines (p. 53-84) and in the Timber Sale Preparation and Administration Handbook, NFT supp. #14. Additional requirements apply for MA 2 (the *Plan*, p. 96-134), MA 4 (the *Plan*, p. 153-161), and MA 6 (the *Plan*, p. 175-179).

2.3.2 Design Criteria

1. Any hardwoods within the 50-foot zone around active RCW cavity trees would be cut and felled by authorized personnel separately from the timber sale.

2. A 660 ft. buffer will be established around all active bald eagle nests to preclude equipment and timber harvest activities near nests during nesting season.

3. To protect water quality, intermittent and perennial streams would be buffered with a minimum of 50 ft. and painted out. No mechanical equipment would be allowed in the primary zones except at approved stream crossings (designated by the Forest Service Timber Sale Administrator).

4. Skid trails would only cross streamside zones at designated points, with prior approval of the Sale Administrator. The *Plan's* standards and guidelines and Texas' Best Management Practices (BMPs, Texas Forestry Association, August, 2010) would be followed in all stages of sale implementation (the *Plan*, p. 158).

5. No mechanical operations would occur during wet ground conditions to minimize soil compaction and rutting. On soils with a severe compaction hazard, areas would be harvested in a way that would reduce repetitious trafficking over previously disturbed areas. The District Timber Sale Administrator would monitor conditions and promptly shut down timber sales when erosion and soil compaction were unacceptable (the *Plan*, p. 82, 158).

6. All skid trails and landings would be closed and revegetated with a non-invasive seed mixture as required by the timber sale contract. Within one growing season, ground cover would be established on 70 percent of the area of all log landings and skid trails (the *Plan*, p. 106).

7. All logging and site preparation equipment would be washed before transition to a different area to help prevent the spread of NNIPS.

8. If previously undiscovered archaeological or historical resources are encountered during the implementation of this project, work in that area would cease immediately until the resources can be assessed and evaluated by a member of the Heritage Management Team and the State Historic Preservation Office (SHPO) has been afforded the opportunity to review the findings. The site area would be excluded from all treatments until this review can be completed. Known archaeological and historical sites which are considered eligible for listing on the National Register of Historic Places (NRHP), and those which have not been fully evaluated in order to determine their eligibility for the NRHP, would be removed from the area of potential effect by adjusting the appropriate boundaries of the proposed actions or by mitigation.

9. If previously undocumented red-cockaded woodpecker (RCW) activity is discovered during implementation of this project, the project activities would cease until the District Wildlife Staff evaluated the situation and determined appropriate management actions to take that would be consistent with US Fish & Wildlife Service guidelines.

10. Mitigation measures to prevent or reduce siltation problems at stream crossings to protect aquatic habitat would be used. Stream crossings would be kept to a minimum to prevent disturbances within mesic habitats to protect sensitive flora and fauna.

11. Visual mitigation measures would be implemented along the travelways. The visual quality objectives (VQO) are partial retention, modification and maximum modification. Within 25-100 feet of Farm Market (FM) 2743, Hopsonville Road and State Highway 63, mid and understory trees are retained. Along Angelina-Guidrey Road, trees will be felled directly away from the travelway for 200 feet. Leaving favorable flowering trees and other vegetation along NFSR 354 may enhance its visual quality. Log landings

are to be a minimum of 300 feet from the travelway. Leave tree marking may not be seen from travelways. Within 200 feet of a travelway, slash would be removed, lopped, or chipped to within two feet of the ground.

12. Marking would follow the *Plan's* guidelines for thinning in red-cockaded woodpecker habitat, leaving the largest, oldest trees available while still meeting the average spacing guidelines. The retained favorable order of pine would be longleaf over shortleaf over loblolly and then slash. This determination would be based on on-the-ground conditions.

13. Herbicides would be applied according to Forest Service Standards and labeling information.

14. Areas would not be prescribed burned for at least 30 days after herbicide treatment.

15. A Certified Pesticide Applicator would be on site to supervise herbicide application operations.

16. Notice signs [Forest Service Handbook (FSH) 7109.11] would be clearly posted when herbicides are to be used.

2.3.3 Monitoring

Before, during, and after the implementation of the selected alternative, the project area will be monitored to determine whether the project is carried out as designed.

1. Where thinning operations occur, the basal areas would be monitored to ensure proper residual basal areas are achieved.

2. As part of the Angelina National Forest's annual RCW monitoring program, all RCW clusters and recruitment stands are surveyed for occupancy and activity status each year. The District Biologists and/ or qualified wildlife technicians, assess cluster condition, status, and search for any new cavity trees. In addition, each known RCW group is monitored throughout the nesting season to track nesting attempts, band nestlings (if needed), and track the number of young fledged.

3. During tree removal operations, a Forest Service Timber Sale Administrator would inspect operations regularly to ensure compliance with mitigation measures and contract provisions. During periods of wet weather or marginal conditions, at the beginning of sale operations and at other critical periods, inspections would be done on a daily basis when timber sale contractors are working. These inspections would be documented, and violations would be promptly reported to the Contract Administration Team and District Ranger.

4. Erosion control work would be monitored, inspected, and documented a growing season after completion by the Sale Adiminstrator or other Forest Service Representative. Erosion control work may include spreading slash and/or chip residue, installing waterbars, seeding and fertilizing skid trails, temporary roads and log landings. If these areas are not recovering adequately, further action would be taken to bring them to standard.

5. During herbicide application, the weather would be monitored regularly and work suspended if temperature, humididty, or wind exceed the following parameters:

Wind - > 15 mph

Temperature - > 98 degrees
Humidity - < 20%

Table 2.7 Summary of Actions.

Project	Alt. 1 No Action	Alt. 2 Scoped Action	Alt. 3 Proposed Action	Alt. 4 No Herbicide Action
Commercial Thinning	0	942 acres	858 acres	858 acres
Site Prep (shear, chop, mulch, and/or burn)	0	169 acres	199 acres	199 acres
Longleaf Regeneration	0	169 acres	199 acres	199 acres
Pine Release and Prescribed Burning	0	169 acres (as needed)	199 acres (as needed)	199 acres (as needed)
Road Reconstruction	0	0.8 miles: NFSR 3012, NFSR 3093, NFSR 354D	0.8 miles: NFSR 3012, NFSR 3093, NFSR 354D	0.8 miles: NFSR 3012, NFSR 3093, NFSR 345D
Temporary Roads (approximate mileage)	0	2.2 miles	2.2 miles	2.2 miles
Road Maintenance (spot gravel, blading)	0	0.3 miles: NFSR 3072	0.3 miles: NFSR 3072	0.3 miles: NFSR 3072
Road Decommission	0	NFSR 3106	NFSR 3106	NFSR 3106
Berms	0	3: NRSR 3012, NFSR 354D, NFSR 3106	3: NFSR 3012, NFSR 354D, NFSR 3106	3: NFSR 3012, NFSR 354D, NFSR 3106
Maintain Wildlife Openings	0	log decks (as needed) or existing openings	log decks (as needed) or existing openings	log decks (as needed) or existing openings

Table 2.8 Evaluation of Alternatives as They Relate to Issues and Objectives.

Issue/Objective	Alt 1 – No Action	Alt. 2 – Scoped Action	Alt. 3 – Proposed Action	Alt. 4 – Alternative 3 No Herbicide
1. RCW Habitat Improvements				
Acres Thinned	0	942 acres	858 acres	858 acres
Acres Midstory Reduction	0	0	0	0
Number of Cavity Inserts	0	0	0	0
2. Aquatic Habitat Enhancement				
Reduce Erosion/Sedimentation				
Miles of Road Closures	0	0.5 miles	0.5 miles	0.5 miles
Roads Decommissioned	0	0.22 miles	0.22 miles	0.22 miles
Improve Fish Passage(# culverts)	0	0	0	0
3. Safety – Road Reconstruction	0	0.8 miles	0.8 miles	0.8 miles
4. Watershed - % Sediment Increase				
Big Creek Watershed	59.7	64.0	64.0	64.0
Parker Creek Watershed	41.6	50.8	50.7	50.7
5. Adverse Impacts to Threatened/Endangered Species Populations	Possibly	No	No	No
6. Adverse Impacts to Sensitive Species Populations	No	No	No	No
7. Adverse Impacts to Management Indicator Species Populations	No	No	No	No
8. Herbicide Use	No	Yes	Yes	No
9. Longleaf Restoration	0	169 acres	199 acres	199 acres
10. Southern Pine Beetle Hazard Reduced	No	Yes	Yes	Yes
11. Economics				
Present Net Value	0	$129,588	$114,447	$118,516
Benefit/Cost Ratio	0	1.21	1.18	1.19
Timber Volume Generated	0	16,804 CCF	16,433 CCF	16,433 CCF

3.0 Affected Environment & Environmental Consequences

3.1 Introduction

This section summarizes the key environmental impacts of the four alternatives. It provides the necessary information to determine whether or not to prepare an Environmental Impact Statement. The analysis that follows has considered the best available science when evaluating the impacts of the proposed project on the forest resources through a review of scientific literature, a consideration of responsible opposing views, and the acknowledgement of incomplete or unavailable information, scientific uncertainty, and risk. This includes reports submitted by Forest Service Specialists that are in the project file.

The project area occurs in the Sandy Uplands Landtype Associations (LTA) of the Southern Loam Hills Subsection, of the Coastal Plains and Flatwoods, Western Gulf Section of the Outer Coastal Plain Mixed Forest Province. The Sandy Uplands LTA occurs on the Eocene Manning and Wellborn formations. These formations consist of littoral sands and sandy clays on undulating to moderately sloping landscapes. Manning formation consists of lignitic clay with lesser sandstone, bentonite and tuff while Wellborn consists of a very fine to coarse grained sandstone and minor clay. This LTA is transitional between the Clayey Uplands to the north and the Mayflower Uplands to the south. The soils consist of loamy, somewhat poorly to moderately well drained surface soils over clay to sandy clay loam subsoils. Historically dominant vegetation in the pre-settlement era was the longleaf pine communities, but these pines communities contained more inclusions of other forest types than the adjacent Mayflower Uplands (232 Fa.15; Van Kley et al., 2007).

The Sandy Uplands LTA occupies a narrow band north of the Whitsett formation across the southern portions of the Angelina and Davy Crockett National Forests. Accounts of historical vegetation suggest the presence of numerous saline prairie openings on this LTA although there are currently no documented occurrences of such sites on national forest lands. Regardless the community type, however, natural fires would have been important in structuring most of those plant communities (Van Kley et al., 2007).

Compartment 63 Project is within two 6th level watersheds, Big Creek and Parker Creek on the Angelina National Forest. The stands proposed for treatment are located in Management Area (MA) 2 – Red-cockaded Woodpecker Emphasis, MA 4 – Streamside Management Zones, and MA 6 - Longleaf Ridge Special Area (*the Plan*, p. 96-134, 145-161, and 168-179).

3.1.1 Analysis Tools Used

Several computer models were used to generate relative outputs for the alternatives analyzed. The soils analysis was completed using a computerized version of soil survey reports developed by the Natural Resource Conservation Service (NRCS). This includes suitability of a soil type for harvest equipment operability, log landings, and haul roads. The watershed analysis was completed using the Revised Cumulative IMPACTS model. This model was developed for the National Forests in Texas and is specific to soil texture zones within the forest. The analysis considers incremental impacts of actions when added to past, present, and reasonably foreseeable future actions in a watershed. The analysis includes all activities within a watershed on

National Forest System land and private lands, regardless of who undertakes the actions. The model estimates average annual sediment values from disturbances in the watershed and compares them to the natural/undisturbed watershed condition. Financial analysis for this project was computed using the Quick Silver Economic Analysis program. This database computer application figures the dollars and cents criteria needed to determine if one management action costs less or has a better payoff than another. A site-specific herbicide risk assessment was computed using the Syracuse Environmental Research Associates, Inc. (SERA) worksheet maker prepared for the Forest Service, Forest Health Protection, version 2.04 (http://www.sera-inc.com/home.html, SERA, 2011). A full report for the risk assessment completed for Triclopyr can be found at: http://www.fs.fed.us/foresthealth/pesticide/risk.shtml (SERA, 2011).

3.1.2 Specialist Reports Submitted

Specialist reports from the forest staff were used for the analysis in this document and are included in the project file. This includes: 1) a wildlife report from Ronald Hasken, District Wildlife Biologist, 2) an aquatics report from Dave Peterson, Forest Fisheries Biologist, 3) a botanical report from Tom Philipps, Forest Botanist, 4) a scenery management report from Nancy Snoberger, Forest Landscape Architect, and 5) a road analysis report for this specific project from Eliode Joseph, District Civil Engineer.

3.1.3 Affected Environment

The Compartment 63 project is proposed in Management Area (MA) 2 – Red-cockaded Woodpecker Emphasis, MA 4 – Streamside Management Zones, and MA 6 Longleaf Ridge Special Area (*the Plan*, p 96-134, 145-161, & 168-179) on the Angelina National Forest. State Highway (SH) 63 is adjacent to the project on the south and FM 2746 makes up the north border of the project. Several National Forest System Roads (NFSR) and County Roads run through the project area and make the area readily accessible.

3.2 Soils

3.2.1 Affected Environment

According to the Ecological Classification System (ECS) for the National Forests and Adjacent Areas of the West Gulf Coastal Plain, this project area lies within the Sandy Uplands Landtype Associations (LTA) (Van Kley et al., 2007). This LTA occurs on gently sloping to strongly sloping uplands and some areas are considered as low ridges. Soils are primarily loamy and somewhat poorly drained to moderately well drained (*the Plan*, Appendix A, p. 21).

The Natural Resource Conservation Service (NRCS) has completed an Order II Soil Resource Inventory for the Angelina National Forest. This soil survey has more detailed information on the soils and their suitability for the existing conditions and proposed actions than the Ecological Classification System. Table 3.1, derived from queries of the GIS (geographic information system) based Order II inventory database, summarizes the properties of the soils that comprise the project area. A soil map of the area is in Appendix A. The following table lists the characteristics of main soil types in each stand.

Table 3.1 Soil Characteristics for Areas Proposed for Treatments in Compartment 63.

Soil Name – Soil Code	Slope Range	Compaction Hazard	Erosion Hazard	Texture
Alazan (AaB)	0-4 %	Severe	Slight	Very Fine Sandy Loam
Bernaldo-Besner (Bb)	0 %	Severe	Slight	Fine Sandy Loam
Keithville (KaB)	0-3 %	Severe	Slight	Very Fine Sandy Loam
Keltys (KcB)	1-5 %	Moderate	Slight	Fine Sandy Loam
Koury (Ko)	0 %	Severe	Slight	Loam
Kurth (KuB)	0-4 %	Moderate	Slight	Fine Sandy Loam
Moswell (MsB)	1-5 %	Severe	Slight	Loam
Raylake (RkB)	0-4 %	Severe	Slight	Clay Loam
Rosenwall (RoB)	1-5 %	Moderate	Slight	Fine Sandy Loam
Rosenwall (RoD)	5-15 %	Moderate	Moderate	Fine Sandy Loam
W		Not Rated	Not Rated	Water
• **Does not include minor soils that may be included in the project area.**				

*__Slight__. Presents, at most, minor problems for the specified use. The soil gives satisfactory performance with little or no modification. Modifications or operations dictated by the use are simple and relatively inexpensive. With normal maintenance, performance should be satisfactory for a period of time generally considered acceptable for the use.

**__Moderate__. Does not require exceptional risk or cost for the specified use, but the soil does have certain undesirable properties or features. Some modification of the soil itself, special designs, or maintenance are required for satisfactory performance over an acceptable period of time. The needed measures usually increase the cost of establishing or maintaining the use, but the added cost is generally not prohibitive.

*** **Severe**. Requires unacceptable risk to use the soil if not appreciably modified. Special design, a significant increase in construction cost, or an appreciably higher maintenance cost is required for satisfactory performance over an acceptable period of time. A limitation that requires removal and replacement of the soil would be rated severe. The rating does not imply that the soil cannot be adapted to a particular use, but rather that the cost of overcoming the limitation would be high (http://soils.usda.gov/technical/manual/contents/chapter6.html; accessed October 24, 2012).

Approximately 69 percent of C-63 project area has severe compaction hazard rate and approximately 30 percent has compaction hazard rate of moderate. Before any proposed activities are applied, special design and maintenance criteria in these areas should be implemented for satisfactory performance during the operational period. However, cost for these requirements depends on the existing ground condition.

3.2.2 Environmental Consequences

The *Plan* establishes parameters for allowable soil loss based on coefficients developed from the Modified Universal Soil Loss Equation (the *Plan*, Appendix F, p. 2). The work proposed in the project area includes regeneration harvests, commercial thinning, site preparation, and prescribed burning (addressed in a separate environmental document). The following table displays the predicted erosion rate in tons per acre per year and the tolerance rate for that soil type in tons per acre per year. The tolerance level indicates the amount of soil loss that could occur without impairing the soil productivity.

Table 3.2 Predicted Soil Loss.

	Soil Type	
	Sandy/Loam	**Clay**
Project	**Tons Per Acre Per Year**	
Geologic Erosion	0.008	0.013
Commercial Thinning	0.07	0.120
Site Prep Shear/Burn	1.1	2.0
Chopping	0.68	0.660
Total	**1.858**	**2.793**
Tolerance Level	4.80	5.40

The figures in this table indicate that erosion rates in tons per acre per year for each project or a combination of all ground disturbing projects are less than that which would impair soil productivity for a sandy/loam or clay soil type. Best management practices would be used in all operations associated with this project. All mechanical operations would cease during wet soil conditions to minimize rutting and compaction.

Alternative 1 – No Action

Direct and Indirect Effects: This is the No Action Alternative. There would be no actions undertaken; therefore, there would be no adverse direct or indirect impacts on the soil resource in this area.

Cumulative Effects: On average, portions of the Compartment 63 have been prescribed burned on a 2-3 year cycle since 1997. If this alternative is selected, prescribed burning would continue on a 2-3 year cycle. Some timber salvage occurred as a result of Hurricane Rita in the area in 2006. No control of NNIPS (non-native invasive plant species) in the foreseeable future should have little impact on soils. No other actions are known to be ongoing in this area at this time. No on-the-ground disturbing actions are proposed in this alternative. Therefore, there should be no cumulative effects from this alternative on the soil resource.

Alternative 2 and 3 – Scoped Action & Proposed Action

Direct and Indirect Effects: Soils would be affected by heavy equipment used to harvest pine trees, prepare planting sites and wildlife opening maintenances. High traffic with equipment and/or foot travel in areas such as skid trails, log landings, and temporary roads lead to erosion and soil compaction especially in wet condition. As a result of erosion and compaction, soil productivity can be lowered. Forest Service standards and guidelines defined in the *Plan* would be incorporated to minimize these impacts. Planning for proposed timber treatments would avoid locating skid trails/landings on critical sites (e.g. RCW cluster or sensitive species) and evaluating existing landings located on critical sites for potential relocation.

Before timber activity begins, the skid trails would be harvest first, and then the back of the sale to the front, which should reduce trafficking outside of designated skid trails. Only operate equipment when soil conditions are acceptable and have the capability to support the load during the harvesting operational period. Additional measures should be taken to prevent

accelerated erosion, compaction, and rutting when operating in areas with slopes greater than 5 percent. After timber treatment is completed, stabilize bare soil with native seed or mulch; slash or chipper residue can also be used as mulch on fine-textured soils and should encourage the development of soil pore space by insects and other creatures. In addition, provisions would be made to disperse water runoff from landings and secondary roads by constructing waterbars or other structures where the potential for increased erosion exists (Soil Report). Skid trails, log landings, and temporary roads would be revegetated to 70 percent ground cover within one year (*Plan*, p. 106 & 179). Soils within ephemeral, intermittent, and perennial streamside zones would not be affected, except where crossed at right angles by equipment. Crossings would be designated by the Sale Administrator. Operations would cease if soils became wet and rutting becomes evident.

Soil disturbance from heavy equipment, such as skidders, would be determined by the amount of timber volume removed in the area. They would compact and rut these areas or corridors while traveling back and forward removing the timber. If mitigations are not implemented in a timely manner, soil properties may become less acceptable after a rain event.

Constructing new and reconstructing existing wildlife openings and annual maintenance would cause some on-site soil erosion until plants become established. Soil productivity is not expected to be impacted by the construction and reconstruction because seeding and fertilization follow these activities.

Erosion hazard is slight on soil types where actions are proposed. Information presented in Table 3.2 indicates that any soil erosion that does occur would be within tolerance levels, as presented in the *Plan*. Predicted erosion rates are below that which would negatively impact soils. Extended streamside buffer zones of 100 ft. should help prevent sediment delivery to streams if erosion does occur.

Twenty-four percent of the affected soils have a moderate compaction hazard while 48 percent of the affected soils have a severe compaction hazard. Harvesting and mechanical site preparation would be limited to periods when soils are dry. No proposed treatments would be implemented within floodplains which are located in the shorelines and streamside buffer zones, except at designated crossings. Any tightly compacted soils resulting from the harvest operation would be tilled to a four inch depth (*Plan*, p. 106 &179). This, coupled with the time lag between entries (generally 10 years), should minimize long-term adverse soil compaction. Best Management Practices would be followed throughout all operations.

It is generally accepted that the majority of sediment produced by forest management practices comes from forest roads (Gucinski, et. al. 2001). Road work would follow *Plan* standards and guidelines to minimize compaction and erosion. Road work would include cleaning side ditches out and reestablishing wing ditches allowing proper waterflow during precipitation events. Soil movement may occur if exposed soil in corridors is not promptly stablized. Temporary roads would be obliterated by blocking, tilling, seeding, and fertilizing after the work is completed. Temporary crossings over streams would be removed after use. Grasses and forbs should eventually fill in the exposed soil on these roads.

If a temporary road would cross a stream, road relocation around the stream or coming in from another side would be considered before a temporary culvert. When using a temporary culvert, the streambed would be protected by laying down a fabric mat first, then placing the culvert on top of it. All forms of temporary crossings over streams would be removed after use.

There should be no adverse direct or indirect impacts on soil productivity as a result of these proposed treatment activities. Impacts occurring as a result of the actions should be within tolerance levels, as the Forest Plan standards and guidelines and Best Management Practices would be followed.

The proposed herbicide application of triclopyr would not be boardcast but applied by directed foliar spray. It would be applied to vegetation on soils that are moderately to very slowly permeable. Fine-textured soils (clay) and organic soils have higher adsorption capacity than coarse-textured (sandy) soils. Therefore, soils with high clay and/or organic matter content have a higher capcity to bind herbicides, making them less available for uptake by plant roots (Osiecka, A & Patrick J. Minogue, 2010). However, triclopyr should have little affect on soil for it is not highly mobile and the soil microbes and ultraviolet light break down the herbicide making it less persistent (FEIS, VMCP/P, Vol I. page II-35).

The herbicide application to control competing vegetation does not disturb the nutrient rich litter layer, does not create additional amounts of bare soil, and does not adversely affect watershed condition (Neary & Michael, 1996). There should be no adverse direct or indirect impacts on soil productivity as a result of these proposed herbicide applications. Impacts occurring as a result of the actions should be within tolerance levels, as the *Plan* standards and guidelines and Best Management Practices would be followed.

The ground disturbing activities proposed in this project would have a high risk of NNIPS spread in (1) habitats that have high susceptibility to NNIPS invasion or (2) areas that are already disturbed. However, a comprehensive plan of NNIPS control and prevention would be integrated into the project design for all of the proposed activities regardless of where they would occur. This would reduce or contain NNIPS and improve the vigor of native vegetation, thereby increasing resistance to further NNIPS invasion. NNIPS treatment would include both manual, non-mechanical, and cultural control and prevention measures, and would be included in the project design criteria (USDA Forest Service, Guide to Noxious Weed Prevention Practices, Version 1.0, Dated July 5th 2001). Under the proposed action, treatment of NNIPS would occur anywhere within the project area. Treatments would be commensurate with the location of existing populations and with individual risk of spread. Monitoring would take place to determine effectiveness of treatment.

Cumulative Effects: Compartment 63 has been inlcuded in a 2 to 3 year landscape prescribed burning cycle. Since 1997, this compatment have been burned 7 times. It is expected to continue this burning cycle. Timber salvage occurred as a result of Hurricane Rita in this area in 2006. Control of NNIPS in the foreseeable future should have little impact on soils. No other actions are known to be ongoing on soils in this area at this time. The cumulative effects to soils from activities proposed in Alternative 2 and 3 should result in minimal risks to soil productivity in stands that are thinned.

Triclopyr herbicide has a moderately short half-life of 10 - 46 days with an average of 30 days. Therefore, the cumulative effect under operational conditions should be of minimal risk to soil productivity (Forestry-Use Pesticides, 2007).

The use of herbicide for site preparation, pine release and NNIPS would not cause soil disturbance or affect soil productivity. Triclopyr is not highly mobile in soil (FEIS, VMCP/P, Vol I. page II-35). Therefore, it has little soil activity and rapid degradation.

Alternative 4 – Proposed Action without Herbicides

Direct and Indirect Effects: Effects from this alternative on soils should be the same as Alternative 3 except no herbicides would be used. Manual hand tool release should have no direct or indirect effect on the soil resource.

Cumulative Effects: Cumulative impacts on soils from this alternative should be the same as in Alternative 3 except that no herbicides are being used and there should be no cumulative impacts on the soils from herbicide use.

3.3 Water

3.3.1 Affected Environment

Compartment 63 Project is within two 6th level watersheds; Big Creek and Parker Creek, on the Angelina National Forest. The majority of the compartment is in the Parker Creek Watershed and the remaining areas on the southern end are in the Big Creek Watershed, see Figure 3.1 below. The stands proposed for treatment are located in Management Area (MA) 2 – Red-cockaded Woodpecker Emphasis, MA 4 – Streamside Management Zones, and MA 6 – Longleaf Ridge Special Area (*the Plan*, p 96-134, 145-161 & 168-179). These watershed delineations come from the US Geologic Survey. A larger map of the watersheds is located in Appendix A.

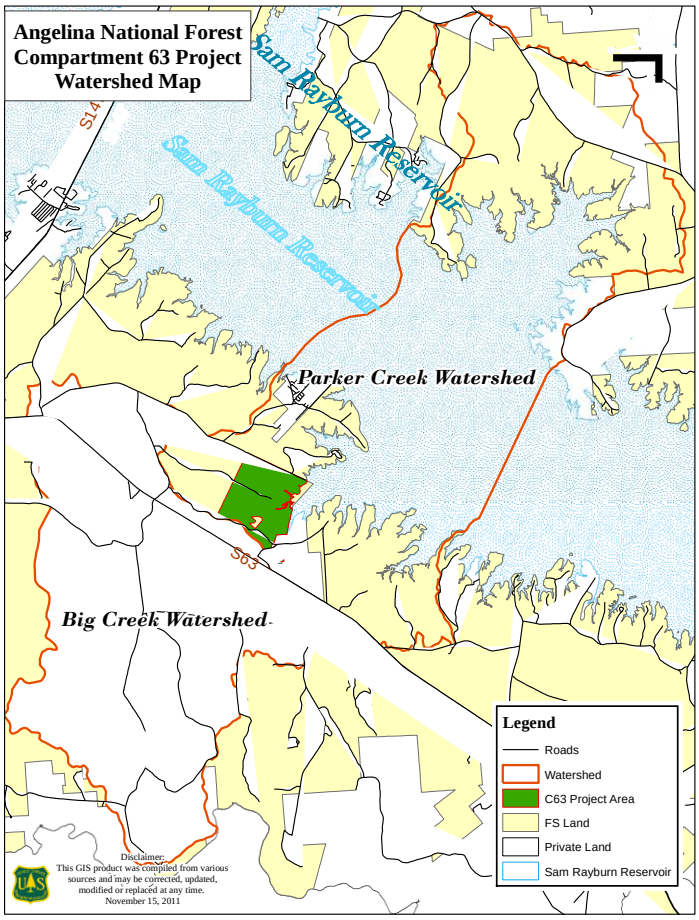


Figure 3.1 Watersheds

Big Creek Watershed encompasses approximately 17,422 acres. There are approximately 13,732 acres of national forest and 3,690 acres of private lands within the watershed. Approximately 13,563 acres of Forest Service lands are forested and 169 acres of non-forested are recreational parks, industrial areas, and special use right-of-ways. Of the private land, approximately 3,371 acres are forested and 319 acres of non-forested are residential, industrial, farmland, and pastures. These are approximate figures. There are approximately 52 miles of roads within this watershed, and approximately 111 miles of perennial and intermittent streams.

Parker Creek Watershed contains 30,230 acres of which 15,563 acres are national forest lands and 14,667 acres are private lands. Approximately 13,318 acres of Forest Service lands are forested and 2,245 acres are non-forested. Of the private land, approximately 3,048 acres are forested and 11,619 acres are non-forested. Non-forest acres may be residential or industrial areas, farmland, pastures, and Sam Rayburn Reservoir. These are approximate figures. There are also approximately 81 miles of roads within this watershed and approximately 125 miles of perennial and intermittent streams.

The Sam Rayburn Reservoir is located on the Angelina River, a major tributary of the Neches River, approximately 5 miles north

of Zavalla, in the heart of the Pineywoods Region of Southeast Texas. Sam Rayburn Reservoir is an 114,500 acre lake formed by the construction of Sam Rayburn Dam in the early 1960s. Recreational activities in and around the reservoir include swimming, boating, picnicking, fishing, camping, hunting, and sightseeing. In addition to downstream flows from the Angelina River, the Sam Rayburn Reservoir watershed drains approximately 1,385 square miles and encompasses five counties and all or part of nine municipalities (http://anra.org/divisions/wastewater/czr/sam_rayburn.html accessed May 17, 2012). Floodplains lie in areas adjacent to this reservoir. Beneficial uses associated with the creeks, streams, and branches that flow into Sam Rayburn are mainly fishing. The desired condition is to provide for the protection and propagation of aquatic life.

Drinking water sources include ground water (wells) and surface water (Sam Rayburn Reservoir). Sam Rayburn Reservoir, Angelina River, and three tributaries into Sam Rayburn Reservoir (Attoyac Bayou, Bear Creek, and Ayish Bayou) are classified as impaired by the Texas Commission on Environmental Quality (TCEQ) (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/08twqi/twqi08.html accessed May 17, 2012). The reason given is mercury found in largemouth bass and freshwater drum. Mercury impairments were found throughout the reservoir and in adjacent streams. None of the activities proposed in this action would lead to an increase in the amount of mercury in the surrounding streams and reservoir. None of the remaining creeks, bayous, and branches in the effected watersheds are listed as impaired.

Compartment 63 is mainly drained by Caney Creek. Numerous intermittent and ephemeral streams are associated with these drains. Caney Creek flows in a southeasterly and easterly direction into Sam Rayburn. Characteristics of these stream courses include meandering streams and relatively flat grades that are stable with actively eroding banks.

Properties and characteristics for jurisdictional wetlands are not present within the areas proposed for harvests. Wetland type areas may occur elsewhere in the watersheds, specifically around areas adjacent to Sam Rayburn and Toledo Bend Reservoirs. Most of the areas classified as floodplains are located in the streamside buffer zones. There are no proposed activities within the floodplains except for designated stream crossings. Through implementation of the *Plan* standards and guidelines, direct and indirect effects from the activities proposed under Alternative 2 and 3 would be minimal.

The Southern Forest Resource Assessment updated in 2009 (http://www.srs.fs.usda.gov/sustain/report/index.htm; accessed June 26, 2012) supports this finding. It states that the non-point source pollutant of greatest concern to forest management is sediment, which reaches stream channels primarily through erosion. Rain splash and sheet erosion account for the majority of hill slope erosion. Of most concern however, is sediment resulting from roads and skid trails, especially if Best Management Practices are not followed. Results from the Texas Forest Service (TFS) most recent forestry Best Management Practices (BMP) monitoring, 2007-2008, found that the NFGT sites had an overall implementation effectiveness of 100 percent, with no significant risks to water quality (http://txforestservice.tamu.edu/uploadedFil

es/Sustainable/bmp/RD%207%20BMP%20Implementation%20Report%20-%20website.pdf; accessed June 26, 2012).

Monitoring and evaluation (M&E) is used to determine the effectiveness of management activities. When standards and guidelines are properly implemented, management activities such as timber thinning, regeneration, and road maintenance do not have significant adverse effect on soil and water and their associated beneficial uses (M&E Report 2011, http://www.fs.usda.gov/detail/texas/landmanagement/planning/?cid=stelprdb5209614 accessed May 17, 2012). Adherence to the *Plan* standards and guidelines mitigate concerns for soil rutting, compaction, damage from harvest equipment, and impacts from road maintenance. Adverse direct or indirect effects from the proposed management actions are unlikely.

Following is a list of activities that have occurred or are planned in the two watersheds in 2011, 2012, and 2013 on Forest Service lands.

Table 3.3 Watershed Activities on Forest Service Land.

Watershed		**Big Creek**	**Parker Creek**
Year	**Action**	**Approximate Acres/Miles**	
2011	Fireline	0.35 mi.	6.5 mi.
	Temp Rd.	0	0.5 mi.
	Clear-cut	0	0
	Seedtree Cut	0	0
	Prescribed Burn	131 ac.	7,145 ac.
	Thinning	0	116 ac.
2012	Fireline	10.5 mi.	2.5 mi.
	Temp Rd.	0	0
	Prescribed Burn	5,506 ac	2,078 ac.
	Thinning	0	0
2013	Fireline	6.5 mi.	4.5 mi.
	Temp Rd.	0.4 mi.	1.8 mi.
	Prescribed Burn	6,797 ac.	4,766 ac.
	Thinning	312 ac.	546 ac.
	Site Preparation (chop & burn)	42 ac.	155 ac.

The prescribed burn in the table above is the landscape prescribed burn. The site preparation burning for regeneration is separate from the prescribed burn acres but was included with the site preparation acres listed above. Private land is scattered throughout the two watersheds. There are approximately 6,419 acres forested and 11,938 acres non-forested. Non-forested is composed of farmlands, pastures, and residences or industries. The activities on private land were calculated in the cumulative impact model but are not shown in the table above. These activities may be commercial thinning, prescribed burning, farming, or conversion from forest land to farmland and grazing pastures.

Although prescribed burning is not part of this project, the area will be prescribed burned in the future. Therefore, the prescribed burning and associated constructed and reconstructed firelines are included in the model along with other proposed actions. Table 3.4 displays the results of the analysis. The summary sheets generated are in Appendix E.

Table 3.4 Percent Sediment Increase for Each Alternative

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
	No Action	**Scoped Action**	**Proposed Action**	**Proposed Action without Herbicides**
Watershed	**Percent Sediment Increase above Baseline**			
Big Creek	60%	64%	64%	64%
Parker Creek	42%	51%	51%	51%

All values for these alternatives fall below the 2,200 percent threshold level that would be detrimental to aquatic populations.

Water yields would temporarily increase in areas where harvesting and release are planned. This effect is more related to reduced water use by vegetation than effects on soil properties (USDA 1989 and Blackburn et. Al. 1989). Surface runoff could cause erosion where water becomes channeled and mineral soils are exposed. Skid trails would produce most of the soil movement. Establishment of stream protection zones, waterbarring, seeding, and fertilizing of exposed soil on temporary roads and skid trails would mitigate the potential for sediment delivery to streams.

A cumulative impacts model, developed for the National Forests in Texas by A. Clingenpeel, Hydrologist on the Ouachita National Forest, was used to address the effects of activities on water quality and fisheries. The model determines the possible cumulative impacts of management activities on water quality and its associated beneficial uses. Changes in land use and disturbance are modeled with respect to increases in sediment. The predicted impacts are summarized by alternatives. Significance is suggested when the impacts are compared to thresholds.

Average annual sediment values from disturbances in a watershed are compared to the natural/undisturbed watershed condition (forested watershed with no roads or trails or other human disturbances). The model

includes sediments generated from activities occurring in the watershed; past, present, and to the extent possible, future. The sediment values from presently occurring activities and proposed management alternatives are expressed as a percent increase over the average annual sediment produced from the watershed. This allows the alternative to be compared to a threshold value associated with fisheries. Predicted sediment increases less than 2,200 percent for clay and clay loam soil textures appears not to pose a threat to existing fish populations (USFS, 2003). This is the threshold value used to compare proposals in each alternative.

The cumulative effects area for water includes known activities occurring on private and Forest Service lands within two watersheds. Activities occurring over the last three years and known existing or reasonably foreseeable future activities are considered for this analysis.

The forest does not regulate the protection of groundwater on national forest lands in Texas. The State of Texas, specifically the State Railroad Commission and Texas Commission on Environmental Quality, are responsible for regulating those activities. The United States Forest Service (USFS) is responsible for the protection of surface resources. The proposed action does not involve any actions that are subsurface. Therefore, there should be no impacts to ground water from this proposal that would be direct, indirect, or cumulative. No further discussion of ground water is included in this EA.

3.3.2 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects: None of the proposed activities would occur. Therefore, there are no direct or indirect effects. The percent increases in the above table in Alternative 1 are due to actions on private land. Culverts that currently restrict fish passage would remain in place.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. There should also be no cumulative effects with other actions going on in this area.

Alternative 2 and 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: The proposed harvests, releases, site preparation and wildlife openings projects would not generate sediment at a level that would be detrimental to aquatic populations in this alternative. This also includes the proposed temporary roads. Removal of the trees in harvesting operations would potentially increase rainfall runoff. The remaining trees and vegetation in a thinning would eventually increase in growth by using the nutrients and water now available because of the decreased competition, and runoff should return to pre-thinning levels. In longleaf restoration areas, there will be an expected short-term increase in runoff; however, by spreading slash throughout the site and following Best Management Practices, this increase should be minimal. As the new stand is planted and sprouting of native vegetation begins, the increase in runoff should decline. When site preparation burning is included, levels of sediment production still do not approach thresholds detrimental to aquatic organisms.

Chemicals can enter streams through a variety of mechanisms-by direct application, drift, mobilization of residues in water, overflow and leaching. Herbicide use under this proposed action would not be broadcasted but applied by foliar spray. Selectively using the herbicide triclopyr in

these alternatives should not affect aquatic populations, due to its little soil activity, and treating areas only outside of streamside zones. Also, the soil types in the project area have very slow to moderate permeability and would further reduce the impact of triclopyr on water resources.

Cumulative Effects: Prescribed burn, associated firelines, harvesting with the associated timber activities, site preparation, midstory removal, and potential tree harvesting on private lands are ongoing activities in these watersheds. The proposed project combined with the other actions in the watershed does not increase sediment levels to the extent that the aquatic resources are impaired. Future NNIPS control projects should result in little or no soil disturbance and should not increase sediment loading into the water systems. Herbicide use for this project and NNIPS treatments would not affect the aquatic resources in these watersheds. No other existing or reasonable foreseeable future actions are known to be occurring in these watersheds.

Alternatives 4 – Proposed Action without Herbicide

Direct and Indirect Effects: The impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

Cumulative Effects: The cumulative impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

3.4 Air

3.4.1 Affected Environment

Under the Clean Air Act, the Environmental Protection Agency (EPA) sets limits on how much of a pollutant is allowed in the air anywhere in the United States (www.epa.gov/air/caa/). Areas of the country where air pollution levels persistently exceed the national ambient air quality standards may be designated "nonattainment" (http://www.epa.gov/airquality/greenbk/ accessed July 1, 2012). The Angelina National Forest is located in Angelina, Jasper, Nacogdoches, and San Augustine Counties. None of these are "nonattainment" counties. The *Plan*'s Final Environmental Impact Statement (1996, p. 132) found that air quality over the Angelina National Forest meets the National Ambient Air Quality Standards (NAAQS) for Class II airsheds. This still holds true in 2012.

3.4.2 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects: There would be no direct and indirect effects on air quality because no actions are being proposed.

Cumulative Effects: There would be no cumulative effects on air quality because no actions are proposed.

Alternative 2 and 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: Air quality would be affected directly by the exhaust from vehicles used to perform the proposed work. Indirectly, air quality would be affected from the dust generated from driving on dirt/gravel roads. Air quality would be impacted just in the vicinity of the road and/or vehicles and should be temporary. Site preparation burning would directly affect air quality temporarily during the burn and possibly a few days afterward.

Cumulative Effects: The increase in fuels on the ground from harvesting and site preparation work may increase the amount of smoke generated when this area is prescribed burned in the future. Prescribed

burning on surrounding National Forest lands would continue contributing smoke that affects air quality. However, site preparation burning burns small acreages at a time and any smoke generated from these burns would be temporary in nature, lasting just the day or a few days after the burns.

Alternatives 4 –Proposed Action without Herbicide

Direct and Indirect Effects: The impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

Cumulative Effects: The cumulative impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

3.5 Threatened, Endangered, and Sensitive Species

The species addressed in this section are categorized into two groups: those listed under the Endangered Species Act as threatened or endangered and those listed by the Forest Service as Regional (R8) Forester's sensitive species (August 13, 2010) (Table 3.5).

Most of the species addressed tend to be habitat specialists, closely linked with specific habitat types, with an uneven distribution across the landscape. Individual species' habitat associations and the effects of the proposed alternatives are described in the following sections.

Table 3.5 Threatened, Endangered, and Sensitive Species or Their Habitat within the Vicinity of the Project Area and Analyzed.

Federally Listed Threatened and Endangered Species
Mammals
Louisiana black bear *(Ursus americanus luteolus)*
Birds
Red-cockaded woodpecker *(Picoides borealis)*

Forest Service Sensitive Species
Mammals
Rafinesque's big-eared bat *(Corynorhinus rafinesquii)*
Southeastern myotis *(Myotis Austroriparius)*
Birds
Bachman's sparrow *(Aimophila aestivalis)*
Bald eagle *(Haliaeetus leucocephalus)*
Reptiles
Louisiana pine snake *(Pituophis ruthveni)*
Fish
Sabine shiner *(Notropis sabinae)*
Insects
Texas emerald dragonfly *(Somatochlora margarita)*
Crayfish
Sabine fencing crayfish *(Faxonella beyeri)*
Blackbelted crayfish *(Procambarus nigrocinctus)*
Mollusks
Texas pigtoe (*Fusconaia askewi*)
Triangle pigtoe *(Fusconaia lananensis)*
Sandbank pocketbook (*Lampsilis satura*)
Southern hickorynut *(Obovaria jacksoniana)*
Louisiana pigtoe *(Pleurobema riddellii)*
Texas heelsplitter *(Potamilus amphiachaenus)*
Plants
Slender gayfeather (*Liatris tenuis*)

3.5.1 Threatened and Endangered Species

3.5.1.1 Mammals - Affected Environment and Environmental Consequences

Louisiana black bear

The historic range of the Louisiana black bear *(Ursus americanus luteolus)* once encompassed all of Louisiana, southern Mississippi, and eastern Texas. Its current range is now limited to two subpopulations in Louisiana's Atchafalaya and Tensas River basins (USFWS 1995). Since 1977, sightings of black bears have been reported in 23 East Texas counties. It is likely that most of these bears are juvenile or sub-adult males that roamed into the region from expanding populations (reintroduced from Minnesota) in Arkansas, Oklahoma, and Louisiana. Only the Louisiana black bear is federally listed.

The U.S. Fish and Wildlife Service (USFWS) endangered and threatened species account of

the Louisiana black bear notes that preferred habitat is in river basin bottomland hardwood forests although the bear does roam far and wide into the pine forests. The bears also need escape cover including extensive areas of minimal human disturbance. The most suitable habitat in East Texas appears to be the Middle Neches River Corridor because not only does it have suitable food and cover, this area also has low levels of human/bear conflict zones and relatively low open road density. Frequently traveled roads are hazardous to bears and manmade structures such as multi-lane highways are one of the reasons that quality bear habitat has been reduced. Black bear home ranges are from 5,000 to 20,000 square acres in size. The USFWS considers good bear habitat to be remote. Remoteness should be at least ½ mile from major roads and be in blocks of at least 2,500 acres (http://www.tpwd.state.tx.us/huntwild/wild/species/endang/animals/mammals/louisianablackbear ; accessed November 2012).

Texas Parks and Wildlife Department keeps a database of black bear sightings in East Texas. There have been four sighting on ANF. The closest sighting from the project area is approximately 2 miles away near Forest Service Road 308B and occurred in October 2010. Surveys conducted by district personnel, specific to the proposed project, did not locate the species. Because black bears have large home ranges and one was seen approximately 2 miles from the project in October of 2010, the species may utilize the area for foraging or as a corridor between habitats.

Alternative 1 – No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects to this species, because no treatment activities would occur.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3 – Scoped Action and Proposed Actions

Direct and Indirect Effects: Preferred habitat, river basin bottomland hardwood, is not found within the project area. The land around the proposed project area is private and generally managed for short rotation timber harvest. Small pockets of marginally suitable habitat may be present. Forest Service Road 354 bisects compartment 63 making one half mile on either side of the road unsuitable habitat. Farm to Market (FM) 2743 runs along the north side of the compartment boundary, and State Highway 63 runs parallel near the south end. The total area would not be considered remote by the USFWS standards mentioned earlier. The area may be traveled through by bears if they are traveling along the Sam Rayburn Reservoir, which connects to the east side of compartment 63 or straying from the Neches River corridor to the north. Thinning of older pine stands and the restoration of pine stands < 32 years into longleaf pine stands should not affect potential den trees or potential den sites due to the guidelines in the Forest Plan. There should be minimal direct or indirect effects because preferred habitat is not present in this project area.

Cumulative Effects: Fire breaks, prescribed burning and the possible occasional application of herbicides are the only other known actions occurring in the area. Most of these activities would not occur until the thinning operation is completed. If bears are in the area during logging operations, they would probably move southwest into the Upland Island Wilderness or along the Neches River to the south. However, the project area provides little suitable habitat for bears

because of the two highways along both the north and south ends and one bisecting the area. There is also limited hardwood bottomland habitat, and the project area has some private lands along it. Thus, this project would have minimal cumulative effects to Louisiana black bears.

3.5.1.2 Birds - Affected Environment and Environmental Consequences

Red-cockaded woodpecker

The federally endangered red-cockaded woodpecker *(Picoides borealis;* RCW) has a high potential to occur on drier ridge tops in open-canopy, fire-maintained, mature pine stands with forb and/or grass dominated ground cover and a midstory relatively devoid of hardwoods (Jackson 1994; Conner et al. 2001; USDI 2003). The RCW excavates cavities in live pine trees, using old trees infected with red heart fungus (*Phellinus pini*), thin sapwood, and a large diameter of heartwood (Conner et al. 1994; Conner et al. 2001). Generally, pine trees ≥60 years old are needed for cavity excavation (Rudolph and Conner 1991; USDI 2003). Threats to this species include conversion of mature forest to short-rotation plantations or non-forested areas, hardwood proliferation resulting from fire exclusion, lack of forest management to develop and maintain open stand conditions, and habitat fragmentation that affects population demographics.

On the National Forests and Grasslands in Texas (NFGT), the red-cockaded woodpecker is distributed within three populations: (1) Sam Houston, (2) Davy Crockett, and (3) Angelina/Sabine. The RCW population on the Angelina National Forest (ANF), considered one population together with the Sabine National Forest, is classified as a primary core population. This type of population is identified in recovery criteria as important to conserving this species in varied habitats and geographic regions, reducing threats of extinction, and delisting (USDI 2003).

The RCW populations in Texas are located within Habitat Management Areas (HMA), delineated around known occupied and potential RCW habitat, managed for the productivity and recovery of this species, and identified in the *Plan* as MA 2 (the Plan, p 96-134) and MA 6. The ANF currently supports 59 of the 350 group objective for the Angelina-Sabine population (USFWS 2003). The ANF population is comprised of three subpopulations; the northern, southern and south-western, which reside in two HMAs that are managed specifically with an emphasis on RCW habitat requirements.

ANF conducts annual monitoring of RCW populations. The nearest active cluster is located approximately 1.5 miles west of the project area in compartment 66. Surveys following the Red-cockaded Woodpecker Recovery Plan were conducted in September 2012 by Kellon Harris and Ron Hasken. No RCW individuals, cavity trees, or starts were observed.

Alternative 1 – No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effect to the RCW because no treatment activities would occur. This alternative would maintain existing to somewhat improving RCW habitat through current levels of prescribed burning. No RCWs currently exist in this area.

The U.S. Fish and Wildlife 2003 Second Revision Red-cockaded Woodpecker Recovery Plan (USDI 2003) recognizes that the fitness of woodpecker groups increase if they have good quality foraging habitat.

Cumulative Effects: Because no thinning actions are being proposed in this alternative,

there would be no cumulative effects. Although, through the results of our continued prescribed burning program RCW habitat would continue to improve, albeit at a slower rate.

Alternative 2 – Scoped Action

Direct and Indirect Effects: Direct effects to the RCW are very unlikely because there are no known cavities in the treatment area. Noise disturbance in the logging area may cause a direct effect to any RCWs that could be foraging in the area, causing them to temporarily avoid the area. Even though no RCW clusters currently exist within the project area, if a future RCW cluster(s) is discovered within or near the treatment areas, the following design criteria will be applied to RCW clusters.

- If any federally listed species or RCW cavity trees are discovered during implementation the project activities will be stopped. The District Wildlife Biologist will determine appropriate management actions consistent with the Forest Plan and the Recovery Plan guidelines before project activities can resume.
- No treatment activities would occur in active red-cockaded woodpecker (RCW) clusters during nesting season (April 1- July 31), unless the cluster is confirmed to have fledged young or does not have a potential breeding pair.
- Monitor active cavity trees within 200 feet of previously closed Forest Service roads being used as haul roads during breading season (April 1 – July 31). If adults are being flushed from cavity trees due to timber removal activities, traffic will be restricted until clusters are confirmed to have fledged young or breeding season has past and no nest has been located. No seasonal restrictions will apply to open public roads.
- No activities in active clusters or use of roads through clusters prior to one hour after sunrise and ceasing one hour prior to sunset. These restrictions are in place all year long.
- Treatments in new RCW clusters would follow applicable guidance from the 1996 Forest Plan and the 2003 RCW Recovery Plan.

These design criteria will minimize potential direct effects to RCWs that could in the future be nesting in or near the project area. With these design criteria in place, all direct effects will be discountable and insignificant.

This alternative would have beneficial indirect effects by improving 942 acres of habitat to a better quality of foraging, by bringing the BA down to a 70 basal area in mature stands in compartment 63 (Table 3.6). It would also improve 169 treatment acres in the long term by restoring these stands to longleaf pine, a species much more conducive to the area and the RCW.

While residual longleaf pine would be left in stand 9 (mainly a loblolly stand) to provide a seed source for future longleaf seedlings, the remaining pine trees would be removed. The herbicide triclopyre may be applied, as needed, as an added release treatment along with burning. Triclopyre's active ingrediant would be applied at a rate of ≤ 2.0 lbs./ac.. Using a herbicide such as triclopyre early on will help reduce the establishment of woody species. This in turn will let a herbacious understory become more fully established under the longleaf pine seedlings, while letting these seedlings become more fully developed.

Eventually, using this method, a more dominant longleaf stand will develop faster.

Cumulative Effects: The cumulative effects analysis area and time-frame for the RCW would be the project area (C 63), and adjacent compartments over a 10 to 30 year period. This project would begin to link the south-west RCW subpopulation, consisting of six groups, to the main southern population on the ANF consisting of 39 groups with better foraging habitat. These two populations are roughly five miles apart from each other. The southwest subpopulation resides in compartments 66 and 67, while the closest cluster in the southern population is in compartment 90. Through recent translocation efforts, prescribed burning, and natural population growth these subpopulations are expanding. The most logical area for the southwest RCW population to grow, concerning the best adjacent established habitat, is to the north in compartments 65 & 64 respectively. Once this is accomplished the south western RCW population would continue to grow to the east into compartment 63 and the Sandy Creek watershed area. The southern population would continue to grow towards the west, ultimately connecting the two populations. We currently have RCW recruitment stands planned for some of these areas as well.

Fire breaks, prescribed burning, and the occasional application of triclopyre in compartment 63 are the only other known actions that would occurr in the project area that may affect RCW's in the short term.

Prescribed burning would not occur until the thinning operation is completed. In the future, control of NNIS (non native invasive species) would occur but should not affect RCW. All activities on the NFGT are undertaken with strict guidelines on when and how work is performed. Because of the potential loss of current RCW habitat on surrounding private lands and not having any control over it, this analysis does not address private lands as potential suitable habitat.

Long-term positive cumulative effects include improved nesting and foraging habitat through thinning, additional prescribe burning, and possibly the use of herbicides in the project area.

Alternative 3 – Proposed Action

Direct and Indirect Effects: The Direct and indirect effects would be the same as Alternative 2 except that stand 3 would be restored to longleaf pine, for a total of 199 acres restored and stand 6 would have no treatments. This would make a total of 858 acres that would be thinned to a basal area of 70 feet per acre.

Cumulative Effects: The cumulative effects would be the same as alternative 2.

Table 3.6 Comparison of Alternatives By The Amount And Quality Of RCW Habitat Improvements.

Alternatives	Total Habitat Treated (acres)	Foraging Habitat, Thinned (acres)	Longleaf Restoration (acres)
Alternative 1	0	0	0
Alternative 2	1,111	942	169
Alternative 3	1,057	858	199

3.5.2 Forest Service Sensitive Species

Sensitive species are taken from the Southern Region (R-8) Regional Forester's Sensitive Species List (8-8-07) and are listed earlier in this chapter. Species are addressed as a group if effects from the proposed alternatives are expected to be similar due to the species similar life histories and habitat requirements.

3.5.2.1 Mammals – Affected Environment and Environmental Consequences Rafinesque's Big-eared Bat and the Southeastern Myotis

Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and the Southeastern myotis *(Myotis austrioriparious)* reaches the western limit of its range in east Texas. These species are experiencing population declines because of the loss of adequate roosting habitat. In East Texas, these bats roost in a variety of places that may include: crevices behind loose bark, hollow trees, under dry leaves, caves, wells, old mine shafts, buildings and cisterns, or other protected cavities or structures (Harvey 1999, Mirowsky et al. 2004). Preliminary research on habitat associations for the Rafinesque's big-eared bat and Southeastern myotis in eastern Texas indicates a strong preference for roosting within bottomland hardwood communities (Mirowsky et al. 2004).

The Rafinesque's big-eared bat has been recorded in 16 counties in eastern Texas, including San Augustine and Jasper Counties (Mirowsky et al. 2004). The nearest known location is a roost site at the Old Aldridge Saw Mill, approximately 6.5 miles from the project area. This location was checked in September 2012, and still had bats present. Southeastern myotis has been recorded in 23 counties in eastern Texas, including San Augustine (Dr. Chris Comer, pers. com. 2010) and Jasper Counties (Mirowsky et al. 2004). Surveys conducted by Dr. Comer (Stephen F. Austin State University) in 2010 located both species in Ayish Bayou in compartment 103 of ANF. Because of its proximity to Sam Rayburn Reservoir, the project area could be used as a corridor between habitats or for limited foraging. During surveys conducted by district personnel specific to the proposed project, no individuals of either species were observed and no potential roost trees were located.

Alternative 1 – No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects, because no treatment activities would occur.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 – Scoped Action

Direct and Indirect Effects: Direct effects are possible, since noise disturbance from forest management activities may temporarily force unknown populations of bats into other areas of the forest, or cause destruction of unknown roosts sites. Noise disturbance would have the most impact on bats roosting sights during the day, if occurring, due to the fact that they would forage at night when equipment would not be running. The majority of bats would temporarily be displaced during the logging and midstory removal phase of the project. Noise levels would increase temporarily during this time, although an increase to what level is not known or easily obtained.

Cumulative Effects: Cumulative effects of project noise along with other non-connected noise (i.e. highway noise, private land activities) in the area would be temporary. No

long-term negative impacts to these species or their populations are expected as no activities are planned in streamside management zones (SMZ's). 50 foot buffers are planned along either side of them. Numerous acres of available habitat for both the Rafinesque's big-eared bat and the southeastern myotis can be found throughout the ANF. Prescribed fire and fuel reduction breaks between private and forest service lands are ongoing in this area. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species. The application of herbicides will require a greater presence in several stands and be additive to any herbicides being applied to nearby private land. Although, this will be applied in young pine plantations where bats will not be roosting, the areas being treated and herbicide being applied should not have any noticeable cumulative effects.

Alternative 3- Proposed Action

Direct and Indirect Effects:
The direct and indirect effects would be the same as Alternative 2 except that stand 3 would be restored to longleaf pine and stand 6 would not be treated.

Cumulative Effects:
The cumulative effects would be relatively the same as Alternative 2.

3.5.2.2 Birds – Affected Environment and Environmental Consequences
Bachman's Sparrow
The Bachman's sparrow *(Aimophila aestivalis)*, a sensitive species, is an inhabitant of open pine forests with grassy understories or other open areas with thick grassy cover (Hamel 1992). This species is a permanent resident of the Angelina National Forest in areas that are frequently burned and maintained to an open type condition. It has been recorded numerous times during annual bird point surveys. Foraging occurs on the ground; therefore a herbaceous cover is necessary. Nesting occurs from mid-April to late May in areas with a high density of herbaceous cover and a low density of midstory and overstory (Dunning 2006). Decline of this species is attributed to the loss of pine forest containing a grassy understory from the lack of fire in a fire maintained ecosystem.

Texas Parks and Wildlife conducts breeding surveys for Bachman's sparrow in high quality habitat on both the Angelina and Sabine National Forests. Surveys have found species fairly common in quality habitat in the southern portions of both forests. Individuals have been located approximately 2.5 miles west of the project area in compartment 67 and approximately 3 miles south of the project in compartment 92. During surveys conducted by district personnel, specific to the proposed project, no individuals were observed

Alternative 1 – No Action
Direct and Indirect Effects: This alternative would have no direct or indirect effects, because no treatment activities would occur. However, without future thinning and removing of midstory, total available habitat would not increase. On-going prescribed burning activities are maintaining current levels of suitable habitat but not increasing total availability for this species. An increased amount of suitable habitat is presumed to translate into an increase in the population, given that the species is currently occupying the area.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2– Scoped Action

Direct and Indirect Effects: Direct effects may involve the destruction of nests or the mortality of individuals through contact with equipment and/or vehicles associated with project implementation.

Although some mortality may occur, the overall indirect effect of implementing these management actions would benefit the species in the long run. By thinning, an open pine overstory is maintained, and 1,111 acres of habitat would be improved.

Cumulative Effects: Positive benefits are expected; as the proposed management for the RCW perpetuates the longleaf pine, fire dominated community which is the preferred similar habitat of the bachman's sparrow. This type management involves prescribed burning, thinning and maintaining fuel breaks all positive effects for improved nesting and foraging habitat. The application of herbicide will require a greater human presence in several stands where applied and be additive to any herbicides being applied to nearby private land but should not have any noticeable cumulative effects. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species either.

Alternative 3- Proposed Action

Direct and Indirect Effects:
The direct and indirect effects would be the same as Alternative 2 except that stand 3 would be restored to long leaf pine and stand 6 would be left untreated.

Cumulative Effects:
The cumulative effects would be the same as alternative 2.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is generally found in coastal areas and around large bodies of water such as reservoirs, lakes, and rivers; which support their food sources, including fish, turtles, and waterfowl. Nests are generally located within two miles of these major water bodies. Sam Rayburn Reservoir is the main foraging habitat near the Angelina National Forest and known nests are located near the reservoir. The nesting season in Texas extends from October to May. On the Angelina National Forest, eagles usually nest in mature loblolly pines, typically using nests and associated pilot trees for many years. Nests are often constructed in the tallest pines in the area, allowing eagles an unobstructed line of sight and flight path.

A combination of factors has led to the bald eagles' decline. These factors include habitat loss (clearing of forest land for agricultural and other uses, cutting of nest and perch trees), shooting and poisoning by humans, indirect effects of pesticide use (organochlorine bioaccumulation), and heavy metal poisoning (NatureServe 2007).

The east side of Compartment 63 connects to the Sam Rayburn Reservoir. In 2008, 10 active nests were located on, or adjacent to the Angelina National Forest, two of which were located within compartment 63. With the delisting of bald eagles in 2007, we are now following the National Bald Eagle Management Guidelines (USDI 2007), which recommends restrictions on activities within 660 feet of nest.

Alternative 1 – No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects, because no treatment activities would occur. In addition, forest management activities are not required in this area in order to provide suitable habitat for this species.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore,

there should be no cumulative effects with other actions going on in this area.

Alternative 2– Scoped Action

Direct and Indirect Effects: Direct effects are possible, since noise disturbance from forest management activities may temporarily force unknown individual eagles into other areas of the forest. Field surveys in and around the treatment area were conducted where applicable, but no eagle nests or signs of activity were found. A 660 ft. buffer will be established around all active bald eagle nests to preclude equipment and timber harvest activities near nests during nesting season (October to May). If an unknown nest is found while treating the project area, the operation will be temporarily shut down, the district biologist will be notified, the nest tree will be protected and a buffer will be established around its perimeter.

Implementation of this project would have indirect beneficial effects to bald eagles. This action would increase viewing distances from within the stand out toward larger drainages that flow into Sam Rayburn Reservoir.

Cumulative Effects: National Forest lands provide most of the suitable bald eagle nesting habitat in the East Texas. There are no known bald eagle nests on any private land near the project area. Some of the privately owned forested land may provide some suitable nesting habitat, but it is doubtful that these landowners would maintain the areas in the long-term. The lack of nesting habitat on surrounding lands increases the importance of managing National Forest lands to maintain quality habitat for the future. Prescribed fire and fuel reduction breaks between private and forest service lands are ongoing in this area. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species. All activities on the NFGT are being undertaken throughout various parts of the forest with specific guidelines to protect bald eagles where applicable.

Alternative 3- Proposed Action

Direct and Indirect Effects:
The direct and indirect effects would be slightly less than Alternative 2 due to the fact that there are less acres being treated.

Cumulative Effects:
The cumulative effects would be slightly less than Alternative 2 due to the fact that there are less acres being treated.

3.5.2.3 Reptiles – Affected Environment and Environmental Consequences

Louisiana Pine Snake *(Pituophis ruthveni)*

The Louisiana pine snake (LPS) is a Forest Service Sensitive species and a candidate species for federal listing. Louisiana pine snakes inhabit areas with sandy, well-drained soils in open, pine forests with minimal midstory and a well-developed grassy understory (Rudolph and Burgdorf 1997). A primary component of the pine snake's habitat is the presence of Baird's pocket gophers (*Geomys breviceps*). Pocket gophers serve an essential role in pine snake ecology by serving as the primary source of food and by supplying shelter. Studies have shown that pine snakes utilize pocket gopher burrow systems for escape cover, nest sites, and hibernation sites (Rudolph et al 1998, Rudolph and Burgdorf 1997). Pocket gopher abundance is directly related to the presence of extensive herbaceous ground cover, which is in turn related to the amount of sunlight able to reach the forest floor. Frequent low intensity fires are also responsible for maintaining the grassy, herbaceous understory required by both gophers and pine snakes. In the absence of fire, a woody midstory quickly develops, greatly reducing the habitat effectiveness of

the area (Rudolph and Burgdorf 1997). No pine snakes have been documented or captured in areas where fire has been effectively suppressed. Because of this association, absence of fire has been proposed as the greatest current threat to Louisiana pine snake populations, by decreasing both habitat quality and quantity (Rudolph and Burgdorf 1997).

On November 16, 2003 the National Forests of Texas (NFGT), entered into and signed a Candidate Conservation Agreement (CCA) in cooperation with the US Fish and Wildlife Service, US Forest Service Southern Research Station, Fort Polk Military Reservation in Louisiana, and the Kisatchie National Forest in Louisiana to establish a framework for conservation and management of the pine snake within the its current and potential range. This CCA was initiated in order to conserve the pine snake on Federal land by protecting known populations and habitat, reducing threats to its survival, maintaining its ecosystem and, where possible, restoring degraded habitat. Through conservation measures such as the proposed management activities in compartment 63, the Louisiana pine snake may be recovered without the necessity of listing.

While habitat is available in and around the project area for the pine snake, the area identified as critical in the CCA is approximately 1/2 mile from Comp 63. Sandy soils do exist, and in some places a sparse midstory along with a herbaceous layer does occur. The U.S. Forest Service Southeastern Research Station conducts the annual trapping of Louisiana pine snakes in the south ANF and tracks their movement using radio-telemetry. They also keep records of any other Louisiana pine snake sightings including road killed individuals. These records show that a road killed individual was found on Hwy 63, relatively 0.1 mile from the project area in 1993. The most recent and closest location of a LPS sighting was one captured on 4 May 2012 approximately 2.5 miles from compartment 63. This was a recapture that was initially caught in 2007. Other recent locations (2005-2010) are approximately 3 miles south of the project area in compartments 87, 90, 91, and 92. Surveys conducted by district personnel, specific to the proposed project, did not locate any individuals, nor were any pocket gopher mounds observed.

Alternative 1 – No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects, because no treatment activities would occur. However, without future thinning and removing midstory, total available habitat would not be increased. On-going prescribed burning activities are maintaining current levels of suitable habitat but not increasing total availability for this species.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 & 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: The increased traffic during harvesting and road improvement puts individual snakes and/or their eggs at risk for mortality through direct contact with machinery and vehicles. Disturbance during forest management activities may force individual snakes into other areas of the forest or deeper underground. Additional protective measures include contractual requirements that prohibit any forest workers from killing, harming, or capturing any snake found within the project area. In addition, areas with concentrations of pocket gophers (visible mounds) would be avoided, in order

to keep equipment out of areas with a higher likelihood of encountering pine snakes. However, no pocket gopher mounds have been observed and there are very little well-drained sandy soils in the project area, so direct effects are unlikely. Activities planned for Compartment 63 would have beneficial indirect effects by providing a habitat preferred by the pocket gopher, a diet mainstay for the snake. An increase in pocket gophers increases the density of their burrowing systems, which provides an increase in shelter, foraging, and snake hibernation areas. Thinning in the upland pine-dominated stands would make the trees less vulnerable to attack by bark beetles (Turchin et al. 1999; Boyle et al. 2004). This would decrease the potential for the loss of large acreages of upland pine habitat to beetles and maintain the mature forest cover needed by the pine snake.

Although some mortality may occur, the overall indirect effect of implementing these management actions would benefit the species in the long run. By thinning, a habitat with open pine overstory with herbaceous understory would be improved.

Cumulative Effects: Ongoing projects in the area include prescribed burning and fuel breaks. Prescribed burning would be suspended until the timber harvest is completed. There may be some snake mortality associated with vehicular traffic on State Highway 63, but overall, there should be little adverse cumulative effect on the snake from the proposed action or modified proposed action.

3.5.2.4 Insects – Affected Environment and Environmental Consequences

Texas emerald dragonfly (*Somatochlora margarita*)

The Texas emerald dragonfly, also known as the Big Thicket emerald dragonfly, has been found in San Jacinto, Sabine, and San Augustine counties, but its potential range may exceed 10,000 square miles in southeast Texas, including all of the National Forests in Texas. Habitat requirements are poorly understood, especially for the larvae which seem to be associated with small, clear, sandy-bottomed streams and boggy seeps within loblolly and longleaf pine stands (NatureServe 2010). Larval characteristics are largely unknown, but members of the genus generally disappear when forests are cleared along with associated activities (Price et al. 1989). Adults have been observed foraging over forest openings, such as roads.

This dragonfly has been recorded at various locations throughout the Angelina National Forest (Price et al 1989; Texas Natural Diversity Database 2010). Natural Heritage records exits for the species in the Lower Angelina watershed (NatureServe 2010), which includes the project area. The nearest known location is over 14 miles to the northeast according to the Texas Natural Diversity Database (2010). Caney Creek, located within the project, is small, clear, and mostly sandy-bottomed with some gravel, but not spring fed and could contain suitable habitat for larvae. During surveys conducted by district personnel specific to the proposed project, no individuals were observed. However, given the habitat and previous observation of the species, it is believed that there remains a high potential for occupancy by the species (both adult and larval stages) within the treatment area.

Alternative 1 – No Action

Direct and Indirect Effects: Impacts from the selection of this alternative are not expected, since forest management activities are not required in order to provide suitable habitat for this species.

Cumulative Effects: Because no actions are being proposed in this alternative, there

would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 & 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: Project activity in possible foraging areas in mature timbered stands would take place and may force any unknown individuals to other available foraging areas away from the project/treatment area. But, because they generally forage high above the forest canopy and over open areas, direct impacts to adult dragonflies are not expected. Direct effects are possible upon the crossing of creeks and drains during logging.

Cumulative Effects: A compounding negative effect on the dragonfly and its habitat is not expected. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species. Long-term impacts to the dragonfly are unknown but a permanent loss of dragonfly habitat would not occur.

3.5.2.5 Fish, Crayfish, and Mollusk – Affected Environment and Environmental Consequences

The aquatics sensitive species have suitable habitat on the Angelina National Forest, which are analyzed based upon two habitat types: 1) those that live in lotic habitats (actively moving water such as streams and rivers), and 2) those that live in lentic habitats (still waters such as lakes, ponds, and swamps). While specific habitat requirements for these species differ, they are primarily impacted by siltation and sedimentation. Therefore, these aquatic species are considered concurrently in the effects analysis.

Fish

The Sabine shiner (*Notropis sabinae*) lives in creeks and small to medium sized rivers with sandy bottoms. Its range extends from east Texas to the Mississippi river drainage, and north to Missouri. Spawning takes place in April through September in Texas and Louisiana, and multiple clutches are likely (NatureServe 2010). It is probable that the Sabine shiner may tolerate higher turbidity waters, precluding the need for silt free sand substrates. Threats to this species include alterations to stream flow, such as culverts that block fish passage, fragmentation, and siltation.

Habitat for the Sabine shiner is available in Caney Creek within the project area. This species has been documented in the Angelina River drainage system that includes Caney Creek (NatureServe 2010). Given this information it is believed that the Sabine shiner has a high potential for occupancy within the project vicinity. Sabine shiner lives primarily in lotic habitats, and its effects are addressed along with the blackbelted crayfish (*Procambarus nigrocinctus*), which also uses lotic habitats.

Crayfish

The blackbelted crayfish (*Procambarus nigrocinctus*) lives primarily in lotic environments, and the Sabine fencing crayfish (*Faxonella beyeri*) lives primarily in lentic habitats.

Blackbelted crayfish is a lotic stream inhabiting crayfish known to occur among debris in streams with sandy bottoms. Little is known about this species. NatureServe (2010) lists land development and habitat draining or surfacing as possible threats. Generally, crayfish are most closely associated with small stream riparian habitats, including intermittent streams and small perennial streams with narrow floodplains.

Sabine fencing crayfish (*Faxonella beyeri*) lives primarily in lentic habitats (still water). This crayfish occurs in temporary and permanent pools or roadside ditches and in individual burrows. Limiting factors for this crayfish include land development, agricultural runoff, and competition with other crayfish (NatureServe 2010). Runoff will be kept to a minimum by leaving buffer zones along both streamside management zones (SMZ's) and the Sam Rayburn Reservoir. Habitat for this species can be found within Compartment 63, as well as along the east side of comp 63 in the Sam Rayburn Reservoir. Creeks and drainages throughout the compartment experience pooling during periods of low water flow. Temporary pooling of water outside creek channels occurs when rainfall is higher.

Mollusk

Texas Pigtoe (*Fusconaia askewi*), Triangle Pigtoe (*Fusconaia lananensis*), Sandbank Pocketbook (*Lampsilis satura*), Southern Hickorynut (*Obovaria jacksoniana*), Louisiana Pigtoe (*Pleurobema riddellii*), Texas Heelsplitter (*Potamilus amphichaenus*) are freshwater mussels that may inhabit a variety of water-body types including large and small rivers and streams, lakes, ponds, canals, and reservoirs (Howells et al. 1996). These six sensitive mussel species have high potential to occur in mud, sand, or gravel substrates in streams and small rivers. They do not occur in deep shifting sands or deep soft silt (Howells et al. 1996), which can contribute to smothering. Mussels filter feed on algae, detritus, and small particles in the water, and may be able to absorb some organic material in solution (Howells et al. 1996).

Impoundment of river systems is believed to be the most significant threat facing freshwater bivalves. Impoundment alters flow regimes, increases sediment accumulation, and may impede movement of fish hosts. Impoundments of streams, such as dams, alter flow and temperature regimes; disrupt the timing of reproduction and associated behavior of fish and mussels. Pollution, over harvest, reduced spring and river flows, introduction of exotic species, and sedimentation are other probable causes of decline (Williams 1993, Howells et al. 1996, Watters 2000). In addition, any impacts to fish may negatively affect mussels, which use certain fish as hosts for larval development (Howells et al. 1996).

Sensitive mussels have been documented in the Angelina and Neches River systems (Nature Serve2010), however none of these species have been located on the ANF in many years, most likely due to the construction of Sam Rayburn Reservoir (Dave Peterson, pers. com. 2010). Reservoirs do not usually benefit native aquatic species, except in the case of some East Texas mussels, particularly in Steinhagen Reservoir, where some of the state's rarest mussels can be found. However, since mussels reproduce through larvae implanted in host fish, their mobility is unlimited within a watershed.

Lotic Habitats (Moving Water)
Sabine shiner (*Notropis sabinae*), blackbelted crayfish (*Procambarus nigrocinctus*), Texas Pigtoe (*Fusconaia askewi*), Triangle Pigtoe (*Fusconaia lananensis*), Sandbank Pocketbook (*Lampsilis satura*), Southern Hickorynut (*Obovaria jacksoniana*), Louisiana Pigtoe (*Pleurobema riddellii*), and Texas Heelsplitter (*Potamilus amphichaenus*)

Alternative 1 – No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects, because no treatment activities would occur.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 & 3– Scoped Action and Proposed Action

Direct and Indirect Effects: Direct effects to blackbelted crayfish, Sabine shiner, and mussels are possible as these species are stream inhabiting. Crayfish that inhabit roadside pools could be directly affected (injured or killed), upon road reconstruction activities.

During harvest activities, *Plan* measures, and project design criteria are employed for protecting stream courses (the Plan, p.82-83, 153-154, and 158-159) and riparian habitat. Prud'homme and Greis (2002) found that scientific literature and monitoring results in the south demonstrate that appropriate BMPs (Best Management Practices) fully implemented as designed and adapted to a site, effectively protect water chemistry, aquatic habitat, and aquatic biota. These practices limit sediment delivery to streams, and are consistent with, or more restrictive than state BMPs for protecting aquatic habitats from sedimentation.

These aquatic species are susceptible to management actions that impact stream habitats. Although timber removal would not occur within the primary zone of MA 4, associated actions have the potential to cause sediment movement. Temporary stream crossings, in particular, may increase sediment delivery to streams for a short period. However, adverse effects to sensitive aquatic species are not anticipated. Stream crossings would be avoided and alternative routes used to access harvest units when possible. When in use, these crossings would be employed for a limited duration, and would be identified and designated in accordance with *the Plan*.

Road reconstruction and temporary road construction has the potential to increase sedimentation; however, much of this work involves improvements to existing road surfaces that would minimize erosion and sedimentation generated.

Cumulative effects - The proposed pine thinning would decrease the potential for the loss of large acreages of mature forest to beetle infestation (Turchin et al. 1999; Boyle et al. 2004). This would benefit aquatic species by helping to maintain forest cover in compartment 63, which would help to reduce sediment delivery to streams.

The construction of Sam Rayburn Reservoir has reduced the amount of high potential habitat for most of these species. In the vicinity of the project, the result is isolated habitat, as species intolerant of conditions created by impounded water are now restricted to the short reaches upstream.

Other planned Forest Service activities, such as prescribed burning and fire breaks between private and public lands would have little effect on aquatic habitat, since *the Plan* contains measures to reduce or prevent impacts to aquatic habitats. High potential habitat is likely scarce on private lands, since protective measures for streams are less stringent, and are optional for landowners. Since activities associated with this project are not expected to cause any deterioration of habitat quality, no cumulative effects are anticipated.

Lentic Habitats (Still Water)

Sabine fencing crayfish (*Faxonella beyeri*)

Alternative 1 – No Action

Direct and Indirect Effects: Impacts from the selection of this alternative are not expected, since forest management activities are not

required in order to provide suitable habitat for these species.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 & 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: Crayfish that inhabit roadside pools could be directly affected (injured or killed) during road improvement activities and through a temporary increase in traffic on the roads during project implementation. Crossing of streams by heavy equipment for logging purposes may cause mortality for stream inhabiting crayfish if occurring in the area. Long-term negative indirect effects to these species or its population are unknown but are expected to be minimal as the work is expected to occur during dry periods and numerous acres of available habitat for these species can be found throughout the ANF. Disturbance in one particular area of the forest during project implementation may temporarily displace individuals into other areas of suitable habitat.

Cumulative Effects: The proposed pine thinning would decrease the potential for the loss of large acreages of mature forest to beetle infestation (Turchin et al. 1999; Boyle et al. 2004). This would benefit aquatic species by helping to maintain forest cover in compartment 63, which would help to reduce sediment delivery to streams.

High potential habitat is likely scarce on private lands, since protective measures are less stringent, and are optional for landowners. Other planned Forest Service activities, such as prescribed burning and fire breaks between private and public lands would have little effect on aquatic habitat, since the *Plan* contains measures to reduce or prevent impacts to aquatic habitats. Since activities associated with this project are not expected to cause any deterioration of habitat quality, no cumulative effects are anticipated.

3.5.2.6 Plants – Affected Environment and Environmental Consequences

The following sensitive plant species have suitable or potentially suitable habitat within the project vicinity.

1. Slender gay feather (*Liatris tenuis*)

Slender gay feather commonly occurs in frequently burned longleaf pine habitat or may be found in areas frequently mowed such as rights-of-way. Liatris tenuis responds very favorably to the effects of prescribed burning. Its numbers seem to be most numerous the season after burning and tends to drop off every year until the next scheduled fire event.

It appears that Liatris tenuis is not strictly restricted to dry upland longleaf pine savanna. This species has also been documented in relation to hillside seepage slope bogs (sphagnum-beakrush series) and Catahoula pine barrens (rayless goldenrod-little bluestem series). With this expansion of suitable habitat and continued use of frequent fire as a management tool it is expected that populations for this species will continue to increase.

Slender gay feather is most abundant on the Angelina NF, with forty two known occurrences. Eight locations of slender gay feather were documented in the 1990 TNHP report. Singhurst (1996) reported relocating the eight locations and also finding seventeen new locations of this species. Surveys conducted by the MacRoberts in 1995 resulted in finding two new occurrences. Surveys in 1998-1999 by Rob

Evans, NFGT Forest Botanist, and other botanists resulted in finding four new populations of slender gay feather and relocating another population. Mize found a new population in 2001. Surveys done on the Angelina in 2006 and 2007 resulted in the discovery of six additional populations. In 2009, Walker documented this species on the Angelina NF scattered across Compartments 91 and 92. In addition, Loos documented this species on the north end of the Angelina NF in Compartment 1 and a new location in Compartment 14, all within areas of sandy soils. Also in 2009, the MacRoberts documented this species along the roadside of FM 2426, which is the southern boundary of the North Moore Plantation on the Sabine NF.

During surveys conducted by district personnel specific to the proposed project, no individuals were observed, however the project area contains suitable habitat for the species.

Alternative 1 – No Action

Direct and Indirect Effects: Direct and indirect effects would not occur if no additional action is taken. Slender gayfeather may be found in early successional habitat which can be established through other means such as mowing right-of-ways and burning. Soils in the project area are suitable for the species and through continued use of prescribed fire, shading and woody encroachment would be prevented.

Cummulative Effects: Prescribed burning would continue to occur in the project area if no action is taken. In the long-term, any suitable habitat would remain constant and/or increase through this management technique.

Alternative 2 & 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: Direct effects to individual plants could occur as a result of logging operations and the possible use of the herbicide triclopyr for release of pine seedlings. No individuals were located during surveys, so these effects would be minimal. Overall, use of herbicide to release pine seedlings would benefit the species by decreasing the amount of woody competition in the stands. Indirect effects from the project to the species would be beneficial because it would move the habitat toward more suitable conditions by reducing shading from the overstory, improving fire behavior, and reducing competition with woody vegetation.

Cummulative Effects: Within the foreseeable future, control of NNIS (non native invasive species) and use of prescribed fire as a management tool would continue to occur and would benefit the species by reducing woody competition, decreasing shading from the mid-story and overstory, and decreasing competition with NNIS.

3.6 Management Indicator Species

Management Indicators (MI) are identified in the Revised Land and Management Plan for the National Forests and Grasslands in Texas (the *Plan*, p.306-307). This MIS (Management Indicator Species) effects analysis is tiered to the *Plan's* Final Environmental Impact Statement (FEIS) discussion of effects on wildlife and fisheries (FEIS: Appendix F, 87-110 pp). Management Indicator Species are addressed in order to implement National Forest Management Act (NFMA) regulations. These species are selected because their population changes are believed to indicate the effects of management activities. Management Indicator Species include: species with special habitat needs that may be influenced

significantly by planned management programs; species commonly hunted, fished or trapped; non-game species of special interest; and plant and animal species whose population changes are believed to indicate the effects of management activities on other species or selected communities.

The management indicator approach is designed to function as a means to provide insight into effects of forest management on plant and animal communities. Management indicators may be used as a tool for assessing changes in specialized habitats, formulating habitat objectives, and establishing standards and guidelines to provide for a diversity of wildlife, fish, and plant habitats.

A subset of the forest-wide management indicator species was selected for this project. See Appendix D for attached list of those management indicators considered and those that were eliminated from further consideration and the rationale therein.

Table 3.7 Habitat Type with Representing Management Indicator

Species	Habitat Type
Red-cockaded woodpecker	Dry-Xeric-Oak Pine forests
Slender gayfeather	Longleaf Pine woodland/savannah
White-tailed deer	Forest/Grassland: Early-succession (0-20 yrs) Mid-succession (20-50 yrs) Late-succession (50-90 yrs) Old growth (90+ yrs)
Eastern wild turkey	Forest/Grassland: Early-succession (0-20 yrs) Mid-succession (20-50 yrs) Late-succession (50-90 yrs) Old growth (90+ yrs)
Yellow-breasted chat	Forest/Grassland: Early-succession (0-20 yrs) Mid-succession (20-50 yrs) Late-succession (50-90 yrs) Old growth (90+ yrs)
Pileated woodpecker	Forest/Grassland: Mid-succession (20-50 yrs) Late-succession (50-90 yrs) Old growth (90+ yrs)
Snags	Forest/Grassland: Mid-succession (20-50 yrs) Late-succession (50-90 yrs) Old growth (90+ yrs)
Sabine Shiner	Stream and River Habitat

The effects of the alternatives on MIS and their habitats are addressed. These project-level effects should not be used to infer effects to forest-wide MIS populations. Population and habitat trends of MIS on national forest lands are best monitored and addressed at the landscape level. Data used for some of the game species in the following sections has been acquired from the Texas Parks and Wildlife Department through a Memorandum of Understanding. They collect some of this data every other year.

Red-cockaded woodpecker *(Picoides borealis)*: Addressed under 3.5.1 Threatened and Endangered Species.

Slender gayfeather (*Liatris tenuis*): Addressed under 3.5.2 Forest Service Sensitive Species

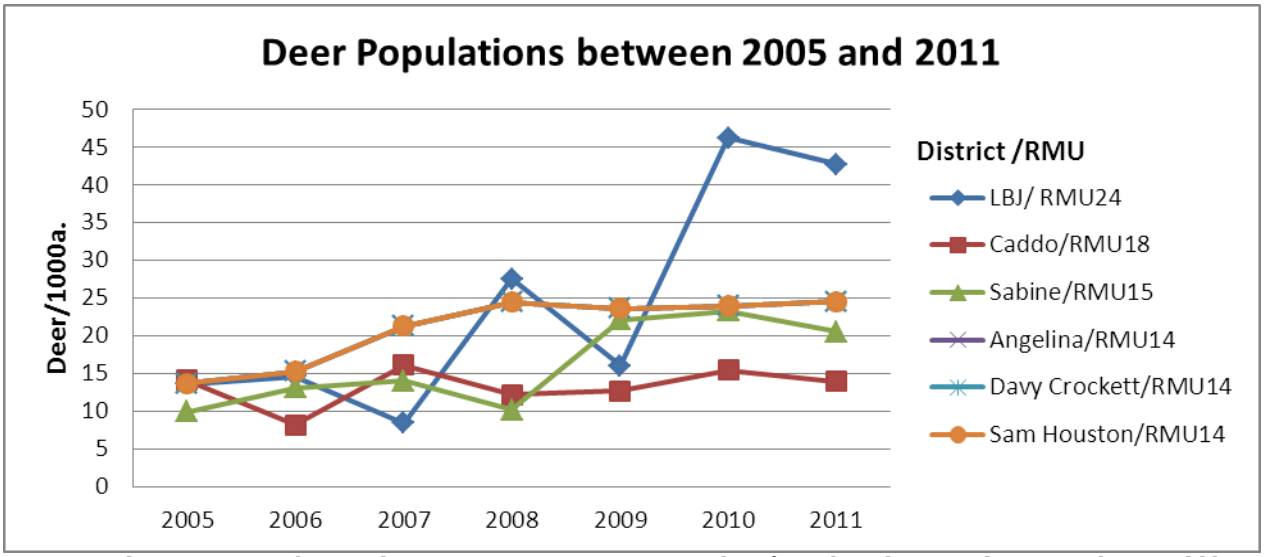
Sabine shiner *(Notropis sabinae):* Addressed under 3.5.2 Forest Service Sensitive Species

White-tailed deer (*Odocoileus virginianus*)
Background and Current Status
The white-tailed deer is a highly adaptable generalist, capable of using a variety of foods and thriving in areas where land management activities have created a diversity of vegetation, cover types, and forage (Smith and Coggin 1984). White-tailed deer are often considered browsers, and do consume considerable amounts of browse. However, they are opportunists, and will eat nearly any available form of plant life (Harlow 1984). Good quality whitetail habitat provides a diversity of vegetation types, successional stages, and forage.

White-tailed deer in the Coastal Plain Region feed on a variety of browse species throughout the year, which includes vines (greenbrier, Japanese honeysuckle, common trumpetcreeper), shrubs (American beautyberry, blueberry, strawberry bush), and trees (red maple, blackgum, redbay), in addition to other species (Newsom 1984; Peitz et al. 1999). They also forage heavily on both hard mast (acorns and nuts) and soft mast, such as fruits and berries. Other foods consumed include mushrooms (Cushwa et al. 1970), grasses and forbs (Newsom 1984). Consumption of twigs from woody species is heaviest in the spring when twigs are actively growing and are soft and succulent (Cushwa et al. 1970; Newsom 1984), while leaves may be consumed during most of the year. Hard mast is consumed year-round, but is particularly important during the fall and winter (Newsom 1984).

The white-tailed deer was selected as a management indicator of four forest seral stage habitats: early, mid, late succession, and old growth (USDA 2007). Because the white-tailed deer is a generalist species occurring in a variety of habitats, this species is not closely associated with a specific seral stage or plant community. This species was also chosen as an MIS because it is in demand by hunters. The objective is to maintain a healthy deer population on the National Forests and Grasslands in Texas.

Texas Parks and Wildlife Department (TPWD) monitor deer population trends and densities, in cooperation with the Forest Service, through analysis of kill data, spotlight transects, and herd modeling. The white-tailed deer population has shown a generally increasing trend in the Pineywoods Region of Texas over the past ten years or so (Fig 3.4). Estimates of deer populations on the National Forests and Grasslands in Texas and the Angelina NF follow a similar trend (USDA 2010). Data for 2012 is not yet available.



Note: Angelina, Davy Crockett, and Sam Houston are in RMU14; therefore, their deer population number would be similar.

Figure 3.2 Trends in estimated whitetail deer population in resource management units containing USFS Lands (USDA 2012).

On the southern Angelina National Forest, deer population densities are estimated at one deer per 25 acres. Carrying capacity for mixed hardwood-pine forests is listed as one deer per 20-40 acres and one deer per 30-50 acres for loblolly-shortleaf pine habitats (Halls 1984). Carrying capacity of homogenous pine habitat is lower than that of mixed pine-hardwood or bottomland hardwoods and streamside areas, as soil nutrients, mast, and available browse are higher in the more mesic areas (Halls 1984).

Effects of Alternatives

Alternative 1 - No Action

Direct and Indirect Effects: Alternative 1 would have no direct or indirect effects on white-tailed deer, because no actions would take place. However, without future thinnings to open the canopy and increase the amount of light reaching the ground, forage availability would decline over time (Blair and Brunett 1977), and deer pressure on remaining browse would increase.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3– Scoped Action and Proposed Action

Direct and Indirect Effects: Direct effects of the proposed action alternatives would be few, and would be limited to possible disturbance or loss of young fawns, should any be present in C-63 during the period that the proposed management activities were occurring. Very young fawns could be injured or killed during timber harvest, although fawns would be vulnerable only during the first few days after birth. The proposed roadwork would have relatively little chance of impacting fawns, since the work would occur on only a small proportion of the compartment, and the scale of the work would be such that even young fawns could avoid injury. Adult deer could easily avoid injury from the proposed

activities. Overall, direct effects on whitetails would be negligible.

Indirect effects of these alternatives on white-tailed deer would be beneficial. Herbaceous forage is somewhat sparse throughout most of the compartment due to the closed canopy. The proposed pine thinning would open the canopy, increasing light penetration and stimulating forage production (Blair and Brunett 1977; Masters et al. 1993; Peitz et al. 2001). Hard mast production may be reduced but would still be produced in the numerous riparian areas protected throughout the compartment. In addition, retention of overstory hardwoods in the treatment areas would ensure that the most mature and robust hard mast-producing trees remained.

Cumulative Effects: The cumulative effects of these two alternatives on white-tailed deer would be beneficial. The proposed thinning would reduce the potential for loss of large acreages of mature forest to beetle infestation (Turchin et al. 1999; Boyle et al. 2004), and would preserve the ability of managers to develop and improve habitat conditions in the compartment for deer. Suitable habitat is dispersed across the forest and adjacent private lands. Removal of large fuels as a result of Hurricane Rita and prescribed fire, combined with activities associated with this project, benefit deer by opening up the forest floor to light and improving forage. However, due to the relatively small scale of this project relative to the amount of habitat available in the vicinity, significant cumulative effects on the deer herd are not anticipated. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species.

Eastern Wild Turkey (*Meleagris gallopavo*)

Background and Current Status

Eastern wild turkeys require a diversity of habitats in order to thrive, and use different habitats during different life cycle stages. Nesting habitat typically has dense herbaceous vegetation, with some shrubs and some type of structure concealing the nest. Nests are often placed near openings or edges such as roads, pastures, young plantations, or similar sites (Hurst, 1992). Brood habitat, particularly for young broods, is especially important. Young poults forage heavily on insects, and need open areas with abundant herbaceous vegetation and associated insects (Healy and Nenno 1983; Healy 1985; Campo et al. 1989; Hurst 1992; Porter 1992). Wintering flocks make heavy use of hardwood stands, particularly bottomland areas (Sisson et al. 1990; Hurst, 1992).

Openings are an important habitat component year around, and are used as strutting areas by gobblers (Hurst, 1992), as bugging areas by hens with broods (Healy, 1985; Campo et al. 1989; Hurst, 1992), and as foraging areas by turkeys of all ages throughout the year (Hurst, 1992). A study in Louisiana found that areas with a larger percentage of acreage in openings usually had higher turkey populations (Dickson et al. 1978).

Turkeys have a varied diet. Young poults are heavily dependent on insects, transitioning to a more plant-dominated diet by four weeks of age (Healy and Nenno 1983; Healy 1985; Hurst 1992). Adult turkeys feed primarily on plant foods, including seeds, hard mast such as acorns and nuts, soft mast such as fruits and berries, and green vegetation. They also consume animal matter, primarily insects (Hurst 1992).

Over hunting extirpated turkeys from much of their original range. Successful reintroduction efforts were conducted from 1979 through 1997. Turkey populations are distributed throughout the National Forests in Texas (USDA 2010). The eastern wild turkey uses a wide range of habitats making it a suitable indicator for early, mid, late succession, and old growth, and it was selected because it is in demand by hunters. The objective is to increase turkey populations on the NFGT.

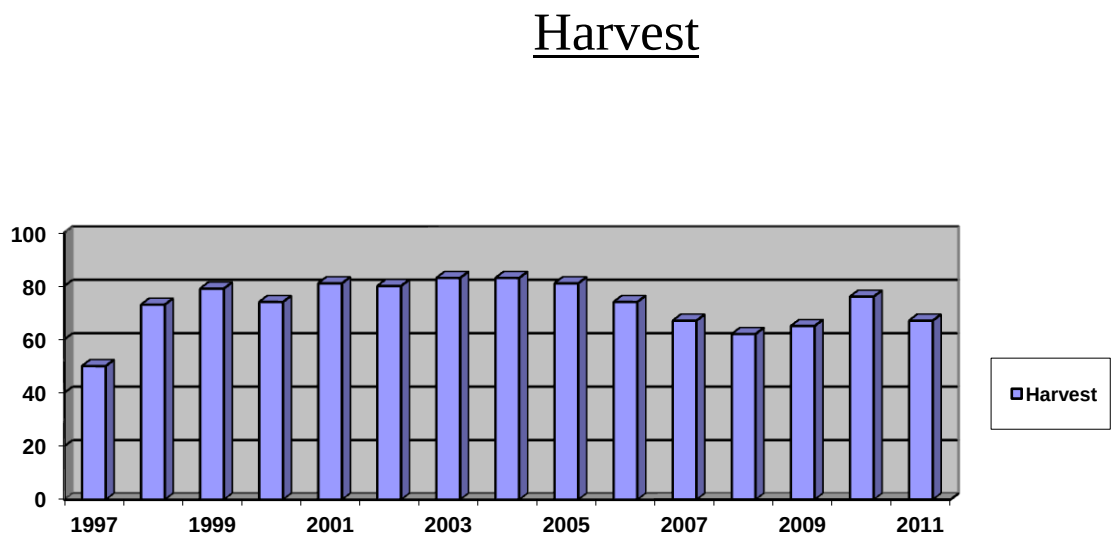


Figure 3.3 Spring Turkey Harvest in Angelina, Houston, Jasper, Nacogdoches, Newton, Sabine, San Augustine, Shelby, San Jacinto, Trinity, Montgomery and Walker Counties (National Forest Counties) from 1997-2011.

Annual surveys and harvest data (Figure 3.5) suggest that Eastern wild turkey populations are stable and viable. Texas Parks and Wildlife Department (TPWD) determined in 1996 that populations were adequate to support a spring gobbler season, and limited hunting was initiated in 1997.

Effects of Alternatives

Alternative 1 – No Action

Direct and Indirect Effects: Because no activities would occur under this alternative, there would be no direct effects on the wild turkey. However, foraging habitat would be limited by the existence of dense pine stands, in which closed canopy conditions would restrict sunlight to the forest floor, and inhibit herbaceous vegetation.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3– Scoped Action and Proposed Action

Direct and Indirect Effects: Direct effects of the proposed action and modified proposed action alternatives would be few, and would be limited to possible disturbance or destruction of some turkey nests, should

any hens be nesting in C-63 during the period that the proposed management activities were occurring. The proposed pine thinning, midstory reduction, and roadwork could destroy some nests, but turkeys often renest and the small number of nests that might be impacted would not have a significant effect on overall population numbers. Further, the long-term benefit of improved habitat conditions would outweigh the possible one-time loss of a few nests. Other possible effects include the displacement of individuals or the possible death or injury of poults, although either of these is unlikely, given the mobility of the birds.

Indirect effects of this alternative would be overwhelmingly beneficial to the wild turkey. Maintaining an open canopy by thinning is beneficial to turkeys (Campo et al. 1989). Thinning would open the canopy, increasing the amount of sunlight reaching the ground and encouraging the growth of grasses and forbs. This would make future prescribed burning more effective. Burning has been demonstrated to increase seed production by legumes (Cushwa et al. 1970) and other seed-producing plants important to turkeys (Porter 1992), and to increase production of soft mast (Hurst 1981), all of which would benefit turkeys.

Cumulative Effects: Periodic prescribed fire, combined with activities associated with this project, should not have an adverse impact on this species as both open up the forest floor to light and increase forage. Thinning and other habitat improvement activities, such as prescribed burning, on federal lands will improve nesting and brooding habitat conditions that will benefit eastern wild turkey. The proposed thinning would also reduce the potential for beetle infestation of pine-dominated stands (Turchin et al. 1999) and the subsequent loss of mature forest habitat. Management practices on adjacent private lands currently do little to enhance habitat for wild turkey, although regeneration of pine stands does provide some transient early successional habitat. Future sustainability or growth of eastern wild turkey populations will depend largely on habitat developed or maintained on national forest lands. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species.

Yellow-breasted Chat (*Icteria virens*)
Background and Current Status
The yellow-breasted chat is a bird of early successional habitats, inhabiting dense thickets, shrub-scrub habitat, and blackberry tangles, including clearcuts and abandoned fields (Conner and Dickson 1997; Burhans and Thompson 1999; Ricketts and Ritchison 2000; Krementz and Christie 2000; Whitehead et al. 2000). Nests are placed in dense foliage, generally within one meter of the ground (Burhans and Thompson 1999; Ricketts and Ritchison 2000). Chats feed on insects low in dense vegetation, and occasionally forage on the ground (Ricketts and Ritchison 2000). This species is a neotropical migrant, departing the U.S. to winter in Mexico and Central America.

The yellow-breasted chat was selected as a management indicator for early successional habitats due to its dependence upon such shrub-scrub vegetation.

Data is available to evaluate chat population trends at several scales. Data from Breeding Bird Survey routes, which have been operated since 1966, provide information on yellow-breasted chat population trends across the species' range (Fig. 3.6). This data reveals that chat populations have fared differently in various parts of the U.S.

There has been some decline in U.S. numbers as farmland and pastures disappear and are reverted back to forests or are being developed. Range wide this species is considered secure with a Global Status of G5 (Nature Serve 2010).

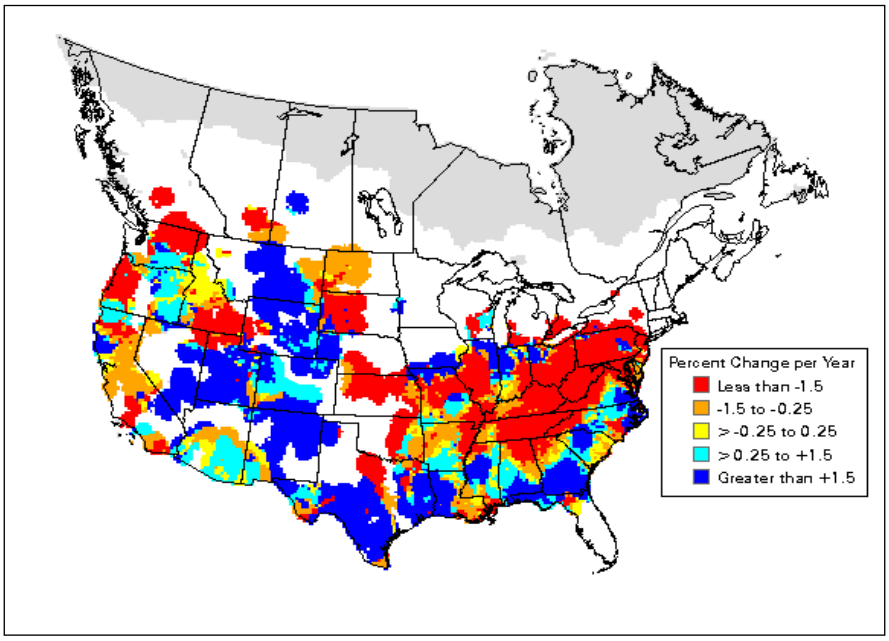


Figure 3.4 Changes in yellow-breasted chat populations across the species' range, based upon Breeding Bird Survey data (1966-2003). Map from Sauer et al. (2004).

Point count surveys on the NFGT indicate a stable trend (Figure 3.7). During spring point counts, chats were encountered in all early successional pine types, but more so in loblolly/shortleaf pine types.

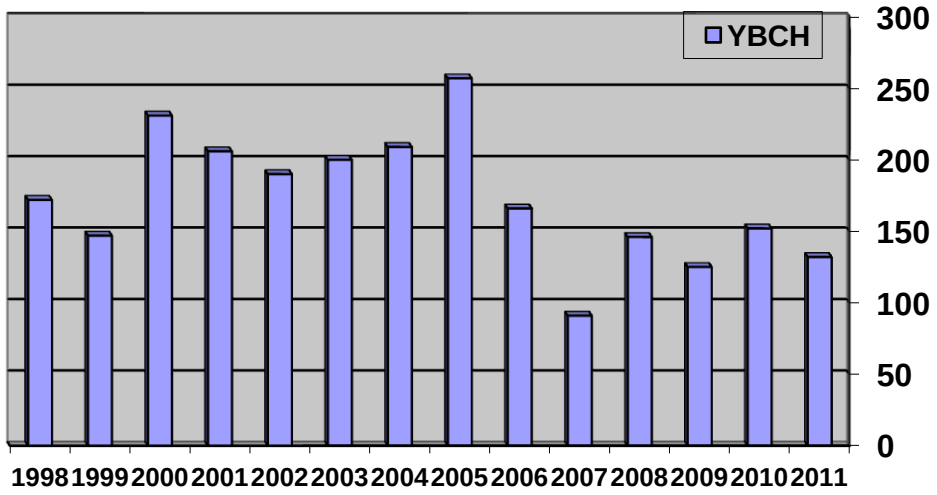


Figure 3.5 Numbers of yellow-breasted chats (YBCH) found in all forest stands during point counts on the NFGT, 1998-2011 (USDA 2012).

Acreage of chat habitat on the National Forests in Texas is expected to decline in the future, as young pine stands mature (USDA 2010), leading to a corresponding decline in chat populations on national forest lands.

Effects of Alternatives
Alternative 1
Direct and Indirect Effects: Because no activities would occur under this alternative, there would be no direct effects on the yellow-breasted chat. However, in the absence of disturbance, any existing early successional or brushy habitat would continue to mature, eventually becoming less suitable for chats.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3 – Scoped Action and Proposed Action
Direct and Indirect Effects: The proposed action and modified proposed action alternatives have the potential for some minor detrimental direct effects to individual chats. Depending upon the season during which timber harvesting occurred, some chat nests could be destroyed. However, chat numbers in mature forest, where most thinning would occur, are typically low, compared to numbers in younger stands. In addition, chats, like other songbirds, will often renest after a failed nest attempt, which would compensate for many of the lost nests.

Indirect effects would be negligible. Thinning may temporarily improve habitat for this species as the canopy of pine stands is opened.

Cumulative Effects: The cumulative effects of these alternatives on chat populations would be largely neutral. The proposed pine thinning would leave the pine-dominated stands less vulnerable to beetle infestation (Turchin et al. 1999; Boyle et al. 2004). There would be less chance that large acreages would be infested and eventually replanted following control actions. Thus, there is less potential for future development of large areas of chat habitat from beetle infestations under this alternative. As acres of early succession habitat decline on the forest, populations of yellow-breasted chats on the NFGT are expected to also decline (USDA 2002).

Prescribed fire would likely be used in the compartment to reduce the occurrence of a woody understory and allow the establishment of grasses and herbaceous ground cover, so this increase in habitat would be temporary. However, the extensive short-rotation pine plantations occurring on hundreds of thousands of acres of private lands in this region provides an ever-shifting mosaic of chat habitat as various stands are clearcut and replanted over a 20-25 year cycle. Thus, yellow-breasted chats will likely continue to thrive in the Pineywoods Ecological Region. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species.

Pileated Woodpecker (*Dryocopus pileatus*)

Background and Current Status
The pileated woodpecker is an indicator of mid and late succession, and old-growth habitats. Preferred habitat includes mature coniferous-deciduous forests or bottomland hardwood forests. Pileated woodpeckers breeding and wintering habitat are mature

and extensive forest with dead snags for nesting (Hamel 1992, p. 190).

Data is available to evaluate pileated woodpecker population trends at several scales. Data from Breeding Bird Survey routes provide information on population trends across the species' range (Figure 3.8; Sauer et al. 2007). This data reveals that pileated woodpecker populations have fared differently in various parts of the U.S. However, in much of Pineywoods Region of East Texas, the species has averaged an increase of 0.25% to over 1.5% per year.

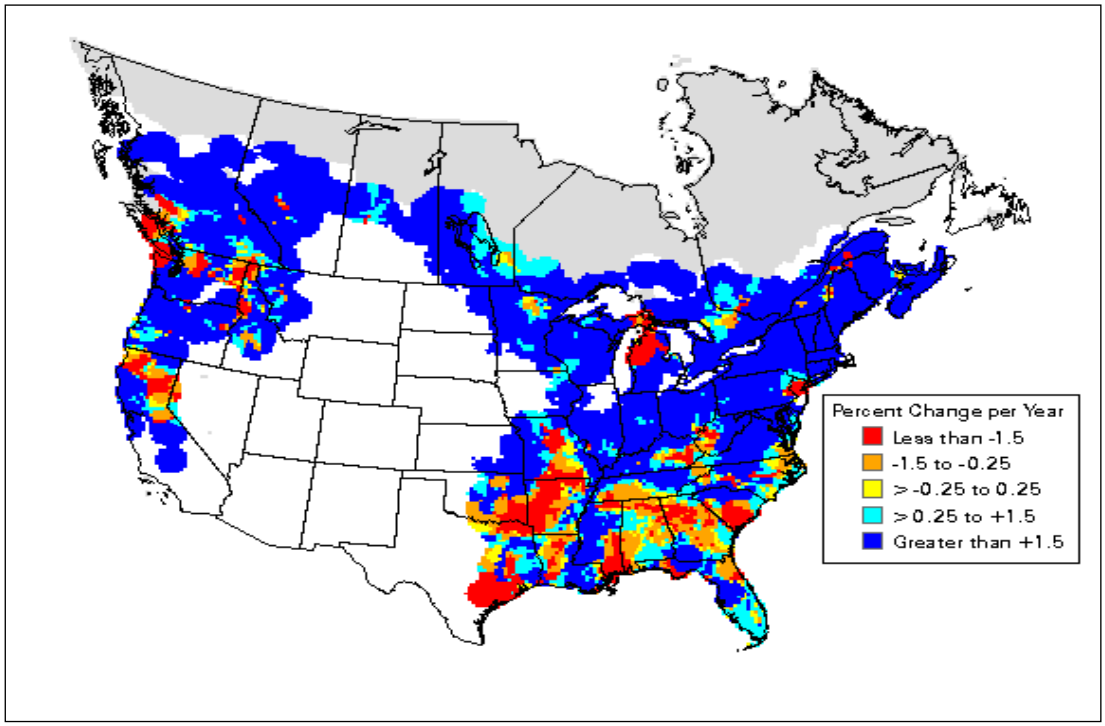


Figure 3.6 Changes in pileated woodpecker populations across the species' range, based upon Breeding Bird Survey data (1966-2003). Map from Sauer et al. (2007).

Habitat for this species, in the form of older age class stands, is increasing across the NFGT. In 1996, suitable habitat was estimated at 280,000 acres, with suitable habitat defined as mid and late successional and old growth. Current habitat trends indicate a net increase of 22,400 acres of suitable habitat and the availability of a variety of habitats across the National Forests (USDA 2002). Point count surveys have been used on the NFGT to monitor pileated woodpecker numbers since 1996.

These data suggest a stable or slightly increasing trend in pileated woodpecker numbers, until 2006 (Figure 3.9). The apparent decline will be watched closely to determine if numbers rebound in 2007.

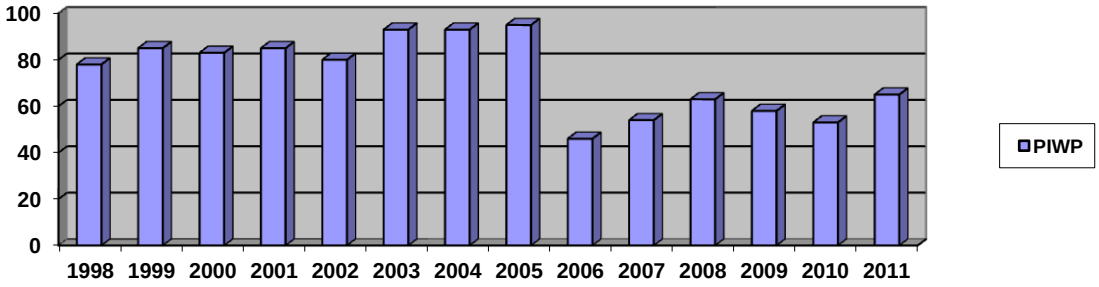


Figure 3.7 Numbers of pileated woodpeckers (PIWP) found in all forest stands during point counts on the NFGT, 1998-2011 (USDA 2012).

Effects of Alternatives

Alternative 1

Direct and Indirect Effects: Because no activities would occur under this alternative, there would be no direct or indirect effects on the pileated woodpecker. However, because some younger stands contain high basal areas, they would grow at a slower rate than if they were thinned, thus taking longer to provide the large diameter trees needed by this woodpecker.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3 – Scoped Action and Proposed Action

Direct and Indirect Effects: The direct effects of these alternatives would be relatively minor. Some pileated woodpecker nests could be disturbed or destroyed during timber harvest, if such activities occurred during the spring nesting season and nest snags were destroyed. However, past experience has shown that relatively few snags are lost during timber harvest operations. Thus, the potential for nest loss is relatively minor and would not be of sufficient extent to affect woodpecker population levels.

Indirect effects are also expected to be minor. Road improvements and timber harvests have the potential to damage some snags that could be used by pileated woodpeckers as roost or nest sites. These activities may also reduce the number of snags and downed logs available, which may limit nesting and foraging opportunities. However, snags and downed logs will continue to exist in streamside zones, in which tree harvesting would not occur. The thinning would encourage faster growth of the remaining pines, allowing them to reach larger diameter sooner than would have occurred without thinning, thus providing a potential source of larger snags.

Cumulative Effects: The cumulative effects of these alternatives would be beneficial to the pileated woodpecker. Thinning the upland, pine-dominated stands in C-63 would reduce their vulnerability to attack by bark beetles (Turchin et al. 1990; Boyle et al. 2004). This would in turn reduce the potential for the loss of large acreages of the mature forest habitat needed by this woodpecker. The lack of management for snags and large areas of mature forest on adjacent private lands would likely continue. Substantial areas of pileated woodpecker

habitat have already been removed, through conversion to pastures, residential development, and management as short rotation pine plantations. National forest lands would continue to provide the majority of the high quality habitat for this species in the project vicinity. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect this species.

Snags

Background and Current Status

Snags are a habitat component of virtually all serial stages, and the lack of snags can be a limiting factor in maintaining or increasing populations of some species. Snags are common in the project area. Prescribed burns, wildfires, weather events, insects, disease, and decay are some of the factors that influence the numbers and distribution of snags across the landscape. For example, the prescribed burning program on the NFGT influences snag distribution by both creating and removing snags from the forest. Any prescribed burn will burn with varying intensity as a result of many factors including: the amount, type, and distribution of fuels, weather conditions, and topographical features. These factors combine to result in a mosaic effect in which some areas burn intensely, while other portions burn with little intensity, or fail to burn at all. The results are that some single trees or pockets of live trees may be killed, creating new snags, while some existing snags are consumed. This creation and consumption of snags results in an uneven distribution of snags across the landscape.

Snags were selected as a management indicator because they are used by and are important to a wide variety of wildlife species for nesting, roosting, foraging, perching, and other uses in all four successional stages—early, mid, late serial and old growth. Woodpeckers are primary cavity nesters that rely heavily on snags for nest sites. Snags are important habitat components throughout the forest; therefore it is used as a management indicator in early, mid, late serial, as well as old growth habitat.

Snag data is gathered as part of the vegetation sampling portion of the R8 Bird protocol. Data on snag numbers has been collected at approximately 700 survey points. A sample of approximately 70 survey points is surveyed annually. The surveys indicate that all areas have from 1 to 2 snags per acre, and the trend has remained stable to slightly increasing (Figure 3.10).

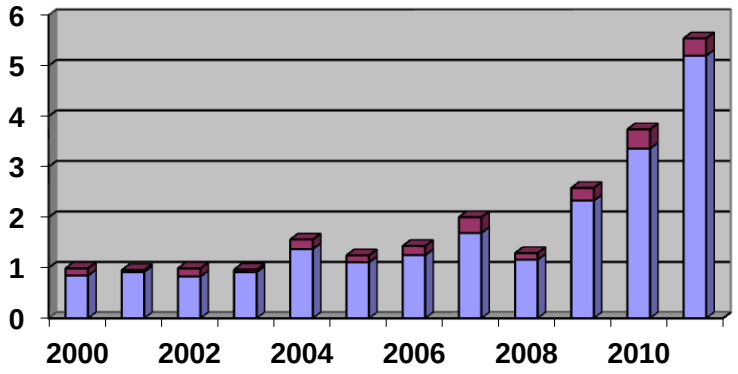


Figure 3.8 Average number of snags at each sample point (USDA 2012).

Effects of Alternatives
Alternative 1
Direct and Indirect Effects: Because no action would occur, there would be no direct effects. Under this alternative, stands identified in this project would be at a higher risk for southern pine beetle outbreaks. Potential outbreaks would result in creation of additional snags and potential for beneficial indirect effects. However, southern pine beetle outbreaks are unpredictable and may or may not occur under alternative 1 and snags that could be created would be of lower quality and short lived.

Cumulative Effects: When added to other relevant actions on private and federal lands, alternative 1 could increase the number of low quality snags across the landscape. Private land management, especially short rotation timber crops, does not typically favor snag development or retention. When added to past present and future actions on private lands, minimal cumulative effects would occur by contributing to poor snag production.

Alternative 2 and 3 – Scoped Action and Proposed Action
Direct and Indirect Effects: The direct effects of these alternatives would be relatively minor. Some snags could be damaged or destroyed during timber harvest. However, past experience has shown that relatively few snags are lost during timber harvest operations. Road improvements have the potential to damage some snags. These activities may also reduce the number of downed logs. However, snags and downed logs will continue to exist in streamside zones, in which tree harvesting would not occur. The project would have a positive indirect effect by encouraging faster growth of the remaining pines, allowing them to reach larger diameter sooner than would have occurred without thinning, thus providing a potential source of larger snags. However, the project would have negative indirect effects because the area is less likely to have pine beetle infestations.

Cumulative Effects: The cumulative effects associated with the lack of management for snags and large areas of mature forest on adjacent private lands would likely continue. Substantial areas of mature forestland habitat have already been removed, through conversion to pastures, residential development, and management as short rotation pine plantations.

National forest lands would continue to provide the majority of the mature forest in the project vicinity. Within the foreseeable future, control of NNIS (non-native invasive species) would occur but should not affect snags. This project may result from increased fire intensities as result of more open canopy and grassy understory, which would increase the potential destruction and creation of snags due to fire. Removal of large fuels as a result of Hurricane Rita and periodic prescribed fire, combined with activities associated with this project, should not alter trends for snags.

3.7 Climate Change

Ongoing research suggests that climate is already changing, and impacts include increases in air temperature, sea level, and frequency of extreme weather, such as hurricanes and droughts. These conditions could eventually result in more stressful forest environments, which could in turn lead to reduced growth and productivity. Declines in vigor may make forests more susceptible to large-scale pest attacks and other disturbances (Anderson, 2008).

The proposed treatments will help to improve the forest's resistance and resilience to climate changes (Anderson, 2008). According to the Intergovernmental Panel on Climate Change, forest management can be used to mitigate climate change, by maintaining stand-level carbon density through reduction of forest degradation, planting, site preparation, and other management practices (Nabuurs et. al., 2007).

The landscape prescribed burning would help to reduce fuel loadings (Ryan, 2008). The amount of carbon dioxide released by a low-intensity fire is small and the store of carbon on the forest floor is rapidly replaced as fine fuels re-accumulate and low shrubs re-grow (Underwood et. al., 2008).

The direct, indirect, and cumulative effects of this project on climate change, as well as the direct, indirect, and cumulative effects of climate change on this project have been considered. Any resulting greenhouse gas emission would not be measurable on a global scale.

3.8 Vegetation

3.8.1 Affected Environment

The area proposed for harvests is in Management Area 2 – Red-cockaded Woodpecker Emphasis and MA 6 – Longleaf Ridge Special Area (*Plan*, p. 96-134, 168-179). These areas are managed for large, older trees in longleaf pine-little bluestem, shortleaf pine-oak, and loblolly pine-oak dominated forest communities for the enhancement of red-cockaded woodpecker (RCW) habitat and the goal of increasing the presence of native longleaf pine ecosystems.

According to the Ecological Classification System (ECS) for the National Forests and Adjacent Areas of the West Gulf Coastal Plain, this project area lies within the Sandy Uplands Landtype Association (LTA) (Van Kley et al., 2007). This LTA occurs on gently sloping to strongly sloping uplands and some areas are considered as low ridges. Soils are primarily loamy and somewhat poorly drained to moderately well drained (*the Plan*, Appendix A, p. 21).

Over 99 percent of the project area occurs in the Sandy Uplands Landtype Association of the Piney Woods Transition Subsection, of the Coastal Plains and Flatwoods, Western Gulf Section of the Outer Coastal Plain Mixed Forest Province (Van Kley et al., 2007). Longleaf pine historically dominated significant upland areas in this subsection; however, this subsection represents the transition zone where longleaf pine communities gradually decrease from south to north and east to west (Van Kley et al., 2007). The topography is generally rolling with some moderate slopes throughout.

The thinning, regeneration, and wildlife openings proposed in alternative 3 and 4 occur in loblolly pine stands. Table 3.8 details the percentage of harvests by stand type.

Table 3.8 Acres of Pine Forest Treated by stand type

Forest Type	Alternative 3 and 4	
	Percent Treated	Acres Treated
Loblolly	100%	1,057

The majority of the proposed pine stands treated are loblolly pine types.

The following table is a summary of the current characteristics of the area where treatments are proposed.

Table 3.9 Current Age Class Distribution

Age Class	Percent Distribution	Acres Distribution
0-10	0	0
11-30	34%	160
31-70	56%	579
71-90	10%	318
90 +	0%	0

This table shows that the majority of the pine forest in compartment 63 is between 31 and 70 years of age. There is young regeneration occurring within each of these older pine stands. Pine regeneration is occurring in old bug spots, areas where fire has created conditions for regeneration, and where trees have blown over from past storm events.

Compartment 63 had been exposed to frequent fire though prescribed burning in the recent past. The area had been prescribed burned every two-to-three years from 1997 to present. Once the stands are marked for treatment, prescribed burning would not occur until after the treatment is complete. Since this may be from three-to-five years, it is beneficial that the compartment was prescribed burned in 2012. This recent burn should help keep the fire interval closer to the desired level, assuming that the area is marked and sold in 2013. As a result of the prescribed burning, the shrub layer is gradually being replaced by a grassy/forb understory. However, hickory, sweetgum, oak, elm, sassafras, green brier, and other woody species are present.

Most of the pine stands in the project area are overstocked and need treatment to improve habitat for RCW, as well as decrease the risk of pine beetle mortality in the future. The proposed thinning would result in a total pine BA ranging between 60 and 70 for each stand. This should improve the vigor of remaining trees and improve habitat conditions for RCW. Longleaf pine would be favored over shortleaf, loblolly, and slash pine in that order as leave trees. No overstory hardwood trees would be removed either during the thinning or midstory work (unless for safety reasons).

The project area is within the natural range of longleaf pine and currently has off-site loblolly plantations. These plantations are at merchantable size and should support harvesting operations. These off-site plantations would be clear-cut to remove the off-site loblolly pine and re-planted with native longleaf pine seedlings. The increase of longleaf pine in the area should greatly benefit the RCW, due to the extended life span of longleaf, and should assist in the goal of restoring this ecosystem to the area. The longleaf pine's adaptation to a short fire frequency would also benefit other species, such as the eastern wild turkey in creating open park-like habitat.

3.8.1.1 Old Growth

To protect possible old growth in MA 2 and MA 6, the *Plan* requires an evaluation of all stands 100 years and older before entry. The stands proposed for treatment currently are less than 100 years old and exhibit no old-growth characteristics. They would require more than another decade to acquire these characteristics.

As none of the alternatives would affect old growth, no further analysis of old growth is required for this project. Stands to be regenerated are in the younger age classes and are off-site loblolly pine being converted to longleaf pine; therefore, these harvests should not affect old growth requirements in the project area.

3.8.1.2 Non Native Invasive Species
A ground survey for NNIPS within the project area was conducted by the Forest Botanist on 7/07/2011. The specialist report that further details the findings of this survey can be found in the project file at the Angelina National Forest Ranger Office. The following invasive species were documented:

Table 3.10 Non Native Invasive Plant Species

Common Name	Scientific Name	Common Name	Scientific Name
chinaberry	*Melia azedarach*	mimosa	*Albizia julibrissin*
tallowtree	*Triadica sebifera*	Japanese climbing fern	*Lygodium japonicum*
paper mulberry	*Broussonetia papyrifera*		

Other NNIPS may be present in the project area but they have not been identified at this time. Any NNIPS found during implementation of this project would be noted and information sent to the Forest Botanist. The Forest Botanist would coordinate treatment of the NNIPS in accordance with the National Forests and Grasslands in Texas Non-Native Invasive Species Environmental Assessment (EA 2008). Any NNIPS that becomes established as a result of this project would be treated in accordance to the NNIPS EA.

3.8.2 Environmental Consequences
Alternative 1 – No Action
Direct and Indirect Effects: This alternative would have no direct or indirect effects because no treatment activities would occur. Pine stands are currently overstocked. Growth would continue to slow down and tree vigor would decrease. Overtime competition for water and nutrients may lead to the death of the less vigorous trees leading to an increase in fuels. Low vigor may also make the trees more susceptible to harmful insects and diseases. These stands are in Management Areas 2 and 6. Without management, habitat for RCW would become less suitable. Any NNIPS in the area would continue to proliferate potentially outcompeting native species.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3 – Scoped Action and Proposed Action
Direct and Indirect Effects: Thinning pine stands would increase vigor of the remaining trees on the site as fewer trees would be competing for water and nutrients. No overstory hardwood trees (generally those greater than 11.9 inches in diameter at 4.5 feet above ground level (DBH)) are proposed to be removed. Herbicide application use in regenerating stands would positively affect the longleaf pine regeneration and should ensure that planted seedlings survive. This should help increase the habitat for the RCW in the future. Reduction of the overstory and midstory should increase sunlight to the forest floor and improve conditions for the growth of grasses and forbs. Areas receiving regeneration harvests would have the composition of the stand directly impacted; however, following the harvest the area would be regenerated with longleaf pine. Several years following longleaf regeneration, the stands should be stocked with seedlings and have an understory of grasses and forbs that would help prescribed

burns become effective.

Thinning the pine stands and wildlife openings may also make the area more susceptible to NNIPS. More sunlight to the forest floor and possible temporary exposure of mineral soil may make it easier for NNIPS to become established. All logging equipment used on the sale would be washed before entering the area to help prevent the spread of NNIPS. If these areas are prescribed burned on a two-to-three year cycle, this may help prevent the establishment and or spread of NNIPS. The Forest Service also no longer uses NNIPS in their erosion control mixtures. Monitoring for NNIPS should be ongoing across the forest and would include the project area.

The amount of herbicide that moves away from the area of application would depend on the physico-chemical properties of the chemical and the agroclimatic characteristics of the target site (Carter, A.D., 2000). The proposed herbicide application of triclopyr would not be broadcasted but applied by hand to individual stems as foliar spray. It would be applied to vegetation on soils that are moderately to very slowly permeable. Fine-textured soils (clay) and organic soils have higher adsorption capacity than coarse-textured (sandy) soils; therefore, soils with high clay and/or organic matter contents have a higher capcity to bind herbicides, making them less available for uptake by plant roots (Osiecka, A & Patrick J. Minogue, 2010). However, triclopyr is not highly mobile and the soil microbes and ultraviolet light break down the herbicide making it less persistent (FEIS, VMCP/P, Vol I. page II-35).

Cumulative Effects: Prescribed burning is going to continue in this area. Fire coupled with the timber harvests work would improve habitat for RCWs, as described in the RCW Recovery Plan (p. 38, 51, 113-115). The proposed thinning and regeneration harvests would change the age distribution classes and stand diversity, reducing insect and/or disease outbreak conditions and establishing understory herbaceous species. Herbicide application use should not have a cumulative impact in the area due to direct foliar application practices. Control of known NNIPS has been initiated since the NNIPS EA was completed. Control may include practices such as manual or mechanical cutting, pulling individual stems out by the roots, prescribed fire, and herbicides. No other actions are known to be occurring or potentially occurring in the foreseeable future in this area. Some of the surrounding private land has residences on it. Future actions on these lands are unknown at this time.

Alternative 4 –Proposed Action Without Herbicides

Direct and Indirect Effects: The impacts for this alternative would be the same as Alternative 3 except no herbicides would be used for pine release in regenerating stands. Manual tools would be used for the release and would assist in the regeneration of longleaf pine; however, the control would not be as long lasting as a herbicide treatment.

Cumulative Effects: The impacts for this alternative would be the same as Alternative 3 except no herbicides would be used for pine release in regenerating stands.

3.9 Heritage Resources

This section is in progress. The decision for this project will not be signed until concurrence has been received from SHPO and affected federal recognized tribes.

The Forest Service is obligated, under the National Historic Preservation Act (NHPA), to consider the effects of all undertakings on historic properties (heritage resources) that may be eligible for listing on the National Register of Historic Places. Consultation with federally recognized tribes with ancestral ties to the National Forests and Grasslands in Texas has been initiated by way of standard scoping for NEPA.

There should be no *direct, indirect or cumulative* effect of the project on heritage resources. Regardless of what activity is ongoing on Forest Service lands, all known historic and prehistoric heritage resources (sites) have been identified and are/would be protected as required. In the event that historic or prehistoric heritage resources are discovered during any of the tree removal operations, work within the immediate vicinity of the discovery would stop and the Heritage Resources staff would be notified. The heritage resource would be protected until consultation between NFGT, the SHPO, and affected federally recognized tribes is completed and a treatment plan is developed and implemented.

3.10 Visual Quality

3.10.1 Affected Environment

The general forest area of Management Area 2 (MA-2) and Management Area 6 (MA-6) in this project has a visual quality objective (VQO) of maximum modification. In maximum modification, management activities may be dominant but appear as natural when viewed as background. Management activities may also be out of character when viewed as foreground and middleground. The more visually sensitive area of MA-4 (streamside management zones) and the predominantly used travelways Farm-to-Market (FM) 2743, Hopsonville Road, and State Highway (SH) 63 have a VQO of partial retention. Management activities in partial retention may be visible but should remain subordinate to the character of the surrounding landscape. Guidrey Road has a VQO of modification. Management activities in modification may be dominant features but are of an appropriate scale and form so as to appear as a natural occurrence within the surrounding area. National Forest System Road (NFSR) 354 has a VQO of maximum modification and the last third of the road is within C-63.

Compartment 63 is in the middle of a fairly contiguous area of national forest land. There are a few in-holdings of private land with the majority of that land in timber. For almost 15 miles of SH 63, both sides of the road are forested, interspersed with a few pockets of private homes visible from the roadway. The tree line is set back from the edge of the pavement along the right-of-way (ROW). While forested on both sides, the wide expanse between the tree lines provides more openness. The roadway undulates over gently rolling slopes, providing a pleasant setting. Highway 63 is the southern borderline of C-63 and it is heavily traveled. The ROW along FM 2743 is narrower and the treelines are closer together and the traveler is more enclosed by the vegetation. Guidrey road is an unpaved county road and travel is slower. The roadway is narrow and the treelines are close to the edge of the travel route and one feels more enclosed within the corridor.

3.10.2 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects: No work would occur. Therefore, there should be no change in the view of this section of forest by the public. Indirectly, if the forest cannot withstand insect and disease attacks, clumps of dead pine trees may eventually appear as stands age and density of trees increases.

Cumulative Effects: Prescribed burning and NNIPS eradication are known management operations occurring in this area. No other projects are known to be ongoing or are foreseeable in the near future in this area.

Alternative 2 and 3– Scoped Action and Proposed Action

Direct and Indirect Effects: The proposed management activities of thinning, site preparation, longleaf pine regeneration, and wildlife opening would have an effect on the scenery. Nearly 80 percent of the compartment would be thinned. The proposed management activities of thinning and prescribed burning would continue to keep existing views open and, with time, where foreground and midstory are the views these views would become more open, increasing visual depth into the forest.

Following the recommendations laid out by the Forest Landscape Architect, there should be no adverse direct or indirect effect on visual resources from this project. Leaving clumps of hardwoods and flowering trees along the roadside would break up the monotony of viewing thinned pine forests with forb/grass ground layers.

Cumulative Effects: The cumulative effects to the visual quality would be minimal as the overall forested character throughout the majority of the project would not be changed. Effects of management activities would be temporary or mitigated to reduce the impact on visual resources. The actions proposed would result in changes to the scenery by increasing the long distance views into the forest, improving the character of the timber, and restoring stands of longleaf pine. Prescribed burning, NNIPS control, and fuel break projects along property lines are known management operations occurring in this area. No other projects are known to be ongoing or foreseeable in the near future in this area. Following the recommendations laid out in the Landscape Architect's report, there should be no adverse cumulative effects on visual resources from this project.

Alternatives 4 –Proposed Action without Herbicide

Direct and Indirect Effects: The impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

Cumulative Effects: The cumulative impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

3.11 Recreation

3.11.1 Affected Environment

The National Forests and Grasslands in Texas provide recreational opportunities to residents in the surrounding communities and to residents from the larger urban cities in East Texas. There are opportunities for hunting, fishing, camping, swimming, hiking, biking, horseback riding, and boating in the forest and on the adjacent lakes. Based on a recreation survey completed in 2009, the top five recreation activities of visitors to the National Forests were relaxing, viewing wildlife, hiking/walking, hunting, and fishing (National Visitor Use Monitoring Report available at http://www.fs.fed.us/recreation/programs/nvum/nvum_national_summary_fy2009.pdf) accessed Oct 12, 2012.

Although there are no developed recreation sites or trails within the project area, it has other recreational usages. These recreation uses include hunting, dispersed camping, fishing, swimming and possibly bird watching.

3.11.2 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects: No thinning would occur. The public would continue to see an overstocked pine forest when driving on adjacent roads. Indirectly, if sections of the forest cannot withstand insect and disease attacks, clumps of dead pine trees may eventually appear as stands age and density of trees in the forest increases. Since no roads would be closed, the potential for additional garbage dumping would continue. There should be no adverse direct or indirect impact on recreation (not including illegal activities) from this alternative other than a decrease in visual quality.

Cumulative Effects: Prescribed burning, NNIPS eradication, and fuel break projects along property lines are known management operations occurring in this area. No other projects are known to be ongoing or are foreseeable in the near future in this area. There should be no adverse cumulative impact on recreation from this alternative.

Alternative 2 and 3– Scoped Action and Proposed Action

Direct and Indirect Effects: Thinning the pine forest and maintaining wildlife openings may make the area more conducive to hunting. Improving the pine forest health and vigor should decrease insect outbreaks reducing the number of dead trees in the forest. Improving habitat for RCW may encourage RCW migration in this area potentially increasing the possibility of the public viewing this endangered species. Creating and maintaining wildlife openings provides additional areas for the public to view and hunt wildlife. Closing old roads may make it more difficult for hunters to reach their favorite hunting areas. Following the recommendations laid out in the Landscape Architect's report, the visual quality of the area should not be adversely affected if mitigation measures are followed. Dispersed camping and the public walking through the area should not be adversely impacted; however, during implementation, safety would be an issue. Otherwise, there should be no adverse direct or indirect effect on recreation from this project.

Cumulative Effects: Thinning, site preparation, and NNIPS eradication along property lines are known management operations occurring in this area. No other projects are known to be ongoing or are foreseeable in the near future in this area. This area is used for walking, wildlife viewing, and hunting. The proposed actions should only temporarily affect these activities. There should be no long-term adverse cumulative effect on recreation from this project.

Alternatives 4 –Proposed Action without Herbicide

Direct and Indirect Effects: The impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

Cumulative Effects: The cumulative impacts for this alternative would be the same as Alternative 3, except that no herbicides would be used.

3.12 Herbicide Risk Assessments

3.12.1 Affected Environment

The Forest Service contracted with Syracuse Environmental Research Associates, Inc. (SERA) for a series of pesticide risk assessments that could be used nationally. These national risk assessments are generic or baseline risk assessments that constitute a summary of

the best available science as can be noted from their extensive list of references. Additional information on the preparation of these risk assessments can be found in SERA 2011. Risk assessment worksheets are models that are designed to disclose effects from a variety of circumstances, some of which may not have anything in common with the proposal.

A hazard quotient that is greater than one does not automatically indicate inconsistency with the *Plan*. Rather, a hazard quotient that is greater than one is a situation that receives further consideration and explanation by the specialist. The probability of occurrence must be taken into consideration along with the fact that the proposal incorporates protective measures not considered in the models, such as following label direction, implementing *Plan* standards, and implementing project-specific design criteria. In most cases, risk is further reduced because the probability of exposure is much less from what is presented in the national risk assessment. Thus, a rational interpretation of the data is necessary in a risk management discussion for individual hazard quotients (HQ) that exceed 1.0.

SERA also developed models to allow forest managers to evaluate the human health and ecological risk. The model for a particular pesticide consists of a series of worksheets presented in *Microsoft EXCEL* format. Specific parameters, such as application rate and application volume, are entered into a software model which then computes the risk of the particular project proposal. The resulting hazard quotients are summarized and discussed in this report.

The Risk Assessment Worksheets present hazard quotients at three levels of exposure: lower, central and upper. The "central" level was used for evaluating risk for this proposal. The upper level presents the concentration of all possible worst-case assumptions within the scenario and is presented only as a highly improbable reference or worst-case evaluation. Examples of these worst-case evaluations are degeneration of renal proximal tubules (kidney damage) or miscarriages among women with child.

On 1 October 2012, an analysis of risks was performed, using human health and ecological risk assessment worksheets, version 6.00.10, for triclopyr at the proposed rate of 1.5 lbs a.i./acre. This rate represents the rate used for pine release by directed foliar spray and was run for treatments throughout the project area. In a variety of human health and environmental health scenarios (including a variety of wildlife scenarios), most typical operational Hazard Quotients (HQ) were not projected to exceed the Regional standard of 1.0. The following scenarios had hazard quotients that exceeded 1.0, but were not scenarios that would pertain to the operational aspect of the treatment being proposed (http://www.sera-inc.com/home.html). The Hazards Quotients of scenarios and the application exposures are listed in tables below.

Table 3.11 Overview of HQs for Workers, Terrestrial Application

Triclopyr TEA					
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**
		Central	**Lower**	**Upper**	
Accidental/Incidental Exposures					
Contaminated Gloves, 1 min	Worker	2.E-05	7.E-06	3.E-04	1
Contaminated Gloves, 1 hour	Worker	1.E-03	4.E-04	2.E-02	1
Spill on Hands, 1 hour	Worker	4.E-04	9.E-05	6.E-03	1
Spill on lower legs, 1 hour	Worker	1.E-03	2.E-04	1.E-02	1
General Exposures					
Acute Exposures					
Backpack Applications:		1.E-02	5.E-04	8.E-02	1.00
Ground Broadcast Application:		2.E-02	7.E-04	0.20	1.00
Aerial Application:		1.E-02	2.E-04	8.E-02	1.00
Chronic Exposures					
Backpack Applications:		0.30	9.E-03	1.60	0.05
Ground Broadcast Application:		0.40	1.E-02	3.00	0.05
Aerial Application:		0.30	5.E-03	1.60	0.05

Triclopyr BEE Formulations					
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**
		Central	**Lower**	**Upper**	
Accidental/Incidental Exposures					
Contaminated Gloves, 1 min	Worker	1.E-02	4.E-03	0.10	1.00
Contaminated Gloves, 1 hour	Worker	0.70	0.20	7.00	1.00
Spill on Hands, 1 hour	Worker	1.E-03	3.E-02	2.E+02	1.00
Spill on lower legs, 1 hour	Worker	4.E-03	9.E-04	5.E-02	1.00
General Exposures					
Acute Exposures (Male Workers Only)					
Backpack Applications:		3.E-02	3.E-02	3.E-02	1.00
Ground Broadcast Application:		4.E-02	4.E-02	4.E-02	1.00
Aerial Application:		3.E-02	3.E-02	3.E-02	1.00
Chronic Exposures					
Backpack Applications:		0.50	3.E-02	6.00	0.05
Ground Broadcast Application:		0.90	4.E-02	12.00	0.05
Aerial Application:		0.60	1.E-02	6.00	0.05

Table 3.12 Overview of HQs for General Public, Terrestrial Applications

Triclopyr					
Scenario	**Receptor (Form)**	**Hazard Quotients**			**RfD* (mg/kg/bw/day)**
		Central	**Lower**	**Upper**	
Accidental Acute Exposures (dose in mg/kg/event)					
Direct spray, body	Child (TEA)	0.02	0.003	0.2	1.00
	Child (BEE)	0.05	0.01	0.7	1.00
Direct spray, lower legs	Woman (TEA)	0.03	0.07	0.5	0.05
	Woman (BEE)	0.1	0.01	1.4	0.05
Accidental Spill	Child	0.1	0.01	2	1.00
All others	Mixed	≤0.001	≤0.0001	≤0.01	Mixed
Non-Accidental Acute Exposure (dose in mg/kg/event)					
Contact with Vegetation	Woman (TEA)	0.07	0.02	0.3	0.05
	Woman (BEE)	0.2	0.1	0.4	0.05
Contaminated Fruit	Woman	0.2	0.1	4	0.05
Contaminated Vegetation	Woman	3	0.2	27	0.05
All other scenarios	Mixed	≤0.007	≤0.00005	≤0.005	Mixed
Longer-term Exposures (dose in mg/kg/day)					
Contaminated Fruit	Woman	0.09	0.03	3	0.05
Contaminated Vegetation	Woman	0.2	0.004	6	0.05
All others	Mixed	≤0.02	≤0.003	≤0.03	Mixed

*Rfd mean reference dose

These scenarios are used to represent accidental situations at the upper level of exposure and are not considered for operational planning in this analysis. However, these situations would be mitigated by the standard placement of warning signs during application.

The first scenario with a hazard quotient over 1.00 dealt with general exposures for workers using backpack sprayers for directed foliar applications. This scenario only exceeded the threshold in the upper level of exposure, which is not used for operational planning in this analysis.

The next five scenarios looked at general public risk for woman and children. These scenarios looked at child direct spraying whole body, woman spraying lower legs, woman with dermal exposure to contaminated vegetation (i.e. picking berries), woman eating contaminated fruit, and a child drinking contaminated water.

Two scenarios for long-term exposures to contaminated vegetation for large mammals and large birds had HQs that exceeded one at the upper level of exposure (i.e. worst-case scenario). These animals would have to be on site and eating vegetation as it was sprayed, for a long duration of time to reach this situation. This situation is highly unlikely because only a single treatment is proposed for this site.

The next scenario evaluated the risk to terrestrial plants from runoff. The only two situations in this scenario that had HQs over 1.00 were for areas that received >200 inches average annual rainfall. East Texas falls well below that value at approximately 40-50 inches average annual rainfall (http://www.seco.cpa.state.tx.us/publications/renewenergy/texasclimate.php accessed Oct, 2012).

The last scenario also evaluated the risk to terrestrial plants from runoff for sensitive species. This situation might be of concern if steeper slopes were present; however, this treatment area is flat. The sensitive species identified in the botanical report are *Agrimonia incisa, Amorpha paniculata, Cyperus grayioides and Liatris tenuis* and would be benefited from the project.

While the modeling process has revealed a number of scenarios where the risk to non-target species groups or humans would numerically exceed the Hazard Quotients of 1.00, extenuating circumstances and mitigation proposed eliminate these as matters of concern in the applied situation. In most cases, the potential for exposure to non-target organisms is very low. The lack of exposure opportunity is due to the mitigation required for the project, few non-target species within the project area, and in the case of accidental spills, a required sequence of highly unlikely events.

Parameters and output from these analyses are available as part of the process record at the Ranger District's Office at the Angelina National Forest.

3.12.2 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects: No herbicides would be applied in this alternative; therefore there would be no effects.

Alternatives 3 –Proposed Action

Direct Effects: This alternative would positively affect regenerating longleaf pines by effectively controlling undesirable grass and hardwood understory that may overtop the seedlings. The use of herbicides in this alternative gives increased control of the woody component by actually killing plants rather than only severing the stem, which would later sprout back (on most species). With this increased control, the longleaf pine should be able to take advantage of sunlight and lack of competition for several growing seasons. This would help the longleaf pine have a competitive advantage when competing for nutrients and light.

Cumulative Effects: Herbicide application use should not have a cumulative impact in the area due to direct foliar application practices. Control of known NNIPS has been initiated since the NNIPS EA was completed. Drift from the application may cause temporary browning of non-target vegetation.

Alternative 4 –Proposed Action without Herbicides

Direct and Cumulative Effects: This alternative's effects should be the same as Alternative 3 except no herbicides would be used. Therefore, control of the woody understory would be implemented with manual tools (i.e. chainsaws or weedeaters

with attached circular blades). This manual release would give control of the woody understory and help release longleaf pine; however, the length of control would be shorter than herbicide treatments. This shortened control could possibly cause increased competition to the longleaf pine and hinder its ability to compete for nutrients and sunlight.

3.13 Economics

These proposed activities in C-63 would improve red-cockard Woodpecker (RCW) habitat. Timber sale revenue should be able to cover the cost of the sale. This includes preparing the timber to be sold, administering the timber sale, the road work required to remove the timber, and reforestation. The remaining work proposed in this project; other road needs, wildlife opening, surveys, and NNIPS eradication are additional projects that could be covered by the revenue generated from the timber sale. However, if funds are not available to cover these other projects, that should not prevent this project from being implemented. Funds would have to be generated from other sources.

The benefit/cost ratio (B/C) is a measure of whether the sale is above or below cost. If this value is greater than one, the sale is cost effective. If less than one, additional funding would be necessary to implement the improvements

The costs involved with this economic analysis include sale administration, temporary roads, road reconstruction, road maintenance, berms to block roads, reforestation, NNIPS eradication, and wildlife opening maintaince. Benefits included the revenue generated from the sale of the timber. The costs associated with this project do not exceed the revenue at this time. Therefore, if prices increase greater that the 4 precent rate included in the analysis, there would be additional money available.

When timber is sold from the forest, a percentage of the receipts are returned to the county the timber is sold from for schools and roads. This is generally 35 precent of the gross receipts from the sale.

Calculations used in this project consider the time value of costs and revenues for each alternative and were used to determine the present net value for this project. Quick-Silver, a project analysis tool developed by the U.S. Forest Service, was used to detemine the economic performance of the long-term investments for this project. A 4 precent discount rate was used for project analysis. The time frame used for this analysis was seven years.

3.13.1 Environmental Consequences

Table 3.11 presents the estimated costs and returns associated with the timber sale and road work. The values used to generate revenue for the sale of timber products were based on the most recent stumpage and unit cost estimates of activities on the forest. A discount rate of 4 precent was used in these calculations.

Table 3.13 Comparison of Estimated Costs and Returns

	Activity	Alternative		
		1	3	4
COSTS	**Timber:**			
	Timber Sale Administration	$0	$32,866	$32,866
	Timber Sale Preparation	$0	$117,825	$117,825
	Roads:			
	Reconstruction	$0	$2,010	$2,010
	Temporary	$0	$1,705	$1,705
	Maintenance	$0	$1,350	$1,350
	Dirt Berms	$0	$225	$225
	Total Timber/Road Cost	$0	$152,777	$152,77
	Other Costs:	**2012 Prices**		
	Site Preparation	$0	$64,430	$64,430
	Planting	$0	$78,567	$78,567
	Pine Release	$0	$50,265	$44,858
	Stocking/Survival Surveys	$0	$6,781	$6,781
	Wildlife Opening Maintenance	$0	$10,623	$10,623
	NNIPS Treatment	$0	$1,625	$1,485
	NNIPS Monitoring	$0	$1,365	$1,365
	Prescribed burning	$0	$26,666	$26,666
	County Returns (35% of Total Return)	$0	$281,687	$281,687
	Total Other Cost	$0	$522,009	$516,462
RETURNS	Volume Hundred Cubic Feet (CCF)		12,327 4,106	12,327 4,106
	Total CCF		16,433	16,433
	Pine Sawtimber @ $64.29/CCF Pine Pulp* @ $3.00/CCF	$0 $0	$792,502 $12,318	$792,502 $12,318
	Total Return	$0	$804,820	$804,820
	Present Value Benefits	$0	$744,102	$744,102
	Present Value Costs	$0	($629,654)	($625,585)
	Present Net Value	$0	$114,447	$118,516
	Benefit/Cost Ratio	0	1.18	1.19

Note: Assumes a discount rate of 4 precent and investment length of 7 years.
*Pine pulp includes topwood.

The benefit/cost ratio for this sale is above 1. This is after 35 percent of the revenue removed for roads and schools.

The base costs used for the above information was calculated for 2012. The "Net" values in the above table are present net values; all costs and revenues have had inflation rates added to them depending on the year the work is to be performed and then these values have been computed back to the year 2013 which is the first year the timber is proposed to be sold. There would be enough funding available to cover the costs of activities not associated with the removal of the timber. There would be extra monies to cover unexpected price increases or timber price drops from the current 1st quarter prices for fiscal year 2013.

Alternative 1 – No Action

Direct/Indirect Effects: No activities would occur under this alternative; therefore, there would be no direct or indirect effects. However, no revenue would be generated and no funds returned to the county for schools and roads. Monies would not be available to improve habitat for the endangered red-cockaded woodpecker (RCW). Roads would not be included or removed from the MVU Maps affecting public access. Money would not be spent by nor returned to the federal government. There would be no employment generated in the timber industry. If timber is not harvested in this decade, future harvests would have to be larger or much of the standing timber (and potential economic returns) might be lost to mortality.

Cumulative Effects: Because no actions are being proposed in this alternative, there would be no direct or indirect effects. Therefore, there should be no cumulative effects with other actions going on in this area.

Alternative 2 and 3 – Scoped Action and Proposed Action

Direct Effects: Income would be generated for the county school and road program. Revenue from the sale of the thinned trees would pay for the proposed timber sale resulting in improved RCW habitat and forest health. Money would be available to address wildlife habitat improvements and block closed roads. The herbicide treatments in this alternative cost slightly more than Alternative 4; however, the added benefits of increased control should justify the additional cost.

Indirect Effects: Jobs would be generated from the sale and removal of the timber and from the contract work for wildlife improvements; this would include jobs associated with the maintenance of equipment used on the jobs. Schools would receive income. Roads within the area and county roads would be improved.

With the current increases in the cost of fuel, all costs may exceed revenues in future years if the price of fuel does not stabilize. Prices for materials, especially road work, may also increase higher than what is projected here; however this project has good potential revenue that should cover this possible increase while still accomplishing project goals.

Cumulative Effects: The local economy is somewhat dependent on the timber industry and the sale of timber should help this industry and the local economy. Timber is being cut and sold from private and timber company lands. Based on the amount of timber sold from National Forest (NF) lands annually, this sale should not have a significant impact on the timber market.

Alternative 4 – Proposed Action Without Herbicide

Direct, Indirect, and Cumulative Effects: The impacts would be the same as Alternative 2, except no herbicides would be used. Therefore, the cost of the pine release would be slightly lower.

4.0 Preparers and Consultation with Agencies, Organizations, and Persons

4.1 Preparers and Contributors to Analysis

ID Team Members	Consultants
Eddie Taylor	Sheila Sprague
Phyllis Wolf	Dave Peterson
Cheryl Foster	Nancy Snoberger
Kathy Duncan	Lynn Jackson
Nathan Renick	Tom Philipps
Jason Engle	Jason Nolde
Ron Hasken	George Weick
April Crawley	Robert Potts
Lanton Chumley	Kathy Ward
Earlene (Bracy) Jackson	
Eliode Joseph	
Walter Cooper	
Tom Zimmerman	
Jaime Sowell	
Justin Seaborn	

4.2 Consultation with Other Agencies, Organizations, and Persons

Interested Persons

Sambo Farley
David Davis
Carl Watts
Albin Comeaux
Clara Boykin
David Renfro
George Wright
Jerry Watkins
Betty Jane Dodds
James Thompson
Ray Hooper
Elaine Havard
Kathleen Davis
Diana Burton
Julie Shackelford
Lee Woodward
Larry Bretzlaff
Leon Ray
Richard Belt
Hubert Bryan
R.E., D, and R. Bryan
Kyle Buckley
Stan Cook
Darrell Dykes
James Johnston
Billy Morton
Michael Legg

US Fish & Wildlife Service

Rober Allen
Jeff Reid

Texas Conservation Alliance

Janice Bezanson
Larry Shelton
Richard Donovan

Texas Parks and Wildlife Department

Karen Hardin
Robert Baker
Bill Adams (Former)
Dick Pike (Former)
Ricky Maxey
Mike Berger
Adam Terry

Elected officials

Kay Bailey Hutchison
Joe Barton
John Cornyn
Louie Gohmert
Steve Ogden
Kevin Brady
Robert Nichols
Wayne Christian
Trent Ashby

County Judges

Wes Suiter
Mark Allen
Joe English
Truman Dougharty
Randy Williams
Mike Perry

Houston Sierra Club

Brandt Mannchen

Other Agencies and Organizations

Robert Loggins
Tom Boggus
Scotty Parsons
Ronald Hufford
James Bruseth
Wendy Ledbetter
Mark Tracy

Interested Persons Continued

Robert Nichols
Mark Walters
James White
Brain Babin
Steve Stockman
Ted Cuz
Travis Clardy

Caddo Nation of Oklahoma

Tamara Francis-Fourkiller
Brenda Edwards (Former)

Tunica-Biloxi Indians of Louisiana

Joey Barbry
Earl J. Barbry, Sr. (Former)

Choctaw Nation of Oklahoma

Gary Batton
Gregory E. Pyle (Former)

United Keetoowah Band of Cherokee Indians, OK

George Wickliffe
Lisa Stopp, NAGPRA (Former)

Alabama Coushatta Tribe of Texas

Nita Battise
Carlos Bullock (Former)
Kevin Sickey (Former)

Coushatta Trine of Louisiana

Lovelin Poncho

5.0 Literature Cited

Anderson, Paul. 2008. Silviculture and Climate Change. (May 20, 2008). U.S.Department of Agriculture, Forest Service, Climate Change Resource Center. Available: http://wwwJs.fedus/ccrc/topics/silviculture.shtml

Belanger, R. P. 1996. Silviculture Guidelines for Reducing Losses to the Southern Pine Beetle. Pages 165-177 in Thatcher, Searcy, Coster, Hertel, eds. The Southern Pine Beetle. USDA Forest Service Expanded Southern Pine Beetle Research and Applications Program, Science, and Education Administration Technical Bulletin 1631. Washington D. C.

Blackburn, W.H., R.W. Knight, J.W. Spillman, R.J. Caffey, H.A. Pearson, A.T. Weichert, and J.C. Wood. 1989. Assessment of water yield and quality from intensive silvicultural practices and livestock grazing in southeast forest. Annual Progress Report, Texas Agricultural Experiment Station, Sonora, Texas.

Carter, A D. 2000. Herbicide movement in soils: principles, pathways and processes. Blackwell Science LTD *Weed Research* 2000, pp 113-122.

Conner, R.N., D.C. Rudolph, D. Saenz, R.R. Schaeffer. 1994. Heartwood, sapwood, and fungal decay associated with red-cockaded woodpecker cavity trees. J. Wildl. Manage. 58(4):728-734.

Conner, R.N., Rudolf, D.G., and Walters, J.R. 2001. An introduction. Pages 1-12 *in* The red-cockaded woodpecker: survival in a fire-maintained ecosystem. University of Austin Press. Austin, Texas.

Conner, R.N., Rudolf, D.G., and Walters, J.R. 2001. Cavity treein fire-maintained southern pine ecosystem. Pages 79-115 *in* The red-cockaded woodpecker: survival in a fire-maintained ecosystem. University of Austin Press. Austin, Texas.

Correll, D.S. and M.C. Johnston. 1979. Manual of the vascular plants of Texas, Second Printing. The University of Dallas, Richardson, Texas. p. 1210.

Davis, W.D. and D.J. Schmidly. 1994. The Mammals of Texas. Texas Parks and Wildlife Dept. Nongame and Urban Program Dept. Austin, Texas. 338pp.

Dunning, J. B., Jr. 1993. Bachman's sparrow. Pages 1-16 *in* A. Poole, P. Stettenheim, and F. Gill, eds. The Birds of North America, No. 38. Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, DC.

Godfrey, R.K., J.W. Wooten. Aquatic and Wetland Plants of Southeastern United States: Monocotyledons. 1979. University of Georgia Press, Athens, Georgia. 736 pp.

Goff, G.F., G.A. Dawson, and J.J. Rochow. 1982. Site Examination for Threatened and Endangered Plant Species. Environmental Management, Vol. 6, No. 4, pp. 307-316.

Gucinski, H., M.J. Furniss, R.R. Ziemer, M.H. Brookes. 2001. Forest Roads: A synthesis of scientific information. General Technical Report PNW-GTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.

Hamel, P.B. 1992. The Land Manager's Guide to the Birds of the South. The Nature Conservancy. Southeastern Region. Chapel Hill, North Carolina. 437pp.

Hardin, K.I. and G.E. Probasco. 1983. The Habitat Characteristics and Life Requirements of Bachman's Sparrow. Birding 15(4/5):89-197.

Harvey, M.J.; Altenbach, J.S.; Best, T.L. 1999. Bats of the United States. Arkansas Game & Fish Commission. Little Rock, Arkansas. p. 54.

Hobbs, H.H. Jr. 1990. On the crayfishes of the Neches River basin of eastern Texas with the Descriptions of three new species. Proceedings of the Biological Society of Washington. 103(3), pp. 573-597.

Howells R.G., R.W. Neck, H.D. Murray. 1996. Freshwater Mussels of Texas. Texas Parks and Wildlife Department. Austin, Texas. 218pp.

Jackson, J. A. 1994. Red-cockaded Woodpecker (*Picoides borealis*). *In* The Birds of North America, No. 85 (A. Poole and F. Gil, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union. 20 p.

Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. 1980. Atlas of North American fishes. North Carolina State Museum of Natural History. 867 p.

LeGrand, H. E., and K. J. Schneider. 1992. Bachman's sparrow, *Aimophila aestivalis*. Pages 299-313 *in* K. J. Schneider and D M. Pence, eds. Migratory nongame birds of management concern in the Northeast. U.S. Fish and Wildlife Service, Newton Corner, MA. 400pp.

McDougal L.A., K.M.Russell, K.N. Leftwich, eds. 2001. A Conservation Assessment of Freshwater Fauna and Habitat in the Southern National Forests. USDA Forest Service. Southern Region. Atlanta, Georgia. 141 pp.

Mirowsky, K. and P. Horner. 1997. Roosting ecology of two rare vespertilionid bats, the southeastern myotis and Rafinesque's big-eared bat, in east Texas. 1996 Annual Report. Texas Parks and Wildlife Dept. Austin, Texas. 48pp.

Nabuurs, GJ., O. Masera, K.Andrasko, P. Benitez-Ponce, R. Boesr, M. Dutschke, E. Eisiddig,J. Ford-Robertson, P. Frumhoff, T. Karjalainen, O.Krankina,W.A.Kurz,M. Matsumoto, W. Oyhantcabal, N.H.Ravindranath, MJ. Sanz Sanchez, X.Zhang. 2007. Forestry. In Climate Change 2007: Mitigation. Contribution of working group IIIto the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B.Metz,O.R.Davidson, P.R.Bosch, R.Dave, LA. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdomand NewYork,NY,USA.

NatureServe Explorer: An online encyclopedia of life [web application]. 2007. Version 6.1. Arlington, Virginia. USA: NatureServe. Available: http://natureserve.org/explorer.

Neary, D. and J. L. Michael. 1996. Herbicides-Protecting Long-Term Sustainability and Water Quality in Forest Ecosystems. New Zealand Journal of Forestry Science 26(1/2): pp 241-264

Oberholser, H. C. 1974. Bachman's sparrow. Pages 917-918 *in* The bird life of Texas, Vol. 2. Univ. Of Texas Press, Austin, Texas.

Orzell, S.L. 1990. Texas Natural Heritage Program Inventory of National Forests and National Grasslands in Texas. Texas Natural Heritage Program. Texas Parks and Wildlife Department. Austin, Texas. 526pp.

Osiecka, A. and P. J. Minogue, 2010. Considerations for Developing Effective Herbicide Prescriptions for Forest Vegetation Management. Document FOR273 of the School of Forest Resources and Conservation Department, University of Florida: Institute of Food and Agriculture Science.

Philipps, Thomas. 2007. Species descriptions for the proposed additions to the sensitive species list. On file at the Angelina Ranger District, Zavalla, Texas, 111 Walnut Ridge Road, 75980.

Price, A.H., R.L. Orr, R. Hornig, M. Vidrine, S.L. Orzell. 1989. Status Survey for the Big Thicket Emerald Dragonfly (*Somatochlora margarita*). Draft Report.

Prud'homme, B.A., and J.G. Greis. 2002. "Chapter 22 (AQUA-4): Best Management Practices in the South." In *Southern Forests Resource Assessment*, Gen. Tech. Rep. SRS-53. Asheville, NC. USDA Forest Service, Southern Research Station.

Reid, Jeffrey. 2006. 2006 Bear Report. December 2006, Black Bear Task Force meeting (On file with the National Forest and Grasslands in Texas, Supervisor's Office, Lufkin, Texas).

Rudolph, D.C. and R.N. Conner. 1991. Cavity selection by red-cockaded woodpecker in relation to tree age. Wilson Bulletin 103(3), pp 458-467.

Rudolph, D.C., R.N. Conner, R.R. Schaeffer. 1995. Red-cockaded woodpecker detection of red heart infection. *in* Kulhavy, D.L. et al. eds. Red-cockaded woodpecker: Recovery, Ecology, and Management. Nacogdoches, Tx: Center for Applied Studies in Forestry, College of Forestry, Stephen F. Austin Univ. 338-342.

Rudolph, D. C. and S. J. Burgdorf. 1997. Timber rattlesnakes and Louisiana pine snakes of the west gulf coastal plain: hypothesis of decline. Texas J. Sci. 49 (3) Supp. 111-122.

Rudolph, D.C., S. J. Burgdorf, J.C. Tull, M. Ealy, R.N. Conner, R.R. Schaeffer, and R.R. Fleet. 1998. Avoidance of Fire by Louisiana Pine Snakes (*Pituophis melanoleucus ruthveni*). Herpetological Review, 29(3).

Rudolph1, D.C., S.J. Burgdorf1, R.R. Schaefer, R.N. Conner1, and R.W. Maxey. 2006. Status of Pituophis ruthveni (Louisiana Pine Snake). Southeastern Naturalist. 5(3):463-472.

Richard N. Conner1, and Ricky W. Maxey3 Texas Parks and Wildlife Department. 2005. East Texas Black Bear Conservation and Management Plan. 2005-2015. Austin, Texas. 56pp.

Ryan, Michael G. 2008. Forests and Carbon Storage. (June 4, 2008). U.S.Department of Agriculture, Forest Service, Climate Change Resource Center. Available: http://wwwJs.fed.us/ccrc/topics/carbon.shtml

SERA (Syracuse Environmental Research Associates, Inc.), 2003a. Triclopyr – *Revised Human Health and Ecological Risk Assessment. Final Report*. March 15, 2003. SERA TR-02-43-13-03b. 264 pages.

SERA (Syracuse Environmental Research Associates, Inc.), 2003b. Triclopyr acid – *EXCEL Worksheets for Human Health and Ecological Risk Assessments*. Version 2.04. February 25, 2003. SERA EXWS 01-43-15-01c.

Underwood, Roger, David Packham, and PhilCheney. 2008. Bushfires, prescribed burning and global warming. Bushfire Fron Inc Occasional Paper No. 1. Available: http://bushfirefront.com.au/opinion/occasional-papers.

USDA Forest Service, Southern Region. 1989. Final Environmental Impact Statement and Record of Decision for Vegetation Management in the Coastal Plain/Piedmont. Atlanta, Georgia.

_____. 1999. Roads Analysis: Informing Decisions about Managing the National Forest Transportation System. Misc. Rep. FS-643. Washington, D.C.: U.S. Dept. of Agriculture Forest Service. 222 p.

_____. 1996. Final Revised Land and Resource Management Plan for the National Forests and Grasslands in Texas. Lufkin, Tx. 308 pp.

_____. 1996. Final Environmental Impact Statement (FEIS) for the Revised Land and Resource Management Plan, National Forests and Grasslands in Texas. USDA Forest Service, 286 pp.

_____. 2003. Cumulative effects analysis for water quality and associated beneficial uses. National Forests in Texas. Internal unpublished report. Southern Region. 21 pp.

_____. 2003. Angelina National Forest. Forest-Scale Roads Analysis Report. National Forests and Grasslands in Texas internal unpublished report. Southern Region. 148 pp.

_____. 2007. Forestry – Use Pesticides – Lables, Material Safety Data Sheets, and Other Supporting Information. Southern Region report. 283 pp.

_____. 1995. Southern Region. Final Environmental Impact Statement and Record of Decision for Management of the Red-cockaded Woodpecker on Southern National Forests. Atlanta, Georgia. 758 pp.

_____. 2004. Southern Region. National Forests and Grasslands in Texas; Monitoring and Evaluation Report. (On file with the National Forest and Grasslands in Texas, Supervisor's Office, Lufkin, Texas).

U.S. Department of Interior. Fish and Wildlife Service. 1989. Southeastern states bald eagle recovery plan. Prepared by Thomas M. Murray. April 1989.

U.S. Department of Interior. Fish and Wildlife Service. 1995. Louisiana Black Bear (Ursus americanus luteolus) Recovery Plan. Jackson, Mississippi. 52pp.

U.S. Department of Interior. Fish and Wildlife Service. 1996. Biological Opinion on the U.S. Forest Service National Forests and Grasslands in Texas Revised Land and Resource Management Plan, Environmental Impact Statement, and Record of Decision of 1996. Prepared by Jeffrey Reid. March 1996.

U.S. Department of Interior. Fish and Wildlife Service. 1998. Endangered Species Act Consultation Handbook. Procedures for conducting Section 7 consultations and conferences. U.S. Fish and Wildlife Service, National Marine Fisheries Service.

U.S. Department of Interior. Fish and Wildlife Service. 2000. Loggerhead Shrike Status Assessment. Bloomington, Indiana. 101pp.

U.S. Department of Interior. Fish and Wildlife Service. 2003. Recovery plan for the red-cockaded woodpecker (Picoides borealis): second revision. Atlanta, Georgia. 296pp.

U.S. Department of Interior. Fish and Wildlife Service. 2006. National Bald Eagle Management Guidelines. 22pp.

Van Kley J.E., R.L. Turner, L.S. Smith, and R.E. Evans. 2007. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain: 2nd approximation. The Nature Conservancy and Stephen F. Austin State University, Nacogdoches, Texas, USA. 379pp.

Williams, J.D., M.L. Warren, Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1993. Conservation Status of Freshwater Mussels of the United States and Canada. U.S. Fish and Wildlife Service, National Fisheries Research Center, Gainesville, FL. 18(9).