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# Environmental Assessment

## Greasy Creek Project

Project Number: 35089
Ava/Cassville/Willow Springs Ranger Districts
Mark Twain National Forest
Douglas County, Missouri

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## ON THE COVER:

**An historic woods road crossing at Greasy Creek.**

***Photo by: Antoinette Sittingup***

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**UNITED STATES DEPARTMENT OF AGRICULTURE**

**Forest Service**

**Eastern Region**

**Mark Twain National Forest**

**Ava/Cassville/Willow Springs Ranger District**

**Douglas County, Missouri**

# GREASY CREEK PROJECT

# ENVIRONMENTAL ASSESSMENT


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**Abstract:** *This Environmental Assessment (EA) describes the direct, indirect, and cumulative effects for proposed activities in two alternatives for the Greasy Creek Project. The purpose of the project is to enhance natural communities and improve forest health conditions while providing a variety of dispersed recreational uses and timber products. This project is needed to address declines in forest health and native plant communities, and deteriorating Forest road conditions.* ***Alternative 1*** *(No Action) – This alternative would not implement any new management activities; however routine maintenance of the existing Forest Service constructed roads would continue.* ***Alternative 2*** *(Proposed Action) – This alternative would provide opportunities for vegetation management, roads management, prescribed fire, and wildlife habitat improvement activities, as well as non-native invasive species control.*

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# CHAPTER 1: PURPOSE AND NEED FOR ACTION

## INTRODUCTION

The Forest Service (USFS) has prepared an Environmental Assessment (EA) for the Greasy Creek Project area, located in northeastern Douglas County, Missouri. This EA complies with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. It discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. It also provides supporting information for a determination to prepare either an Environmental Impact Statement or a Finding of No Significant Impact.

Additional documentation, including more detailed analyses of project-area resources, can be found in the project planning record located at the Ava/Cassville/Willow Springs Ranger District Office. If it is determined that an Environmental Impact Statement is not warranted at this time, a final decision on this proposed action should be made during June 2012.

The EA is organized into four chapters:

**Chapter 1: Purpose and Need for Action:** The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

**Chapter 2: Alternatives Considered:** This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the interdisciplinary team, the public, and other agencies. Summary tables of the proposed activities for each alternative are provided at the end of each section.

**Chapter 3: Environmental Effects:** This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by Physical, Biological and Social Environments; individual resource topics are addressed under each of these headings. Each resource discussion will include short-term uses, long-term productivity, and cumulative effects of each alternative proposed for implementation. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

**Chapter 4: Consultation and Coordination:** This brief section provides a list of preparers and agencies consulted during the development of the environmental assessment.

**Appendices:** The appendices provide more detailed information to support the analysis presented in the preliminary assessment.

## LOCATION, SETTING AND BACKGROUND

### Analysis Area Location and Setting:

The Greasy Creek Project is located on approximately 2,987 acres of National Forest System (NFS) lands in the northwestern part of the Willow Springs Unit of the Mark Twain National Forest (MTNF). The legal description for the area is T27N, R11W, Sections 9-11, 14-17, and 21-23 in Douglas County, Missouri. It is located approximately five miles south of Cabool, Missouri (see attached map). The project area is bounded by State Highway 181 on the east side; County Road 160 to the north; County Road EE-160 along the

northwestern edge; the North Fork River along the southwestern edge; and an unnamed tributary of the North Fork along the south edge in Sections 21 and 22.

The project area lies within the White River Hills subsection of the Ozark Highlands State Natural Division. Roughly 55 % of the area is classified as the North Fork River Oak-Pine Woodland/Forest Hills Landtype Association (LTA) (OZ4o). The topography of this LTA is characterized by broad ridges that give way to steep slopes of narrow, sinuous valleys. The valleys are lined with low cliffs and many seep-fed moist cliffs that support rare species. Caves, springs, and losing streams are among the common karst features found in this LTA. Local relief is 200-350 feet. Historically, pine-oak woodland occupied the higher elevations and graded into oak-pine and mixed-oak forest in deep valleys. More recently, the area has converted to second growth oak forest with scattered pine plantings. The remaining 45% of the area is in the North Fork Pine-Oak Woodland Dissected Plain LTA (OZ4p). This LTA is represented by a narrow, dissected plain that borders the eastern edge of the North Fork River basin. It is moderately dissected with local relief of 150-250 feet and principally includes the dissected plain on Roubidoux sandstone where shortleaf pine is native. Both shortleaf pine and pine-oak woodlands grow there now as in the past. Currently, it is a nearly even mixture of pasture interspersed with pine and oak-pine forest (Nigh and Schroeder 2002).

The dominant soil types in the project area are somewhat excessively drained to well drained Paleudults and Paleudalfs on ridges and side slopes; the moderately well drained Fragiudults on slopes; the somewhat excessively drained, shallow Hapludolls and areas of rock outcrop on steep, dissected landscapes; and the Udifluvents on flood plains and Hapludalfs on terraces in stream valleys. The dominant soil mapping units are the Scholten-Poynor-Tonti (38%) and the Coulstone-Scholten-Captina (62%) associations. The project area lies immediately east of the North Fork River in northeastern Douglas County, Missouri. The land is drained by Greasy Creek and several other unnamed streams that are part of the North Fork River watershed (Hydrological Unit 11010006) which flows south and empties into Norfork Lake in Ozark County, Missouri. From there, it flows south to the Middle White River watershed (HUC 11010004) downstream in Arkansas. The region is characterized by a well-developed karst terrain with many caves, springs, sinkholes, and gaining and losing streams.

**Background:**

In recent history, notable drought events, late frosts, ice storms, and outbreaks of spring defoliators have stressed trees in the area. Older, suppressed, and otherwise weakened trees have become susceptible to additional stress agents such as root rots, wood-boring insects, and fungal cankers. The combination of all these factors contributes to decline and death of trees that could otherwise withstand these factors individually, and is called oak decline. Much of the red oak group (black, scarlet, and northern red oaks) in the area, originated with the abandonment of the agricultural practices and rural development of the early 1900's. Consequently, the age of the red oak group is nearing biological maturity which is around 80-90 years old. This advanced age makes the red oak group more susceptible to decline than trees of the white oak or pine groups which are not as close to the end of their biological life cycles. As a result, much of the project area is in a state of severe decline. Where red oak was once a dominant forest type, white oak, and mixed oak and hickory forests are becoming more common.

## FOREST PLAN GOALS, DIRECTION, AND DESIRED CONDITIONS

### The Role of the Forest Plan

The 2005 Land and Resource Management (2005 Forest Plan) provides a programmatic framework regarding allocation of land and the measures necessary to protect National Forest resources. It describes how different areas of the MTNF should be managed and what resources should be provided by these lands now and in the future. The Forest Plan Final Environmental Impact Statement (FEIS) displays the forest-wide effects of

activities such as timber harvest, wildlife habitat management, recreation management, and visual resource management. Since the site-specific effects of activities planned for this project were not addressed as part of the Forest Plan FEIS, an environmental assessment will be prepared to analyze the site-specific, management activities included in this proposal. A copy of the 2005 Forest Plan can be found at: http://www.fs.usda.gov/detail/mtnf/landmanagement/?cid=fsm8_045643

## Forest-wide Goals and Objectives

The 2005 Forest Plan establishes goals and objectives for the management of the Mark Twain National Forest. These goals and objectives convey what the desired condition of forest resources will be in the foreseeable future and are the basis for all project-level planning. The standards, guidelines, and management prescriptions contained in the 2005 Forest Plan set parameters which guide the management direction of project-level planning and implementation. Project approval must be consistent with these parameters (16 U.S.C. 1604(i)).

The Greasy Creek Project is designed to meet the Forest-wide Goals and Objectives as stated in Chapter 1 of the Forest Plan. Activities in this project would contribute to the social and economic well-being of local communities by providing a variety of uses, values, and products that are within the capabilities of the land. The proposed Greasy Creek Project would move resource conditions toward the desired state by meeting the following Forest-wide goals and objectives summarized below.

Goals:

Goal 1.1 – Maintain, enhance, and restore site appropriate natural communities, including the full range of vegetation composition and structural conditions.

Goal 1.2 – Maintain desired ecosystems throughout the forest with few occurrences of non-native invasive species. Prevent new invasions and control or reduce existing occurrences of non-native invasive species.

Goal 1.3 – Minimize erosion and compaction. Restore and maintain soil productivity and nutrient retention capacity. Protect the water quality and integrity of the watershed on Forest lands. Maintain healthy, sustainable, and diverse natural communities. Prevent wetland degradation and loss, and restore and enhance wetlands when possible. Establish and maintain riparian management and watercourse protection zones.

Goal 1.4 – Provide the range of natural habitats necessary to support populations of existing native plant and animal species. Restore and manage natural communities as the primary means of providing quality terrestrial, karst, and aquatic wildlife and rare plant habitat. Provide specialized habitats that are a healthy, functioning part of the larger landscape and require no special protection or additional management considerations. Provide specialized habitat components across the landscape in amounts and types commensurate with the natural communities in which they occur. Encourage habitat that responds to demand for both consumptive and non-consumptive fish and wildlife use.

Goal 2.1 – Within the capability of sustainable ecosystems, offer multiple benefits that contribute to the social and economic well-being of the local and regional communities by providing a variety of uses, values, products, and services in a cost effective manner for present and future generations. Provide accessibility of the full range of uses, values, products, and services to members of underserved and low-income populations.

Goal 2.2 – Re-establish the role of fire in natural communities of the Ozarks, and reduce hazardous fuels while lowering the wildland fire risk to surrounding communities.

Goal 2.3 – Develop and maintain a transportation system which provides the minimum permanent road access needed to meet resource management objectives. Provide temporary road access that complements the permanent road system for effective resource management. Decommission unneeded roads.

Goal 2.4 – Use timber management, where appropriate, to restore or enhance degraded natural communities, sustain healthy and productive forest, and reduce hazardous fuels. Provide timber and wood products to help support sustainable local industry and economic interests.

Goal 2.7 – Within the capability of sustainable ecosystems, provide range forage on openlands in response to demand. Encourage the restoration, establishment, and management of native grass communities on ecologically appropriate sties. Restore and sustain the distribution and quality of native vegetation in range management units by increasing species diversity and eliminating the spread on non-native invasive species. Mange cool season pastures to provide quality forage that includes a variety of cool season grasses and forbs.

Goal 2.8 – Provide a diversity of recreational opportunities and benefits through a variety of settings.

Goal 2.9 – Maintain or enhance the quality of scenic resources to provide desired landscape character.

Goal 2.10 – Support preservation of the cultural heritage of Missouri by identifying, protecting, managing and interpreting heritage sites.

Objectives:

Objective 1.2a – Control a minimum of 2,000 acres of existing noxious or non-native invasive species over the plan period.

Objective 1.3b – Restore or enhance 125 acres of bottomland hardwood forest.

Objective 1.4a – Improve open woodland conditions on at least 10,500 acres to provide habitat for summer tanager, northern bobwhite, Bachman's sparrow, and Eastern red bat.

Objective 1.4b – Increase the proportion of managed native grasslands to that of exotic cool season grasses from the current 46% native grass to 55% native grass to provide habitat for northern bobwhite.

Objective 1.4c – Maintain forest, closed woodland or open woodland cover over 85% or greater of Mark Twain National Forest acres to provide habitat for worm-eating warbler.

Objectives 1.4d – Treat at least 4,000 acres of glades or reduce woody vegetation to provide habitat for Bachman's sparrow.

Objective 2.2a – In addition to the traditional late-winter through early-spring burn season, facilitate restoration treatments that emulate the range of natural variability for historical fire regimes in glades, savannas, and pine woodlands by prescribed burning up to 40% of total projected burn acres from September through December.

Objective 2.2b – Use prescribed fire to reduce hazardous fuels and improve Fire Regime Condition Class on 45,000 acres or more per year.

## Forest-wide Standards and Guidelines (S & G)

Standards and guidelines are permissions or limitations that apply to on-the-ground implementation of management practices. Standards and guidelines in Chapter 2 of the Forest Plan apply to all management practices for the entire Mark Twain National Forest. Where Forest-wide Standards and Guidelines are different from those for a management prescription, the management prescription standard applies. If a specific resource is not addressed in a management prescription, then only the Forest-wide Standards and Guidelines apply.

Resource managers that implement projects under this environmental analysis and ultimate decision will refer to the 2005 Forest Plan, Standards and Guidelines to execute legal documents (e.g. recreation or timber sale contracts and clauses). Forest-wide Standards and Guidelines with direction that applies specifically to this project are found in Chapter 2 of the 2005 Forest Plan as follows:

Forestwide Standards and Guidelines for Vegetation Management (Forest Plan, page 2-2). Mimic ecosystem dynamics, patterns, and disturbance processes to achieve desired conditions except where ecological recovery is

unlikely or unfeasible.

Forestwide Standards and Guidelines for Non-Native Invasive Species (NNIS) Management (Forest Plan, page 2-2). Prioritize areas of NNIS for treatment based on threats to resources, species status, relationship to boundaries, size of the infestation, potential for further spread and effectiveness of available control measures. Include NNIS control and prevention clauses in contracts and permits as needed. Grazing of livestock other than cattle and horses may be used for biological control of NNIS.

Forestwide Standards and Guidelines for Caves and Abandoned Mines (Forest Plan, page 2-11). Mechanically constructed firelines for prescribed burns shall be located at least 100 feet from known cave and abandoned mine entrances. Hand constructed firelines shall be located at least 50 feet from cave and abandoned mine entrances. Prohibit timber harvest activities within 100 feet of the edge of a cave entrance.

Forestwide Standards and Guidelines for Constructed Waterholes and Wildlife Ponds (Forest Plan, page 2-14). Manage and rehabilitate existing waterholes as a priority over constructing new ones. Maintain several large (at least 4-inch dbh) pieces of downed woody material (logs, stumps, and large branches) along the north bank of constructed ponds, partially submerged in the water. Remove trees and shrubs along the pond bank only if needed to prevent roots from penetrating the dam.

Forestwide Standards and Guidelines for Snags, Dens, Cavity Trees, and Downed Woody Debris (Forest Plan, page 2-14). Whenever vegetation management is undertaken, leave standing dead trees, cavity or den trees, and downed woody material whenever possible, while providing for public safety and the achievement of resource management goals and objectives.

Forestwide Standards and Guidelines for Prescribed Fire (Forest Plan, page 2-15). Emphasize large burns using year-round prescribed burning to meet management direction as appropriate to ecosystems involved and project objectives. Re-vegetate soils disturbed by constructed firelines by encouraging growth of existing on-site vegetation where possible. If heritage resources or human remains are discovered during project implementation, halt the work near the find until a professional archaeologist assesses the situation. Use best available smoke management practices to minimize adverse effects on public health, public safety, or visibility from prescribed fire. Minimize the impact of smoke for each prescribed fire by identifying smoke-sensitive areas, using best available control measures, monitoring smoke impacts, and following applicable guidance.

Forestwide Standards and Guidelines for Pesticide Use (Forest Plan, page 2-19). Use pesticides only after alternative analysis clearly demonstrates that pesticide use is the most effective means to meet overall management objectives. The use of pesticides must comply with the product label. Areas treated with pesticides shall be signed, as appropriate, to ensure users are informed of possible exposure. Use the least impacting application method needed for effective control of the target species.

Forestwide Standards and Guidelines for Rangeland Management (Forest Plan, page 2-20). Haying is allowed within the Riparian Management Zone (RMZ) and Watercourse Protection Zone (WPZ) only if it meets the management area direction and contributes toward meeting the desired condition. Fertilization shall not be allowed within RMZ, WPZ, on glades or other natural communities. Fertilization on cool season pastures should be done primarily for desirable legume establishment and maintenance. Within allotments, retain all living shagbark hickory and shellbark hickory, white oak, lightning struck trees and cavity trees with a diameter 12 inches or more, unless necessary to protect structures, private property or to maintain public and firefighter safety.

Forestwide Standards and Guidelines for Timber Management (Forest Plan, page 2-27). Use silvicultural systems, harvest methods, and intermediate treatments to move the forest towards the desired condition. Intermediate harvests should generally leave the oldest and or largest trees to meet basal area objectives. Space reserve trees and reserve tree groups to mimic natural community structure and composition. Apply precommercial treatments to each entry to achieve structural objectives for stands managed under uneven-aged

silvicultural systems. Management objectives should be met through commercial practices or through firewood cuts when feasible. Salvage timber resources damaged by natural or man-caused disturbance events when salvage activities are compatible with overall resource goals and objectives, management prescriptions, or to protect public safety. Salvage of dead or dying timber and other sanitation removals may occur in the RMZ, when the riparian values are protected and the activities are needed to protect public safety, resource values, and maintain the health of the forest.

Forestwide Standards and Guidelines for Transportation System - Temporary Roads (Forest Plan, page 2-39). Stream channels and drainages shall not be used as travel ways for any mechanized equipment. Temporary roads are prohibited within the RMZ and WPZ except at designated locations. Decommission temporary accesses when no longer needed for the purpose for which it was developed.

## Management Area Prescriptions

Management prescriptions provide direction to help achieve goals and objectives expressed at the forest level. Management prescriptions define where differing types of opportunities and experiences are available to the public, and where a variety of management practices may be carried out. They identify proposed and probable practices and actions appropriate to achieve the desired conditions. All management prescriptions provide multiple uses, even though their titles may imply a single use.

Management prescriptions are applied to geographical units on the ground, which are called Management Areas. The 2005 Forest Plan assigns management prescriptions to accomplish a desired condition and identifies the project area within **Management Prescription 2.1** (MP 2.1). This management prescription emphasizes multiple use resource objectives while allowing for enhancement of natural communities, improvement of forest health conditions, and roaded natural recreation experiences.

### Management Prescription Goals

Management Prescription goals are concise statements that describe the primary purpose or aim of the management prescription.

The goals for Management Prescription 2.1 are:

- Provide a variety of uses, products, and values by managing within the capability and resource potential appropriate to natural communities and the landscape.
- Manage terrestrial and aquatic natural communities to enhance and retain their characteristic ecological elements.
- Provide a wide diversity of habitats to meet the needs of plants, fish, and wildlife species distributed across the Forest.

### Management Prescription Desired Conditions

Desired conditions are characteristics and conditions expected because of the prescribed management. They provide a snapshot of what resources will look like when goals, objectives, standards, and guidelines are met. Desired conditions can apply to the present or future and do not consider cost.

The Forest Plan desired conditions for Management Prescription 2.1 are:

- Vegetation consists of a variety of stand sizes, shapes, crown closures, and age structures in patterns that simulate the structural variability of natural communities.
- Areas exhibiting old growth characteristics comprise 8% to 12% of the management area.
- Regeneration openings comprise 8% to 15% of each management area. From 1% to 5% of these regeneration openings are ≤ 2 acres in size.

- Natural communities are distributed similar to historical vegetation patterns.
- Recreational opportunities provide for interaction between users ranging from moderate to high depending on the specific location.

## PURPOSE AND NEED FOR THE PROPOSED ACTION

**Purpose and Need:**

The Ava/Cassville/Willow Springs Ranger District is proposing this action for the purposes of enhancing natural communities and improving forest health conditions while providing a variety of dispersed recreational uses and timber products. This project is needed to address declines in forest health and native plant communities, and deteriorating Forest road conditions.

The mosaic patterns, structure, age-class distribution, and composition of open woodland, closed woodland, and forest areas within the Greasy Creek Project area have departed from their historic range of natural variability (RNV) due to a lack of natural disturbances, such as fire. The recent development of oak decline, particularly among the red oak group, has further complicated this departure from RNV. The RNV is the variation of physical and biological conditions and disturbance factors that influence composition, structure, distribution, and dynamics of natural communities before European settlement of North America.

The goals of this project are as follows:

- Use a variety of timber management practices and prescribed fire to enhance the condition of terrestrial natural communities and reduce hazardous fuels while providing timber and wood products to the local economy.
- Reduce and control existing populations of non-native and invasive plant species that threaten native plant communities.
- Provide the range of natural habitats necessary to support populations of existing native plant and animal species.
- Maintain a transportation system which provides the minimum permanent road access needed to meet resource management objectives and provide roaded recreation opportunities.
- Decommission unneeded roads and user-created trails that pose the greatest risk to public safety and are potentially detrimental to watershed conditions.

**Existing Conditions:**

Approximately 69% of the area is considered upland forest and closed woodland complexes located on ridges and side slopes. These complexes are comprised of shortleaf pine, oak/pine, red oak group, white oak, and mixed oak. Approximately 76% is oak and oak/hickory and 17% is shortleaf pine. Pure pine stands were planted in 1934 and 1950. Roughly 69% of the project area exhibits basal areas exceeding 70 and the average stand diameter (dbh) is 8 inches. Approximately 66% is in sawtimber size classes. Having reached maturity, the average age of red oak group stands is 73 years. Many of these stands are showing signs of decline and are vulnerable to attack by insects and disease. Many of the trees are already dead or have been blown over.

There are approximately 4.9 miles of National Forest “system roads” and 2.5 miles of “non-system roads” within the project area. System roads are under the jurisdiction of the Forest Service and are determined to be needed for long-term motorized access. Non-system roads are roads on NFS lands that are not managed as part of the Forest Transportation System, such as unplanned roads, abandoned travel ways, and off-road vehicle trails that have not been designated and managed as a trail.

There are approximately 5.7 miles of roads and streams that would be used as existing fire lines within the project area. Approximately 3.6 miles of additional line would be constructed. Of this, approximately 3.0 miles would be constructed using a dozer while 0.6 miles would be constructed using manual labor.

There is one 12-acre hay allotment in the project area. This area, known as the Highway 181 haying area, contains both cool season and native, warm- season grasses. It is currently being managed under the ACW Openlands Haying Project Decision Memo signed on May 9, 2008.

**Desired Conditions:**

Historically, shortleaf pine was the predominant overstory species mixed with post oak and white oak. The majority of the area was open woodlands which were located on the side slopes. The understory of open woodlands consisted of scattered grasses, sedges, and forbs. There was 30-50% leaf-litter cover and shrubs made up 20-40 % of the understory. Closed woodlands were located predominately on broad ridges and narrow bottoms. The understory consisted of shrubs and scattered sparse grasses, sedges, and forbs. There was 100% leaf litter cover and shrubs made up 5-10% of the understory. The steepest north and east-facing portions of side-slopes were upland forests. These areas had moderately deep leaf litter, and sparse ground cover. Shrubs made up 50% of the area in small openings or wind gaps (2 acres) and were less than 5% of the understory elsewhere. Wind gaps are defined here as a shallow notch or narrow dry valley in the crest of a ridge. The lower reaches of major bottoms were bottomland hardwood forests, generally composed of white and black oak mixed with some hickory. These areas were multi-layered, uneven-aged with few gaps. Ground cover was deep leaf litter and ephemeral herbs.

The following table represents a range of desired conditions for natural community types found within the project area.

**Table 1.1 Desired conditions for natural community types in the project area (2005 Forest Plan, Appendix A, Table A-2)**

| Natural Community Types | % Overstory Canopy | Overstory Basal Area (sq. ft.) | % Shrub Layer | Ground Cover | % Ground Cover |
|---|---|---|---|---|---|
| Open woodland | 40 - 70 | 40 - 70 | 20-40 | Scattered grasses, sedges and forbs; 30 – 50% leaf litter cover | 30 - 40 |
| Closed woodland | 70 - 90 | 80 - 100 | 5-10 | Scattered sparse grasses, sedges and forbs; 100% leaf litter cover | 20 - 30 |
| Upland forest | 90 - 100 | 80 – 100 | 50% in 2 acre openings/gaps; < 5 % elsewhere | Moderately deep leaf litter; sparse ground cover | < 30 |

Natural communities within the project area could be enhanced by maintaining most of the existing shortleaf pine in the overstory and encouraging pine regeneration on ridges and side slopes. Within riparian areas, the natural communities are largely in good condition. No harvesting activity is needed to enhance riparian areas. Forest health could be improved by management activities that would remove declining, mature and fire-damaged trees. The proposed action would achieve these goals while providing roaded recreation access to dispersed recreation areas.

Under the proposed action, a combination of commercial harvest, non-commercial treatments, and prescribed fire would be used to move the area toward the desired condition. The desired condition consists of a variety of stand sizes, shapes, crown closures, and age structures in a pattern that simulates the structural variability of

natural community types similar to historical vegetative patterns. Changing conditions from existing to desired will take several decades. In some areas, restoration of the natural communities may never be possible due to the inability to use prescribed fire, protection of areas for other resource needs, or a general inability to manipulate the vegetation.

Besides enhancing natural communities, other connected actions would occur. Forest Service system roads that are needed for long-term access would be reconstructed and maintained to engineering standards. Roads that are not needed for long-term access, pose a threat to public safety, or are contributing to poor watershed conditions would be decommissioned. Populations of non-native, invasive plant species that threaten native plant communities would be either eradicated or controlled. Vegetation management would be conducted according to 2005 Forest Plan guidance and in a manner that enhances the recreation experience.

Timber stand boundaries within the project area were revised based on the terrestrial natural communities (TNC) present and desired conditions for the area. Generally, adjustments were made by combining several small stands into one that best represented the natural community designation for each revised stand area. Figure 1 (appendix) depicts the relationship between the revised stand boundaries and the terrestrial natural communities found in the project area. The previous stand boundaries and more information on the stand boundary revision process are available upon request.

## DECISION FRAMEWORK

The District Ranger of the Ava/Cassville/Willow Springs District is the responsible official for selecting an alternative for the Greasy Creek Project. Based on the environmental analysis, Forest Plan direction, and results of public involvement, the Deciding Official must decide whether to proceed with a specific action. If the action alternative is selected, the decision may include mitigation measures in addition to the 2005 Forest Plan Standard and Guidelines.

The decision is not one of land allocation, nor is the analysis intended to look at every combination of activities. The scope of the decision would be confined to a reasonable range of alternatives that would meet the project's purpose and need.

## PUBLIC INVOLVEMENT

Letters of notification announcing the availability of the project proposal for 30-day comment were mailed on May 5, 2011 to 157 interested and affected parties to invite comment on the proposed action. The scoping and 30-day comment periods required by 36 CFR 215 ran concurrently since the nature of this project is low in complexity, is conducted routinely, and the environmental effects are highly predictable. A legal notice was published in the Springfield News-Leader on May 9, 2011, notifying the public of the opportunity to comment on the Greasy Creek Project. Project documents, including the Public Comment Package, have been posted on the Mark Twain National Forest web-site since May 2011 and the project is listed on the Forest-wide Schedule of Proposed Actions (SOPA).

The District received five responses to the public comment package. All comments received were reviewed by the District Ranger and the Interdisciplinary Team (IDT). Two individuals were jointly concerned that a portion of the proposed project area adjoined their property and that proposed activities might impact the value of their property; nevertheless, they stated that the project was a "good idea" and would "greatly improve the forest". One respondent supported all proposed activities but added that trash needed to be removed and that a wet area or "mud pit" on the northern edge of the project area needed to be drained and protected from additional damage caused by motor vehicle access and sport "mudding". One respondent stated that letters used

to notify the public of the availability of the project for public comment were insufficient and that web-posting of project documents is inadequate. One respondent was concerned that the aesthetic quality along Blue Buck Knob Scenic Byway would be affected; and additionally, that no "old growth" timber was being designated in the project area. One respondent provided information on privately-owned caves in the vicinity of the project area. Detailed responses to comments can be found in the project record and are available by request.

The IDT developed the issues and alternatives analyzed in the Environmental Assessment (EA) based on comments received during the 30-day comment period and internal and external issues brought forward during scoping. No new issues were identified during the 30-Day Comment period and no new alternatives were developed as a result. This EA has been prepared as permitted by our regulations for notice, comment and appeal (36 CFR 215, published in the Federal Register Vol. 68, No. 107, pages 33581-33602).

## ISSUES

In accordance with laws and regulations, factors such as vegetation, wildlife, threatened and endangered species, water and air quality, and cultural resources will be addressed in the analysis. The Deciding Official and the IDT identified project issues and separated them into two groups: key issues and non-key issues. Key issues were identified as those directly or indirectly caused by implementing the proposed action. Non-key issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision being made; or 4) conjectural and not supported by scientific or factual evidence. The Deciding Official reviewed and concurred with the key and non-key issues. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7,"…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

Key issues create a foundation for the EA, both in terms of alternative development and for analyzing environmental effects. The purpose of soliciting comments is to determine where there are any unresolved issues that affect a resource, the proposed action or another alternative. Issues and concerns originating from public comments and internal agency concerns are identified for analysis. After reviewing the comments from the public, other agencies, and organizations, the interdisciplinary team identified three key issues, listed below and addressed in Chapter 3. Based on public input and specialist input, this project does not present any highly controversial issues.

- **Issue 1: Maintaining shortleaf pine:** Shortleaf pine was once the predominant overstory species in portions of this area. Pine currently is being replaced by hardwoods.
- **Issue 2: Protection of caves, springs, sinkholes, and riparian areas:** There are caves, springs, sinkholes and riparian areas within the project area. Due to the area's karst topography, it is important that these features are protected to maintain their natural functions.
- **Issue 3: Declining forest health:** The general health of the forest in this area is declining from a combination of factors. A major component of forest stands in the project area is red oak species. These trees have reached physiological maturity and are declining.

# CHAPTER 2: ALTERNATIVES CONSIDERED

## INTRODUCTION

This chapter describes and compares alternatives for the Greasy Creek Project Environmental Assessment. It includes a description of each alternative to be considered by the Responsible Official in making a decision. This chapter also presents the alternatives in comparative form, defining the difference between each alternative and providing a clear basis for choice among options by the decision-maker and the public. The comparison is based on the objectives identified in Chapter 1.

## FORMULATION OF ALTERNATIVES

The Interdisciplinary Team analyzed both internal and external comments received during the public comment period. Alternatives were developed to respond to unresolved issues as related to the purpose and need for this project, including laws, regulations, and policies that govern land use on National Forest System (NFS) lands. Alternatives, both those considered in detail and those eliminated from further study, display a range of options which could be used to implement the Greasy Creek Project. Management needs and opportunities, as determined by site-specific investigations, were also considered in this process.

Viable alternatives, such as Alternative 2, must meet the Purpose and Need for the project and address any key issues. A "No Action" alternative (Alternative 1) must also be included as one of the alternatives. No additional alternatives or key issues were brought forward during the 30-Day Comment period or from the IDT's subsequent analysis of public comments and project issues.

## DESCRIPTIONS OF ALTERNATIVES CONSIDERED IN DETAIL

The following is a description of alternatives analyzed in detail by the Interdisciplinary Team. All changes would be evaluated to ensure that any effects are within the parameters of effects analyzed in this document and would be documented in the Greasy Creek Project administrative record. Pertinent Forest Plan Standards and Guidelines designed to mitigate effects of implementing each alternative are listed in the **Forest Plan Goals, Direction, and Desired Conditions** section (pp. 6-10) of this document. Maps depicting activities that would be implemented under the action alternative are presented in **Appendix D** of this document.

## THE PROPOSED ACTION AND PRELIMINARY ALTERNATIVES

This section provides a detailed description of the alternative methods for achieving the project's purpose and need. The alternatives were developed based on issues raised by the IDT, the public and other agencies.

### Alternative 1 – No Action

No vegetation management, prescribed burning, noxious weed control, wildlife habitat management, or transportation management would occur if this alternative is selected. This alternative provides a baseline or reference point against which to describe environmental effects of the action alternatives. This is a viable alternative and responds to the concerns of those who want no vegetation management activities (e.g. "No logging"), no transportation management activities (e.g. "no road closures"), etc. This alternative would not meet the purpose and need for which this project was proposed.

Under this alternative, no trees would be removed from National Forest land and the road system would continue to deteriorate. Some consequences of selecting this alternative would include: 1) loss of economic value of salvageable wood products; 2) increased potential for insect and disease infestations in adjacent woodlands; 3) increased fuel loads and potential for stand-replacing wildfires, 4) persistent soils erosion from unneeded roads; and 5) continued spread of noxious weeds.

If Alternative 1 is selected, no new federal management activities would be initiated. Routine maintenance of the existing Forest Service system roads would continue. Changes might also occur through natural processes or future management direction. Selection of this alternative would not foreclose the option for future management in this area.

**Table 2.1. Summary of proposed activities for Alternative 1.**

| Activity | Location | PROPOSED ACTIVITIES |
|---|---|---|
| No timber removal | Entire project area | All Forest Service lands within the project area would remain in their current condition, and forest health would continue to decline for many years due to forest insects and diseases. The entire area would progress toward old growth timber; which is, for the most part, uniform and unproductive wildlife habitat. |
| No prescribed burning | Entire project area | No Forest Service lands would be burned within the project area. Fuel loads would increase along with the proliferation of brushy undergrowth and unproductive understory species in some areas of the forest. Beneficial forbs and woodland grasses would decline. |
| No improvements to roads | Forest Service system roads within the project area | The road system in the project area would remain unchanged. Soils erosion would continue unchecked. |
| No improvements to wildlife habitat | Entire project area | Wildlife habitat within the project would continue to decline for many years and species diversity would decrease due to habitat loss. |
| No noxious weed control | Entire project area. | Approximately 31 acres have been identified to contain non-native and invasive plant species. Undoubtedly, many more exist that have not been identified, and proliferation of these noxious weeds will continue in the area. |

## Alternative 2

This section provides a detailed description of the action alternative. The purpose of this action is to enhance natural communities and improve forest health conditions while providing opportunities for wildlife habitat improvement, dispersed recreational uses, and harvest of timber products. This project is needed to address declines in forest health and native plant communities, and deteriorating Forest road conditions. This alternative addresses forest-wide goals and objectives, and adheres to the standards and guidelines established in the 2005 Forest Plan.

Vegetation Management: Due to the advanced age of most of the trees and the species composition, the following management activities are being proposed. Approximately 86% (2,580 acres) of NFS lands within the project area would undergo some form of vegetation management. Trees designated for removal that are

equal to or greater than 11 inch diameter at breast height (DBH) would be harvested commercially; and depending on markets, those designated trees less than 11 inches DBH could be removed or cut and dropped. Approximately 78% (2,011 acres) of the 2,580 acres proposed for vegetation management would be designated for commercial harvest; 18% (470 acres) for non-commercial removal activities. Actual commercial harvest acres would be less than these estimates because slopes over 35% would not be harvested. Additionally, areas near heritage sites and specialized habitats such as drainages, sinkholes, and caves would be protected reducing actual harvest acres. Proposed vegetation management activities are depicted by harvest type for each timber stand in Figure 2 and summarized in the "Vegetation and Wildlife Habitat Management" section of Table 2.

Approximately 1,858 acres within the commercial harvest areas would undergo salvage harvesting in areas where oak decline is evident. These areas typically have a significant red oak species group component. Commercial harvest activities would include a variety of even-aged and uneven-aged silvicultural prescriptions to achieve the desired condition for each stand. Non-commercial activities would consist of pine planting (328 acres) and timber stand improvements (470 acres). Due to changing markets and a growing potential for small roundwood sales, all or some of the areas currently planned for timber stand improvement could possibly be sold commercially. This may occur if the market for small roundwood, including firewood, continues to grow. Within the commercial sales areas, small roundwood also may be removed in order to move the area towards the desired condition.

Prescribed fire would be implemented on approximately 2,422 acres within the project area (Figure 3). Of this, approximately 2,382 acres would be on NFS lands and may include 40 acres on private land if an agreement with the landowner is established. The objectives of prescribed burning are to establish pine regeneration and reduce accumulated hazardous fuels. Prescribed burns would be timed and conducted in accordance with the 2005 Forest Plan and the burn plan for the project area. At least one burn would be conducted prior to timber sale marking and another after harvesting is completed. The project area would be monitored for pine seedling establishment as well as the general success of hazardous fuels and brush removal efforts. Additional burns would be conducted if the results of monitoring indicate that initial prescribed fires did not achieve objectives. The burns should expose bare mineral soil that is essential for pine seedling establishment while reducing the amount of fuel on the ground. Prescribed burning would also enhance plant vigor and diversity of fire-dependent native plant communities such as occurs in open woodlands.

As a result of this alternative for vegetative management, the entire area would have a mosaic appearance with a range of tree densities and ages, from dense stands of mature trees to newly regenerated areas. This alternative would assist in moving natural communities toward the desired condition for the area.

Wildlife openland habitat would be maintained on approximately 12 acres of NFS lands within the project area. Maintenance would include haying and enhancement of native warm and cool season grasses, and forbs in the Highway 181 Hay Area. Additionally, five ponds would be maintained for wildlife use in the project area; and, approximately 10 vernal pools would be constructed along the sides and at the ends of temporary roads used for vegetation management. Native pond plants would be established to rehabilitate an intermittent shallow pond located adjacent to non-system road 14001 in the northeast corner of the project area. This area has been heavily disturbed and eroded by unauthorized ATV and ORV use.

Approximately 31 acres infested with non-native and invasive plant species have been identified for manual, mechanical, and chemical treatments. Noxious weeds include: Chinese bush clover or sericea lespedeza, *Lespedeza cuneata* (Dum. Cours.) G. Don (25 ac.); multiflora rose, *Rosa multiflora* Thunb. (1 ac.); and spotted knapweed, *Centaurea stoebe* L. subsp. *micranthos* (Gugler) Hayek (5 ac.). Some areas have more than one noxious weed growing en masse and would be treated accordingly.

<u>Road Management:</u> There are approximately 4.9 miles of FS system roads and 2.5 miles of non-system roads within the project area (Figure 2). Data for all roads depicted on the map were collected and updated by Global Positioning System (GPS) during April 2011. Approximately 0.9 miles of non-system roads have been

identified for reconstruction and would be converted to FS system roads. Conditions of these roads have deteriorated over time and they currently do not meet Forest Service engineering standards. Plans for road reconstruction consist of improvements to the original surface material and constructing drainage features. In some cases, realignment of the road may be necessary. Approximately 2.9 miles of FS system roads have been identified for maintenance, which would consist of ongoing repairs necessary to retain or restore roads to the approved road management objective. Activities associated with road maintenance may include surface blading; replacement of surface material; mowing and limbing of roadside vegetation; cleaning and restoring drainage features; and replacing road signs. Approximately 1.1 miles of non-system roads and 1.2 miles of FS system roads have been identified for decommissioning. Any unauthorized and user-created trails that are observed in the project area also would be decommissioned. Road decommissioning would result in stabilization and restoration of unneeded roads to a more natural state. Decommissioning activities may include blocking access with earthen or rock berms, boulders, or slash piles; contouring; and re-vegetation by seeding, planting, and fertilizing. Small forest openings, suitable for turning around and parking 2-3 vehicles, may be placed where FS roads terminate due to decommissioning activities. The level of construction used to establish parking areas would be dependent on suitable land area and the availability of funds during implementation; nevertheless, any construction that would occur would be consistent with FS engineering standards. Approximately 0.5 miles of road may need to be placed under special use permit administration to provide access to private lands.

Connected Actions: Actions connected to vegetative and road management activities discussed above include construction of approximately 3.0 miles of fireline by dozer and 0.6 miles by hand crews. There are 5.7 miles of existing fireline in the project area. There would be approximately 8.6 miles of temporary road constructed for timber sale access.

A summary of the proposed action (Alternative 2) is provided in Table 2-2 below.

**Table 2-2. Summary of proposed activities for Alternative 2.**

| Proposed Activities | Measures (Estimated) |
|---|---|
| **Road Management** | |
| System road maintenance: (system roads 129 (1.4 mi), 427 (1.2 mi), 428 (0.3 mi)) | 2.9 miles |
| System road reconstruction: 427 (0.8 mi). | 0.8 miles |
| Non-system road converted to system road with reconstruction: 427 (0.5 mi), 428 (0.2), 14146 (0.2 mi), | 0.9 miles |
| Decommission system roads: 129 (1.2 mi). | 1.2 miles |
| Decommission non-system roads not under special use permit. | 1.1 miles |
| Special Use Permits Road Maintenance (two roads) | 0.5 miles |
| **Vegetation and Wildlife Habitat Management** | |
| Clear Cuts with Reserves | 18 acres (1 stand) |
| Shelterwood Cuts with Reserves | 22 acres (1 stand) |
| Thinning | 180 acres (5 stands) |

| **Proposed Activities** | **Measures (Estimated)** |
|---|---|
| Overstory Removal | 32 acres (1 stand) |
| Salvage/Sanitation (intermediate treatment, not regeneration) | 1,480 acres (28 stands) |
| Salvage/Sanitation (heavy salvage cut, regeneration activities required) | 378 acres (12 stands) |
| Timber Stand Improvement | 470 acres (19 stands) |
| Maintain existing ponds | <1 acre each 5 ponds |
| Construct 10 vernal pools | <1 acre total 10 pools |
| Rehabilitate 1 intermittent shallow pond | Approx. 1 acre 1 pond |
| Openland maintenance (haying) | 12 acres (1 stand) |
| Pine planting | 328 acres (7 stands) |
| Prescribed fire | 2,422 acres |
| Noxious weed control: hand pulling, herbicide spot treatments, boom sprayer, and/or mowing. | 31 acres |
| **Connected Actions** | |
| Fireline construction | 3.6 miles |
| Temporary road construction | 8.6 miles |
| Trash dump removal | As needed |

## ALTERNATIVES NOT CONSIDERED IN DETAIL

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments and agency concerns may provide suggestions for alternative methods for achieving the purpose and need for the proposal. Some of these alternative methods are often duplicative of the proposal; are actions that need to be addressed at a higher level within the organization, and therefore are beyond the scope of this analysis; would not accomplish the purpose and need for the project as well as the proposal; or are technically unfeasible. One alternative that was considered, but dismissed from detailed consideration is summarized below.

**Alternative that would have provided for a transportation loop and throughway**

An alternative to complete a road loop and throughway for public vehicular use on the project area was considered during the scoping process but was dropped from further consideration for several reasons discussed below. This alternative would have allowed for reconstruction of degraded sections of FS 129 and non-system

road 14146 and conversion of non-system roads to system roads to complete the transportation loop and throughway. The results of field observations and gathering of additional data indicated the following:

- Substantial sections of FS 129 and non-system road 14146 currently do not meet FS engineering standards for vehicular traffic. Field observations indicated that use of these road sections by normal vehicular traffic was not apparent.
- Light to moderate use by ATV/ORV traffic is apparent; however, ATV use is legal only on numbered Forest System roads.
- Reconstruction of the road would require significant and costly mitigation at two crossings of Greasy Creek and within the associated riparian management zone (RMZ, Figure 4).
- Water depth and flow is normally substantial at both historical crossings.
- The creek appears to be permanent and spring fed.

# CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

## INTRODUCTION

This chapter summarizes the physical, biological, and social environments of the affected project area and the cause and effect relationship of implementing each alternative on that environment. It also presents the scientific and analytical basis for comparison of alternatives presented in the previous tables. Resource specialists analyzed the magnitude of direct, indirect, and cumulative effects of the proposed activities on both short and long-term productivity. Only information necessary to understand the environmental consequences was included in this document. The project record contains all project-specific information, including specialist reports and results of public participation. The project record is located at the Ava/Cassville/Willow Springs Ranger District Office. Information from the record is available upon request.

The following are definitions of terms used in discussing the environmental effects of proposed activities:

**Affected environment** (40 CFR 1502.15) is a brief description of the area(s) to be affected by the proposed activities. The description shall be no longer than necessary to understand the effects of the alternatives.

**Direct effects** (40 CFR 1508.8) are those occurring at the same time and place as the triggering action (e.g. Prescribed fire causes smoke).

**Indirect effects** (40 CFR 1508.8) are those caused by the action, but occur later, or at a distance from the triggering action (e.g. Prescribed fire causes smoke, which puts particulates in the air and can cause adverse health effects to nearby residents).

**Cumulative effects** (40 CFR 1508.7) are the effects on the environment that result from incremental effect of the action added to the effects of other past, present, and reasonably foreseeable future actions, regardless of whether or not the agency or person undertakes them and regardless of land ownership on which other actions occur. An individual action, when considered alone, may not have a significant effect, but when its effects are considered in addition to effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (e.g. Smoke from this project in addition to smoke from other projects occurring in the same airshed would be cumulative). The cumulative effects analysis for each alternative is evaluated separately for each resource and may have different spatial and temporal boundaries. Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effects of all past actions combined. The analysis of cumulative effects begins with consideration of the direct and indirect effects on the environment that are expected or likely to result from the alternative proposals for agency action. Agencies then look for present effects of past actions that are, in the judgment of the agency, relevant and useful because they have a significant cause-and-effect relationship with the direct and indirect effects of the proposal for agency action and its alternatives.

The USDA-Forest Service uses the most reliable and timely data available. Accuracy from the Geographical Information Systems (GIS), Natural Resource Information System (NRIS), Forest Inventory and Analysis Database (FIADB), Infrastructures Database (INFRA), Forest Service Activity Tracking System (FACTS), Missouri Fish and Wildlife Information System (MOFWIS), and other databases vary in accuracy. All attempts to verify and update this information have been made where possible.

# SOILS

## Affected Environment/Existing Conditions

**Project Setting.** The project area lies within the White River Hills subsection of the Ozark Highlands State Natural Division. Roughly 55 % of the area is classified as the North Fork River Oak-Pine Woodland/Forest Hills Landtype Association (LTA) (OZ4o). The topography of this LTA is characterized by broad ridges that give way to steep slopes of narrow, sinuous valleys. The valleys are lined with low cliffs and many seep-fed moist cliffs that support rare species. Caves, springs, and losing streams are among the common karst features found in this LTA. Local relief is 200-350 feet. Historically, pine-oak woodland occupied the higher elevations and graded into oak-pine and mixed-oak forest in deep valleys. More recently, the area has converted to second growth oak forest with scattered pine plantings. The remaining 45% of the area is in the North Fork Pine-Oak Woodland Dissected Plain LTA (OZ4p). This LTA is represented by a narrow, dissected plain that borders the eastern edge of the North Fork River basin. It is moderately dissected with local relief of 150-250 feet and principally includes the dissected plain on Roubidoux sandstone where shortleaf pine is native. Both shortleaf pine and pine-oak woodlands grow there now as in the past. Currently, it is a nearly even mixture of pasture interspersed with pine and oak-pine forest (Nigh & Schroeder 2002).

The dominant soil types in the project area are:

- somewhat excessively drained to well drained Paleudults and Paleudalfs on ridges and side slopes
- moderately well drained Fragiudults on slopes
- somewhat excessively drained, shallow Hapludolls and areas of rock outcrop on steep, dissected landscapes
- Udifluvents on flood plains
- Hapludalfs on terraces in stream valleys

The dominant soil mapping units are the Scholten-Poynor-Tonti (38%) and the Coulstone-Scholten-Captina (62%) associations. The project area lies immediately east of the North Fork River in northeastern Douglas County, Missouri. The land is drained by Greasy Creek and several other unnamed streams that are part of the North Fork River watershed (Hydrological Unit 11010006) which flows south and empties into Norfork Lake in Ozark County, Missouri. From there, it flows south to the Middle White River watershed (HUC 11010004) downstream in Arkansas. The region is characterized by a well-developed karst terrain with many caves, springs, sinkholes, and gaining and losing streams.

**Existing Conditions.** Approximately 69% of the area is considered upland forest and closed woodland complexes located on ridges and side slopes. These complexes are comprised of shortleaf pine, oak/pine, red oak group, white oak, and mixed oak. Approximately 76% is oak and oak/hickory and 17% shortleaf pine. Pure pine stands were planted in 1934 and 1950. Roughly 69% of the project area exhibits basal areas exceeding 70 and average stand diameter (dbh) is 8 inches. Approximately 66% is in sawtimber size classes. Having reached maturity, the average age of red oak group stands is 73 years. Many of these stands are showing signs of decline and are vulnerable to attack by insects and disease. Many trees are already died or have been blown over.

There are approximately 4.9 miles of National Forest system roads and 2.5 miles of non-system roads within the project area. System roads are under the jurisdiction of the Forest Service and are determined to be needed for long-term motorized access. Non-system roads are roads on NFS lands that are not managed as part of the Forest Transportation System, such as unplanned roads, abandoned travel ways, and off-road vehicle trails that have not been designated and managed as a trail.

There are approximately 5.7 miles of roads and streams that will be used as existing fire lines within the project area. Approximately 3.6 miles of additional line would be constructed. Of this, approximately 3.0 miles would be constructed using a dozer while 0.6 miles using manual labor.

There is one 12-acre hay allotment in the project area. This area, known as the Highway 181 Haying Area, contains both cool season and native, warm- season grasses. It is currently being managed under the ACW Openlands Haying Project Decision Memo signed on May 9, 2008.

**Management Considerations.** The use of heavy equipment required to harvest trees creates a risk of soil disturbances that could reduce productivity of forest soils. The resulting soil disturbances can contribute to reduced water infiltration rates, increased runoff and sediment delivery to streams, and visually suggests poor land management practices. Soil disturbances resulting from timber harvests can be limited by using the appropriate equipment, avoiding operations during wet periods, and by careful monitoring during harvest operations. When disturbances occur, their potentially negative effects can be reduced by remedial actions such as tillage, re-establishing drainage patterns, or erosion control.

A brief listing of the land issues and concerns is as follows:

- **Compaction**: Compaction is likely one of the leading causes of soil degradation resulting from timber harvesting operations (Brais 2001). The immediate (direct) effects of heavy equipment on soil properties are to: a) increase soil resistance to penetration; b) reduce conductivity of soil to water and gas flow through a reduction in size, continuity, and total volume of pores, especially large pores; and c) reduce the number, size, and/or strength of structural aggregates. The distribution of these effects within the profile is a function of the ground pressure and total load (ground pressure * contact area of the tire or track), soil characteristics (e.g., texture, structure), and moisture conditions at the time of operation. Soil compaction commonly reduces the growth of young trees that regenerate on sites following conventional harvests (Greacen and Sands 1980). Severely compacted forest soils could remain compacted for decades (Froehlich et al. 1985). Even in cold climates where freezing and thawing are assumed to loosen soil to considerable depths, the bulk density of compacted soil decreases slowly (Voorhees 1983, Corns 1988). Measurement thresholds for bulk density can be found in FSH 2509.18. Soil Quality Standards for the Eastern Region of the Forest Service require that soil disturbance (exposure of mineral soil) should be limited to no more than 15 percent of a land unit scale area (USDA-Forest Service Handbook, Supplement R9RO 2509.18-2005-1, Section 2.2).

- **Displacement**: Excessive mechanical relocation or removal of the surface mineral and or organic soil layers sufficient to reduce long-term productivity and biodiversity of soil dependent flora and fauna. This is especially important because most of the soil nutrients are held in the surface horizons (Brady 1974). Mixing of mineral and organic soil materials is not considered detrimental displacement. However, its effects must be assessed on a case-by-case basis.

- **Puddling**: Is the result of the destruction of the natural structure of a mineral soil when the ground is too wet or saturated. Fine-textured soils containing high amounts of clay are more susceptible to puddling type disturbances. Puddling usually results in a reduction of macropore space by 50 percent or more in severely damaged areas; this condition may restrict or even prevent the infiltration of water at the ground surface, causing erosion by surface runoff conditions.

- **Ground Cover**: Lack of adequate effective ground cover usually results in accelerated surface erosion. Effective ground cover can include low growing vegetation including lichens and mosses, rock, litter, and duff. The amount of effective ground cover needed to prevent erosion varies by local climate, slope and soil texture.

The indicator of the effects of soil disturbance is the intensity, spatial extent, and duration of the impacts for each activity area. Detrimental disturbance exist when the severity of soil impacts exceeds the Region 9

measurement standards over the activity area for a long enough time. At least 85 percent of the activity area must be maintained in a non-detrimentally disturbed condition to meet National and Region 9 soil quality standards. If 15 percent or more of the activity area is in a detrimentally disturbed condition, then the area is considered impaired, unless restoration is successfully implemented. Measurement techniques defined by Region 9 (USDA Forest Service 2005c) are used to measure existing soil disturbance from previous activities. These methods are primarily ocular qualitative assessments that are followed up by quantitative monitoring where management practices appear to have produced unacceptable results.

**Desired Conditions of Resource.** Soil productivity within the project area would be maintained or enhanced to the maximum extent possible while achieving other resource objectives. Soil erosion would return to natural levels of variability after a short recovery period; during which bare soil disturbed by project activities would be stabilized using native vegetation and drainage structures where required.

**Analysis Area.** The analysis area for the direct and indirect effects on the soil resource is the Greasy Creek Project area boundary because all vegetation management would occur in stands within it. Under Alternative 2, the stand analysis area totals 2,580 acres. The project analysis area lies within the North Fork River watershed. Part of analyzing the direct and indirect effects on soil erosion and compaction is considering how soils have responded to effects of past similar actions.

The project is comprised of soils common to southwest Missouri, where soils are moderate to well-drained fine sandy loam or sandy loam on average. Most soils formed in Mississippian limestones and Ordovician dolomites. The soils are generally highly weathered; deep and have low base saturation. The terrain of the project area is gentle enough that mass movement or debris flow will not be a hazard. Therefore, soil erosion and compaction are the potential physical hazards resulting from the proposed action.

Historically, the project area consisted of pine-oak woodlands on higher elevations and graded into oak-pine and mixed-oak forest in deep valleys. Currently, the area has converted to second growth oak forest with scattered pine plantings. The remaining 45% of the area is in the North Fork Pine-Oak Woodland Dissected Plain LTA (OZ4p).

Effects are analyzed in terms of Forest Service Soil Quality Standards (USDA-Forest Service Handbook, Supplement R9RO 2509.18-2005-1). The standards define thresholds for soil characteristics that are used as indicators of detrimental soil disturbance. The interpretations presented in this report were obtained using the latest information available at the USDA Natural Resource Conservation Service (NRCS) Soil Data Mart. Detailed soil maps and soil characteristics of the project area and the MTNF may be obtained by visiting http://soildatamart.nrcs.usda.gov/ or http://websoilsurvey.nrcs.usda.gov/app/.

**Table 3.1. Project area soils.**

| Map Symbol | Soil Name |
|---|---|
| 70025 | BRANSON-SPLITLIMB COMPLEX, 1-3% SLOPES |
| 70026 | TONTI SILT LOAM , 1-3% SLOPES |
| 73019 | POYNOR VERY GRAVELLY SILT LOAM, 1-8% SLOPES |
| 73021 | POYNOR EXTREMELY GRAVELLY SILT LOAM, 15-35% SLOPES |
| 73121 | SCHOLTEN-TONTI COMPLEX, 3-8% SLOPES |
| 73198 | GRESSY-VIRATON COMPLEX, 3-8% SLOPES |
| 73220 | POYNOR EXTREMELY GRAVELLY SILT LOAM, 8-15% SLOPES |
| 73223 | COULSTONE-BENDER COMPLEX, 15-50% SLOPES, VERY STONY |

| Map Symbol | Soil Name |
|---|---|
| 73236 | SCHOLTEN-POYNOR COMPLEX, 3-8% SLOPES |
| 73243 | TOPAZMILL LOAM, 3-8% SLOPES |
| 73311 | SCHOLTEN-BENDAVIS-POYNOR COMPLEX, 8-15% SLOPES |
| 73326 | TOPAZMILL-COULSTONE COMPLEX, 3-15% SLOPES |
| 73327 | TOPAZMILL-COULSTONE COMPLEX, 15-35% SLOPES |
| 73332 | TOPAZMILL LOAM, 8-15% SLOPES |
| 74683 | CEDARGAP-RAZORT COMPLEX, 0-3% SLOPES, FREQUENTLY FLOODED |
| 75417 | RELFE-SANDBUR COMPLEX, 0-3% SLOPES, FREQUENTLY FLOODED |

**Erosion Potential (Road/Trail) –** Levels of nutrients lost to soil erosion is usually high because the most nutrients are within the surface horizon (Brady 1974). In addition, erosion also results in a loss of carbon which is sequestered in the surface horizon. Erosion potential is rated according to the risk of erosion on forestland where normal practices are used in managing and harvesting trees.

Ratings indicate the hazard or risk of soil loss from un-surfaced roads and trails following harvest activities. Soil loss is caused by sheet or rill erosion following disturbance by trucks, skidders, or similar equipment. Additionally, gulley erosion may occur in the ruts of heavy equipment.

This hazard is described as "**Slight**", "**Moderate**", or "**Severe**". A rating of "**Slight**" indicates that erosion is unlikely under ordinary climatic conditions. "**Moderate**" indicates that some erosion is likely; occasional maintenance may be needed, and simple erosion-control measures may be needed. "**Severe**" indicates that significant erosion is likely and that erosion-control measures, including re-vegetation of bare areas, are advised. Hazard ratings are located in Appendix F.

**Rutting Hazard -** Rutting is a process of compaction, caused by spinning tires of vehicles or equipment on wet soils. Ratings indicate the risk of vehicles causing ruts (compaction). Rutting also channels water, thus increasing the probability of soil erosion. Ratings are based on soil texture, depth to a water table, rock fragments on or below the surface, depth to a restrictive layer, and slope.

A rating of "**Slight"** indicates little or no risk of rutting by the planned activity. "**Moderate"** rating indicates that ruts are likely. "**Severe"** rating indicates that the soil ruts readily, and the soil may be unsuitable for the planned activity. The rutting hazard for each soil in the project area is located in the Appendix F.

**Fragipan in Profile -** Soils with a fragipan in the profile are of special concern. A fragipan is a brittle subsurface horizon with low organic matter content, low to moderate clay, but high in silt or very fine sand. A fragipan appears cemented, but a dried soil sample will slake in water indicating that it is not cemented. When dry, it is hard or very hard and has a higher bulk density than the horizon above or the horizon below it and restricts water movement and root penetration. When moist, it tends to rupture suddenly under pressure rather than to deform slowly. The fragipan can perch water during seasonably wet periods, thus making the soil more apt to rut and be compacted. Five map units (70026, 73121, 73198, 73236, and 73311) contain components with a fragipan in the profile.

**Soil Compaction -** Compaction is caused primarily by wheel traffic, but can also be caused by animal traffic or natural processes. Soil is especially susceptible to compaction when it is at field capacity or wetter, has a low content of organic matter, or has poor aggregate stability. Saturated soils lack adequate strength to resist the

deformation caused by traffic. Log landings and haul roads are expected to be the most compacted areas due to the amount of traffic they receive.

## Direct and Indirect Effects on Soils

### *Alternative 1*

#### *Direct and Indirect Effects*

Under Alternative 1, none of the proposed management activities would take place. Therefore, no management related impacts to the soil resource would occur. Sediment produced by normal use and maintenance of existing roads would remain unchanged. Non-system roads would also be left in place; allowing for further impacts to the soil and water resources.

In the absence of a catastrophic wildfire, surface runoff and soil erosion should remain at natural levels. Natural processes and functions would continue to occur as dead material decomposes. Soil organic matter may increase with an accompanying increase in microorganisms and fungi. Since there would be no timber harvest, only a wildfire would remove carbon from the forest. Projects previously cleared through NEPA, in and adjacent to the Greasy Creek Project area would still be implemented.

#### *Cumulative Effects*

The cumulative effects boundary for both alternatives will be the project area boundary. This was selected because there are no known activities beyond the spatial extent of the project area impacting the Greasy Creek area. The temporal extent of analysis is the ten previous years and ten years into the future.

In this alternative, current and previously planned activities would continue, but no new management activities would be initiated within the analysis area. Skid- trails and temporary roads would not be constructed and would not create additional sources of erosion and sedimentation. Salvage operations would not take place under this alternative. Dead and downed trees would increase fuel levels, leading to increased wildfire danger. In the absence of wildfire, current runoff and erosion patterns would be maintained. An upland erosion rate of less than one ton per acre per year is predicted by FSWEPP for stands on moderate to steep slopes in the absence of fire.

### *Alternative 2*

#### *Direct and Indirect Effects*

**Timber Harvest**

Timber harvesting has the potential to adversely impact soil resources. The effects associated with timber harvests can be described as short and long-term effects to soil productivity. Short- term effects generally last three years or less, and include the recovery period in which disturbed soils become re-established with vegetative cover. Short-term effects imply that the existing soil profile is left essentially intact. Surface disturbances, such as shallow compaction and removal of vegetation are possible short-term impacts. In contrast, long-term effects are associated with activities which displace the topsoil. Many years are needed for the soil to recover its original productivity when the surface layers are removed. Soil formation typically occurs at a rate of one inch per 200-1000 years, and depends on many local environmental factors. Severe compaction caused by rutting is an example of a long-term impact. Harvest operations should be suspended during wet periods to limit risk of rutting.

In conventional harvesting operations, the impacts of unbladed primary and lateral skid trails should be short-term. Anticipated soil disturbances caused by skidding include minor soil displacement and tracking. Temporary roads and log landings are expected to have more adverse impacts to the soil due to the high amount of traffic they receive. The general timber harvest units should recover quickly. Research has shown that the upper few inches of soil recovers quickly from light compaction and tracking. This is due to organic matter

additions from logging debris, soil biota activity, freezing and thawing and plant root growth from existing and new vegetation. Recovery from compaction is slower in the 8 to 12 inch depth zone, but compaction is not expected at these depths unless equipment operates in wet conditions. Soil compaction would occur on log landings and primary skid trails as a result of heavy equipment use with Alternative 2.

Areas of concentrated use, such as log landings are expected to receive the most use and effects. This compaction would increase the bulk density and result in decreased pore space, infiltration rate**,** and water holding capacity. These effects are considered detrimental to plant growth. The degree and depth of compaction depends on the number of passes made by the equipment, and moisture content of the soil at the time the passes are made. Changes in pore space do not normally occur on well drained soils, such as those that occur over most of the project area, until three or more passes have occurred. Compacted areas should be ripped and seeded to help mitigate the effects of compaction and promote re-vegetation. Rutting would occur if equipment operates on wet soils; therefore wet soils should be avoided in logging plans. Seasonal soil wetness is difficult to predict, but when soils are prone to high seasonal water tables, dry season or logging on frozen soils is preferred. When rutting occurs in the general harvest area, it is considered a long term effect. Literature shows that the effects of the severe compaction that rutting produces can reduce plant growth for many decades.

Soil movement (erosion) can occur on long unimpeded slopes, where mineral soil material is exposed to raindrop impact and overland water flow. Soils on upper slopes can lose productive topsoil as it moves down slope with water. Soil erosion may occur where bare soil is exposed on a slope as a result of equipment tracking difficulties (spinning wheels), bladed skid roads and landings, or where logs are dragged across the soil repeatedly. The placement of landings on gentle topography prevents long unimpeded runs. The presence of vegetative soil cover, water diversions, and logging debris; which is commonly found on harvested areas, would prevent long unimpeded runs.

**Prescribed Fire**

Prescribed fire would be implemented on approximately 2,422 acres within the project area. Of this, approximately 2,382 acres would be on NFS lands and may include 40 acres on private land if an agreement with the landowner is established. The objectives of prescribed burning in this project area are to establish pine regeneration and reduce accumulated hazardous fuels. Prescribed burns would be timed and conducted in accordance with the 2005 Forest Plan and the burn plan for the project area. At least one burn would be conducted prior to timber sale marking and another after harvesting is completed. The project area would be monitored for pine seedling establishment as well as the general success of hazardous fuels and brush removal efforts. Additional burns would be conducted if the results of monitoring indicate that initial prescribed fires did not achieve objectives. The burns should expose bare mineral soil that is essential for pine seedling establishment while reducing the amount of fuel on the ground. Prescribed burning would also enhance plant vigor and diversity of fire-dependent native plant communities such as occurs in open woodlands.

When conducting prescribed burns, dozer fireline construction poses the greatest risk of detrimental soil disturbance. Combustible fuels are removed by blading, resulting in topsoil displacement and exposed mineral soil. Removal of the protective vegetative layer leaves the soil vulnerable to wind and rain erosion until vegetation is re-established. Constructed fire lines may alter infiltration rates, become sediment sources, and may alter surface runoff patterns (Van Lear and Waldrop 1989). Approximately 3.0 miles of dozer line would be constructed in the project area. Some fireline would be placed in existing road beds, which would reduce the amount of soil displacement on previously undisturbed sites. Nonetheless, bladed dozer lines would likely produce sediment until they are re-vegetated. In the absence of severe erosion, detrimental soil disturbance associated with dozer line construction is expected to be minimal.

It is important to understand the difference between fire intensity and fire severity. Fire severity is best described as the amount of energy (heat) that is released by a fire, and the degree that it affects soil physical and chemical properties. Fire intensity is a term used to describe the rate at which fire produces thermal energy

(heat); fire intensity is best measured by fireline flame length, where fire intensity is the rate at which an on-going fire produces thermal energy (Van Lear and Waldrop 1989). Although the two terms can be closely related, they may also be unrelated. For example, a burn that completely consumes the organic matter layer and alters mineral soil structure and color would be classified as a severe burn. While a high-intensity fire in heavy fuels occurring when the soil and forest floor are moist would leave a large amount of residual forest floor, and not alter soil structure and color. Thus, in this example, a high intensity fire would be classified as of light severity.

High intensity broadcast burns generally leave portions of the forest floor intact, because rarely do these types of fires burn uniformly across an entire landscape. Prescribed fire is a random process (Johnson 1984), and there are usually areas that fail to burn or burn only lightly, even in generally intense fires. The quantity of forest floor left unconsumed can be controlled by terrain and weather conditions.

Prescribed burns conducted when soil and fuel moisture conditions are too dry can cause severe damage. Broadcast burns conducted under these conditions can remove all materials on the forest floor and cause accelerated erosion in steep terrain. Fires which burn completely down to mineral soil may accelerate soil erosion in steep terrain.

### Road Management

There are approximately 4.9 miles of Forest Service (FS) system roads and 2.5 miles of non-system roads within the project area. Approximately 0.9 miles of the non-system roads will be reconstructed and adopted as FS system roads; while the remaining 1.1 miles would be decommissioned. Maintenance of FS system roads would consist of ongoing repairs to retain or restore the road to the approved road management objective. Activities associated with road maintenance may include surface blading, replacement of surface material, mowing and pruning of roadside vegetation, cleaning and restoring drainage features, and replacing road signs. Road decommissioning would involve stabilizing and restoring unneeded roads to a more natural state. Decommissioning activities would include blocking access with earthen or rock berms, boulders, slash piles, or gates; re-contouring; and/or re-vegetating by seeding, planting, and fertilizing. An additional 0.5 miles of road will be maintained under special use permits to access private land.

User-created roads are not maintained and therefore contain ruts and gullies, which contribute to soil erosion and sediment production. The presence of un-maintained roads can influence overland flow, geomorphology, and ecosystem processes (Switalski et al. 2004). Roads reduce soil infiltration and can be chronic erosion sources. Decommissioning the user-created roads in the project area would benefit soil and water resources by reducing or eliminating sediment delivery to stream channels. Re-contouring and re-vegetating roads would provide immediate stabilization and reduction of watershed impacts.

Road maintenance activities could also result in direct sediment delivery to streams. Ground disturbance from road blading, particularly where the road is adjacent to streams, constitutes the greatest risk from increased sediment production (Sheehy 2001). The potential adverse effects of road maintenance must be considered in the context of performing maintenance versus possible consequences of not maintaining roads. Road maintenance is necessary to prevent damage to the road, to maintain safety by reducing dust, washboards and raveling, and to minimize adverse impacts to resources resulting from lack of road maintenance. Proper and timely road maintenance is proven to minimize sediment delivery to streams from open roads (Sheehy 2001). Lack of maintenance can produce severe rutting and gullying during wet periods, thus contributing large amounts of sediment into the watershed. Road maintenance and decommissioning may require the use of heavy equipment to re-contour road surfaces or to rip deeply compacted soil. Short-term increases in dust and sediment may result until new vegetation is established.

## Invasive Plants

Control of invasive plants would involve an adaptive management approach which would combine the use of herbicides, prescribed fire, and hand tools.

*Herbicides*

Herbicides would be used to control or eradicate unwanted vegetation. It is desirable for the chemicals to remain in the soil long enough to control weeds, but not so long that it becomes a pollutant. The amount of time that an herbicide remains active in the soil is known as persistence. Factors affecting the breakdown of an herbicide affect persistence. Many factors determine the length of time herbicides persist in soil and they fall into three categories: soil factors, climatic conditions, and herbicide chemical properties.

Soil factors affecting herbicide persistence include physical, chemical, and microbial properties. Soil composition is a factor that measures soil texture and soil organic matter. Chemical properties of soil include pH, cation exchange capacity (CEC), and nutrient status. Soil composition affects herbicide phytotoxicity and persistence through adsorption, leaching, and volatilization (Hager et al. 1999). Generally, soils high in clay or organic matter have a greater potential for herbicide persistence because there is increased binding with soil particles, with a corresponding decrease in leaching and loss through volatilization.

Some herbicides are affected by soil pH, an important part of the soil chemical makeup. Chemicals do not readily adsorb soil particles at higher soil pH, so they remain in the soil solution. Herbicides in the soil solution could then leach through the soil profile and move offsite. Chemical breakdown and microbial breakdown, two major herbicide degradation processes, are often slower in soils of higher pH. So, although decreased adsorption of herbicides occurs in soils of higher pH, there would also be less degradation.

Degradation by soil microorganisms depend on the type and abundance of the soil microbes present. Soil microorganisms are partially responsible for the breakdown of many herbicides. The types of microorganisms and their relative amounts determine how quickly decomposition occurs. Soil microbes require certain environmental conditions for optimal growth and breakdown of any herbicide. Factors that affect microbial activity are temperature, pH, oxygen, and mineral nutrient supply. Usually, warm, well aerated, fertile soil with a medium soil pH is most favorable for micro-organisms and hence herbicide breakdown.

Climatic conditions influencing herbicide degradation are soil moisture, temperature, and sunlight. Herbicides degrade more rapidly as temperature and moisture increases due to higher chemical and microbial decomposition rates (Hager et al. 1999). Cool or dry conditions slow degradation, which could increase herbicide persistence. If winter and spring conditions are wet and mild, herbicide persistence is less likely. Sunlight plays a role in herbicide degradation as well. Herbicides may be lost when applied to the soil surface and remain there for an extended time period without rainfall; therefore, degradation is accelerated on very sunny days. Conversely, heavy rainfall would increase the chance that herbicides are carried, either by processes of solubilization or sediment transport into area streams. The likelihood that harmful concentrations of herbicide would be carried via surface flow to area streams is reduced in proportion to the distance between the herbicide application site and the nearest stream.

Chemical properties of a herbicide also can affect its persistence. Important factors include water solubility and susceptibility to chemical and microbial degradation. The solubility of an herbicide influences its leaching potential; leaching occurs when an herbicide is dissolved in water and moves down through the soil profile. Highly soluble herbicides may be carried to rooting zones of susceptible plants, or be moved offsite. Herbicide leaching is determined by both the herbicide's water solubility and its ability to bind to soil particles. Herbicides exhibiting low solubility are held strongly to soil particles, in addition, herbicides that exist in dry soils are less likely to leach and have a greater potential to persist.

The capacity of the soil to filter, buffer, degrade, immobilize, and detoxify herbicides is a function or quality of the soil. Soil quality also encompasses the impacts that soil use and management can have on water and air

quality, and on human and animal health. The presence and bioavailability of herbicides in soil can adversely impact human and animal health, and beneficial plants and soil organisms. Herbicides can move off-site contaminating surface and groundwater and possibly having adverse impacts on aquatic ecosystems.

Herbicides stay in the treated area long enough to produce the desired effect and then degrade into harmless materials. Three primary modes of degradation occur in soils:

- biological - breakdown by micro-organisms
- chemical - breakdown by chemical reactions, such as hydrolysis and redox reactions
- photochemical - breakdown by ultraviolet or visible light

The rate at which a chemical degrades is expressed as the half-life. A table listing the half-life in soil of herbicides proposed for potential use in the project area is available in the project record. The half-life is the amount of time it takes for half of the herbicide to be converted into something else, or its concentration is half of its initial level. The half-life of an herbicide depends on soil type, its formulation, and environmental conditions (e.g., temperature, moisture). Other processes that influence chemical fate include plant uptake, soil sorption, leaching, and volatilization. If herbicides move off-site (e.g., wind drift, runoff, leaching), they are considered pollutants. The potential for herbicides to move off-site depends on the chemical properties and formulation of the herbicide, soil properties, rate and method of application, herbicide persistence, frequency and timing of rainfall or irrigation, and depth to ground water.

It is unlikely that chemical control would increase the potential for soil erosion because the method would kill, but would not abruptly remove plants and their root systems. Dead plants would be expected to offer short-term soil stabilization to protect against erosion until new plants re-establish naturally, usually within two growing seasons. Sites requiring the use of a non-selective herbicide or disking would be mulched and re-seeded as needed. Disturbance size, slope, and landscape location would be considered to determine the appropriate action on a site-specific basis. Treating root stumps of woody NNIP species with herbicides, such as tree-of-heaven and autumn olive, would discourage re-sprouting without soil disturbance required to grub out the stumps. This is also one of the chemical application methods, which does not result in chemicals coming in direct contact with the soil.

Most infested sites would receive foliar applied spot treatments, in an effort to limit the amount of herbicide sprayed directly on the ground. Large infestations may receive foliar applied broadcast treatments with ATV or tractor-mounted boom sprayers. Broadcast application would increase the herbicide loss potential on some sites. However, herbicides that do come in direct contact with the soil would leave some level of residue until it is degraded.

Once in contact with the soil, herbicides can persist until degraded by sunlight, water or microorganisms; and/or move offsite by leaching or surface runoff. Soil physical and chemical properties would influence how water infiltrates the surface and moves throughout the soil profile. The capacity of herbicides to accumulate in soil is controlled by the chemical formulation as well as soil and climatic factors (Hager et al. 1999). Herbicide transport to area streams through sedimentation processes would be mitigated by implementing BMP's.

Analysis of soil-herbicide interaction used WIN-PST3, which is a screening tool developed by the Natural Resources Conservation Service to evaluate overall potential for a specific herbicide to leach or runoff, based on properties of individual soils. Herbicide values considered are solubility, half-life, human toxicity, and fish toxicity. Soil factors such as slopes > 15%, high water table within 24 inches of the surface during the growing season, presence of macrospores in the surface horizon deeper than 24 inches, texture of surface horizon, hydrologic soil group, K-factor (erosion potential of surface horizon and its thickness), and organic matter percent of surface horizon are also considered. WIN-PST3 matches the selected herbicide and soil, and returns ratings for potential for leaching, solution runoff, and adsorbed runoff ratings. The matrixes for soil/herbicide interactions can be found in the project record.

WIN-PST3 reports for this project's herbicides and soils are available upon request and are incorporated by reference. The reports are generated by the Forest Service unit, are several hundred pages in length, and cannot be easily summarized and displayed in this document. They are used to assist in planning herbicide applications for specific soil map units with NNIP infestation where herbicides would be used.

*Hand Tools*

Very small areas of disturbed or bare soil could occur with this treatment, generally limited to the basal area of the individual plant. Areas where large numbers of plants would be removed could be covered with nearby leaf litter to reduce the potential for soil erosion. Excessive runoff and sedimentation of streams would be reduced through such mitigation and other cultural BMP's.

***Cumulative Effects***

The cumulative effects for all alternatives consider the sum of existing, project-related, and foreseeable future impacts. Under Alternative 2, past measurable detrimental impacts to the soil resource primarily associated with timber harvests and non-system roads would still exist in the project area. Additional short-term and long-term soil impacts, such as compaction or removal of vegetative ground cover, would result from construction of temporary roads, log landings, and dozer lines. In contrast, proposed road maintenance and decommissioning would work towards enhancing watershed health by reducing sediment. Compacted or eroded areas on abandoned roads and illegal ATV trails would be rehabilitated and returned to biomass production.

Reasonably foreseeable actions include the construction of temporary roads, dozer lines, and road maintenance. Watershed health and trail sustainability can be accomplished by ensuring the rates of natural recovery and maintenance always exceed the rates of disturbance. Future effects may result from the illegal use of temporary haul roads and skid trails. However those risks can be mitigated through proper closure of haul roads at the completion of harvests. Additional cumulative effects from erosion and sedimentation may come from other activities within the project area including herbicide application, prescribed fire, and wild fire.

Alternative 2 has the potential to affect soil resource as a result of activities associated with timber harvests and prescribed fires. The effects of these activities on soil resources in the project area can be described in terms of short and long term effects on soil productivity. Short-term effects are those lasting three years or less, and are associated with a recovery period in which disturbed soils become re-vegetated. Short-term effects imply that the existing soil profile is left essentially intact. Surface disturbances, such as shallow compaction and removal of vegetation are possible short term impacts. In contrast, long-term effects are associated with activities which displace the upper portions of the soil profile (topsoil). Many years are needed for the soil to recover its original productivity when surface layers are removed. Soil formation typically occurs at a rate of one inch per 200-1000 years, and depends on many local environmental factors. Severe compaction associated with rutting is considered a long-term impact.

Estimated impacts of road maintenance on the soil resource are listed below. Estimates are classified as short-term or long-term impacts to soil productivity. Total acres would be in addition to those affected by current and past use in the Greasy Creek Project area.

**Table 3.2. Length of Effects on Soil of Proposed Activities in the Greasy Creek Project Area.**

| ALTERNATIVE 2 ACTIVITIES | SOIL EFFECTS | | |
|---|---|---|---|
| | SHORT-TERM | LONG-TERM | TOTAL |
| System Road Maintenance (2.9 miles) | 5.3 acres | 0 | 5.3 acres |
| Road Reconstruction (1.7 miles) | 3.1 acres | 0 | 3.1 acres |
| Road Decommission (2.3 miles) | 4.3 acres | 0 | 4.2 acres |

| ALTERNATIVE 2 ACTIVITIES | SOIL EFFECTS | | |
|---|---|---|---|
| | SHORT-TERM | LONG-TERM | TOTAL |
| Special Use Road Maintenance (0.5 miles) | 0.9 acres | 0 | 0.9 acres |
| Temporary Road Construction (8.6 miles) | 2.1 acres | 10.4 acres | 12.5 acres |
| New Fireline Construction Dozer (3 miles) | 1.3 acres | 0.1 acres | 1.4 acres |
| Log Landings (43) | 5.4 acres | 5.4 acres | 10.8 acres |
| **Totals** | **22.4** acres | **15.9** acres | **38.2** acres |

**Assumptions used for the table above:**

1. Haul roads have 10 feet of travel way and 12 feet of cleared right-of-way.
2. System roads have 15 feet of travel way and 17 feet of cleared right-of-way.
3. Temporary haul road construction impacts areas that are currently and may continue to be expected to produce biomass in the future. Temporarily using these sites for roads may cause some long-term impacts to soil productivity.
4. Haul road travel way is bladed, and topsoil is displaced.
5. Primary skid trails are unbladed and have a 12 foot width.
6. Log landings may be constructed at the end of each temporary road. Log landings are approximately 0.25 acre each and 50% of this area is a long term impact due to blading and compaction where trucks are loaded, while the balance of the area is unbladed and considered a short term impact.
7. New dozer firelines are approximately 4 feet wide, and 10% may cause long-term impact.

Short-term impacts would occur on approximately 22.4 acres, and 15.9 acres would receive long-term effects. To put the magnitude of these impacts into perspective, the estimated acres impacted by Alternative 2 is compared to the total acres in the activity area in the table below. This will show the percentage of the activity area impacted by the proposed activities for the alternative. As stated earlier, the scope of this analysis is the activity area. The activity area for Alternative 2 is 2,580 acres. Alternative 1 does not propose ground disturbing actions.

**Table 3.3. Estimated Percentage of the Activity Area Soils Affected.**

| Alternative | Extent of Activity Area (acres) | Percent of the Activity Area | |
|---|---|---|---|
| | | Short Term Effects | Long Term Effects |
| Alternative 2 | 2,580 | 0.9 | 0.6 |

Table 3.3 shows that the alternative considered in this analysis would affect less than 1 percent of the overall proposed activity area, and of those, most impacts would be short term.

Mitigations for soil movement within the activity area apply to primary skid trails, haul roads, and log landings. Locating these facilities on slopes less than 15% can greatly reduce the potential for soil movement or mass

wasting on these sites. The use of waterbars, slash mats, re-seeding, and establishment of vegetation to slow the flow of water down the travelway would interrupt long unimpeded runs. Thus, potential contributions that primary skid trails make to soil erosion are greatly mitigated. Soil may move on these impacted acres, but it is not expected to move far because of more gentle slopes, and use of waterbars and vegetation. The potential for soil movement is also expected to be temporary, and limited to the recovery period time of approximately 1 to 3 years. Prompt seeding of the disturbed areas would further prevent continued soil movement after harvest area closure. Soils with fragipans could potentially perch water during seasonally wet periods, creating areas where equipment could sink or rut the soil. Special care should be taken to identify these areas during project planning, and they should be monitored during project implementation.

Implementing the activities proposed in the Greasy Creek Project would allow the Mark Twain National Forest to enhance natural communities and move the area towards the desired condition. Additional benefits include a reduction of erosion and sediment from unneeded roads and trails; which would improve overall watershed health. Based on review of existing field conditions and the project proposal, activities proposed in this project combined with existing activities are unlikely to produce enough long-term impacts to the soil resource to move the Greasy Creek area into a detrimentally disturbed condition.

### Irreversible or Irretrievable Commitment on Soils and Water Resources

Neither alternative would have an irreversible or irretrievable commitment on soils and water resources in the proposed Greasy Creek Project area.

## WATER

### Affected Environment/Existing Conditions

This project lies within the North Fork of the White River Watershed in the Salem Plateau Subdivision of the Ozark Plateau Physiographic Region. There are twenty-one 12-digit HUC's in North Fork of the White River watershed; however, the entire project area falls within the 12-digit HUC 110100060103 named Greasy Creek – North Fork River. The total acres within the Greasy Creek – North Fork River watershed is 14,109 acres (3,978 acres USFS and 10,131 acres Non-USFS). The Greasy Creek Project area is approximately 2,987 acres in size or 21% of the watershed. Classification and designated use of streams in Missouri can be found in the Code of State Regulations for the Missouri Department of Natural Resources (MDNR), Division 20, and Chapter 7; however, MDNR has not classified Greasy Creek because it is a small stream. Greasy Creek flows directly into North Fork River, which is divided into several segments with different designations.

**Table 3.4. MDNR Designated Uses of the North Fork River at the mouth of Greasy Creek.**

| Location | Designated Use |
|---|---|
| North Fork River from T25N, R11W, Section 34 to T27N, R11W, Section 17. | Irrigation.<br>Livestock & wildlife watering.<br>Protection of warm water aquatic life and human health (fish consumption).<br>Cool water fisheries.<br>Whole body contact recreation, including swimming. |

The Greasy Creek Project area has one small spring; but no other known unique areas. Specific standards and guidelines require the Forest Service to manage springs, seeps, fens, and caves to protect their natural features. No commercial harvest of timber is proposed within a 100-foot radius of these features. All vegetation

management within springs, seeps, fens, and caves are designed to protect their natural features. It would be highly unlikely the single spring would be affected by forestry operations using Forest Plan Standards and Guidelines and BMP's (USEPA 2010). Springs, seeps, fens, and caves would not be negatively impacted by the proposed actions in the Greasy Creek Project. No wetland functions would be lost with implementation of the proposed activities in the Greasy Creek Project area.

There are no streams designated for industrial use or as a drinking water supply within the project area.

Missouri is a riparian water rights state. The quantity withdrawn may not be so much that it adversely affects another riparian water users utilizing water from the same source. Under riparian water rights law, landowners have the right to use the water that is beside or below their lands, but they do not own it (MDNR 2003). The Mark Twain NF has no existing or proposed water withdrawal within the project area.

## Direct and Indirect Effects on Water Resources by Alternative

### *Alternative 1*

In this alternative, System Road 129 from mile post 1.4 to 2.6 would not be decommissioned; preventing the elimination of two unimproved intermittent stream crossings. In this alternative, 1.1 miles of abandoned non-system roads would not be decommissioned. In their existing condition, these roads contribute sediment to streams which could lower existing water quality. Implementation of the No Action Alternative could cause changes to water quality and quantity within the project area; but not of the magnitude to impair MDNR-designated beneficial water uses.

### *Alternative 2*

#### Vegetation Treatment and Road System

In this alternative, System Road 129 from mile post 1.4 to 2.6 would be decommissioned; eliminating two intermittent stream crossing (sediment travel ways). In addition to the system road; approximately 1.1 miles of non-system road would be decommissioned. These system and non-system roads would be restored to forest-like conditions using one or more of the following treatments: blocking the access with earthen berms, rock berms, boulders, or slash piles; restoration of natural drainage features by removing man-made drainage features and re-contouring the area; scarification to remove the road bed; re-vegetation by seeding, planting, or fertilizing. These roads are not needed for public access for recreational pursuits. Motorized use on the unneeded roads would be eliminated. Decommissioning would return the land back into suitable areas for natural resource production (wood products, wildlife habitat, and forage). These unneeded roads would no longer be a source of soil erosion and sedimentation.

According to MDNR (2004), up to 90 percent of the erosion from timber harvesting can be traced to the logging road system. Soil erosion can result in sedimentation to streams. Sedimentation alters the natural relationship between biota and the stream substrate by changing the condition of the substrate. Increased sedimentation can adversely affect the biota by reducing or covering their food supply and interfering with feeding and respiration (Water 1995). The Best Management Practices (BMP) as described in Thomas F. Waters' Monograph 7 "Sediment in Streams", page127, "Methods for the reduction of erosion from logging roads" will be utilized in designing approximately 8.6 miles of temporary roads. Water (1995) describes road placement as often the single most important factor to reduce erosion and transport to streams. Intercepting and retaining sediment between the site of its origin and a receiving stream is second best to prevent erosion. Therefore, skid trails and haul roads would be monitored to identify where maintenance is needed to prevent soil movement into streamcourses. Road location, water barring, drainage diversion, and re-vegetating the area after use are just a few of the effective measures that can be implemented to significantly reduce erosion from temporary roads and skid trails and prevent sediment from directly entering streamcourses. Waters' methods (1995) are common BMP's practices in the Forest Plan and practiced by the Mark Twain National Forest.

Log landings would be no larger than necessary (approx. 1/4 acre or less), and located on stable, adequately drained soils where skidding is directed away from streamcourses. No log landing, cleared to mineral soil in the Greasy Creek Project, would require more than one acre of land. With implementation of these BMP's (USEPA 2010) and Forest Plan Standards and Guidelines, the proposed logging road system would have no effect on MDNR- designated beneficial water uses for North Fork River. Non-point source contaminants from timber harvest activities, including temporary roads, should not have an adverse effect on water quality and quantity; so long as Forest Plan standard and guides and BMP's (USEPA 2010) are implemented. Timber stand improvement would expose little to no mineral soil and would not have an adverse effect on water quality and quantity; so long as BMP's (USEPA 2010) are implemented.

For system road construction, reconstruction, operation, and maintenance; the Forest Service would use limestone gravel removed from a quarry, rather than native gravel removed from a stream. Roads with a hardened gravel surface would generate less erosion, and would cause less sedimentation to move off site. The Forest Service would maintain a riparian tree corridor along its river frontage along perennial streams. Use of Forest Plan Standards and Guidelines and BMP's (USEPA 2010) would reduce the amount of sediment entering streamcourses; therefore, commercial harvest activities would not adversely affect the cool water fisheries of North Fork River.

Within the project area, there is a ford crossing over an intermittent stream, where the streambed serves as the road bed, on Forest Road 427. This intermittent stream crossing would be re-constructed using large base rock, which would stabilize the crossing, prevent rutting and erosion, and reduce the amount of sediment generated. Infrequent uses of ford crossings provide a natural passageway for the migration and movement of aquatic organisms. Best Management Practice measures allowed by the Forest Plan include enforcement of motorized traffic to cross streams at a designated crossing and to not allow motorized use traveling in the stream outside of the crossing.

Another effect from timber harvesting is increased water temperatures in streams when trees are removed in the riparian zone. Increased water temperatures can decrease the dissolved oxygen holding capacity of a waterbody, adversely affecting aquatic species and habitat. Timber harvest is not proposed in any Riparian Management Zone or Water Protection Zone (within 25 feet of a stream) in Alternative 2. Timber harvesting, as proposed in Alternative 2, would not cause water temperatures to exceed state standards in classified waters of the North Fork River, so long as Forest Plan Standards and Guidelines and BMP's (USEPA 2010) are implemented.

### Prescribed Burning

Historically, shortleaf pine was the predominant overstory species in the Greasy Creek Project area. The proposed hazard fuels and pine regeneration burns to establish shortleaf pine would expose the soil for a shorter period of time in the spring (February to May) than in the fall (October to December). Shortleaf pine seeds that lie on the ground during the winter are naturally stratified, and germination near the ground surface takes place in early spring. Seedbed treatments that expose mineral soil tend to increase the initial establishment of seedlings. Scarification during logging and burning provide effective site preparation for natural regeneration of shortleaf pine. A leaf-off late spring regeneration spot check is recommended before proceeding with repeated burns. Control of hardwood competition is also necessary to insure survival of seedlings, although some residual hardwoods have the beneficial effect of shading and protecting them from drying winds, especially on southerly aspects during the first few years after establishment. Releasing seed trees by removing hardwoods and thinning from below to densities less than 50 basal area greatly increases seed production in shortleaf pine stands. Retaining 10-30 basal area of shortleaf pine and potential hardwood den trees is desirable. Good to excellent shortleaf cone crops occur every 3 to 6 years (Lawson, E.L. 1986)

The local effect of a given prescribed burn on streams varies depending on the intensity or severity of the fire, which is directly related to terrain, weather conditions, and the time of year. The primary concern is how fire

accelerates the delivery of sediment to the surface water system. A site preparation burn in the spring would expose soils for a short period of time and the area would quickly green-up. A spring site preparation burn would not contribute a significant sediment load into Greasy Creek or North Fork River. A fall site preparation burn would expose mineral soil over a longer period of time; therefore, more caution is required. Fall burns conducted when soil and fuel moisture conditions are too dry could cause severe damage by removing all materials on the forest floor; especially in steep terrain. In fall, high intensity broadcast burns, which leave portions of the forest floor intact can be controlled by terrain and weather conditions. Post-harvest burns in the fall for fuel reduction is by nature extremely patchy when conducted under the correct weather conditions; and would not contribute a significant sediment load into Greasy Creek or North Fork River.

There are approximately 5.7 miles of existing fireline. Approximately 0.6 miles of new hand line and 3.0 miles of new bladed fire lines would be needed to complete the proposed burns. Bladed fire lines could cause soil erosion and allow sediment to enter streamcourses. It is critical to intercept and retain sediment between the fire line and a receiving stream. Bladed fire lines would not have an adverse effect on water quality; as long as Forest Plan Standards and Guidelines and BMP's (USEPA 2010) are implemented. Prescribed burns, as described above, would not adversely affect beneficial water uses (MDNR 2010), including "cool water fisheries" of North Fork River.

### Invasive Plants

In this alternative, approximately 31 acres infested with non-native and invasive plant species have been identified for manual, mechanical, and herbicide treatments. Aerial application of herbicides has a greater potential to adversely affect water quality than ground-based applications, especially if herbicides are applied under unfavorable conditions, such as on windy days, or if they are applied directly to watercourses. In this alternative, there would be no aerial application of herbicide. Also, no herbicide would be applied directly to standing water, such as seeps, fens, or springs. Only aquatic herbicide formulations of herbicides would be used near aquatic systems. All safety measures identified in the Soil section of this document and in the Biological Evaluation for Greasy Creek would be followed. The Forest Plan analysis on page 3-139 (USDA Forest Service 2005a) concluded that there are unlikely to be direct or indirect effects of herbicide use due to implementation of strict standards and guidelines.

The careful selective use of herbicides can provide a safe and cost-effective means to control non-native and invasive plant species. Adverse effects on water quality and aquatic biota due to herbicide applications typically result from not following specific application directions on the manufacturers label for the chemical being used, which can lead to improper application, such as applying too much or not observing buffers around watercourses. Only trained personnel would recommend, use, and supervise the application of herbicides in accordance with label directions, there should be no effect on MDNR- designated beneficial water uses, including protection of aquatic life (MDNR 2010).

The non-native and invasive species identified for manual, mechanical, and herbicide treatments proposed in Alternative 2 would not cause direct or indirect changes to water quality and quantity within the project area nor impair MDNR-designated beneficial water uses; so long as Forest Plan Standards and Guidelines and BMP's (USEPA 2010) are implemented.

### Mitigation

Impacts from implementation of Greasy Creek Alternative 2 would be indirect and non-significant provided BMP's (USEPA 2010) and Forest Plan standard and guides are followed.

### Monitoring

Implementation monitoring of Forest Plan Standards and Guidelines and BMP's (USEPA 2010) would be conducted by the project administrator.

## Cumulative Effects on Water

### *Cumulative Effects Area (CEA)*

### Spatial boundary

Cumulative effects on water related resources are best addressed from analyses based on a watershed or sub-watershed area. The cumulative effect analysis area is the Greasy Creek watershed of the North Fork River which is 14,109 acres in size (3,978 acres USFS and 10,131 acres Non-USFS). The Greasy Creek Project area is approximately 2,987 acres in size or 21% of the watershed.

### Temporal boundary

The time period is 10 years because "water-yield effect associated with timber harvest would be transient and decrease to background levels in 10 years or less as evapotranspiration increased with vegetation regrowth" (Jacobson 2004).

### Past and Present Activities

Past actions on National Forest land include: Topaz (signed 1/8/02); Hazard Tree Removal Along Road Right-of-Way (2/18/03); Carmen Springs (8/1/03); Willow Spring Pine Fuel Reduction (3/1/04); ACW Openlands Haying Project (5/9/08); Openlands Grazing Management Project (9/27/08); and Blue Hole (9/24/09).

### Reasonably Foreseeable Actions

Actions planned for National Forest land include the Indian Creek Project (approximately 14,000 acres) which is scheduled for a Decision Notice to be signed in 2013, and Siloam Springs (approximately 11,000 acres) in 2015. The Non-Native Invasive Plant Control EIS is expected to be implemented in CY 2012. The main focus of this project is to treat non-native invasive plant infestations on the Mark Twain National Forest using an integrated combination of manual, mechanical, cultural, chemical, prescribed fire, and biological control treatment methods. The Forest Service is not aware of any large scale management actions planned on the land owned by the State of Missouri near the Greasy Creek Project area. There is no State land inside the project area itself. Reasonable foreseeable actions on private lands, based on past trends in the area, could include some timber harvesting and prescribed burning. Other activities on private land are expected to include pasture conversion and housing development on a percentage of the lands being harvested. Lands most suitable for pasture are already in pasture; new housing developments have a close correlation to good access. Based on aerial photos between 50%-80% of the private land within the cumulative effects area is openland, predominately in pastures.

### *Cumulative Effects Analysis*

#### ***Alternative 1:***

In this alternative, current and on-going activities, including system road maintenance, would continue, but no new management activities would be initiated. Sediment is the primary pollutant associated with forestry activities (USEPA 2010). System Road 129 from mile post 1.4 to 2.6 would not be decommissioned; preventing the elimination of two unimproved intermittent stream crossings. In this alternative, 1.1 miles of abandoned non-system roads would not be decommissioned. These roads would remain open under this alternative. Over this 10-year period, the amount of sediment entering stream watercourses would most likely increase. Implementation of the No Action Alternative could cause changes to water quality and quantity within the project area; but not of the magnitude to impair MDNR-designated beneficial water uses, including changes to aquatic habitats which would impair the existing cool water biota in North Fork River.

#### ***Alternative 2:***

Surface water resources are classified and have designated beneficial uses as presented in Tables G and H of the Rules of the Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality

(MDNR 2010). These waters must meet or exceed established criteria as defined in Table A of the above rules. MDNR designated uses associated with North Fork River are: irrigation, livestock and wildlife watering, protection of aquatic life, human health protection-fish consumption, cool water fishery, and Category A - Whole body contact recreation (fishing, wading, boating, and swimming). There are no streams designated for industrial use or as a drinking water supply (MDNR 2010).

Sediment yield and associated aquatic habitat degradation are minimized on timber lands compared to alternative land uses, such as cropland and urban areas; because impacts associated with forestry operations, such as timber harvest and prescribed burning, involve short pulses of disturbance instead of persistent disturbance (Jacobson 2004). Proposed logging operations and prescribed burning within National Forest boundaries could increase short-term sedimentation in the watersheds, but the effects from prescribed burning and logging, including the use of temporary skid trails, would be minimized by Forest Plan Standards and Guidelines and BMP's (USEPA 2010) designed to protect the integrity of the watersheds. Cumulative effect on the watersheds would be negligible.

The Forest Service would maintain a riparian tree corridor along its perennial and intermittent stream frontage, including Greasy Creek. A riparian zone is widely recognized to be highly beneficial to water quality and aquatic habitat (Waters 1995). Vegetation in the riparian zone reduces runoff and traps sediments generated from upslope activities, and reduces nutrients in runoff before it reaches surface waters. Canopy species provide shading to surface waters, which moderates water temperature. Trees in the riparian zone provide a source of large woody debris to surface waters, which serves as important habitat for fish and other aquatic organisms (USEPA 2010). National Forest lands are managed to provide good examples of water quality protection and form the basis for the Mark Twain's efforts to promote water quality protection on both public and private land. Protecting riparian corridors would help to reduce and filter surface runoff as well as provide streambank and channel stability. Proposed projects such as closing non-system roads, restoring hydrological water flow, road closures, and establishment of trees would all have a positive long-term effect on the water quality in Greasy Creek Project area.

Long term population and even aquatic species trends may change during the next decade, as non-public landowners would determine land uses on approximately 61% of the 12-digit HUC 110100060103 named Greasy Creek – North Fork River. Increased land clearing in riparian areas and the county road network in riparian areas would negatively impact stream habitat quality. It will take the cooperation of county, state, and federal agencies to work with all landowners within the Greasy Creek – North Fork River watershed to find ways to better manage riparian corridors to protect the existing water quality and cool water fisheries in the North Fork River.

The duration and magnitude of effects from activities proposed in this project do not incrementally add to the effects of past, present or foreseeable activities on NFS or private lands. This is because 1) Adherence to Forest Plan standards and guidelines would not result in appreciable changes to long-term impacts to water quality, 2) The type and amount of ground disturbing activities proposed are not extensive, and 3) Road reconstruction and decommissioning would reduce negative sediment impacts to the 12-digit HUC 110100060103 named Greasy Creek – North Fork River.

## Irreversible or Irretrievable Commitment on Transportation

Neither of the alternatives would have an irreversible or irretrievable effect on MDNR's Designated Uses of North Fork River at the mouth of Greasy Creek.

# WILDLIFE

## Background

### Resource Impacts or Issue Addressed

This section discloses effects on MIS (Management Indicator Species), Threatened and Endangered Species (T&E), Regional Forest Service Sensitive species (RFSS), and state endangered species.

### Scope of the Analysis

The spatial boundary used to evaluate direct and indirect consequences was approximately 2,218 acres because this land is administered by the Mark Twain National Forest and would receive impacts from the proposed activities. The spatial boundary used to address cumulative impacts was 2,580 acres, for all species, which includes the proposed project area and private lands contained inside the project boundary. Cumulative effect area was dependent on species habitat needs. The temporal boundary or measurement used to assess direct, indirect and cumulative consequences was years because vegetation changes from proposed activities would be ongoing.

### Methodology

Geographic Information System (GIS) ArcMap 10, FSVeg, site visits, and satellite imagery were used to determine amount and change in habitat for MIS, T&E, and RFSS.

## Affected Environment/Existing Conditions

In recent history, notable drought events, late frosts, ice storms, and outbreaks of spring defoliators have stressed trees in the area. Older, suppressed, and otherwise weakened trees have become susceptible to additional stress agents such as root rot, insect borers, and fungal cankers. The combination of all these factors contributes to decline and death of trees that could otherwise withstand these factors individually, and is referred to as oak decline. Much of the red oak group (black, scarlet, and northern red oaks) in the area, originated with the abandonment of the agricultural practices and rural development of the early 1900's. Consequently, the age of the red oak group is nearing biological maturity which is around 80-90 years old. This advanced age makes the red oak group more susceptible to decline than trees of the white oak or pine groups which are not as close to the end of their biological life cycles. As a result, much of the project area is in a state of severe decline. Where red oak was once a dominant forest type, white oak, mixed oak and hickory forests are becoming more common. The land is drained by Greasy Creek and several other unnamed streams that are part of the North Fork River watershed (Hydrological Unit 11010006) which flows south and empties into Norfork Lake in Ozark County, Missouri. From there, it flows south to the Middle White River watershed (HUC 11010004) downstream in Arkansas. The region is characterized by a well-developed karst terrain, with many caves, springs, sinkholes, and gaining and losing streams. The general wildlife community that occurs in the Greasy Creek Project area is typical of the oak/hickory forest.

### State Endangered Species

There are five species listed on the Missouri State endangered species list that occur in Douglas County. They are: Ozark hellbender, Bachman's sparrow, gray bat, black tailed jack rabbit and plains spotted skunk. Black-tailed jackrabbit and plains spotted skunk will be discussed here. The Ozark hellbender and gray bat are discussed under threatened and endangered species, and Bachman's sparrow under MIS.

**Table 3.5. State Endangered Species addressed in this section.**

| Species | Habitat | Habitat available in project area |
|---|---|---|
| Black-tailed jackrabbit | Open, prairie-like habitats | Yes |
| Plains spotted skunks | Open prairies, brushy areas, and cultivated lands | Yes |

The No Action Alternative would provide brushy and open woodland habitat to a greater extent than Alternative 2. However, this alternative poses a greater risk of catastrophic wildfire, which may remove habitat temporarily.

Alternative 2 would improve open woodlands, which these species use. Salvage harvests would not occur in riparian areas, springs, seeps or side slopes over 35% per the 2005 Forest Plan. Salvage harvests would improve the quality open woodlands. Downed timber left on side slopes and ridge tops, and areas not harvested would provide brushy habitat for foraging and cover. The proposed alternatives would not cause a trend toward federal listing of the plains spotted skunk and black-tailed jack rabbit. Habitat would still be available in the project area under both alternatives. These species will not be discussed further in the document.

**Management Indicator Species**

The Mark Twain National Forest MIS include: northern bobwhite, summer tanager, Bachman's sparrow, worm-eating warbler, and red bat. These species were selected because they are considered most likely to provide an indication of the effects of management in response to changing issues.

Bobwhite quail – Bobwhite quail are usually found in prairies and grasslands along forest edges. They form tight coveys at night with each bird facing outward. This way they conserve heat at night and make it very difficult for predators to sneak up on the covey. They prefer to nest along the edge of woods or in fields of tall grass or brush piles. The primary nesting season for quail is between March and September. Because of declining habitat, populations have also declined. This decrease in the population is not surprising given that many other prairie and grassland species numbers are also declining in Missouri, the Midwest, and other portions of the country.

Summer Tanager – The summer tanager is found in pine-oak forests, bottomland deciduous woodlands, and parks. It forages on bees, wasps, and other insects, as well as berries and other fruits. Primary nesting season is May-June (NaturServe, 2006).

Bachman's sparrow – In Missouri, this species lives in areas with scattered, shrubby vegetation and a dense herbaceous understory. They are found in dry open pine or oak woods with an undercover of grasses and shrubs; brushy or overgrown hillsides; or overgrown fields with thickets and brambles (MDC, 1997). They are also found in glade habitat; Missouri is the northwest edge of this species' range. Birds nest and forage on the ground for insects and seeds. Primary nesting season is in late June.

Worm-eating warbler – This ground nesting warbler uses large tracts (minimum 25 acres) of upland deciduous forest on wooded slopes and ravines, usually in drier areas, foraging near or on the ground for insects. This species is most abundant in mature woods, but is also common in young and medium-aged stands of continuous forest (Patton and Hanners 1998). This warbler is very sensitive to forest fragmentation and requires contiguous forestland. Primary nesting season is June-August.

Red bat – In Missouri, red bats use forests year round. In winter, they are known to hibernate in trees and under leaf litter. However, on warmer winter nights they forage for insects. They consume moths, crickets, flies, mosquitoes, true bugs, beetles, cicadas, and other insects. They mate in August and September and females give birth in late spring or early summer.

### Natural Communities as Management Indicators

Glades, open woodland, and groundwater seepage natural communities were included as management indicators because they are considered most likely to show response to management activities on the Mark Twain National Forest.

Glade – There is no glade habitat within the Greasy Creek Project area.

Open woodland – There are approximately 1,583 acres of open woodland habitat.

Ground water seepage communities – There is one spring located within the Greasy Creek Project boundary.

### White Nose Syndrome

White nose syndrome is a fungus that is infecting hibernating bats in the eastern United States and Canada. This fungus often forms white tufts on the bats' muzzle. These infected bats have appeared to have used up their winter fat reserves and congregate much closer to the entrance of the hibernacula than usual.

White nose syndrome has been confirmed in New York, Vermont, New Hampshire, Rhode Island, Connecticut, Massachusetts, New Jersey, Pennsylvania, Maryland, Maine, West Virginia, Virginia, North Carolina, Kentucky, Tennessee, Alabama and Missouri. Tri-colored, little brown, northern long-eared, small-footed and Indiana bats have been affected. The disease was just recently confirmed in Missouri during April 2012.

Currently, the Mark Twain National Forest has extended the emergency cave closure order until 2016. Since the proposed project would not affect caves or bat species that reside in the Greasy Creek Project area, this project would not contribute to the spread of this fungus in Missouri.

## Direct and Indirect Effects on Wildlife by Alternative

### *Alternative 1*

### Management Indicator Species (MIS)

There would be no direct effects of proposed activities such as loss of individuals, nests or roosting trees under Alternative 1. Indirect effects include continued encroachment by cedar and hardwood into openlands and open woodlands. Forested areas would move toward old growth conditions, affecting early seral habitat for bird species that prefer a more open setting.

Indirect effects to forested areas would be a move toward old growth conditions, indirectly affecting nesting and foraging habitat, as summer tanagers, for example, prefer a more open setting. However, forested conditions moving toward old growth conditions maintain roosting habitat for red bats. Foraging would still be available in stream corridors and where forests meet agricultural lands. Movement toward old growth conditions may cause an extra expenditure of energy for bats during foraging activities because tree canopies would continue to close, thus making maneuvering during flight more difficult.

Much of the wildlife habitat in the project area would remain unsuitable for Bachman's sparrow. Grass fields would be replaced with invasive woody vegetation within three to four years. Open areas would still be encroached upon by redcedar, as well as the open pine and oak forests. This would continue to shade out herbaceous ground cover, such as grasses and forbs, which this species prefers. Upland deciduous forests moving toward old growth conditions would improve foraging and nesting habitat for worm-eating warbler in the project area.

Natural succession and weather events would still change habitat conditions in the project area. Forested and open habitats would still be available, retaining nesting, roosting and foraging habitat. Most of the area is adjacent to county roads and state highways; passing vehicles and recreationists could introduce and spread noxious weeds in the project area.

### Federal Threatened and Endangered Species

The January 24, 2012 U.S. Fish and Wildlife Service list was used for this project analysis on threatened and endangered species. A biological evaluation (BE) with detailed effects analysis can be found in Appendix C in this document. Only gray and Indiana bats were considered for Greasy Creek Project.

Gray bat

No direct effects would occur to the species, because there are no documented maternity colony or hibernacula caves within the project area. Indirect effects to foraging areas would stay the same. Vehicular traffic would cause sedimentation in streams that may affect habitat for prey species; however, foraging areas would still be available for gray bats within the project area.

Indiana bat

There would be no direct or indirect effects to the Indiana bat. Numerous bat surveys conducted in the past decade indicate that there is no presence of Indiana bat on the ACW Ranger District and in this project area. This District is in the extreme western range for Indiana bats, which indicates there would not be a great population of bats (Gardner 2003). The nearest maternity colony is 65 miles northeast and the nearest hibernaculum is 52 miles southwest of the project area and used sporadically. No removal of standing dead or flaking bark tree species would occur. There would be no direct or indirect effects from Alternative 1.

### Regional Forester Sensitive Species

The 2011, R-9 Regional Forester Sensitive Species (RFSS) list is being utilized for this project. There are 139 species currently listed. All of the current RFSS species are evaluated. There are RFSS known to occur in the Greasy Creek analysis area; however, only 28 RFSS have suitable habitat in the area.

Due to a lack of suitable habitat for 111 RFSS in the area, there is a determination of “No Impact” concluded for these species. Because there would be no impacts, these species will not be discussed further in this document.

Direct and indirect effects from Alternative 1 to the 28 RFSS known to have suitable habitat in the project area would be minimal and non-significant. The RFSS BE (Appendix C of this document) stated that Alternative 1 “may impact, not likely to adversely impact” and would not cause a trend toward federal listing to those RFSS that have suitable habitat in the Greasy Creek Project area.

## ***Alternative 2***

### Management Indicator Species

Direct effects to birds would be loss of young and nests if harvest activities occur during breeding season. Mature birds would be able to move from this area and may re-nest if the first nest is lost. Direct effects to bats would be loss of adult bats, if they are in hibernation and cannot wake up fast enough to leave, and during maternity season, when young are not able to care for themselves.

Indirect effects would be changes to the existing habitat for MIS. All MIS species use tree and ground cover to some extent.

Removal of trees within the project area would indirectly affect red bats as they are tree bats; however roosting habitat would still be available on side slopes within harvest units.

This would improve potential foraging areas and hiding cover for quail and Bachman’s sparrow for the first three years after the harvest or until new forest begins shading out necessary ground cover (AGF, 1997). This would also improve stand health and open the canopy to allow more herbaceous ground flora for hiding cover and foraging. Pine and oak/pine open woodland would be maintained, and would improve foraging, breeding, and winter habitat for quail and Bachman’s sparrow. Harvesting trees would also enhance foraging and nesting

habitat for summer tanager, by creating a more open overstory for better mobility while foraging, however some areas temporarily may be too open for summer tanager to use after harvests are complete.

Nest trees and potential nest trees would be removed during salvage harvests. One study on forest management practices found that "landscape configuration was more important to avian community characteristics than the amount of habitat area…except where harvesting large areas homogenized landscape over time." This study also found that neotropical migrants respond positively to fragmentation of forest types at a broad scale, negatively to evenness of overstory type at a broad scale and positively to variability of forest age on a fine-scale (Mitchell et.al. 2008). The proposed vegetation management would provide diversity in canopy closure, understory, and fragmentation in the Greasy Creek Project area.

These findings are also in line with other studies conducted on disturbance of habitat and neotropical migrants. All these studies have found that even-aged timber harvest at large scale change the bird communities from forest interior to early seral, for some amount of time. However, as the forest matures again, forest interior birds repopulate the area. Prescribed burns may keep some areas in early seral condition.

Proposed activities would remove merchantable salvage trees, which would allow more grasses, forbs, and shrubs to grow in the understory, improving habitat for worm eating warbler and ground nesting and foraging birds. Populations of forest interior birds may be reduced in the area until forests reach maturity. Habitat for all MIS would be available in the project area. Open woodland communities would be enhanced in Alternative 2.

### Federal Threatened and Endangered Species

Gray bat

Proposed activities were found to have a determination of "may affect, not likely to adversely affect" the gray bat. A detailed Biological Evaluation was completed February 15, 2012 regarding the effects of the proposed action to gray bat (Appendix C). The U. S. Fish and Wildlife Service concurred with the determinations of the BE on March 21, 2012.

Indiana bat

Proposed activities were found to have a determination of "may affect, not likely to adversely affect" the Indiana bat. A detailed Biological Evaluation was completed February 15, 2012 regarding the effects of the proposed action to Indiana bat (Appendix C). The U. S. Fish and Wildlife Service concurred with the determinations of the BE on March 21, 2012.

### Regional Forester Sensitive Species

Direct and indirect effects from Alternative 2 to the 28 RFSS known to have suitable habitat in the project area would be minimal and non-significant. The RFSS BE (Appendix C) stated that Alternative 1 "may impact, not likely to adversely impact" and would not cause a trend toward federal listing to those RFSS that have suitable habitat in the Greasy Creek Project area.

## Cumulative Effects on Wildlife

### *Cumulative Effects Area (CEA)*

The cumulative effects area (CEA) for all species is 2,987 acres, which includes the project area composed of Forest Service lands and private land. The cumulative effects area was chosen because there is a variety of habitat for MIS, threatened and endangered and Regional Forester's sensitive species. Effects of the project that would be considered are for the past ten years and those likely to occur in the next ten years. This would allow habitats enough time to show change with any management occurring on them.

### *Cumulative Effects Analysis*

### Past, Present, and Foreseeable Future

Within the CEA, recreation activities have taken place on Forest Service lands within the last ten years. Haying, ATV/ORV riding, horseback riding, hiking, camping and hunting are some of the activities that have occurred, currently occur, and will occur in the future. These activities can cause stress to wildlife either by noise or contact with humans. These activities can also bring in non-native invasive species, which can degrade habitats used by MIS, T&E, and RFSS.

Privately owned pastures are grazed almost year round, keeping these areas open for grassland foraging species such as scissor-tailed flycatchers, Bachman's sparrow, raptors and bobolinks. Most pastures have fence rows and riparian zones available for nesting. There are also private residential houses, two-lane highways and numerous dirt roads in this area. All these activities and structures have changed the natural environment. Natural succession, weather events, timber theft, and arson fires are ongoing and could change the existing habitat.

Foreseeable actions within this area at this time are a continuation of salvage harvests. This activity would be done in the same way and have the same effects. Although private lands are generally grazed year round and have little residual cover and forage available to birds, they would stay in the existing agricultural state or may be subdivided. It is unlikely that private land would be restored or converted to warm-season grasses and forbs, which would continue to limit opportunity for nesting and winter habitat for bobwhite quail. Some private lands have areas of brush and forested riparian areas where suitable quail habitat exists. These blocks of forest may be large enough for forest interior birds to use like worm-eating warbler and ovenbirds.

Privately-owned acres may be cut or cleared for pasture land in the future, however some areas would stay timbered, maintaining habitat for red bat and forest interior birds. Any harvesting that would occur on private lands would reduce roost trees for red bats and larger blocks of forest that forest interior bird species use.

Conclusion: The duration and magnitude of effects from no action for the next ten years would not maintain open woodland communities, unless it is done through natural succession, weather, tree theft or arson. Open woodland communities would become more encroached upon by cedar and hardwoods. There would be negative cumulative effects to bobwhite quail habitat, and further reduction of birds and habitat could occur on Forest Service lands.

There would be no negative cumulative effects to red bats or their essential habitat from the no action alternative. Remaining forested areas would continue to move toward old growth conditions. The no action alternative would continue to provide habitats for red bats on NFS lands.

Eventually, mature forest habitat would return to the project area along with forest interior and old growth dependent species. Early seral species habitat would remain until the forest matures. Adjacent private pastures provide plenty of open land habitat for early seral species. There are forest blocks in private ownership that would also provide forest interior bird habitat.

### Management Indicator Species

The duration and magnitude of effects from recreation and salvage activities of Alternative 2 on pine, oak/pine, open woodland, and forest environments would occur for the next 15 to 20 years. There would be no negative cumulative effects to bobwhite quail, red bat or essential habitat. Salvage efforts would benefit the species by restoring open woodland communities to a more natural state and creating slash piles for cover and providing old growth in RMZs and steep slopes. The duration and magnitude of effects of activities proposed in Alternative 2 do not negatively affect past, present and foreseeable actions that have or would occur on NFS or private lands. The unharvested areas would continue to provide habitat for forest interior species such as worm-eating warbler and red bats. Salvage activities would scarify the land and increase the amount of

pine/hardwood open woodland habitat for Bachman's sparrow and summer tanager. Alternative 2 would aid in improving habitat for MIS on NFS lands.

**Threatened and Endangered Species**

There would be no cumulative effects to gray or Indiana bats from Alternative 1. There are no caves within the project area. Foraging habitat would still be available for gray bats. Indiana bats have not be documented on the ACW Ranger District. Eight years of negeative bat surveys and the District being on the western extreme of the species range both indicate low or no Indiana bat use. Foraging habitat and maternity roost trees would still be available within the project area for Indiana bats should they use the area.

There would be no cumulative effects to gray bats from Alternative 2 because there are no known maternity colony or hibernacula caves within the project area. There would be no direct or indirect effects to known cave habitats. The 2005 Forest Plan Standard and Guidelines would ensure protection of riparian areas, which are foraging habitats for gray bats. Therefore, the potential for adverse impacts to gray bat by proposed activities in the Greasy Creek project is remote and considered discountable.

There are no cumulative effects for Indiana bat from Alternative 2 since there are only indirect effects to unoccupied suitable habitats. The nearest known Indiana bat hibernaculum is 52 miles southwest of the Greasy Creek project. This hibernaculum has not been occupied since the winter of 2004/2005. The closest maternity colony is located on the Salem Ranger District about 65 miles northeast of the Greasy Creek project area. Bat surveys conducted in the last eight years have not detected any Indiana bats present on the ACW Ranger District. With application of standards and guidelines designed to provide and protect suitable habitat, potential impacts would be further minimized. Therefore, potential impacts to Indiana bats from proposed activities are considered remote and discountable.

**Regional Forester Sensitive Species**

There are no cumulative impacts to any Regional Forester Sensitive Species from Alternative 1 or Alternative 2.

**Unavoidable Adverse Impacts**

None of the proposed alternatives would cause unavoidable adverse impacts.

**Irreversible or Irretrievable Commitment of Resources**

There are no irreversible or irretrievable commitments of resources.

**Consistency with the Forest Plan**

The project is consistent with Forest Plan goals, standards, and guidelines (pp. 2-2 – 2-14, 3-11, 3-45)

**Consistency with Laws, Regulations, and Handbooks**

The project is consistent with applicable laws, regulations, and handbooks.

## FUELS

### Affected Environment/Existing Conditions

**Background**

Objectives of prescribed fire activities are to enhance the ecological role of fire, maintain and enhance natural community types, and reduce heavy buildup of accumulated fuels. Altered fire regimes have resulted from increased fire suppression efforts and decreased use of fire since European settlement. Current heavy buildup of fuels, combined with an increasing population establishing their presence in wildlands are resulting in

significant threats and increased potential for wildfires that can destroy homes, adversely impact forest resources, and pose more dangerous situations for firefighters and private individuals.

Altered fire regimes pose great threats to biodiversity, ecosystem sustainability, and public and firefighter safety. When ecosystems, become overstocked with trees and shrubs, chances of catastrophic wildfire increase dramatically. This condition indicates that fire frequency has declined, as amounts of available fuels increases. Without fire to reduce fuels buildup, conditions develop that lend themselves to increased fire size, intensity, and severity. These conditions also contribute to damage of commercial timber and other resources from wildfire events.

Fire Regime Condition Class (FRCC) is a classification of the amount of departure from the natural fire regime. There are three classes based on low (FRCC 1), moderate (FRCC 2) and high (FRCC 3) departures from the central tendency of the natural or historic regime (Hann and Bunnell 2001; Hardy, et al. 2001). In this project area FRCC's are based on the National Fire Regime Condition Class Map and FRCC Definitions produced by the Interagency FRCC Working Team. The National FRCC map identifies areas in respective condition classes based on departure from historic fire regimes and historic forest conditions, and on observations made in the General Land Office surveys.

Fire Regime Condition Classes are defined as follows:

**FRCC 1** is within the natural range of variability of vegetation characteristics, and risk of losing key ecosystem components is low. Less than 122 acres (3%) within the Greasy Creek Project area are classified as FRCC 1.

**FRCC 2** is defined as areas where fire regimes have been moderately altered from their natural range. Risk of losing key ecosystem components is moderate. Fire frequencies have departed from natural frequencies by one or more return intervals, resulting in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation and fuel attributes have been moderately altered from their natural range. Approximately 564 acres (14%) of the Greasy Creek Project area is classified FRCC 2. These are areas that have previously been prescribed burned once and thinned once. If fire were not used as a management tool to maintain or enhance areas in FRCC 2, these habitats would eventually move into FRCC 3.

**FRCC 3** is defined as an area with a high departure from the historic fire regime. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical intervals by multiple return intervals. Dramatic changes can occur in fire size, intensity, severity, and landscape patterns. Vegetation arrangement and composition have been substantially altered from historic conditions. Within the Greasy Creek Project, 2,479 acres (83%) have been identified as being in FRCC 3. Dense stands of shortleaf pine will continue to stagnate and create deadfall as they try to maintain their vigor. They are also shading any sunlight on the forest floor that would allow a diverse forb seedbed to sprout. These stands are also a hazard for a continuous crown fire during heightened fire danger. Without fire and mechanical treatments to areas in FRCC 3, the eventual loss of key ecosystem components is eminent and risk of catastrophic wildfires will increase.

Fuel composition with respect to vegetative species, combined with fuel arrangement and continuity determines fuel loading. Fuel loading is a function of site productivity, decomposition rates, and time since last disturbance, such as fire or logging activities. Fuel loading can be further described as the amount of vegetation either dead or alive available for consumption by a fire. Fuels may be further described by size class. Wildland fire managers commonly refer to fuels size classes as "time lag" fuels. Time lag refers to the length of time that a particle responds to within 63.2% (1-1/e) of the new equilibrium moisture content (either drying or wetting). Larger diameter fuels generally have longer time-lags, meaning they respond more slowly to changes in environmental conditions. The time lag categories traditionally used for fire behavior and fire danger rating are specified in Table 3-6 below.

**Table 3.6. Fuel Size and Timelag Classes**

| Fuel Size Diameter | Timelag fuel class (hours) |
|---|---|
| 0 to ¼” | 1 |
| ¼ to 1” | 10 |
| 1 to 3” | 100 |
| > 3” | 1000 |

Fuel loadings are typically measured in tons/acre, averages of which have a strong correlation to FRCC’s with regard to heavy or normal loadings based on the particular site characteristics represented. Areas in FRCC 1 are most likely to exhibit average fuel loadings that are considered normal for a specific ecotype. Areas in FRCC 2 and 3 would exhibit higher than average fuel loadings due to the increase of vegetation and large woody debris resulting from altered fire regimes.

### Existing Condition of Fuels

Fuels in the Greasy Creek Project area are typically oak-hickory and oak-pine mix. Fuel loadings in these fuels typically average 3-4 tons/acre of duff and 10-15 tons/acre of woody material (Ottmar, Vihnanek 1999). Many dense pine stands scattered across the project area consist of 30- to 60-year-old, overcrowded stands where tree canopies interconnect. Trees in these conditions tend to be weakened by competition for available growing space and become more susceptible to disease, insects, wildfire, and drought. Over the past 10 years there have been 5 wildfires within the project area, which have burned 130 acres; an average fire size of 26 acres. The fuels within the Greasy Creek Project are characterized by overcrowded, weakened, dying, or dead trees that provide elevated fuel loads for potential wildfires. Most stands have densely crowded overstories, with accumulations of fine surface fuels and pockets of ladder fuels. Those fuel characteristics tend to increase potential for wildfire occurrence within the project area and tend to burn at a higher intensity and severity. *Intensity* is the rate at which fuel is consumed, and *severity* refers to the damage to forest components. Historically, shortleaf pine was the predominant overstory species. Due to harvest methods and wildfires, oak has begun to become the dominant overstory species.

### Desired Condition

The landscape would be much more open, similar to the Open Woodland community type (2005 Forest Plan, Appendix A, Table A-2). Overstory canopies would be more open, allowing sunlight to stimulate establishment and growth of grasses, sedges, and forbs. While these latter fuel types are usually typified as light and flashy, fires are easier to control and are less destructive to residual stands. Shortleaf pine would once again become the predominant species across the landscape. Pine and oak species produce close to the same amount of litter and duff; pine fuels are more compacted and have a longer drying time than that of oak. Shortleaf pine more fire resilient, and when thinned, generally do not support a sustained crown fire.

## Direct and Indirect Effects on Fuels by Alternative

### *Alternative 1*

This alternative would allow fuels to accumulate and decompose naturally as currently seen, particularly in pine stands. Eastern redcedar would continue to encroach, and thick, dense shortleaf pine stands would continue to thin themselves, as trees die due to overcrowding and disease. This dense understory, sometimes called ladder fuels, would allow fire to climb into the canopy and burn the crowns of shortleaf pines if the correct fire conditions existed. This buildup of fuels would increase in density, allowing for leaf litter and large amounts of dead and down material to accumulate. Under these conditions, buildup of large diameter fuels in the 100 and 1000 hour time lag categories could accumulate in concentrations that, in the event of a wildfire, could cause

significant damage to commercially viable timber. These larger fuels would burn for longer durations than smaller diameter fuels, and could sustain heat at lethal temperatures at durations long enough to cause cat-facing (scarring) or even mortality in standing live timber. Smaller diameter fuels may produce intense heat; however, behavior of fire in these fuels is most always high intensity, fast moving, and has very short duration of localized heat release. Fires in these smaller, lighter fuels pass through so quickly that lethal temperatures do not occur at durations long enough to cause damage to standing live timber.

Lack of fire would eventually result in declines in species richness, composition, and increases in existing populations of non-native, invasive species. Diversity of shade-intolerant and understory species would continue to decline. Increased fuel loadings and higher density vegetation could contribute to higher fire intensities, severity, and increased fire size. FRCC's would not be maintained or moved closer to the desired condition of FRCC 1, but continue to degrade and move toward FRCC 3.

***Alternative 2***

Managing fuels in this alternative calls for prescribed burning 2,422 acres, of which 40 acres is private; pre-commercial thinning on 470 acres; and commercial timber harvest activities on 2,580 acres of the project area. Prescribed fire would be applied pre-harvest and post-harvest. This would help to reduce the fuel loading immediately in the project area, while the post-harvest burning would focus on residual fuels left over from harvest activities. Prescribed burning would also promote regeneration of shortleaf pine. After the post-harvest prescribed fire application, monitoring would take place to determine if another application of prescribed fire would be necessary. The additional application of fire would be dependent upon establishment of shortleaf pine saplings large enough to withstand a low severity fire. This normally occurs between the ages of 8-15 years. Frequent burning (1 to 4-year frequency) likely promotes regeneration, but a lowered frequency (8 to 15 yrs.) promotes survival and recruitment into the overstory. Monitoring will be used to determine when sufficient regeneration has occurred to reduce prescribed burning frequency; thereby, allowing recruitment to occur. One or more burn cycles likely would have to be skipped to allow for pine recruitment into the overstory. We hypothesize that an 8 to 15 year fire frequency may be a range where shortleaf has a higher probability of recruitment than many hardwood competitors, especially after long periods of continuous burning (Stambaugh, Guyette, Dey 2006). Logging slash would remain on site after timber harvest activities, which does not necessarily increase fuel loading since those fuels were already present, but slash is more available for consumption by fire at ground level. Treating the project area with prescribed fire soon after logging would quickly consume a considerable amount of slash and decrease the surrounding fuels, thus decreasing potential for high intensity wildfires in the future. Initially, there would be more fuel available for consumption by fire after the timber is harvested. However, removing that fuel with prescribed fire under specific environmental conditions identified in the prescribed fire prescription would mitigate damage to timber by burning under conditions (i.e. cooler temperatures, leaf off) that aid in preventing heat from reaching lethal limits. Prescribed burning and timber harvesting would reduce canopy cover and encourage development of understory vegetation.

The Greasy Creek Project would focus on the removal, arrangement, and availability of fuels throughout the project area and potential enhancement of natural communities. The project would also address the need for fuel reduction in areas around homes and communities within and adjacent to the project area. These communities are in danger due to their location within the wildland/urban interface and large accumulations of hazardous fuel within the interface. There are also forty acres of private land that would be burned along with the Forest Service land, which would be accomplished through an agreement with the landowners. The authority to do so comes from the Wyden Act. Areas that would be impacted by the Greasy Creek Project have been altered from natural occurrences, and potential for catastrophic fire and loss of certain ecosystems is high.

There would be a significant change in the arrangement and availability of residual fuels, which would reduce the chance of a running crown fire, and therefore reduce the risk of catastrophic fires. There would also be better firefighter and equipment access to these areas, especially adjacent to private property lines. In these

areas there would be a temporary increase in fuel flammability as cut fuels dry and cure, however this should be mitigated with decomposition. These smaller fuels would decompose at a much faster rate than 100- and 1000-hour fuels. Areas where prescribed fire would be introduced, would remove approximately 1 ½-2 tons/acre of dead fuel. After treatment with fire, these areas would be thinned mechanically to remove more of the live fuel loadings. Post-burn thinning would improve the overall health and vigor of the stand, and long term, actually reduce the amount of fuel build up.

## Cumulative Effects on Fuels

### *Cumulative Effects Area (CEA)*

#### Spatial boundary

The fuels cumulative effects spatial boundary of the Greasy Creek Project is 5 miles around the perimeter of the project area. This boundary was selected because of the effects of fuels treatments on commercial timber values and risk of wildfire spreading from USFS land to adjacent private lands (Fuels Cumulative Effects Spatial Boundary map, Greasy Creek Project file).

#### Temporal boundary

The cumulative effects temporal boundary was set to analyze 10 years prior to and 10 years following this decision. The boundary was selected because 10 years is the standard management cycle and this is the extent to which effects are measurable and meaningful.

These spatial and temporal boundaries were selected because this is the extent to which cumulative effects information would be measurable and meaningful, and direct and indirect effects would be relevant.

### *Cumulative Effects Analysis*

#### Past, Present, and Reasonably Foreseeable Actions

Past and present activities have included timber harvest and wildfires. Within the last ten years there have been 5 wildfires within the project boundary that burned a total of 130 acres.

Past projects (date signed) within the Fuels cumulative effects boundary include the following:

***Blue Hole (9-4-09):*** Prescribed burn 4,858 acres, commercially harvest 2,948 acres, non-commercially thin 177 acres, and construct 7.1 miles of fireline.

***ACW Openlands Haying (5-9-08):*** Lime and fertilize 230 acres of grasslands for haying, mow and hay 335 acres to maintain open lands, and disk 68 acres for enhancement of legumes.

***Willow Springs Pine Fuel Reduction (3-1-04)****:* Mechanically thin 722 acres of pine stands on 30 different projects sites across the Willow Springs unit.

***Carman Springs (8-1-03):*** Activities include but not limited to approximately 678 acres of mechanical salvage of dying black oak, 3,435 acres of commercial thinning or pre-commercial thinning, 4,582 acres of ecosystem restoration burning, fireline construction, road construction/re-construction and maintenance.

***Hazard Tree Removal Along Road Right-of-Way (2/18/03):*** Removal of hazardous trees along roads and trails; and adjacent to and within parking lots, picnic areas, and campsites within all developed recreation facilities.

***Topaz (1-8-02):*** The activities to be implemented in this project include 556 acres of commercial thinning, mechanical harvest on approximately 2,907 acres, and 666 acres of prescribed burning.

Activities that do not occur on Forest Service lands, but often occur on privately-owned lands include in part, land clearing for farms and/or home sites, dairy and beef farm operation expansions, and construction of new homes or subdivisions.

**Reasonably foreseeable actions**

Reasonably foreseeable actions include prescribed burning within the project area a minimum of two times after which monitoring would determine the need for additional applications of prescribed fire. Based on observations within the Greasy Creek Project cumulative effects boundary, the same or similar activities previously mentioned are likely to continue.

**National Forest Land**

Other foreseeable activities on National Forest lands within the Willow Springs unit include the Indian Creek Project, which is scheduled for a Decision Notice to be signed in 2013, Siloam Springs (2014), Pomona (2015), and Red Mountain (2019).

**State of Missouri Land**

The Forest Service is not aware of any fuels management actions planned on the land owned by the State of Missouri near the Greasy Creek Project area. There is no State land inside the project area itself.

**Private lands**

Reasonable foreseeable actions based on past trends in the area include some timber harvesting and prescribed burning occurring on the surrounding private ownerships. Other activities on private land are expected to include pasture conversion and housing development on a percentage of the lands being harvested. Lands most suitable for pasture are already in pasture; new housing developments have a close correlation to good access.

**Cumulative Effects Discussion**

Cumulative impacts associated with smoke from prescribed fires, fireline construction, and vegetation are discussed in the Air, Soils, Vegetation, and Wildlife sections of this analysis. Other cumulative impacts from fuels management activities in the analysis area would include a reduction in closed canopy timber stands, which would allow for increased sunlight and precipitation to reach the ground surface. An increase in fine fuels would likely result from the removal of timber, combined with a reduction of vegetation density after fire treatments. An increase of fine fuels may increase potential for sustainability of wildfire ignitions, however fire intensities should remain manageable and effects well below severe limits. With the reintroduction of annual prescribed burning for 3 to 5 years, based on management prescriptions for Management Area 2.1, in the 2005 Mark Twain Forest Plan (USDA Forest Service 2005), which calls for maintaining and enhancing natural communities, fuels within these areas could be maintained at loadings that would prevent catastrophic wildfires. In addition, the FRCC of these areas would be maintained or moved closer to FRCC 1.

The historic fire return interval for this cumulative effects area was the primary disturbance regime that determined vegetation types, species, and arrangement of vegetation that made up open woodland ecosystems, and conversely determined fuel loadings as well. Fire has been integral to the development and function of open woodland ecosystems. Removal of fire from these fire-dependent ecosystems has caused an increase in densities of eastern redcedar, oak, and other shrub-type species. This has resulted in a loss of key ecosystem components such as declines in species richness, composition, and establishment of non-native invasive species. Maintenance of these ecosystems is limited primarily to National Forest System lands.

Without prescribed fire and mechanical fuels treatments to maintain ecosystem characteristics, areas classified as FRCC 1 & 2 would continue to degrade into FRCC 3. Cedar would continue to encroach on these areas, stand densities would increase, conditions of key ecosystem components would decline, and an increase in

hazardous fuel loadings would continue. Additionally, with increased fuel loadings, potential for larger, high intensity, and costly wildfires would rise, requiring even more intensive enhancement efforts in the future.

### Irreversible or Irretrievable Commitment on Resources

Neither of the alternatives would have an irreversible or irretrievable commitment on resources in the proposed Greasy Creek Project area if management practices adhere to Forest Plan Standards and Guidelines.

**Fuels Summary:** Fuels management activities proposed in this project would not have significant negative impact to soils, watershed, vegetation, or wildlife habitat. The result of prescribed burning and timber harvest would dramatically improve the health and vigor of native plant communities, reduce potential for catastrophic wildfires, and move areas currently in FRCC 2 & 3 into FRCC 1. Additionally, these activities would provide wildfire protection for timber resources and adjacent private lands.

## Air Quality

### Affected Environment/Existing Conditions

The Clean Air Act (CAA) of 1963 was developed to protect humans against negative health or welfare effects from air pollution. Air pollution can be defined as the presence in the atmosphere of one or more contaminants of nature, concentration, and duration to be hazardous to human health or welfare (Sandberg 1999). Measurable values in the Clean Air Act are the National Ambient Air Quality Standards (NAAQS). The NAAQS are defined as amounts of air pollutant above which detrimental effects to public health or welfare may result. National Ambient Air Quality Standards have been developed for six criteria pollutants. These pollutants consist of carbon monoxide (CO), particulate matter (PM-2.5 and 10), ozone ($O_3$), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$) and lead (Pb). NAAQS are established as primary and secondary. Primary NAAQS are set at levels to protect human health; secondary NAAQS are set to protect human welfare effects to include visibility as well as plant and materials damage (Sandberg et al. 2002). In general, air quality in the proposed project area is good (Ozark-Ouachita Highlands Assessment 1999).

The proposed project lies within lands designated as Class II with respect to the air resource. The Clean Air Act defines a Class II area as, "A geographic area designated for a moderate degree of protection from future degradation of the air quality" (Clean Air Act 1990). The closest Class I area is the USDA-Forest Service's Hercules Glades Wilderness, located about 80 miles west of the proposed project area. The CAA defines a Class I area as "A geographic area designated for the most stringent degree of protection from future degradation of air quality." The only other Class I area in the state is the Mingo National Wildlife Refuge, which is approximately 129.5 miles east of the proposed project area. Winds in this region of the country blow predominately from the southwest.

Climate in the area (Pomona, Missouri station) is defined by:

- Summers are hot and humid high temperatures averaging 87$^{o}$F, and average low temperatures around 63$^{o}$F.
- Autumns are warm and moist with average high temperatures ranging from 56 to 80$^{o}$F; average low temperatures range from 35 to 56$^{o}$F.
- Winters can be cold and snowy, with average high temperatures around 44$^{o}$F, with lows averaging around 23$^{o}$F.
- Springtime is cool and moist with high temperatures ranging from 57 to 77$^{o}$F and average lows from 34 to 52$^{o}$F.

Monthly precipitation ranges from a low in winter of 2.35 inches to 4.8 inches in spring. The average annual precipitation is 45 inches (Midwest Regional Climate Center 2009).

The project area is designated as attainment areas for all six NAAQS criteria pollutants. The Environmental Protection Agency (EPA) defines attainment areas as "A geographic area in which levels of a criteria air pollutant meets the health-based primary standard (NAAQS) for the pollutant." Of the six criteria air quality pollutants identified by the EPA, the main pollutants of concern for this proposed project are carbon monoxide, particulate matter$_{2.5}$, and ozone. Although the other 3 pollutants, $NO_2$, $SO_2$, and Pb, are important, levels associated with this type of project are typically well below NAAQS (Sandberg and Dost 1990).

The pollutant of most concern in smoke from fire is fine particulate matter, both $PM_{10}$ and $PM_{2.5}$. Studies indicate that 90 percent of all smoke particles emitted during wildland burning are $PM_{10}$, and 90 percent of $PM_{10}$ is $PM_{2.5}$ (Ward and Hardy 1991). Past studies of human health with regard to the effects of particulate matter have shown that fine particles, especially $PM_{2.5}$, are largely responsible for health effects (Dockery et. al. 1993; Schwartz et. et. al. 1996).

The main sources of carbon monoxide are from combustion engines associated with vehicles, and outdoor burning. The main sources of $PM_{10}$ and $PM_{2.5}$ are from local wood-burning home units, debris and broadcast burning on private, state, and federal lands, wildland fires, fugitive dust from un-surfaced roads, and other agricultural activities. There are no main sources of ozone in the proposed area. There are a few activities such as burning, which can produce some of the precursors to ozone such as oxides of nitrogen and organic carbon. Table 3.7 below identifies levels of human health concerns based on measured $PM_{2.5}$ concentrations, air quality indices, and visibilities.

**Table 3.7. Human Health Concerns based on $PM_{2.5}$ Smoke Emissions**

| $PM_{2.5}$ 24-hr Avg. Concentration (ug/m$^3$)* | $PM_{2.5}$ 1-hr Avg. Concentration (ug/m$^3$)* | EPA Air Quality Index Values | Visibility (Miles) | Level of Health Concern | Cautionary Statements |
|---|---|---|---|---|---|
| 0.0 – 15.4 | 0.0 – 40.0 | 0-50 | > 10 | Good | None |
| 15.5 – 40.4 | 40.1 – 80.0 | 51 – 100 | 5.1 – 10.0 | Moderate | None |
| 40.5 – 65.4 | 80.1 – 175.0 | 101 - 150 | 3.1 – 5.0 | Unhealthy for Sensitive Groups | People with respiratory or heart disease, the elderly, and children should limit prolonged exertion. |
| 65.5 – 150.4 | 175.1 – 300.0 | 151 – 200 | 1.6 – 3.0 | Unhealthy | People with respiratory or heart disease, the elderly, and children should avoid prolonged exertion, everyone else should limit prolonged exertion. |
| 150.5 – 250.4 | 300.1 – 500 | 201 – 300 | 1.0 – 1.5 | Very Unhealthy | People with respiratory or heart disease, the elderly, and children should avoid any outdoor activity, |

**Table 3.7. Human Health Concerns based on $PM_{2.5}$ Smoke Emissions**

| $PM_{2.5}$ 24-hr Avg. Concentration ($ug/m^3$)* | $PM_{2.5}$ 1-hr Avg. Concentration ($ug/m^3$)* | EPA Air Quality Index Values | Visibility (Miles) | Level of Health Concern | Cautionary Statements |
|---|---|---|---|---|---|
| | | | | | everyone else should avoid prolonged exertion. |
| **250.5 +** | 500.0 + | 301 - 500 | < 1.0 | Hazardous | Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly, and children should remain indoors. |

* micrograms per cubic meter

The major physiographic features influencing the climate, and movement and dispersion of smoke for the Greasy Creek prescribed burn would be the North Fork watershed, adjacent north-south running ridges and other small entrenched valley areas. Under certain weather parameters, valleys can act as cold sinks and trap smoke. Additionally, Indian Creek, Clifty Creek, and other small drainages could possibly act as corridors for smoke dispersion.

All proposed prescribed burn treatments are within eastern Douglas County. The City of St. Louis and four counties in and around the city are the closest non-attainment areas in Missouri for Ozone (8 hour) and Particulate ($PM_{2.5}$). This determination is based on the Environmental Protection Agency Office of Air Quality Planning and Standards, and is based on air monitoring data in EPA's Air Quality System database. EPA defines non-attainment areas, as "A geographic area in which the level of a criteria air pollutant is higher than the level allowed by the federal standards." St. Louis and the surrounding counties are approximately 130-160 miles northeast of the proposed Greasy Creek Project area. Jefferson County, approximately 100-125 miles northeast of the proposed Greasy Creek Project area, is a non-attainment area for lead. Missouri has no CO, $PM_{10}$, $O_3$ (1-hour), $NO_2$, and $SO_2$ non-attainment areas.

State Rule 10 CSR 10-3.030, 4 (c.7), which addresses open burning in Missouri, proclaims the USDA-Forest Service is exempt. Because proposed activities for the Greasy Creek Project are in an attainment area, the conformity requirement would be met. No further conformity analysis is needed at this time. Thus, the project would comply with all federal, state, and local regulations relating to air quality, as well as the Forest Plan.

**Table 3.8. National Ambient Air Quality Standards for the Six Criteria Pollutants**

| Pollutant | Primary Standards | | Secondary Standards | |
|---|---|---|---|---|
| | Level | Averaging Time | Level | Averaging Time |
| Carbon Monoxide | 9 ppm ($10\ mg/m^3$) | 8-hour [(1)] | None | None |

**Table 3.8. National Ambient Air Quality Standards for the Six Criteria Pollutants**

| Pollutant | Primary Standards | | Secondary Standards | |
|---|---|---|---|---|
| | Level | Averaging Time | Level | Averaging Time |
| Carbon Monoxide | 35 ppm (40 mg/m$^3$) | 1-hour [(1)] | None | None |
| Lead | 0.15 µg/m$^3$ [(2)] | Rolling 3-Month Average | Same as Primary | |
| Lead | 1.5 µg/m$^3$ | Quarterly Average | Same as Primary | |
| Nitrogen Dioxide | 0.053 ppm (100 µg/m$^3$) | Annual (Arithmetic Mean) | Same as Primary | |
| Particulate Matter$_{10}$ | 150 µg/m$^3$ | 24-hour [(3)] | Same as Primary | |
| Particulate Matter$_{2.5}$ | 15.0 µg/m$^3$ | Annual [(4)] (Arithmetic Mean) | Same as Primary | |
| Particulate Matter$_{2.5}$ | 35 µg/m$^3$ | 24-hour [(5)] | Same as Primary | |
| Ozone | 0.075 ppm (2008 std) | 8-hour [(6)] | Same as Primary | |
| Ozone | 0.08 ppm (1997 std) | 8-hour [(7)] | Same as Primary | |
| Ozone | 0.12 ppm | 1-hour [(8)] (Only in limited areas) | Same as Primary | |
| Sulfur Dioxide | 0.03 ppm | Annual (Arithmetic Mean) | 0.5 ppm (1300 µg/m$^3$) | 3-hour [(1)] |
| Sulfur Dioxide | 0.14 ppm | 24-hour [(1)] | 0.5 ppm (1300 µg/m$^3$) | 3-hour [(1)] |

All the above information was obtained from the EPA web site http://www.epa.gov/air/criteria.html April 7, 2009

(1) Not to be exceeded more than once per year.

(2) Final rule signed October 15, 2008.

(3) Not to be exceeded more than once per year on average over 3 years.

(4) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m$^3$.

(5) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m$^3$ (effective December 17, 2006).

(6) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

(7) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(8) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone non-attainment Early Action Compact (EAC) Areas.

## Direct and Indirect Effects on Air Quality by Alternative

### *Alternative 1*

Alternative 1 would result in the least emission of particulate and gaseous air pollutants in the short term. Potential for uncontrolled wildfire and uncontrolled release of pollutants would however, be higher for this alternative as time passed because of the accumulation of natural fuels in the forest environment and lack of management used to treat this condition. Many years of fire suppression actions have reduced the amount of acres burned, thus increased the amount of available fuels for a wildland fire. Smoke from uncontrolled fires has potential to affect an area for several days.

Carbon monoxide as a product of combustion, is rapidly diluted at short distances from a wildfire on private and federal lands and prescribed burns on private lands, and therefore poses little or no health risk to the general public. Firefighters are at the greatest health risk because they have longer exposures at higher concentrations.

### *Alternative 2*

All analysis for the proposed project would be based on potential impacts to the identified smoke sensitive receptors with respect to the NAAQS levels for carbon monoxide, $PM_{10}$, $PM_{2.5}$, ozone and visibility. Table 3-4 displays the smoke sensitive receptors in the Greasy Creek Project, along with distance and direction to planned prescribed burns.

**Table 3.9. Smoke Sensitive Receptors for the Greasy Creek Project.**

| Smoke Sensitive Receptor | Distance from Receptor to Fire (miles) | Direction from Fire to Receptor |
|---|---|---|
| State Hwy 181 | 0.0 mi | E |
| State Hwy 76 | 0.0 mi | S |
| State Hwy EE | 7.0 mi | SW |
| US Hwy 63 | 12.0 mi | SE |
| US Hwy 60 | 4.0 mi | NE |

Smoke sensitive receptors were used in the analysis to estimate impacts of various alternatives at these locations. They were chosen, based in part, on proximity to the proposed project, known smoke concerns, safety concerns, and ability to represent similar locations in the area.

The smoke dispersion modeling analysis runs (using VSmoke and/or VSmoke-GIS) for this project was performed for the prescribed burn called Greasy Creek. Each planned prescribed burn has input criteria and is based on prescription parameters that would be included in the prescribed fire burn plan for each burn. Prescription parameters are established based on optimum conditions for burning, which include specific weather and atmospheric conditions that have influences on fire behavior and smoke dispersion. The Forest Service is required to have a prescribed burn plan for each prescribed burn conducted, and managers must adhere to the prescriptions identified in these plans. Greasy Creek VSmoke analysis runs can be found in Folder D of the Greasy Creek Project file.

The VSmoke model produces three types of outputs that estimate:

a.) ability of atmosphere to disperse smoke and likelihood that smoke will contribute to fog formation,
b.) downwind concentrations of particulate matter and carbon monoxide, and
c.) visibility conditions downwind of the fire.

High concentrations of particulate matter, especially fine particles (PM 2.5), and carbon monoxide can have a negative impact on human health. The Environmental Protection Agency has developed a color coding system called the Air Quality Index (AQI) to help people understand what concentrations of air pollution may impact their health. When the AQI value is color code orange, people who are sensitive to air pollutants, or have other health problems, may experience health effects. This means they are likely to be affected at lower levels than the general public. Sensitive groups of people include the elderly, children, and people with either lung disease or heart disease. The general public is not likely to be affected when the AQI is code orange. Everyone may begin to experience health effects when AQI values are color coded as red. People who are sensitive to air pollutants may experience more serious health effects when concentrations reach code red levels. This analysis shows the air quality at downwind distances less than 1.24 miles from the edge of the fire may have a 1-hour particulate matter concentrations predicted to be code red or worse, while distances less than 3.92 miles are predicted to be code orange or worse. At distances less than 328 feet from the edge of the fire the one-hour carbon monoxide concentrations are predicted to be code red or worse, and distances less than 328 feet from the fire are predicted to be code orange or worse.

Smoke can also have an impact on how far and how clearly we can see on a highway or in viewing scenery. Fine particles in the smoke are known to be able to scatter and absorb light, which can reduce visibility conditions. Visibility estimates from VSMOKE are valid only when the relative humidity is less than 70 percent. Also, the visibility estimates assume that smoke is passing in front of a person who is looking through the plume of smoke. Visibility thresholds used for this modeling analysis were to maintain a contrast ratio of greater than 0.05 and a visibility distance of 0.25 miles. Visibility conditions may exceed the threshold less than 328 feet from the edge of the fire.

Carbon monoxide, as a product of combustion is rapidly diluted at short distances from a fire and therefore poses little or no health risk to the general public. Firefighters would be at greatest health risk because they have longer exposures at higher concentrations. It is recommended that fireline personnel rotate away from the fireline periodically to decrease their exposure. By doing so, health impacts to firefighters could be mitigated. This would be implemented under all action alternatives, thus allowing the proposed activity to comply with NAAQS for carbon monoxide.

There are a few activities such as prescribed fires, which can produce some precursors to ozone such as oxides of nitrogen and organic carbon. Levels for the proposed project are estimated to be low enough that they would not contribute to development of ozone levels above the NAAQS (Sandberg 1990).

Based on the location of the proposed project, and prescribed wind directions for implementation of a prescribed fire in the Greasy Creek Project area, visibility at Hercules Glades Wilderness Area or the Mingo National Wildlife Refuge would not be impacted. Based on analysis, literature review, and implementation of the identified mitigation measures, all NAAQS would be met for the proposed project.

The NAAQS would not be exceeded under the desired burning prescription. Direct effects of prescribed fire would result in smoke impacts lasting 6 to 8 hrs. Downwind one hour $PM_{2.5}$ concentration greater than 0.25 miles from the fire's edge would not be a threat to public health. Visibility would be greater than 10 miles at all receptor sites. Prescribed fire treatments would be conducted pre and post-harvest, and then monitored to determine when sufficient pine regeneration has occurred to reduce prescribed burning frequency and allow pine recruitment to occur.

In this alternative the following direct effects are likely to occur:

- Increased particulate matter and carbon monoxide concentrations
- Eye, nose, and throat irritations
- Decreased visibility along travelways
- Odor/nuisance of smoke

Under this alternative, slash created from timber harvest activities may increase smoke intensities if the initial burn is conducted after timber harvesting has occurred. After the first post timber harvest burn, most fine fuels created from the logging slash would be consumed. Medium to large diameter fuels (greater than ¼") may take several burns to reduce.

For Alternative 2, under ideal burning conditions, the VSmoke model indicates health concern levels would be good to moderate. Visibility would be greater than 10 miles from all receptor sites. $PM_{2.5}$ one-hour concentration would range from 0.0 to 30.95 ug/m3. Smoke impacts to U.S. Highway 60 and 63 and State Highways 76 and 181 would be minimal as predicted by VSmoke outputs. The smoke column would be projected to cross Highway 76 and could possibly create slightly hazy conditions on a short segment of the roadway, not likely to exceed 3 hours. Visibilities on Highway 76 should not be diminished to the extent that traffic control would be needed for public safety. The overall duration of smoke impacts to the entire cumulative effects analysis area would not be expected to exceed 8 hours.

Firefighters would be at greatest health risk because they have longer exposures to smoke at higher concentrations. In Alternative 2, there would be a decrease in potential smoke exposure to firefighters, by periodically rotating firefighters out of high concentrations of smoke during prescribed burns.

Currently, the amount of ozone precursors produced by fire would not be enough to produce ozone levels that would exceed NAAQS (Sandburg and Dost 1990). Decreased potential to exceed NAAQS would be applicable to Alternative 2. With Alternative 1, there would be an increased potential of exceeding NAAQS during a fire event, specifically $PM_{10}$ and $PM_{2.5}$, resulting from increasing fuel quantities. Decreasing the amount of fuel available to burn is one way to reduce potential for exceeding NAAQS because of an uncontrolled wildland fire.

## Cumulative Effects on Air Quality

### *Cumulative Effects Area (CEA)*

### Spatial boundary

The cumulative effects spatial boundary for the Greasy Creek Project is 5 miles. The Greasy Creek Project lies within Douglas County. Refer to the air quality cumulative effects spatial boundary map in the Greasy Creek Project file, Folder I. This boundary was selected based on effects of fuels treatments on commercial timber values and risk of wildfire spreading from USFS land to adjacent private lands.

### Temporal boundary

The cumulative effects temporal boundary was set to analyze 10 years prior to this decision, plus 10 years following. The boundary was selected because 10 years is the Ava/Cassville/Willow Springs Ranger District management cycle and this is the extent that effects are measurable and meaningful.

These boundaries (spatial and temporal) were selected because this is the extent to which cumulative effects information would be measurable and meaningful, and that direct and indirect effects would be relevant.

### *Cumulative Effects Analysis*

### Past, Present, and Reasonably Foreseeable Actions

Past and present activities have included timber harvest and wildfires. Within the last ten years there have been 5 wildfires within the project boundary that burned a total of 130 acres. Past projects within the Greasy Creek Project cumulative effects boundary include the following (decision date):

***Blue Hole (9-4-09): Activities include*** prescribed burning 4,858 acres, commercial harvesting 2,948 acres, non-commercial thinning 177 acres, and constructing 7.1 miles of fireline.

***ACW Openlands Haying Project (5-9-08):*** Lime and fertilize 230 acres of grasslands for haying, mow and hay 335 acres to maintain open lands, and disk 68 acres for enhancement of legumes.

***Willow Springs Pine Fuel Reduction (3-1-04)****:* Mechanically thin 722 acres of pine stands on 30 different projects sites across the Willow Springs unit.

***Carman Springs (8-1-03):*** Activities include but not limited to approximately 678 acres of mechanical salvage of dying black oak, 3,435 acres of commercial thinning or pre-commercial thinning, 4,582 acres of ecosystem restoration burning, fireline construction, road construction/reconstruction and maintenance.

***Hazard Tree Removal Along Road Right-of-Way (2/18/03):*** Removal of hazardous trees along roads and trails; and adjacent to and within parking lots, picnic areas, and campsites within all developed recreation facilities.

***Topaz (1-8-02):*** Activities to be implemented in this project include 556 acres of commercial thinning, mechanical harvest on approximately 2,907 acres, and 666 acres of prescribed burning.

Reasonably foreseeable actions include prescribed fire within the project area annually for 5 to 10 years. All activities listed have occurred previously in the Greasy Creek cumulative effects spatial and temporal boundary, and based on observations, the same type of activities are likely to continue.

### National Forest land activities

Other foreseeable activities on National Forest lands include the Indian Creek Project, which is scheduled for a Decision Notice to be signed in 2013, Siloam Springs (2014), Pomona (2015), and Red Mountain (2019).

### State of Missouri land activities

The Forest Service is not aware of any fuels management actions planned for nearby land owned by the State of Missouri. There are no state lands within the Greasy Creek Project area.

### Private lands activities

Some activities inside the project area do not occur on Forest Service lands. Activities on private lands include land clearing for farms and/or home sites, dairy and beef farm operation expansions, and construction of new homes or subdivisions. Reasonable foreseeable actions based on past trends in the area include some timber harvest and prescribed burning occurring on surrounding private ownerships. Other activities include some pasture conversion and perhaps housing development on some of the land. Lands most suitable for pasture are already in pasture and any new housing developments would have close correlation to reasonable access.

### Cumulative Effects Discussion

For air quality, cumulative effects include reasonable and foreseeable activities that produce pollutants. This includes, but is not limited to activities such as operation of combustion engines (i.e. vehicles, lawn mowers, chainsaws, turbines etc.), use of fireplaces, dust from unpaved roads, wildfires, industrial emissions etc. These emissions coupled with prescribed burning, may have potential to exceed the NAAQS for ozone and $PM_{2.5}$. Based on the growth of these other activities that produce pollutants, the proposed project would be implemented before they reach a level that would cause NAAQS to be exceeded.

A wildfire in any alternative has the potential to last for several days. If climatic conditions change, some travelways such as the State Highways in Douglas and Howell Counties may experience decreases in visibility of three miles or less. Direct effects include development of ozone precursors from the combustion process and a decrease in potential for exceeding NAAQS due to a decrease in fuels for wildfires.

### Irreversible or Irretrievable Commitment on Air Quality

Neither of the alternatives would have an irreversible or irretrievable commitment on Air Quality in the proposed Greasy Creek Project area.

**Air Quality Summary:** Alternative 2 would not produce smoke emissions for the extent or duration that would cause serious public health threats at identified smoke sensitive receptor sites, providing the Greasy Creek prescribed fire is conducted according to prescription parameters on a day when no other large fires are occurring in the analysis area. There would be no significant cumulative effects on air quality because of the limited nature and extent of cumulative effects discussed above. This conclusion was reached after analyzing all information previously discussed regarding past, present and reasonably foreseeable future activities on all ownerships within the specified spatial and temporal boundaries. Additional air quality analysis can be found in the 2005 Mark Twain Forest Plan FEIS beginning on page 208 of Chapter 3.

## RECREATION

### Affected Environment/Existing Conditions

The Greasy Creek Project area has a recreation emphasis for General Forest, Roaded Natural Recreational Opportunity Spectrum (ROS) in Management Prescription 2.1. Within the Roaded Natural setting, the area is characterized by predominantly natural or natural-appearing environments with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Conventional motorized use is provided for in construction standards and design facilities. Both probabilities exist to experience contact with other user groups and for isolation from sights and sounds of humans. Opportunities exist to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive types of recreation are not prevalent.

Opportunities for both motorized and non-motorized forms of recreation are available (Forest Plan Appendix F, pages 1-6). Motorized use is permitted, but restricted to numbered Forest Service roads only with system roads usually being aggregate.

There are no developed recreation areas in the Greasy Creek Project area, but opportunities for dispersed recreation are plentiful. Dispersed recreation opportunities and uses in this area are similar to those found in many parts of the Ava/Cassville/Willow Springs Ranger District.

The most prevalent uses in the analysis area are dispersed recreation activities. Hiking, general sightseeing by vehicle, and equestrian use are predominate activities year round. Other activities include birding, mountain bike riding, small game hunting, fall firearms deer season, and the spring and fall turkey seasons. Unauthorized off-highway vehicle (OHV) use is also present.

The project area is bounded by State Highway 181 on the east side; County Road 160 to the north; County Road EE-160 along the northwestern edge; the North Fork River along the southwestern edge; and an unnamed tributary of the North Fork along the south edge in Sections 21 and 22. These boundary roads, along with interior Forest System roads, offer opportunities for accessing a large part of the project area and viewing fall colors or wildlife throughout the area. State Highway 181 is a National Forest Scenic Byway and is called the Blue Buck Knob Scenic Byway. The entire byway runs from the junction of Highways AP and 14, north on AP Highway, then north on Highway 181 to the Forest's boundary.

## Direct and Indirect Effects on Recreation by Alternative

### *Alternative 1*

Under Alternative 1, the project area would continue to provide opportunities for dispersed recreation, driving for pleasure, and both consumptive and non-consumptive wildlife uses. In the absence of vegetation management, the quality of deer and turkey hunting (and consequently the amount of camping during hunting season), and berry picking opportunities may be somewhat reduced over a period of time. Firewood gathering opportunities may increase as declining black and scarlet oak die and fall to the ground.

As more trees in the red oak group are affected by oak decline, potential safety hazards would increase. Instances of trees blocking trails and roads, and limbs falling near people while recreating in the forest would increase.

Overall, this alternative would still provide recreation opportunities. People could continue to use all the Forest Roads within the project area. There would be increased costs to maintain roads and trails beyond regularly scheduled maintenance to remove hazard trees.

Habitat diversity resulting from harvesting and prescribed burning would not occur under this alternative; consequently, opportunities to observe a diversity of animal and plant species would decline over time. Additionally, opportunities to gather fuelwood would be diminished and hazards to hikers, equestrians, etc. would increase due to accumulation of hazard trees in the project area.

### *Alternative 2*

Under this alternative, logging activities would create intermittent noise and could temporarily reduce the enjoyment recreationists get from experiencing the natural environment. The actual impact of the noise depends on the time of day, time of year, and proximity of recreation users to harvest operations. The highest risk of recreationists encountering noise would occur during the fall firearm seasons for deer and turkey as hunters are camping, walking and hunting in the project area during harvest activities. Fuelwood cutting activities, a form of recreation to some people, would be made available following commercial timber sales. Recreationists could also encounter traffic and adverse road conditions during logging operations that could increase the risk of accidents. Traffic problems would be mitigated by the use of signs to warn recreationists of logging traffic in the area. Road surfaces would be improved (thru a timber sale appraisal allowance for reconstruction and maintenance) or repaired using money (road maintenance deposits) collected from timber purchasers.

This alternative would provide Roaded Natural recreation opportunities per Management Area 2.1 direction (USDA Forest Service 2005). After improvement of system roads from harvest activities, roads would be able to accommodate passenger vehicles (i.e. cars). Non-system roads and temporary roads within the project area would be closed to deter vehicular traffic per 2005 Mark Twain Forest Plan, page 2-42. The Forest's Motor Vehicle Use Map (MVUM) depicts those roads designated for motor vehicle (including OHVs) use pursuant to 36 CFR 212.51.

In the short term, timber harvesting and other management activities would cause temporary disturbance or displacement of dispersed hunting and camping opportunities due to unattractive conditions, disturbance of wildlife, and slash on the ground making walking difficult.

Some stands proposed for treatment are dissected by unauthorized OHV trails. Every opportunity would be taken to close those trails with logging slash in order to discourage unauthorized use. Decommissioning 1.8 miles of system and non-system roads should also help reduce these illegal activities. As roads are decommissioned, the overall quality of recreational experience would be enhanced for the public that likes to hike and enjoy nature in the absence of vehicular traffic. For visitors that have used these roads in the past, the experience would be reduced as they would now have to walk into some areas instead of driving a vehicle or OHV. Closure, reconstruction, and maintenance of roads in the project area would improve access to the area for recreation and also aid the management of unauthorized activities.

In the long term, improved vigor of the forest and road conditions, and the creation of more diverse wildlife habitats, would result in improved recreation opportunities. Hunting opportunities would likely be enhanced in treated areas due to temporary concentration of game species resulting from improved foraging habitat and better visual conditions. Nevertheless, hunting experiences may be less enjoyable or productive for some hunters due to increased encounters with other hunters and/or wildlife disturbance resulting from increased access. Berry pickers would also likely benefit from an increase in temporary openings, and more firewood gathering opportunities would be available.

Opportunity to view wildlife species associated with early successional habitat would be greatest under Alternative 2 with the use of regeneration harvests. Hunting for game animals associated with temporary openings and edge would be enhanced. Additionally, activities such as sightseeing, birding, horseback riding, mountain biking, and motor vehicle use on improved Forest Service roads would be enhanced.

## Cumulative Effects on Recreation

### *Cumulative Effects Area (CEA)*

A cumulative effects spatial boundary of the Greasy Creek Project area was selected because effects of the proposed action on the recreation use would be limited to the area receiving vegetative treatment. The project area consists of approximately 2,987 acres on NFS lands. A cumulative effects temporal boundary of 10 years was selected because that is considered the life of the expected effects of the Greasy Creek Project activities. These boundaries were selected because this is the extent to which cumulative effects information would be measurable, meaningful, and relevant.

### *Cumulative Effects Analysis*

### Past, Present, and Reasonably Foreseeable Actions

The Greasy Creek Project area features dispersed recreational opportunities on National Forest lands. Dispersed recreation use in the area is low to moderate, and has been compatible with past silvicultural and wildlife habitat management activities. In the past, wildfires have occurred in the project area but have not had a substantial impact on recreational activities. Past projects in the neighboring area include the following (decision date):

***Blue Hole (9-4-09): Activities include*** prescribed burning 4,858 acres, commercial harvesting 2,948 acres, non-commercial thinning 177 acres, and constructing 7.1 miles of fireline.

***ACW Openlands Haying Project (5-9-08):*** Lime and fertilize 230 acres of grasslands for haying, mow and hay 335 acres to maintain open lands, and disk 68 acres for enhancement of legumes.

***Willow Springs Pine Fuel Reduction (3-1-04)****:* Mechanically thin 722 acres of pine stands on 30 different projects sites across the Willow Springs unit.

***Carman Springs (8-1-03):*** Activities include but not limited to approximately 678 acres of mechanical salvage of dying black oak, 3,435 acres of commercial thinning or pre-commercial thinning, 4,582 acres of ecosystem restoration burning, fireline construction, road construction/reconstruction and maintenance.

***Hazard Tree Removal Along Road Right-of-Way (2/18/03):*** Removal of hazardous trees along roads and trails; and adjacent to and within parking lots, picnic areas, and campsites within all developed recreation facilities.

***Topaz (1-8-02):*** Activities to be implemented in this project include 556 acres of commercial thinning, mechanical harvest on approximately 2,907 acres, and 666 acres of prescribed burning.

One other project, Indian Creek, other than that described in the Greasy Creek Project is proposed within the next 10 years. The Indian Creek analysis area is located just to the east of this project area.

The Forest Service is not proposing any Wilderness or other special area designation within the Greasy Creek Project area.

### Private Lands/State Lands

Private lands in Douglas county are primarily open lands (pasture or hay) and timbered. Timber harvesting has occurred on private lands in the past and is expected to continue in the future.

### Cumulative Effects Discussion

The project area caters to many dispersed uses such as hunting, fishing, mountain biking, hiking, horseback riding, sightseeing, gathering of forest products, and dispersed camping. The amount of recreational use, which is moderate to high in the fall and spring, has been stable and is in harmony with past management practices. Management practices in this area have included various silvicultural treatments, prescribed fire, and follow up reforestation work. Old logging slash from these past activities decays in a few years and is no longer noticeable to the casual forest user. The proposed actions, with mitigation measures as appropriate, are considered to be consistent with Recreation Opportunity Spectrum (ROS) objectives. The cumulative effect of any action alternative would be minimal on the overall recreation setting and potential future recreational use patterns.

A moderate pattern for dispersed recreational use has been fairly constant over the past 10 years and is not expected to change considerably. There would be no additional resource management activities in the project area within the reasonably foreseeable future. Some timber harvesting has been completed on private lands in the vicinity; mainly removing sawtimber size trees, thinnings, and land clearing. There are other in-holdings that have not been harvested or are reverting to overgrown fields. The population of Douglas County has grown by 4.6% since 2000 (www.quickfacts.census.gov.).

The combined effects of past actions, the proposed action and its alternatives, and actions in the reasonably foreseeable future on the project area and immediately adjacent lands are not substantial. The only effects would be an increase in the quality of future recreation opportunities, though there may be short-term negative impacts during the implementation of management activities.

## Irreversible or Irretrievable Commitment on Recreation Resources

Neither alternative would have an irreversible or irretrievable commitment on recreation resources in the analysis area if management practices adhere to Forest Plan Standards and Guidelines.

# VEGETATION

## Affected Environment/Existing Conditions

The project area contains approximately 2,987 acres of National Forest System land. Shortleaf pine was the dominant species at the time of European settlement. Fire, whether natural or started by Native Americans, occurred at a minimum every 12.8 years at any given location and at a minimum of every 3 years in an area (Guyette, 1992). Most of the area was logged around the turn of the 20th century. Farming and open-range grazing followed. Burning was frequently done to promote the growth of grasses and to control insects. The existing timber is what grew back when these activities were discontinued, primarily after Forest Service acquisition in the late 1930's and 1940's.

The pine was replaced primarily by oak and hickory through natural succession. Most of the existing pine is a result of planting in old fields after Forest Service acquisition. Under Forest Service management the amount of burning was reduced. When logging started under Forest Service management, the plan was to do the logging on a rotation so that relatively equal amounts of timber would be available each decade. Approximately 10-15% of the area would be logged at each entry. Approximately 18% of the area was harvested between 1978 and 1992. No logging has been done in the project area since 1992. With most of the area starting to grow at the same time, a large portion of the area is dominated by trees that are the same age and have reached maturity. This is evident by the large amount of dead and declining oaks, particularly trees in the red oak species group.

Three previous NEPA decisions have been signed for this project area. Hazard Tree Removal Along Road Right-of-Way, signed February 18, 2003, allows for removal of hazardous trees along public roadway. Willow Springs Pine Fuel Reduction, signed March 1, 2004, allows for thinning of pine in Stands 11, 15, and 45 located near private land to reduce the hazard of wildfire spreading to private land. ACW Openlands Haying Project, signed May 9, 2008, allows openland maintenance at the Highway 181 hayfield.

### Age of the Forest

There are two 2005 Forest Plan goals that affect the age class distribution of the forest. They are: 1) Provide a variety of uses, products, and values by managing within the capability and resource potential appropriate to natural communities and the landscape; and 2) Provide a wide diversity of habitats to meet the needs of plants, fish, and wildlife species distributed across the Forest.

In order to meet these goals, the Forest Plan provided the following desired conditions:

- Vegetation consists of a variety of stand sizes, shapes, crown closures, and age structures in patterns that simulate the structural variability of natural communities
- Areas exhibiting old growth characteristics comprise 8% to 12% of the management area
- Regeneration openings comprise 8% to15% of each management area. From 1% to 5% of these regeneration openings are $\leq$ 2 acres in size. (USDA 2005, FP 3-11)

Based on the desired conditions, at any given time, between 239 and 358 acres should be in old growth and between 239 and 502 acres should be in regeneration openings of which 30 to 149 acres should be in $\leq$ 2 acre openings. The guideline is that old growth is the oldest or largest average diameter stands that are at least 70 years old. There are 1,763 acres (59% of the area) that are 70 years old or older. The average diameters for these stands range from 9" to 16". All the regeneration openings are at least 10 years old. Table 3.10 below shows the age-class distribution.

**Table 3.10. Greasy Creek Project timber age class distribution.**

| Age | 0 | 1-9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90-99 | 100-109 | 110-119 | 120-129 | 130+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acres | 13 | 0 | 334 | 82 | 121 | 15 | 37 | 620 | 526 | 193 | 654 | 94 | 109 | 22 | 165 |

Highlighted table text has 1932 to 1951 year of origin, which correlates with the time when the Forest Service acquired this land and burning was reduced which allowed trees to become re-established. Stands over 80 years old are predominately located on steep slopes that are difficult to access.

**Species Composition/Historic Vegetation Cover**

Natural vegetation cover in this area in the mid 1800's was predominately pine with post and white oak. Black oak was a minor component other than in drainages, where it shared equal prominence with white oak. FSVeg data was collected in the late 1970's and early 1980's on a stand basis which averaged 3 plots per 20 acres. Based on FSVeg data, pine and pine-oak forest types made up 13% of the area. Sixty-one percent of the area was in the black oak forest type while another twenty-one percent of the area was mixed oaks. The mixed oak type is used when there is roughly equal representation of the white oak species group and the red oak species group in an area. In 2003, a 1 plot per 100 acres grid plot survey was done that shows the effects of the decline in the red oak species group. Forest types are starting to change from predominately black and scarlet oak to mixed oak and white oak. There is an increase in pine that is likely the result of changes in forest type due to timber stand improvement treatments in young stands that favor pine over oak, and the decline of the red oak species group in older mixed oak-pine stands.

The table below shows the changes in the number of acres in a given forest type that has occurred in the 20 years between when the FSVeg data was collected and the grid plot data was collected.

**Table 3.11. Acres of forest types in the Greasy Creek Project area.**

| | Pine | Oak-Pine | Black/ Scarlet Oak | White Oak | Mixed Oak | Open/ Semi-open |
|---|---|---|---|---|---|---|
| FSVeg Acres | 37 | 341 | 1,835 | 130 | 627 | 16 |
| Grid plot Acres | 309 | 206 | 619 | 722 | 930 | 0 |

**Forest Health**

The combination of a large amount of black, scarlet, and red oak, and the other, older-aged species has resulted in a rapidly declining forest. Many of the trees are dead or dying. Standing trees are more susceptible to wind-throw because as the trees start to decline their root systems weaken. As a result, there are large areas where the trees have been laid on the ground. Declining trees are hosts to many diseases and insects, most notably *Armillaria* root rot. As is the case with *Armillaria*, these diseases can spread from declining trees to healthy trees through root contact and other vectors (Williams 1986).

**Natural Communities**

The Forest Plan refers to natural communities several times in Management Prescription 2.1. One of the themes is that it emphasizes multiple use resource objectives while allowing for the enhancement of natural communities. A goal is to provide a variety of uses, products, and values by managing within the capability and resource potential appropriate to natural communities and the landscape. The desired condition states that 1)

vegetation consists of a variety of stand sizes, shapes, crown closures, and age structures in patterns that simulate the structural variability of natural communities and 2) natural communities are distributed similar to historical vegetation patterns.

The comparison of the historic natural communities versus the existing condition based on grid plots is shown in the chart below.

**Table 3.12. Percent of Greasy Creek Project area by natural community.**

| | Savanna | Open Woodland | Closed Woodland | Forest |
|---|---|---|---|---|
| Historic | 0 | 53.6 | 39.4 | 7 |
| Grid Plots | 6.9 | 24.1 | 69.0 | 0 |

## Direct and Indirect Effects on Vegetation by Alternative

### *Alternative 1*

Under this alternative, natural processes will continue. The only trees that would be cut are those that present a hazard to the public. These are usually limited to those trees near state, county, and Forest Service roads.

#### Age of the Forest

Trees would continue to grow older, thus the overall age of the forest would continue to move towards old growth. Approximately 80% of the area (2,383 acres) would be over 70 years old in 10 years. There would be areas of regeneration interspersed where groups of trees die.

#### Species Composition/Historic Vegetation Cover

The species mix would favor white and post oaks since they are longer lived than the red oak group. This is seen in the change that has taken place in the 20 years between when plot data was collected. Some areas would develop a more open canopy, which would encourage the development of shrubs. The white oak group, hickory, and maple would be the species most likely to occupy the shrub layer. The amount of shortleaf pine would decline, since conditions favorable for the regeneration of pine would not develop. Deep leaf litter and shade are unfavorable for pine germination and growth. The area would partially return to the historic vegetation cover by having white and post oak in positions of dominance. However, the shortleaf pine component would be missing.

#### Forest Health

Forest health would continue to decline. As more trees in the red oak group die, the chance of diseases such as *Armillaria* spreading into the white oak group would increase. Older age and fewer species would make the area more susceptible to damage due to a single disease or insect outbreak.

#### Natural Communities

Because individual trees would be dying out, the canopy closure of the overstory would move towards that desired for open and closed woodland. Without prescribed fire to control the understory, a dense shrub layer would develop. A dense understory is not desired for either of these natural communities. The forb and grass ground cover that is desired in the open woodland community would not develop to the levels desired and likely would decrease from what currently exist.

### *Alternative 2*

There are two primary objectives of this proposal: 1) salvage declining trees while they still have market value; and 2) enhance the restoration of natural communities.

This alternative proposes harvesting to address the declining health of the forest as evidenced by the number of dead, blown-down, and dying trees. Trees in the red oak group are declining the most, although other species are not exempt. The predominant type of harvest proposed is salvage/sanitation on 1,858 acres (62% of the area). The primary purpose is to remove declining trees and decrease the chance of spreading disease. Some stands (378 acres) would have regeneration follow-up treatments. In these stands, the removal of the declining trees would leave very few trees in the overstory. In order to assure regeneration, all remaining trees over 1" diameter unless designated as reserve trees would be cut. Pine would be planted in stands located on ridge tops and south and west facing slopes to assure pine would be part of the future overstory. The remaining salvage/sanitation harvest would not have any follow-up treatments. However, some healthy trees may be removed to reduce basal areas to the desired natural community level.

Forty-one acres are proposed for even-aged management. These stands are not adequately stocked, mature, and starting to show signs of decline. Follow-up treatments for these areas would be the same as for salvage/sanitation with follow-up treatments.

Six hundred fifty acres are proposed for thinning or precommercial thinning. These stands would be thinned to "B" level stocking, which provides the optimum growing space for the trees and is calculated based on the diameter of the dominant and co-dominant trees. The primary difference between precommercial thinning and thinning is the age and size of the trees to be thinned. With changing markets and the push for utilization of small roundwood for biomass, some stands that would previously not had any commercial value (precommercial) may at the time of harvest have commercial value. There would be no difference in the resulting stand. The difference would be in the potential use of mechanized equipment to remove the material rather than letting it lay on site.

One stand is proposed for overstory removal (32 acres). This stand has a well-stocked, established understory of pine poles with scattered large mature pine and hardwood trees overtopping them. Removal of the mature trees would allow for utilization of the trees before they die, while making available more nutrients, sunlight and water for the pole size trees.

### Age of the Forest

If the desired conditions stated in the Forest Plan were being met, at any given time, between 239 and 502 acres would be in regeneration openings, of which openings $\leq$ 2 acres would make up 30 to 149 acres. Between 239 and 358 acres would be in old growth. Under this alternative 418 acres would be regenerated. The amount that would be in small openings (1/4 to 2 acres) is hard to determine. These would occur primarily in the salvage/sanitation harvest areas that won't have follow-up treatments. The number of openings would depend entirely on how the declining trees are interspersed with healthy trees.

Based on the desired conditions, at any given time, between 239 and 358 acres should be in old growth. The guideline for old growth is the oldest or largest average diameter stands that are at least 70 years old. There are 1,763 acres (59% of the area) that are 70 years old or older and 390 acres (13% of the area) over 100 years old. Average diameters for these stands range from 9" to 16". Approximately 80% of the area (2,383 acres) would be over 70 years old in 10 years. There would be areas of regeneration interspersed where groups of trees die. The amount of old growth currently exceeds the desired condition and would exceed it even more in 10 years.

The Forest Plan sets guidelines for when a stand has reached its maximum vigor of growth and reproduction (Society of American Foresters 1958). This concept is referred to as the rotation age. The rotation age for red, black, and scarlet oaks and shortleaf pine is 70 years. Rotation age for post and white oaks is 90 years (USDA 2005, FP 2-28). Optimally, any stand reaching these ages would be harvested and regeneration established. Since the area was basically cut at the same time around the turn of the century, nearly 60% of the area would need to be harvested at this time to meet this guideline. This would perpetuate the problem of all the trees being the same age. Instead harvesting would be concentrated in these older stands in order to meet regeneration and

old growth objectives as the primary goal. Other stands are thinned or salvage harvested to remove those trees in the worst condition and improve growing conditions for the remaining trees.

The table below compares current age class distribution and what it would be 10 years from now by the time harvesting is completed under this alternative.

**Table 3.13. Current and proposed timber age class distribution in the Greasy Creek Project area.**

| **Age Class** | **0** | **1-9** | **10-19** | **20-29** | **30-39** | **40-49** | **50-59** | **60-69** | **70-79** | **80-89** | **90-99** | **100-109** | **110-119** | **120-129** | **130+** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current Acres | 13 | 0 | 334 | 82 | 121 | 15 | 37 | 620 | 526 | 193 | 654 | 94 | 109 | 22 | 165 |
| 10 year Acres | 418 | 13 | 0 | 321 | 82 | 121 | 15 | 37 | 501 | 467 | 175 | 503 | 55 | 89 | 187 |

**Species Composition/Historic Vegetation Cover**

Shortleaf pine regeneration would be encouraged. Three hundred thirty-six (336) acres of the 418 regeneration acres would have pine planted. Prescribed burning would provide a suitable seedbed for natural pine regeneration. A burn would be done prior to harvesting and at least one after harvesting is completed. One of the objectives of prescribed burning is to remove the leaf litter ground cover in the open woodland stands on at least 50% of the area. In the closed woodland areas there would be small isolated areas that would have the leaf litter removed. Burning, along with disturbance from logging operations, would expose the mineral soil, providing a beneficial seedbed for the pine. Planting would be done after the first post-harvest burn has been completed. Depending on pine seed sprouting and competition from hardwoods, other prescribed fires may be done. These burns would be used to control hardwoods competing with pine seedlings.

All regeneration and salvage/sanitation harvesting with follow-up treatment is proposed for black and scarlet oak stands. These areas are where pine regeneration is most likely to become established. The other salvage/sanitation harvesting would concentrate on removing the declining red oak group. The overstory in these stands would move towards white oak, post oak, and pine. Some pine regeneration may become established in areas where the overstory crown closure is less than 50%.

Prescribed burning would favor pine seedling development by reducing the leaf litter depth; and, on some of the side slopes it would be removed all together, exposing bare mineral soil needed for pine seedlings to sprout and survive. After the seedlings, both natural and planted, have become established, prescribed burns would help reduce competition from hardwoods. Hardwoods tend to put on top growth more quickly than shortleaf pine, thus within about 5 years they are overtopping the pine. Hardwoods are not as fire adapted as shortleaf pine thus they do not recover and resprout as readily as pine after a fire. Bark thickness plays a role in whether the seedling/sapling will survive a fire at all. Most pine with their thicker bark, will survive fire and put needles back out. However, at the same heat intensity, most hardwoods will die back and have to resprout from the base. Pines gain a competitive advantage if a fire's intensity is enough to kill back the hardwood seedlings and saplings.

Harvesting, planting, and burning would increase the amount of pine, white oak, and post oak in the overstory and understory while decreasing the amount of black and scarlet oak. It could take 40 years or more for the pine regeneration to become a dominant part of the overstory.

**Forest Health**

There are numerous signs that trees in this area are in poor health. Some of the signs include: standing dead trees; blown over trees (an indication of root rot); standing trees with many dead limbs, insect bore holes in the trunk, fungus growing on the limbs; and bore holes and rot inside of cut trees. The east side of the project area

appears to be showing more signs of poor health, although the west side does have some signs. One objective is to remove the trees that are in poor health and currently harboring insects and diseases that can spread to healthy trees. Salvage harvesting would remove all trees that would not survive for at least the next 10 years. This removes breeding grounds for these pests.

Removing unhealthy trees provides for stump sprouting which encourages young sprouts and reduces the competition for nutrients and sunlight, providing a better growing environment for the sprouts and existing regeneration.

Further reducing the basal area to the desired natural community level by removing some healthy trees would maintain the remaining trees in a healthy growing condition by keeping the trees at a stocking level that would utilize the growing space and reduce competition.

### Natural Communities

As shown by the grid plots, 70% of the area is classified as closed woodland based on the vegetation structure. Historically only 40% of the area was closed woodland with the majority being open woodland. Regeneration harvests do not fit into any of the natural community definitions, but they do provide important wildlife benefits. Salvage/sanitation harvests without follow-up treatments would convert 920 acres (31% of the area) to open woodland in locations that were historically open woodland. They would also reduce canopy closures on 308 acres that were historically closed woodland and upland forest below the desired level. Precommercial thinning and thinning would bring those areas more in line with the desired conditions for the natural communities since they would not be thinned below the desired level for the community where they are located. Typically thinning to “B” level leaves a higher stocking level than is desired for open woodland, but would be close to the level desired for closed woodland and upland forest.

After-harvest prescribed burns would help establish the desired ground cover vegetation. South and west-facing side slopes, which are usually open woodlands tend to be better drained than ridge tops and receive more radiant heat; thus, it is more likely that the leaf litter would dry out more quickly there than leaf litter on the ridges, which are often closed woodland. Because of this, more leaf litter would be consumed on side slopes. This would reduce the amount of area with leaf litter cover and increase the amount of grasses and forbs that could become established on open woodland sites. On closed woodland sites, the surface layer of the leaf litter would dry out quickly but the deeper litter would stay moist. This would result in the depth of the leaf litter being reduced but still have nearly 100% leaf litter cover. There would be small areas where enough leaf litter would be consumed to allow for some herbaceous ground cover establishment. Upland forest areas would not be affected as much by any burns because they are located in coves on the north and east facing side slopes that tend to stay moist and do not burn as intensely or at all.

## Cumulative Effects on Vegetation Resources

### *Cumulative Effects Area (CEA)*

### Spatial boundary

The spatial boundary used to address **cumulative** impacts is the 2.1 Management Prescription area where the project is located because Forest Plan objectives are prepared for entire management areas rather than individual project areas.

### Temporal boundary

The temporal boundary used to assess **cumulative** impacts is 10 years because it is the normal management cycle and this is the extent to which effects are measurable and meaningful. We are generally unable to predict activities beyond 10 years and the effects of this project should dissipate within that period.

### *Cumulative Effects Analysis*

The cumulative effects area includes 2.1 MP lands within the North Fork River Oak-Pine Woodland/Forest Hills and the North Fork Pine-Oak Woodland Dissected Plain Land Type Associations (LTA). Forest Plan objectives are based on meeting the objective for the entire management area. Natural communities and historic vegetation are tied to the LTA. Future activities will consider what is expected to occur within the next 10 years. The cumulative effects area consists of 53,326 National Forest acres. Based on aerial photos, between 50%-80% of the private land within the cumulative effects area is openland, predominately in pastures.

The primary NEPA decisions that have affected this area include (date signed): Topaz (1/8/02); Hazard Tree Removal Along Road Right-of-Way (2/18/03); Willow Springs Pine Fuel Reduction (3/1/04); ACW Openlands Haying Project (5/9/08); Openlands Grazing Management Project (9/27/08); and Blue Hole (9/24/09). Reasonably foreseeable actions include the Indian Creek Project (approximately 14,000 acres) which is scheduled for a Decision Notice to be signed in 2013 and Siloam Springs (approximately 11,000 acres) in 2015.

### Age-Class Distribution

The chart below compares the age-class distribution within the project area with the cumulative effects area. The peaks show times when stands were regenerated. This usually is the result of timber harvesting, open land reverting to forest, or wildfires. There is a slight rise in the amount of regeneration in the project area at around the time the lands were being acquired by the Forest Service. This rise was not as dramatic as is seen in the 2.1 Management Area as a whole. The rise in regeneration that occurred in the management area in the 1980's and 1990's did not occur in the project area. More significantly, the number of acres being regenerated in the management area has steadily decreased since the late 1970's when 10% of the area was regenerated.

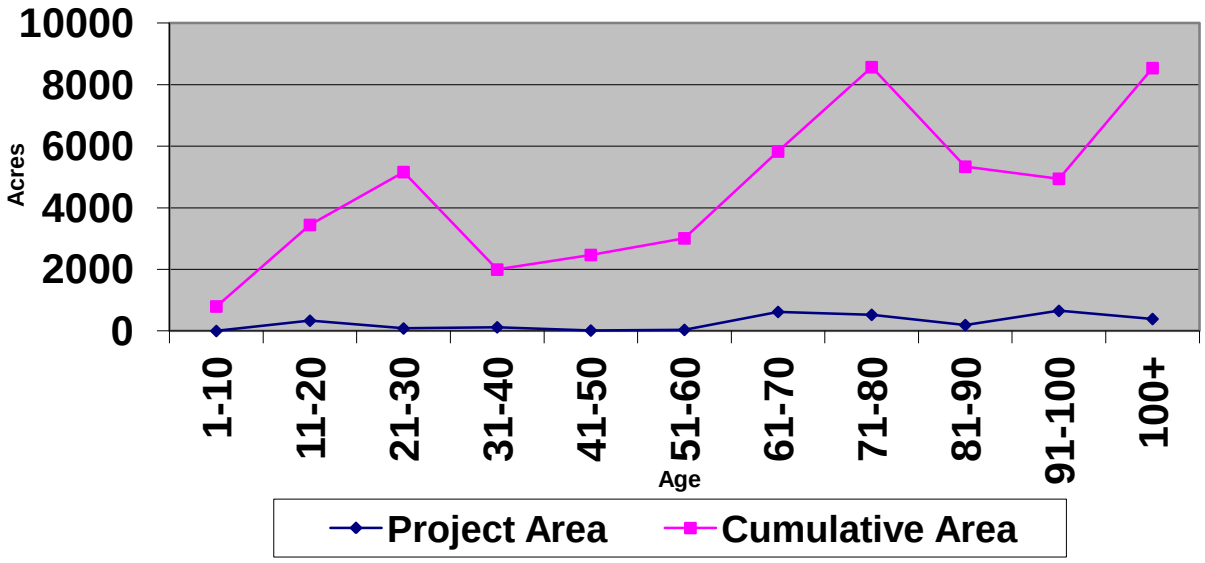


**Figure 3.1. Comparison of timber age class distribution in the Greasy Creek Project area and the cumulative effects area.**

### Species Composition

The white oak group is more dominant in the project area compared to the rest of the management area (See Chart 2 below). However, this is likely due to the age of the data in the FSVeg program which is based on the most recent plots. Most of the management area has not had plots taken in over 20 years. Similar movement towards white oak would probably be found in the remainder of the management area if plots were taken now.

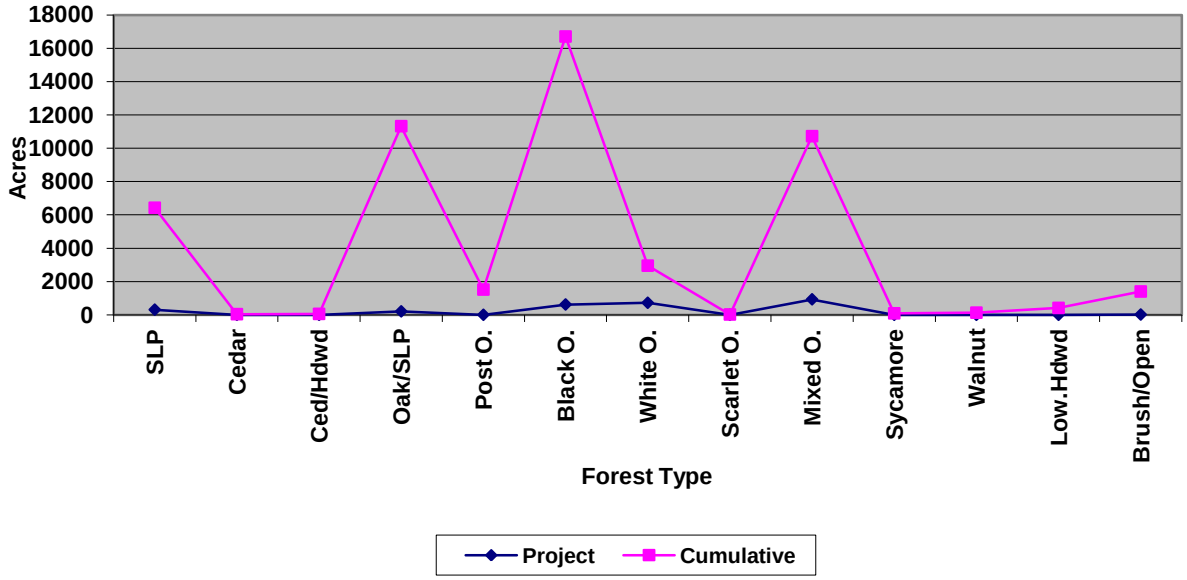


**Figure 3.2. Comparison of forest types in the Greasy Creek Project area and the cumulative effects area.**

### Forest Health/Timber Quality

Detailed individual stand plots have not been collected within the project area. Within the adjacent Indian Creek Project area, data was collected using 1 plot per 100 acres to give an overall picture of the area, not stand specific. Therefore, detailed information about the stand conditions is not available. Stand data has been updated in stands that were harvested for forest type, basal area, and year of origin. Oak decline has been noted throughout the management area with some areas being in worse condition than others.

The incidence of wildfires is not high in the project area compared to the management area overall. Isolated areas of stand replacing fires have occurred in the management area but none have been noted in the project area. Most fires usually cause minor damage, generally to the understory.

There are 12,563 acres (24% of the management area) that are at high risk of oak decline based on age and forest type. An additional 6,946 acres (13%) are at moderate risk. There are large areas where the overstory trees have already died (Hardman personal observations). The database has not been updated to reflect these conditions. Damage and stocking data have not been updated recently enough to give accurate estimates of what percentage of the area they make up. Based on general field observations, the cumulative effects area appears to have less damage overall compared to the project area.

### Natural Communities

Within the two LTAs all seven natural communities are represented on both private and National Forest land. Closed woodland and open woodland are the predominant communities making up 47% and 44% of the area, respectively. Upland forest is the next largest community making up 8%. Bottomland forest (2%) is located along the major drainages including North Fork of the White River, Spring Creek and Noblett Creek. Prairie, glade and savanna (<1%) are minor scattered components located primarily to the southeast and north.

## ***Alternative 1***

### Age-Class Distribution

The No Action Alternative would continue the decline in regeneration, resulting in a less evenly balanced age-class distribution. Approximately 3,000 additional acres would move into the over 60 age group, which for most forest types is rotation age. There would be no recruitment into the 1 – 10 year old age-class group. This

would not move the 2.1 Management Area towards meeting the Forest Plan objective for regeneration openings. Some small openings (≤ 2 acres) would develop in areas where the trees are declining. As trees die, small gaps in the canopy would occur. Whether 1% - 5% would develop is uncertain. There would likely be more small openings under this alternative than Alternative 2.

**Species Composition**

Species composition would change gradually towards the white oak group. Short term, the white oak group would make up the majority of the understory. On more moist sites, such as north and east facing slopes and the lower slopes, red maple would become a major component. These sites would also be favorable for dogwood and redbud, which would increase shade levels, making the sites less favorable for shade-intolerant species. Alternative 1 would not meet the objective of having shortleaf pine as a major vegetation component.

**Forest Health/Timber Quality**

The No Action Alternative would contribute to the decline in forest health and subsequent loss of timber quality currently being seen throughout this area. If no action is selected, future proposed projects will include large areas of dead standing trees with regeneration of predominately white oak. This increases the potential for disease to spread to the remaining healthy trees.

**Natural Communities**

The cumulative impact of implementing Alternative 1 on the natural communities would be minor as far as reaching the overall objective of enhancing natural communities in the cumulative impact area. However, if other planned projects also implement the No Action Alternatives, there would be a major impact. Approximately 47,590 acres (89% of the area) would not be moved towards the desired natural communities.

***Alterantive 2***

**Age-Class Distribution**

Implementing Alternative 2 would start moving the area towards a more balanced age-class distribution. This project would shift approximately 14% of the area from the older age-classes into the 1-10 year age-class. The last project analyzed was Blue Hole, which shifted 7% from the older age-classes. Considering much of the 2.1 Management Prescription area is in similar conditions as Greasy Creek and Blue Hole, an assumption can be made that approximately the same percentage of the area would need harvesting and be accessible in future projects as in these project areas. Short of a large tornado or wildfire occurring, the age-class distribution will always be distributed more heavily on older age-classes. This is due to the amount of area that can't be logged with the technology currently being used in this area. These areas have either steep slopes (over 35%) or are inaccessible. Past activities of even-aged management on 458 acres have provided the majority of the acres in the current 1-10 year old age-class. Another approximately 94 acres were created by wildfires.

**Species Composition**

Shortleaf pine would be present in more of the area than in Alternative 1. There may not be as much opportunity to use prescribed burning to encourage pine regeneration in the other planned project areas as in the Greasy Creek and Blue Hole projects. If that is the case, other methods to encourage pine regeneration would need to be used such as pine planting. The feasibility of this option would depend on economics at the time the projects are planned. Also by that time, research may develop other effective methods of regenerating pine.

**Forest Health/Timber Quality**

Forest health and timber quality will be major issues in this management area, including Indian Creek and Siloam Springs projects where large areas of timber are already dying. It is important to stop the spread of any insect and disease problems by maintaining healthy, vigorously growing trees in all areas. The Greasy Creek

Project would contribute towards the goal by removing declining trees, thinning overstocked stands, and regenerating a young forest.

**Natural Communities**

Implementing Alternative 2 would enhance the natural communities. When combined with other planned projects, natural communities would be enhanced over a large area. Enhancement would be done by reducing the basal area and maintaining shortleaf pine as a major component of the area. It is unlikely that shortleaf pine would gain the dominance it once had. Private land will probably remain predominantly open with areas closest to the cities becoming subdivided into smaller parcels. National Forest land provides the best opportunity to enhance these natural communities.

**Unavoidable Adverse Impacts**

There would be no unavoidable adverse impacts to the vegetation resource by implementing either alternative. Species composition would change under both alternatives. Shortleaf pine would be less dominant under Alternative 1 as compared to Alternative 2. This change would not be an adverse impact.

Alternative 1 would have an adverse impact on maintaining open and closed woodland communities. It would move much of the project area toward the upland forest community which is not the desired future condition.

**Irreversible or Irretrievable Commitment of Resources**

Implementing Alternative 1 would result in an irretrievable loss of timber value as trees continue to decline.

**Consistency with the Forest Plan**

Alternative 2 is consistent with the Forest Plan. It would move the area towards the conditions and goals for Management Area 2.1.

**Consistency with Laws, Regulations, and Handbooks**

Both alternatives are consistent with Federal, regional, State, and local laws, land use plans, policies and controls for vegetation management.

## Economics

**Affected Environment/Existing Conditions**

Missouri was a leader in lumber production at the turn of the century when the pine forests of the Ozarks were logged to the point of wide spread depletion. Through forest protection and management, Missouri is once again a leader in forest products, including charcoal, barrels, walnut nutmeats and shell products, and redcedar closet lining and gift items. For many communities, wood products are the mainstay of the local economy. Statewide, nearly 2,500 firms are involved in logging and wood products manufacturing. These businesses employ more than 33,000 people and contribute $3 billion each year to Missouri's economy.

The Economic Impact Area (EIA) includes Douglas, Texas, and Howell Counties, which tend to be impacted by forest management activities conducted on the Ava/Cassville/Willow Springs Ranger District. These counties contain 90,344 acres of NFS lands and 6% of the Mark Twain National Forest. The average median household income for these counties in 2009 was $32,049 and a per capita personal average income of $24,632. In 2010 the unemployment rate of 10.3% in Douglas County, 9.5 % in Texas County and 9.2% in Howell County with the poverty rate at 22.5% (2009 data, http://www.stats.indiana.edu/uspr/a/us_profile_frame.html), Per capita personal income is a measure that includes trends in population and total personal income. This measure is

often used as an indicator of economic well-being in the area. Per capita income at the state level has remained stable, while it has declined slightly for areas in South Central Missouri between 1999 and 2009.

Each year the National Forest returns 25% of all revenues to states where National Forest System lands are located. This money is distributed to the counties, which are prorated on the number of National Forest acres in the county. These funds are used to benefit public schools and county roads. Counties with federal lands also receive payments in lieu of taxes (PILT). PILT funds are not limited to schools and roads. Total PILT payments for 2011 in Douglas and Howell Counties were $20,211and $38,508. In 2008, PILT payments in Douglas and Howell Counties were $50,051and $61,982, respectively – this shows a 59% and 38% decrease in that three year period. This is depicting a decreased amount of timber sale revenues over the past 3 years (http://www.doi.gov/pilt/). Jobs and income in Douglas and Howell Counties are affected by management activities on the Mark Twain National Forest through direct employment in timber harvest, forest regeneration, and timber stand improvement contracts; as well as, needed products and services that are generated from these activities and recreation activities on National Forest system lands. Priced commodities (revenues) from the Greasy Creek Project would be timber sale receipts. The main non-priced benefits include dispersed recreation opportunities such as hunting, fishing, hiking, canoeing, swimming, horseback riding, wildlife viewing, berry picking, etc.

Recreation is a major activity on the Ava-Cassville-Willow Springs District, with a wide range of settings available for recreation, from semi-primitive to motorized developed recreation areas. Many areas across the Forest receive very low use indicating that the supply of places to recreate exceeds the demand. Most recreation use occurs at developed recreation sites such as campgrounds and trails (motorized and non-motorized). The Greasy Creek Project area has no developed recreation affiliated with it; only dispersed recreation opportunities are available in the area. The nature of dispersed recreation is that it is flexible, based on the needs of the user, and characteristics of a piece of land at a given time. Visitors have opportunity to choose and enjoy a wide variety of recreation experiences on the Mark Twain National Forest, an opportunity not duplicated on many other public lands. Non-local recreation users of the analysis area contribute to the local economy as they pass through or stay overnight in the area. According to the National Hunting, Fishing and Wildlife Survey conducted by the U.S. Fish and Wildlife Service, in 2006, state residents and nonresidents spent $3.4 billion on wildlife recreation. Of that total, trip-related expenditures were $912 million and equipment purchases totaled $1.7 billion. The remaining $778 million was spent on licenses, contributions, land ownership and leasing, and other items.

This analysis focuses on incremental economic differences between the alternatives, and includes only variable costs associated with each alternative. Fixed costs, such as NEPA planning and analysis do not change among alternatives and are not included. Furthermore, costs included in the economic analysis are only those to be incurred by the Forest Service. Costs incurred by timber purchasers or other parties are not included. Estimates are based on historical costs for similar projects on the MTNF.

## Direct and Indirect Effects on Economics by Alternative

This project identified the need to enhance natural communities and improve forest health conditions while providing a variety of dispersed recreational uses and timber products. Oak decline is prevalent throughout the project area and many stands would be salvaged to combat this ongoing mortality problem.

### *Alternative 1*

#### Employment

There would be no timber harvests occurring in the Greasy Creek Project area, thus no economic benefits would be provided through revenues of timber sales. No additional employment opportunities would be realized. Furthermore, with no timber harvesting, local industries may need to reduce employment. Local industries and businesses would not receive benefits from Forest Service contractors who would be purchasing fuel, food and

supplies for their work completed on Forest Service lands. The economy would remain the same, or decline, with regard to local industries and businesses. Income from recreationists and tourism would essentially remain the same and would have no significant impact on local industries and businesses.

**Future Economic Values**

No vegetative treatments would be implemented. A future increase in the economic value of timber resources would be lost due to mortality and degrading of the wood fiber in the trees. Oak decline would continue to occur, especially in black and scarlet oak species, due to years of drought, growing on poor sites, and the mature and over-mature condition of the forest. In addition, the infestation of declining trees by insects and disease would threaten the future of the timber industry. Economic benefit would be limited by not harvesting these trees prior to their death (Dwyer and Kurtz 1994). Normally, there would be no monetary cost to the government with implementation of Alternative 1 other than the standard custodial or stewardship costs associated with managing a National Forest. In this project area, a completely new set of circumstances would have to be addressed, including:

- increased fire suppression or hazardous fuel reduction costs due to increased availability of fuels,
- concerns and hazards for road maintenance.

In the short term, no change in local jobs or income would result from the implementation of **Alternative 1**, and there would be no monetary benefit to the federal treasury from timber harvesting. In the future, forested stands in the project area would produce lower value timber, revenues to the federal treasury would continue to be lower and local employment opportunities would be reduced. The Forest Plan goal for a sustained yield would not be met and any future economic benefit would be lost. Income from recreationists and tourism would have no significant impact on local industries and businesses.

***Alternative 2***

**Employment**

Timber harvests would provide economic benefits beyond revenues generated by the timber sales. These benefits include employment of local harvest crews, supply to wood products industries, and economic support for the local and surrounding businesses associated with goods and services. In the short term, income and jobs would be produced through timber harvesting, subsequent reforestation, wildlife habitat improvements, and other land-use activities. Because indirect employment is variable, the direct employment from this project can be analyzed and expressed as crew weeks. The project would be expected to generate approximately 102 crew weeks of employment to the local economy. A crew week is equivalent to three individuals producing 50,000 board feet (50 MBF) of timber (approximately 15 acres harvested timber per week), or three individuals producing 30 acres of non-commercial treatment, in a five day week. Income from recreationists and tourism would essentially remain the same and would have no significant impact on local industries and businesses.

**Future Economic Values**

The value of residual trees in stands treated by intermediate harvest should increase. Regenerated stands would provide sustained yields of timber for the future, thus providing future economic benefits. Timber management activities would improve the quality and size of preferred timber species; foster the establishment of higher value, shade-intolerant tree species; and provide for a sustained yield of high quality hardwoods and softwoods. Increased long range benefits for other resources include 1) habitat for wildlife species requiring early successional and semi-open areas, 2) variety in canopy closure in mature stands, 3) healthy mast producing stands, 4) reduced potential fire severity, 5) decreased fire suppression costs, and 6) a less hazardous outdoor experience due to treatment of areas with heavy decline and mortality. While there would be costs to the government associated with implementation of Alternative 2, they would be offset by revenues returned to the national treasury, job production, the resulting tax base for federal, state, and local (county) infrastructure; and

healthy, productive forest land requiring less investment over time to remain available for multiple-use by all forest visitors.

**Table 3.14 Cost/Benefit Comparison by Alternative**

| **Cost/Benefit** | **Alt. 1** | **Alt. 2** |
|---|---|---|
| Total Volume(MBF) | 0 | 3,600 |
| Cost of Planning, Preparing and Implementing Timber Sales | $0 | $312,000* |
| Revenues from Timber Activities(Timber Sales, Firewood) | 0 | $268,872* |
| Timber Sale Cost/Benefit Ratio | (-) | 0.81 |
| Other Costs(Prescribed burning, Pond Mtc./Rehab, Pine planting and survival surveys, Noxious Weed Control, Openland Mtc. | 0 | $157,256* |
| Total Cost/Benefit Ratio | (-) | 0.73 |

*Value determinations are in the Greasy Creek Project File.

The net cash flow shows that implementation of Alternative 2 would have a negative net return. A sustained yield of timber products from implementation of Alternative 2 would support local economies. A benefit cost ratio of 1.00 would assume that costs and benefits are equal. Alternative 2 has a negative benefit cost ratio less than 1.00. This is primarily due to depressed timber markets and reduction of our transaction evidence base values. The Forest has experienced several no-bid timber sales which affect revenues from timber activities.

Other cost values may fluctuate based on if and how timber sales are advertised. Timber removal could be done using a regional timber sale contract or could be performed under a stewardship contract. A stewardship contract is likened to goods for services contract where the contractor would do some service work in exchange for the timber removed. There has been no determination on which type of contract would be used for the Greasy Creek Project area.

In the short-term, the proposed management activities may negatively affect recreationists in their use of land scheduled for treatment. Based on feedback from field personnel and visitors themselves, recreationists generally move to another location if harvesting affects a primary activity. Often a suitable setting is found within a few miles of the original site. On occasion, a few users may quit coming to the Forest due to the interference of other proposed land management activities with recreational opportunities, but usually return in a few years. However, certain activities increase the use for some recreationists as well; harvesting may enhance opportunities for hunting or viewing wildlife species that require or utilize a seedling component in their preferred habitat. The balance of these effects indicates no significant effect on recreation income or related jobs.

## Cumulative Effects on Economics

### *Cumulative Effects Area (CEA)*

### Spatial boundary

Douglas and Howell Counties were selected as the cumulative effects spatial boundary because the counties and their associated local economies are a definitive political boundary by which to measure effects.

### Temporal boundary

The cumulative effects temporal boundary of 10 years was selected because that is the life of the expected effects of the Greasy Creek Project activities. These boundaries were selected because this is where the cumulative effects information would be measurable, meaningful, and relevant.

### *Cumulative Effects Analysis*

### Past, Present, and Reasonably Foreseeable Actions

Vegetative management practices have occurred on National Forest System lands in both counties in the past 10 years. Past projects in the neighboring area include the following (decision date):

***Blue Hole (9-4-09): Activities include*** prescribed burning 4,858 acres, commercial harvesting 2,948 acres, non-commercial thinning 177 acres, and constructing 7.1 miles of fireline.

***ACW Openlands Haying Project (5-9-08):*** Lime and fertilize 230 acres of grasslands for haying, mow and hay 335 acres to maintain open lands, and disk 68 acres for enhancement of legumes.

***Willow Springs Pine Fuel Reduction (3-1-04)****:* Mechanically thin 722 acres of pine stands on 30 different projects sites across the Willow Springs unit.

***Carman Springs (8-1-03):*** Activities include but not limited to approximately 678 acres of mechanical salvage of dying black oak, 3,435 acres of commercial thinning or pre-commercial thinning, 4,582 acres of ecosystem restoration burning, fireline construction, road construction/reconstruction and maintenance.

***Hazard Tree Removal Along Road Right-of-Way (2/18/03):*** Removal of hazardous trees along roads and trails; and adjacent to and within parking lots, picnic areas, and campsites within all developed recreation facilities.

***Topaz (1-8-02):*** Activities to be implemented in this project include 556 acres of commercial thinning, mechanical harvest on approximately 2,907 acres, and 666 acres of prescribed burning.

Reasonably foreseeable proposed actions include the Indian Creek Project, which is scheduled for a Decision Notice to be signed in 2013 and Siloam Springs/Pomona (2015). These are the proposed NEPA projects scheduled for the 2.1 Management Areas on the Willow Springs unit.

### Private Lands

Private lands in the effects area are primarily open lands (pasture or hay) and timbered. Timber harvesting has occurred on private lands in the past and is expected to continue in the future.

### Cumulative Effects Discussion

The cumulative effects on economics from past activities, the proposed action, and future foreseeable actions are at best, difficult to measure, but should be similar to the past ten years. One factor that has remained constant is that the local economy relies on timber production and recreation opportunities provided by the Mark Twain National Forest as well as the associated indirect monetary benefits supporting these activities (food, fuel, lodging, equipment sales, and other services). Douglas County and counties surrounding the project area have been involved in timber production for many decades.

On public lands, timber outputs have been reasonably steady over the past 5 years where harvesting has addressed the oak decline problem. Additionally, red oak borer damage has drastically reduced the value of logs where infestations are high, reducing the chances for short term sustainability until these lands can be regenerated to a more sustainable species mix. On private lands, it is evident that much of the timber has been liquidated or "high graded", which will take these lands out of sustainable production for many years.

Under the No Action Alternative, the trend to liquidate timber would continue because more pressure would be put on private land to meet the demand. Once the timber is liquidated, the historic trend is to convert the land to uses that provide a higher return such as cattle ranching or subdivisions. Over the long term, Alternative 2 would help alleviate the pressure of timber liquidation on private lands, provide market sustainability, and increase the value of all timberlands in the future by reducing high-risk, declining, low quality, and borer-damaged areas with healthy vigorous timber stands. Short term disturbance may displace some recreation opportunities, but as work to control the spread of oak decline and degradation from the red oak borer is accomplished, healthier stands and forested lands would move into a sustainable healthy condition.

### Irreversible or Irretrievable Commitment to Economics

Neither alternative would have irreversible or irretrievable commitments to economics of the proposed Greasy Creek Project area.

### Consistency with the Forest Plan

Alternative 1 would not be consistent with Forest Plan direction. It would move the area away from Forest Plan Goal 2.1 – "…..offer multiple benefits that contribute to the social and economic well-being of local and regional communities…..". Alternative 2 would meet this goal. No standards affecting economics of the region would be violated by implementing either alternative.

### Consistency with Laws, Regulations, and Handbooks

Both alternatives are consistent with laws, regulations, and handbooks with regard to economics.

## TRANSPORTATION (ROADS)

### Affected Environment/Existing Conditions

The Greasy Creek Project area is bounded by State Highway 181 on the east side; County Road 160 on the north; County Road EE-160 on the northwest; the North Fork River along the southwest; and an unnamed tributary of the North Fork along the south side in Sections 21 and 22, all within Douglas County. The project area is approximately 5 miles south of Cabool and lies within a 2.1 Management Area, which emphasizes multiple resource objectives while providing a roaded natural recreation experience.

Roads under state jurisdiction normally move people from one major point to another within the state and traverse a large part of the state. State highways are paved to handle large amounts of commercial truck traffic and high volumes of passenger car traffic.

State Highway 181 is designated Blue Buck Knob National Forest Scenic Byway and is a Forest Highway. Forest Highways are eligible for specific Federal Highway funding for improving the road and its related features. This Forest Highway generally is in good to excellent condition according to the 2007 Road Inventory Report for the Mark Twain National Forest by the Federal Highway Administration's Eastern Federal Lands Highway Division.

County and Mark Twain National Forest system roads provide localized access within the project area. The county roads have an aggregate surface, whereas Forest Service roads have an aggregate or native surface. County and Forest Service roads are used by passenger and high clearance vehicles, and carry considerably less

traffic than state highways. Anyone traveling to the project area is likely to drive upon a combination of state, county, and Forest Service roads.

Privately-owned land is primarily along the perimeter of the project area and is accessed mainly by State and county roads. Forest Service roads access several private in-holdings. Two non-system roads are managed under special use permits.

The project area contains three National Forest System roads, with a combined length of 4.9 miles. These roads vary in length from 0.3 miles to over 2 miles. These roads are single lane and dead-end within the National Forest. National Forest System roads are marked with brown, vertical posts showing the road's number and length. Some system roads also have a tree marked with pink paint at the road's designated ending point for motorized travel.

On September 15, 2011 the Mark Twain National Forest updated the motor vehicle use map (MVUM) for the Willow Springs unit in which the project area is located. This map identifies those Forest Service system roads designated for public motorized vehicle use. Motorized use is limited to those vehicles and operators that comply with all federal, state, and local traffic laws and regulations. The map also shows which designated roads have seasonal restrictions. Public motorized access is prohibited on any Forest Service road not shown on the MVUM. This black and white map is free to the public and is updated annually. All-terrain (ATV) and utility vehicle (UTV) operators with a valid Douglas County ATV or UTV permit may use those county roads and any Forest Service system roads shown on the MVUM within that particular county. Mixed-use of the roads by licensed trucks and cars and permitted ATVs is a common occurrence.

National Forest system roads are developed and maintained for long-term access and as such, provide primary access into the project area for recreation, administration, and commodity production. System roads within the project area are generally located on ridge tops, have been constructed to Forest Service engineering standards, are maintained and signed in accordance with their objective maintenance level, and are considered adequate for use under normal operating conditions. Any management activity, which increases use or considerably alters normal road conditions or traffic patterns, may be mitigated with appropriate warning and precautionary signing. Additional road maintenance may be required to safely accommodate heavier volumes of traffic. Roads may also require reconstruction in order to allow commercial vehicle access for resource management activities.

In addition to system roads, there are approximately 2.5 miles of non-system roads on National Forest land in the project area. Non-system roads are roads on Forest Service managed land that are generally not needed for long-term access. Many have been in place since the early 1900's when the area was first harvested for timber. However, they generally aren't needed to accomplish Forest management activities. The condition of these roads is usually fair to poor because little or no improvements or maintenance work has ever been done. Those located on ridge tops are relatively stable, except for areas that become soft when wet. Those located on side slopes or riparian areas are less stable and may become entrenched, rutted, or washed out. These roads have continued to be used for recreational activities, timber harvesting, and other resource management activities. Some non-system roads have been decommissioned by the District or have become inaccessible due to natural vegetation growth, but many have remained open because of continued recreational vehicle use. Motorized use on non-system roads is prohibited, unless written authorization is granted.

Some non-system roads access private property and are under a special use permit (SUP). A special use permit authorizes the permit holder to use a non-system road for access to private property. The road is still under the jurisdiction of the Forest Service, but the permit holder is solely responsible for performing any necessary road maintenance. The condition of SUP roads vary. Those SUP roads that access a primary residence are more likely to be maintained for low-clearance vehicles (passenger cars), while those used to reach property primarily used for agricultural or recreational purposes are generally maintained for use by high-clearance vehicles (trucks and SUVs). Currently, there are two non-system roads under special use permit within the project area.

All open roads, including both system and non-system, receive some degree of vehicular traffic. Use occurs primarily on weekends for recreational driving, hunting, firewood gathering, and other recreational pursuits. Evidence of hunter camps can be seen along several of the roads. A majority of non-system roads within the project area are used frequently by unauthorized high clearance vehicles and ATVs. As stated previously, the MVUM prohibits motorized vehicles on non-system roads, without written authorization. However, non-motorized travel, such as hiking, biking, or horseback riding is allowed.

## Direct and Indirect Effects on Transportation by Alternative

A majority of system roads needed for resource management activities and public access are already in place. The need for road maintenance, reconstruction, or decommissioning activities is based on management area objectives, proposed management activities, and the need for resource protection. National Forest system roads are meant to provide safe and efficient access for both the public and agency employees and its contractors.

The intent of road construction or reconstruction is to provide long-term access into an area with the least amount of disturbance possible. Part of the "least disturbance" objective is to ensure resource damage does not occur after a road has been constructed or reconstructed. Proper construction or reconstruction would minimize disturbance to the area. Road construction or reconstruction increases the degree of soil and vegetative disturbance in the short term, while providing long-term load bearing strength and stabilization of the surrounding soil and vegetation. Roads are constructed or reconstructed to provide a minimum standard of road necessary for management area objectives. Road reconstruction would reduce seasonal access restrictions due to wet weather. Road reconstruction consists of clearing vegetation from the roadway, installing drainage features, and adding aggregate to harden the driving surface of the road. In some cases, realignment of the road may be necessary.

Road maintenance is the ongoing upkeep of a road necessary to retain or restore it to its approved road management objective. Road maintenance activities are preventive measures, used to stabilize the road, protect road investments, and minimize disturbance to surrounding resources. Activities associated with road maintenance and improvement may include surface blading, replacement of driving surface material, mowing and limbing of roadside vegetation, cleaning and restoring drainage features, and replacing signs.

Roads identified for decommissioning are not needed for long-term resource management and in many cases are poorly located on the landscape, within or very close to streams and drainages, or on extremely steep slopes that are highly erosive. Road decommissioning eliminates motorized vehicular travel and returns the roadway back to a natural state. The result of road decommissioning is restored hydrology, a reduction in soil erosion and sedimentation, and the growth of new vegetation where the road once existed. Road decommissioning may involve one or more of the following treatments: blocking access with earthen berms, rock berms, boulders, or slash piles; restoration of natural drainage features by removing culverts and re-contouring the area; scarification to remove the roadbed; re-vegetation by seeding, planting, or fertilizing; and signing to discourage motorized use of the road. Priority roads for decommissioning are those causing the greatest resource damage, such as erosion, and/or constituting a risk to public safety.

All road miles in the following analysis are estimates and are based on current data in the Mark Twain National Forest's Geographical Information System (GIS) and INFRA database (Year). Some adjustment of estimated miles may occur in order to protect resources, reconcile GIS and INFRA mileage differences, and provide for the application of sound engineering judgment when implementing proposed road projects on the ground.

### *Alternative 1*

No changes would be made to the existing 4.9 miles of National Forest System roads within the project area. Routine maintenance on approximately 2.9 miles of system road would continue. These maintained roads would continue to provide access for both Forest Service management activities and public enjoyment of the area.

No reconstruction of system roads would occur. Without reconstruction, these roads would continue to deteriorate and become less safe to travel upon. Travel would be impeded due to rutting and vegetation growing within or next to the roadway. Without aggregate surfacing, the roads would continue to be a source of soil erosion and sedimentation into nearby streams. Lack of surfacing material would exacerbate rutting and mud holes when vehicles are driven on saturated soils within the road. Excessive rutting and large mud holes would force drivers to maneuver around them, which could result in the vehicle leaving the roadway or even dragging or hitting the bottom of the vehicle, and thus make driving more hazardous. In addition, trees, bushes, and grasses growing along or within the road would limit sight distance, scratch the sides of vehicles that brush against them, and smack windshields.

No unneeded roads would be decommissioned within the project area. These roads would likely continue to receive unauthorized motorized traffic, diminishing the ability of the roads to re-vegetate naturally and return the area to a natural appearing environment.

This alternative would not foreclose authorization of the current 0.5 mile of special use permits or future potential special use permits for non-system roads used to access private property within the project area.

***Alternative 2***

This alternative would address the purpose and need of providing a safe and efficient transportation system at a level that meets the need for resource management and public access. Routine maintenance of approximately 2.9 miles of system road would continue. The effects of road maintenance would be the same as in Alternative 1. In addition, approximately 0.8 miles of system road would be reconstructed. Approximately 0.9 miles of non-system road would be converted to system road and reconstructed. Road reconstruction would improve motorized access into the Greasy Creek Project area. High-clearance and/or commercial vehicles could safely use reconstructed roads, as drivers would not encounter large mud holes, ruts, or tree limbs whacking their vehicles. Sight distances would also be improved. Upon completion of road reconstruction, drivers could travel much more safely and efficiently. Due to their hardened driving surface, reconstructed roads would have less erosion; and thus, less sedimentation into nearby streams. The area's recreational experiences would be enhanced by improved driving conditions on the reconstructed roads.

Approximately 1.1 miles of non-system and 1.2 miles of system road would be decommissioned. Motorized access on these unneeded roads would be eliminated. Decommissioning would help ensure that drivers are not using unsafe roads and would return the land back into suitable areas for natural resource production (wood products, wildlife habitat, forage, etc.). These unneeded roads would no longer be a source of soil erosion and sedimentation into nearby streams, springs, seeps, or fens.

Two non-system roads are currently managed under special use permit for access to private land (0.5 miles total). If it is determined that access is not necessary or no longer needed for any of these roads, they would also be decommissioned.

**Table 3.15. Road management activities for Alternative 2.**

| *Alternative 2* | *Measures (Estimated)* |
|---|---|
| System road maintenance: 129 (1.4 mi), 427 (1.2 mi), 428 (0.3 mi). | 2.9 miles |
| System road reconstruction: 427 (0.8 mi). | 0.8 miles |
| Non-system road converted to system road with reconstruction: 427 (0.5 mi), 428 (0.2), 14145 (0.2 mi), | 0.9 miles |
| Decommission system roads: 129 (1.2 mi). | 1.2 miles |

| *Alternative 2* | *Measures (Estimated)* |
|---|---|
| Decommission non-system roads not under special use permit. | 1.1 miles |
| Manage non-system roads under special use permits. | 0.5 miles |

**Table 3.16. Comparison of road management activities by alternative.**

| ***Road Management Activities*** | *Alt. 1* | *Alt. 2* |
|---|---|---|
| Total miles of system roads | 4.9 | 4.9 |
| Miles of system road to maintain | 2.9 | 2.9 |
| Miles of system road to reconstruct | 0 | 0.8 |
| Miles of system road to decommission | 0 | 1.2 |
| Miles of non-system road to convert to system road and reconstruct | 0 | 0.9 |
| Miles of non-system road to decommission | 0 | 1.1 |
| Miles of non-system road managed under special use permits | 0.5 | 0.5 |

## Cumulative Effects on Transportation

***Cumulative Effects Area (CEA)***

**Spatial boundary:**
The Greasy Creek Project area is the cumulative effects boundary for transportation.

**Temporal boundary:**
Cumulative effects for roads will be analyzed for the next 5 years because government (federal, state, and local) transportation planning is normally limited to a five-year period. Government road-related budgets are also difficult to predict beyond a couple of years.

***Cumulative Effects Analysis***
Past projects in the surrounding area include the following (decision date):

***Blue Hole (9-4-09): Activities include*** prescribed burning 4,858 acres, commercial harvesting 2,948 acres, non-commercial thinning 177 acres, and constructing 7.1 miles of fireline.

***ACW Openlands Haying Project (5-9-08):*** Lime and fertilize 230 acres of grasslands for haying, mow and hay 335 acres to maintain open lands, and disk 68 acres for enhancement of legumes.

***Willow Springs Pine Fuel Reduction (3-1-04)****:* Mechanically thin 722 acres of pine stands on 30 different projects sites across the Willow Springs unit.

***Carman Springs (8-1-03):*** Activities include but not limited to approximately 678 acres of mechanical salvage of dying black oak, 3,435 acres of commercial thinning or pre-commercial thinning, 4,582 acres of ecosystem restoration burning, fireline construction, road construction/reconstruction and maintenance.

***Hazard Tree Removal Along Road Right-of-Way (2/18/03):*** Removal of hazardous trees along roads and trails; and adjacent to and within parking lots, picnic areas, and campsites within all developed recreation facilities.

***Topaz (1-8-02):*** Activities to be implemented in this project include 556 acres of commercial thinning, mechanical harvest on approximately 2,907 acres, and 666 acres of prescribed burning.

The Greasy Creek travel analysis evaluated both system and non-system roads within the project area. These are the types of roads more readily impacted by project actions. The travel analysis evaluated which roads should be maintained, reconstructed, constructed, or decommissioned. The analysis did not identify any new opportunities for motorized trails or areas within the project area. The Greasy Creek Project area was selected as the appropriate analysis boundary to give the Responsible Official the site-specific context dealing with roads to determine the ultimate effects of the Greasy Creek Project actions. The area involved in the travel analysis process is described in further detail in the 2007 Road Inventory Report for the Mark Twain National Forest (available on request) and is incorporated by reference in the Greasy Creek Project Environmental Assessment.

The Forest Plan calls for decommissioning unneeded roads, with priority given to those roads that pose the greatest risk to public safety or where use is causing unacceptable resource damage, such as soil erosion. This would be applicable to Alternative 2 as discussed above. When needed, an existing non-system road may be used to temporarily access project activities, but would then be decommissioned when such activities are complete. This would reduce the amount of new road construction needed and associated sediment movement. Unauthorized use of non-system roads would be reduced or eliminated after roads are decommissioned. Non-system roads have been identified as current or potential candidates for special use permits. If it is determined that any of these roads provide primary access to private property, then they would not be decommissioned, and would be managed as special use permit roads. The private individual who is issued the special use permit would be responsible for any necessary road maintenance.

Mitigation measures currently employed and found in the Forest Plan Standards and Guidelines, such as constructing roads with less than a 10% grade or installing drainage features at appropriate intervals, ensure the integrity of the roads is maintained. Roads, which were used in the past, will likely be used again (USDA 2005). Current Forest Service annual road maintenance budgets have only been adequate for Maintenance Level 3 and 4 roads, and a small percentage of Maintenance Level 2 roads. Maintenance Level 3 and 4 roads are the most heavily traveled roads on the Forest. In addition to the annual road budget, road maintenance deposits collected through commercial activities (such as timber harvesting) have been used for surface blading and roadside mowing and limbing. In some cases, commercial users of roads have performed road maintenance activities themselves, such as; surface blading, removal of roadside vegetation, or replacement of road surfacing materials, primarily on Maintenance Level 2 roads. Periodic road maintenance activities would provide a safe and efficient transportation system within the Greasy Creek Project area. Without regular maintenance, future road reconstruction would likely be needed on system roads within 10-20 years.

The Forest Plan requires an assessment of the types and amounts of traffic found on Forest Service roads. Where public traffic on these roads is primarily due to non-Forest activities, the appropriate county should be contacted to determine their maintenance responsibility. However, all Forest Service roads within the Greasy Creek Project area appear to serve mainly Forest Service-related travel activities.

According to the State Transportation Improvement Plan for 2010-2014, no state highways or routes within the analysis area are scheduled for improvement. Routine maintenance of state highways is expected to continue within the project area. The Safe and Sound Bridge Improvement Project lists no bridges inside the project area (Missouri Department of Transportation 2012).

It is expected that the vast majority of road activities by Douglas County would consist of routine maintenance, such as surface blading, culvert cleaning, and roadside mowing and limbing. Access to the project area should be safer and more efficient for motorized travel as a result of Forest Service road reconstruction (as identified in Alternative 2) and maintenance of state, county, and Forest Service roads.

The paved surface of State Highway 181 eliminates surface erosion, but presents impacts from winter salt and petroleum product residues from the road surface. Residues come from the paving material itself (asphalt) and leaks from automobiles, trucks, farm machinery and other gas-powered vehicles.

Aggregate roads, in particular Forest Service and county roads, would continue to be sources of sediment that may migrate to area streams. National Forest system roads and county roads represent the same potential source of fine material via erosion that affects water resources as sediment. Aggregate roads are perpetual sources of fine materials (dust and small particles), with potential to become sediment in nearby streams. However, with routine maintenance, the amount of sediment eroding from roads surfaces would be reduced. An aggregate road would produce a minimum amount of sediment when the road is used infrequently during wet periods, heavy truck traffic is limited, maintenance is performed on a routine basis, or any type of off-road use that disturbs the road is prohibited.

***Cumulative Effects Discussion***

Since Forest Service system roads are normally built and maintained to a higher standard than most private roads (with the possible exception of private roads that directly access homes and are driven by low-clearance passenger vehicles), private roads would be expected to have a greater impact on stream sedimentation from erosion of their road surface materials.

Past transportation system activities, current proposed actions, and reasonably foreseeable future activities do not pose any appreciable cumulative effects on motorized access to or use of the project area or its vicinity for all alternatives.

The preceding analysis was based on the following resources: 1) GIS spatial data and maps; 2) Tabular road data in INFRA; 3) Missouri State Transportation Improvement Plan 2010-2014; 4) Missouri State Safe and Sound Bridge Improvement Project ; and 5) Monitoring by personal observation. Information was also borrowed from the soils analysis using the Water Erosion Prediction Model (Elliot et al. 2000).

### Irreversible or Irretrievable Commitment on Transportation

Neither of the alternatives would have an irreversible or irretrievable commitment on transportation in the proposed project area.

## VISUAL RESOURCES

### Affected Environment/Existing Conditions

The Greasy Creek Project area contains lands administered under Management Prescription 2.1 (General Forest). Management Prescription 2.1 emphasizes multiple use resource objectives while allowing for enhancement of natural communities, improvement of forest health conditions, and roaded natural recreation experiences. Management prescriptions are further discussed in the “Forest Plan Goals, Direction, and Desired Conditions” section of this document.

The **Visual Quality Objective** (VQO) is determined for a specific area by referring to the visual quality matrix found in the standards and guidelines for each management prescription. Each district has variety classes and sensitivity levels mapped and criteria for determining variety classes and sensitivity levels are documented in Appendix G of the 2005 Forest Plan. They may be changed based on field conditions. The Greasy Creek area is in Visual Variety Class A and B with a small portion of Variety Class C. It only contains Sensitivity Level 3 travelways and is adjacent to one Sensitivity Level 1 travelway- Blue Buck Scenic Highway along the eastern boundary.

The main highway access to the area is from State Highway 181 in Variety Class B. State Highway 181 is a National Forest Scenic Byway and is called the Blue Buck Knob Scenic Byway. A small portion of Hwy 181 is in Variety Class A. The VQO for the portions within Variety Class B is Partial Retention for the foreground and for that portion in Variety Class A it has a VQO of Retention for the foreground area. All the other roads or travelways are Sensitivity Level 3 with a VQO of Modification in the near foreground. The existing road surfaces, other than paved state highways, are gravel or chip and seal, with an average low travel speed and little or no shoulder (Reference: VQO map in project file and 2005 Forest Plan, Table 3-4, *Visual Quality Objective for Management Prescription 2.1,* p. 3-12).

**Variety/Scenic attractiveness classifications:**

**Class A (Distinctive) -** areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

**Class B (Typical) -** areas where landform, vegetation patterns, water characteristics, and cultural features use combine to provide ordinary or common scenic quality. These landscapes have generally positive, yet common, attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern and balance. Normally they would form the basic matrix within the ecological unit.

**Class C (Indistinctive) -** areas where landform, vegetation patterns, water characteristics, and cultural land use have low scenic quality; often water and rockform of any consequence are missing. These landscapes have weak or missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Sensitivity levels for travelways were developed considering user-related concerns and expectations. Landscape visibility is subject to many essential, interconnected considerations which include:

- context and experiences of viewers
- expected images
- position of observer in the landscape
- number of people
- viewer scrutiny of the landscape caused by duration of view, viewing distance, air clarity, and visual magnitude

The Greasy Creek area has visual variety throughout the area. There are conifer and a variety of hardwood trees throughout the project area. Due to changes in elevation of the terrain and vegetation, it is not common to see internal areas from travelways, especially during the time of year when deciduous trees have their leaves.

There are mixed vegetative species that provide seasonal color and texture in all vertical levels of the forest from low-growing mayapples that sprout and bloom in spring to large oak trees turning colors in the fall. Roadways are primarily narrow gravel surfaces that are winding and climb up and down hills. Many bird and animal species can be seen and heard throughout the year.

The existing Scenic Integrity for the Greasy Creek area ranges from High (appears unaltered-retention) to Very Low (heavily altered - maximum modification) depending on the area being viewed. The frame of reference for measuring achievement of scenic integrity levels is the valued attributes of the “EXISTING” landscape character “BEING VIEWED” (USDA 1995). In Natural or Natural Appearing character, this is limited to natural or natural appearing vegetative patterns and features, water, rock and landforms. Direct human alterations may be included if they have become accepted over time as positive landscape character attributes.

The Visual Quality Objective (VQO) requires that we meet integrity levels. In general, a specific integrity level can be achieved by decreasing the visual contrast of deviations being viewed by using several approaches. The following are those pertaining to this project area (USDA 1995):

1) To repeat form, line, color, texture, pattern, and scale common to the valued landscape character being viewed. If repetition is accurate and well designed the deviation may blend so well the change is not evident (HIGH). It may only borrow well enough to be noticeable but visually subordinate (MODERATE). Designing and maintaining trails and associated structures to repeat form, line, color, texture, pattern, and scale common to the valued landscape character being viewed.
2) To borrow form, line, color, texture, pattern, and scale from similar but different valued landscapes outside that being viewed. Because these are introduced elements from landscape character outside the one being viewed, they are usually evident (MODERATE) if not dominant (LOW). Trails and associated structures would be designed and maintained such that they fit the landscape and utilize similar form, color, texture, pattern, and scale.
3) An approach used for the (VERY LOW) level is to shape and blend only with landforms. Trails would conform to folds and ridge lines in the landscape to avoid dominance. Trails and associated structures would be designed and maintained such that they blend only with the landforms.

**Forest Plan Standards and Guidelines for Visual Management**

The 2005 Forest Plan (page 2-24) provides the following required standards:

- Resource management activities must meet or exceed the established VQO. Allow a short-term reduction, the equivalent of one VQO, for central hardwood regeneration or similarly impacting activities.
- Foreground sensitivity level 1 (fg1) or foreground sensitivity level 2 (fg2) areas must not be reduced below modification.
- Retain the original VQO for adjusted areas, and meet it within 20 years after initial entry into the corridor or viewshed. Residue treatment requirements must meet those specified for the original VQO.

**Within fg1 and fg2 areas with a VQO of Retention or Partial Retention**

- Mitigate negative visual impacts concurrently with or immediately after each phase or activity.
- Complete mitigating measures for each cutting unit or project area before beginning activities in the next sequential block or project area in the same corridor or viewshed.
- Complete obligations specified by a contract or a project prescription within one year from initiation of activities for any single cutting unit or project area. Emphasize completing all work within these areas in a systematic manner within the shortest practical time.

Within fg1 and fg2 areas with a VQO of Modification, the standards are the same as above except the total lapsed time from initiation of activities to completion of obligations specified by a contract or a project prescription shall not exceed two years for any sale block or project area.

**Table 3.17. Maximum residue treatment heights (above ground surface) for designated travelways and use areas by sensitivity levels in the Greasy Creek Project area.**

| Visual Quality Objective - VQO | Distance Zone | Travel Speed MPH | Sensitivity Level 1 (Mandatory) | Sensitivity Level 2 (Mandatory) | Sensitivity Level 3 (Optional) |
|---|---|---|---|---|---|
| **Retention - R** | Nfg* (0-300') | 0-10<br>11-35<br>36-55 | 18 inches<br>24 inches<br>30 inches | N.A. | N.A. |
| | Secondary Zones (up to 600') | 0-10<br>11-35<br>36-55 | 6 feet<br>8 feet<br>8 feet | N.A. | N.A. |
| **Partial Retention - PR** | Nfg* (0-300') | 0-10<br>11-35<br>36-55 | 18 inches<br>24 inches<br>30 inches | 30 inches<br>30 inches<br>36 inches | 36 inches<br>36 inches<br>48 inches |
| | Secondary Zones (up to 600') | 0-10<br>11-35<br>36-55 | 8 feet<br>8 feet<br>12 feet | 10 feet<br>10 feet<br>12 feet | 12 feet<br>12 feet<br>12 feet |
| **Modification - M** | Nfg* (0-300') | 0-10<br>11-35<br>36-55 | N.A. | 36 inches<br>48 inches<br>48 inches | 48 inches<br>48 inches<br>48 inches |
| | Secondary Zones (up to 600') | All Speeds | N.A. | 12 feet | N.A. |
| **Maximum Modification - MM** | Nfg* (0-300') | All Speeds | N.A. | N.A. | 48 inches |
| | Secondary Zones (up to 600') | All Speeds | N.A. | N.A. | N.A. |

Reference 2005 Forest Plan, Table 2.6, page 2-26
*Nfg = Near foreground

A general discussion of visual management and effects of the different types of management activities can be found in the Landscape Aesthetics "A Handbook for Scenery Management" - Forest Service-US Department of Agriculture-Agriculture Handbook Number 701 (year), incorporated here by reference.

## Direct and Indirect Effects on Visual Resources

This section describes the area of analysis for direct and indirect effects and the area evaluated for cumulative effects. The scope of the analysis will include the scenic resources within the Greasy Creek Project area and potential visual quality effects from developed recreation areas, roads, trails and waterways within and adjacent to the area. Because the Forest provides a wide range of recreation opportunities and scenic landscapes, there are no scenery resources limited or specific to the Greasy Creek area.

### *Alternative 1*

No sudden changes from the existing condition would be expected to occur. Barring natural disturbance, it is anticipated that the existing visual condition of the project area would slowly change. The project area as a whole would appear as a natural mature or old growth forest in the future. Over time there would be less visual variety than exists now as declining oak species die and habitat diversity would not improve without prescribed burning and harvesting.

***Alternative 2***

Under this alternative, the activity would be visible to Forest user's within the project area and in the time, immediately following the harvest activity, slash would be visible on the ground. Areas of prescribed burns would appear black between the time of a spring burn until green up. The long term effect of the proposed action would be to improve the visuals of the area and increase diversity of both flora and fauna. By decommissioning roads and unauthorized trails, this alternative would improve the look of the area. Reconstructing and maintaining roads would make it more safe and easier for the Forest visitor to see and enjoy the project area.

## Cumulative Effects on Visual Resources

### *Cumulative Effects Area (CEA)*

### Spatial boundary

The spatial boundary used to evaluate direct and indirect consequences and cumulative impacts is the Greasy Creek Project area and the adjoining private and government property for one mile from the project area boundary. This area was used because it would adequately address any effects related to vegetative management on scenery resources.

### Temporal boundary

The temporal boundary was set to analyze ten years prior to this decision, plus ten years following this decision. The boundary was selected because ten years is the normal management cycle and this is the extent to which effects are measurable and meaningful.

### *Cumulative Effects Analysis*

The primary NEPA decisions that have affected this area include: Topaz (1/8/02); Hazard Tree Removal Along Road Right-of-Way (2/18/03); Willow Springs Pine Fuel Reduction (3/1/04); ACW Openlands Haying Project (5/9/08); Openlands Grazing Management Project (9/27/08); and Blue Hole (9/24/09). Reasonably foreseeable actions include the Indian Creek Project (approximately 14,000 acres) which is scheduled for a Decision Notice to be signed in 2013 and Siloam Springs (approximately 11,000 acres) in 2015.

### *Cumulative Effects Discussion*

Vegetation and ground disturbing activities would be necessary to implement Alternative 2. These activities would result in short-term increases of residue and possible slash on the ground due to vegetation management activities. Various items such as the mitigation measures in this EA and other items found in the Forest Plan would be implemented to minimize any short-term impacts.

All options would follow the Forest Plan S&Gs. There would be no long term negative impacts on visual quality for this area. In fact, over time, this activity would improve the quality and quantity of most visual and recreational activities.

Past and present actions on private and National Forest lands were considered in forming the affected environment of the area as described above. No anticipated future actions are known that would be inconsistent with the visual quality objectives for the analysis area.

Under all the alternatives, there would continue to be open woods due to natural low soil fertility, natural disturbance (windstorm, insect & disease, etc.) or wildfire. Most existing roads would continue to be maintained. The cumulative effects for Alternative 2 would meet the VQO for all levels. Over time, the area would no longer meet the desired future conditions of the VQO if Alternative 1 were implemented. Under Alternative 2, the cumulative effects of visual enhancements and development would move this area toward the

desired future condition of the VQO for the area; particularly along travelways, which would encourage visitors to continue enjoying this area.

### Irreversible or Irretrievable Commitment on Visual Resources

Neither of the alternatives would have an irreversible or irretrievable commitment on the visual resources in the proposed Greasy Creek Project area.

**Visual resource summary**: There would be no significant cumulative effects on the area's Visual Resources because of the limited nature and extent of the cumulative effects discussed above. This conclusion was reached after analyzing all of preceding information regarding past, present visual resources.

## ENVIRONMENTAL JUSTICE

### Affected Environment/Existing Conditions

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was signed on February 11, 1994 by President Clinton. This order states:

> …..each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands (Section 1-101).

This analysis is intended to evaluate selected quantitative demographic indicators of minority populations and low-income populations of communities for purposes of assessing environmental justice. This quantitative analysis can reveal useful information about the analysis area.

It is important to note that the following demographic analysis addresses indicators to determine the presence or absence of minority and/or low-income communities in an analysis area. This analysis summarizes one key demographic indicator of minority populations and two key demographic indicators of low-income populations. While these indicators and the associated thresholds are not formally identified in federal codes and regulations, they serve as reasonable predictors of minority and low-income population status.

The Greasy Creek Project is located in Douglas County, Missouri, and is one of the seven counties (Barry, Christian, Douglas, Howell, Ozark, Stone, and Taney) impacted by forest activities conducted on the Ava/Cassville/Willow Springs Ranger District. This seven county region has experienced the largest percent of population growth (38%) since 1990 within the 29 counties containing Mark Twain NF lands (2005 Forest Plan FEIS). Douglas County covers 814.53 square miles and has 13,377 people residing within the county. The following table summarizes the 2010 U.S. Census Bureau estimates of general population characteristics for the county and the state of Missouri.

**Table 3.18. Demographics for Douglas County and the state of Missouri.**

| Demographic | Douglas County | Missouri |
|---|---|---|
| **Total Population** | 13, 684 | 5,988,927 |
| **Gender** | | |
| Male | 49.4% | 49% |
| Female | 50.6% | 51% |
| **Race/Ethnic Group** | | |

| Demographic | Douglas County | Missouri |
|---|---|---|
| White | 97.1% | 82.8% |
| Black/African American | 0.2% | 11.6% |
| Native American | 0.6% | 0.5% |
| Asian | 0.2% | 1.6% |
| Hispanic | 0.8% | 3.5% |
| Mixed Ethnicity | 1.8% | 2.1% |
| **Age** | | |
| under 5 years old | 5.9% | 6.5% |
| under 18 years old | 22.4% | 23.8% |
| 65 years old and over | 19.8% | 14% |
| | | |
| **Median household income** | $30,968 | $46,262 |
| | | |
| **Persons below poverty level** | 22.4% | 14% |
| | | |

*Source, U.S. Census Bureau QuickFacts* at: http://quickfacts.census.gov/qfd/index.html

***Minority Population***

The 2010 estimates indicated that greater than 97 percent of the population of Douglas County is White. Less than 3 percent are non-white minorities; including those who identified themselves as Black, Hispanic, Asian, Native American, and of mixed ethnicity. This is less than the state average of just over 19 percent and far less than the Environmental Protection Agency (EPA) threshold value of 25 percent. It is unlikely that this project will have disproportionate negative impacts on any minority population (USDA, Forest Service 2005).

***Low-Income Population***

The poverty rate is a commonly used indicator of the level of economic need in a community. The 1999 Ozark Ouachita Highland Assessment (OOHA) found that thirty-seven counties in the OOHA assessment area experienced "persistent poverty." The Economic Research Service defines persistent poverty counties as those non-metro counties with poverty rates of 20 percent or more in each census from 1970 through 2000. Douglas County was classified in the 1999 OOHA as a county that is under persistent poverty.

More recently, the median household incomes for Douglas Counties in 2010 was $30,968, while that for the entire state of Missouri was $46,262. This income value is more than the U.S. Census Bureau, Weighted Average Poverty Thresholds for a family of 5 in 2010 ($26,439); however, it differs from the state median household income by more than 10 percent. The poverty level in Douglas County was 22.4%, while it was 14% for the State of Missouri. This project would not impact low-income populations; although, Douglas county may be considered a borderline poverty area.

**Direct and Indirect Effects on Environmental Justice**

Alternatives for the Greasy Creek Project were evaluated to determine potential impacts to low-income and minority communities, as well as consumer, economic, and civil rights issues, including those affecting minority groups and women. The following discussion addresses potential impacts of the proposed alternative.

***Alternative 1***

This alternative neither adds to nor diminishes the local economy or employment opportunities; and thus, has no effect on low-income populations, nor does it affect minority communities.

***Alternative 2***

This action alternative would add to the local economy and employment opportunities for skilled and unskilled labor forces by providing:

a) commercial timber sales through which contractors hire sawyers, equipment operators, and truck drivers

b) road and trail maintenance contracts

c) contracts for timber stand improvements, which may include sale of small roundwood and firewood, depending on local markets

d) contracts for control of invasive plant species.

This alternative would also supply timber products for local sawmills that hire residents to operate machinery, and stack and grade lumber; as well as, provide wood products that satisfy needs of the greater economy. Any effect on low-income populations would be positive. This action would not affect minority communities.

## Cumulative Effects on Environmental Justice

### *Cumulative Effects Area (CEA)*

Demographic analysis was limited to communities within Douglas County and included consideration of the provisions of Executive Order 12898.

### *Cumulative Effects Analysis*

The analysis compared demographic characteristics for the county with suggested threshold levels of concern and concluded that low-income and minority populations would not be adversely affected by either direct or cumulative affects resulting from a decision on either the action or the no-action alternatives. Furthermore, a decision on these alternatives would not pose disproportionately high or adverse environmental, human health, economic or social effects on the residents of Douglas County. A review of demographic characteristics for residents of Douglas County, and how they compare to suggested threshold levels for concern, indicate there is no reason to suspect that communities within the county might fall under the provisions of Executive Order 12898.

### *Effects on Consumers, Civil Rights, Minority Groups, and Women*

Forest Service activities must be conducted in a discrimination free atmosphere according to civil rights policy. Any contract work that may be generated from a decision would include specific clauses offering civil rights protection to consumers, minority groups, and women. Executive Order 12898 (Environmental Justice) calls for consideration of the environmental, health, and economic effects of Forest Service projects on minority and low-income populations as part of the National Environmental Policy Act (NEPA) process. The Forest Service would make a concerted effort to enforce these policies.

## Irreversible or irretrievable commitment on resources

Neither of the alternatives would have an irreversible or irretrievable commitment on minority populations and low-income populations of Douglas County.

# HERITAGE RESOURCES

## Affected Environment/Existing Conditions

### Inventory Survey Coverage

Broad scale cultural resources inventory surveys utilized in the Greasy Creek Project area have been undertaken at various levels of intensity by private sector archaeologists under contract with the Mark Twain National Forest as components of the Greasy Creek Project as well as separate undertakings. Recent surveys were focused specifically on those areas in which Greasy Creek Project activities are proposed that have the potential to affect historic properties.

Of the 2,903 acres of cultural resources survey employed in the Greasy Creek Project area, Effigy Archaeological Services, Inc., of Overland Park, Kansas, surveyed eight acres during the summer of 2002 as part of a larger, separate undertaking; Effigy surveyed an additional 2,895 acres between September and November, 2011 specifically in support of the Greasy Creek Project (Moerbe and Gannon 2012). Effigy's 2011 survey included an inventory of 40 acres of privately owned property within which prescribed fire is proposed in a public/private partnership authorized under the Wyden Amendment (Public Law 105-277, Section 323 as amended by Public Law 109-54, Section 434). With certain exceptions (see below), all of the Areas of Potential Effect (APE) as defined for each of the alternatives in the Greasy Creek Project have been surveyed for cultural resources.

### Inventory Survey Limitations: Activity Locations Not Yet Known

Cultural resource surveys have not necessarily been completed for various activities because additional planning/adjustment may be required prior to implementation; these activities include, but are not limited to:

- Fireline construction locations;
- Burn boundary locations;
- Temporary roads, skid trails, and log landings that may be outside areas already surveyed;
- Road reconstruction, maintenance, conversion, or decommissioning activities involving ground disturbance occurring outside areas already surveyed;
- Vernal pool construction outside areas already surveyed.

Areas in which the above activities would take place that have not yet been surveyed for cultural resources would be surveyed and regulatory consultation completed prior to project implementation.

### Previously Surveyed Areas

In addition to the recent survey implemented specifically in support of the Greasy Creek Project, the Mark Twain National Forest is proposing a variety of land management activities within an eight acre parcel surveyed during 2002 for a separate undertaking (Gannon and Moerbe 2002). Regulatory consultation with the Missouri State Historic Preservation Office regarding the adequacy of the inventory methodology and National Register of Historic Places site eligibility determinations was completed for that project during 2003 (SHPO Log No. 008-BY-03). The MTNF has reviewed that survey in light of newly proposed actions and recommends that it was adequate for current needs.

### Section 106 Consultation

Regulatory consultation with the Missouri State Historic Preservation Officer (SHPO) has been carried out for the activities proposed in the Greasy Creek Project. Such consultation is required under the National Historic Preservation Act, as Amended (NHPA) and the accompanying regulations found at 36 CFR 800 with respect to

the adequacy of the inventory survey in the APE, the National Register eligibility of archaeological sites within the project area, and the expected effects on the cultural resources of the various actions proposed in the two project alternatives. Formal consultation has been completed. A letter of concurrence was issued by the State Historic Preservation Officer on April 27, 2012 that concurred with survey adequacy. Findings of "no effect," "no adverse effect," and site eligibility determinations were made regarding project effects on historic properties. These conclusions were contingent on application of mitigation measures (Appendix G of this document) during project implementation, as described in the case report.

## Cultural Resources

### *Archaeological Site Information*

Thirty-two archaeological sites have been identified as a result of both the previously implemented and recently undertaken broad scale cultural resources inventory surveys in the Greasy Creek Project area. Of these sites, fourteen contain evidence for prehistoric period occupation and ten contain evidence for historic period occupation; eight multicomponent sites show evidence of both prehistoric and historic period occupations. Of the Thirty-two total sites summarized above, twenty-seven are newly recorded; these include fourteen prehistoric period sites, six historic period sites, and seven multicomponent sites showing evidence of both prehistoric and historic period occupations. The remaining five sites (four historic and one multicomponent) were recorded/indicated during previously completed archival investigations or limited field visits.
In addition to the archaeological sites enumerated above, eight newly identified historic features (isolated historic features such as historic trash dumps that are not associated with larger archaeological sites or with artifacts) and one isolated find (isolated artifacts that have been displaced from primary context and whose data-producing potential would be exhausted through recordation and/or collection) have been recorded during current investigations. The reader is referred to the inventory survey report prepared for the currently proposed undertaking for descriptions of the above-mentioned newly recorded and/or revisited archaeological sites, historic features, and isolated finds (Moerbe and Gannon 2012).

Information on cultural sequences and on both the historic and prehistoric backgrounds for the Greasy Creek Project area can be found in the project record. The Archaeological Site Inventory Forms (on file with the Missouri SHPO and Mark Twain National Forest) provide more detailed descriptions of individual archaeological sites.

Prehistoric archaeological sites/site components investigated to date in the Greasy Creek Project area indicate that the region saw moderately widespread and occasionally moderately intensive use by peoples throughout prehistory. Sites occur on a variety of landforms, including broad ridge divides, terraces, benches, ridge tops, ridge saddles, and ridge fingers, and range in size and complexity from very small limited activity loci (incidental activity areas) represented by one or more artifacts, to more extensive seasonal camps/activity areas. Several temporally diagnostic prehistoric artifacts have been recovered within the project boundary, to date, and it appears that the area was being utilized by prehistoric peoples from the Late Archaic through the Mississippian Periods in Missouri. Descriptions of the diagnostics recovered within the project area can be found in the reports and site recordation forms generated in support of this undertaking, and are available in the project record.

Archaeological investigations in the Greasy Creek Project area as well as information derived from archival sources have provided evidence of Euro-American agrarian land use and settlement that dates from the late-nineteenth to the mid-twentieth centuries. The settlement period within the project area is bounded on the terminal end by the U. S. government's acquisition of local land tracts; however, it is possible that such settlement was in decline prior to that time. Site-types observed within the project area include rural farmsteads/homesteads, abandoned agricultural field areas, ore mining areas, rural schoolhouse locations, a sorghum cooker location, and two sawmill/temporary sawmill locations. Sites are represented by various features, frequently including structural foundations, rock walls, artifact scatters, floral indicator species, field

clearing piles/alignments of local stone, and water impoundment features, such as check dams and/or ponds. Descriptions of the sites and associated features recorded within the project area can be found in the reports and site recordation forms generated in support of this undertaking, and are available in the project record. The reader is referred to Gannon and Moerbe (2002:84) & Moerbe and Gannon (2012:39-90) for additional details regarding the prehistoric and historic period sites recorded within the project area.

***National Register of Historic Places Significance***

With several exceptions, investigations of the thirty-two archaeological sites identified within the Greasy Creek Project area to date have been of an intensity sufficient to credibly evaluate them with respect to National Register of Historic Places Significance Criteria, as found in 36 CFR 60. The Mark Twain National Forest has determined that twenty-six of these sites (81%) are "not eligible" for inclusion on the National Register (see below: *Ineligible Sites*); six sites (19%) are being managed as "unevaluated" properties that have the potential to meet one or both of principally two NRHP Significance Criteria (reference 36 CR 60.4), as being:

- Properties that are associated with events that have made a significant contribution to the broad pattern of our history (Criterion A), and/or
- Properties that have yielded, or may be likely to yield, information important in prehistory or history (Criterion D)

Unevaluated archaeological sites are afforded protection from project activities that may adversely impact them just as eligible sites are protected. Following consultation and concurrence with the Missouri State Historic Preservation Officer, sites determined to be ineligible for inclusion on the National Register are not necessarily protected from all effects during project implementation. Additionally, neither the isolated finds nor the historic features are considered to be eligible for inclusion on the National Register; because they are not considered to be historic or eligible properties, the finds and features are not necessarily protected during project implementation.

***Ineligible Sites***

Twenty-six of the thirty-two archaeological sites identified within the Greasy Creek Project area have been determined to be "not eligible" for inclusion on the National Register of Historic Places. These sites include fourteen prehistoric period sites, eight historic period sites, and four multicomponent sites. Ineligible sites currently identified within the project area consist of:

<u>Prehistoric</u>

- (3) isolated finds in relatively undisturbed context consisting of a single prehistoric artifact; their research potential has been exhausted through Phase I investigations;
- (11) low density lithic debris/lithic debris and tool scatters of limited extent; their research potential has been exhausted through Phase I investigations;

<u>Historic</u>

- (2) rural schoolhouse locations with very few or no intact structural features and no significant subsurface archaeological deposits; their research potential has been exhausted through Phase I investigations;
- (4) rural farmsteads/homestead sites with very few or no structural remains and no significant subsurface archaeological deposits; their research potential has been exhausted through Phase I investigations;
- (2) mining sites of limited scope with little or no associated artifacts or structural remnants; their research potential has been exhausted through Phase I investigations;

Multicomponent

- (2) prehistoric isolated find and rural farmstead core areas containing very few or no structural remains and no significant subsurface archaeological deposits; their research potential has been exhausted through Phase I investigations;
- prehistoric lithic debris scatter of limited scope and an historic artifact/trash scatter; its research potential has been exhausted through Phase I investigations;
- prehistoric lithic debris scatter of limited scope and an abandoned historic agricultural field area with associated features; its research potential has been exhausted through Phase I investigations.

The Missouri State Historic Preservation Office issued a letter of concurrence on April 27, 2012 regarding the NRHP eligibility determinations submitted during consultation for the Greasy Creek Project.

## Direct and Indirect Effects on Heritage Resources

### Definition of Effects and Area of Potential Effects

An Effect to a cultural resource is defined as "…alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." [36 CFR 800.16(i)]. An “adverse effect” is found "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." [36 CFR 800.5(a)(1); see also subsection (a)(2)]. Effects to cultural resources may be either Direct or Indirect.

The Area of Potential Effects (APE) is defined as "…the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties…. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." [36 CFR 800.16(d)].

#### *Direct effects*

With respect to the Greasy Creek Project, direct effects are those that would occur during project implementation. In essence, any activity that has potential to disturb the ground has potential to directly affect archaeological sites, as does the use of fire as a management tool.

Specific activities outlined in the Greasy Creek Project that have potential to directly affect cultural resources, and therefore are considered to be undertakings for the purposes of this project, include the following:

- Commercial timber harvesting;
- Conversion of non-commercial thinning/timber stand improvement areas to commercial harvest and sale areas;
- Construction and use of landings, skid trails, and temporary roads used to access treatment areas;
- Prescribed burns;
- Mechanical fireline construction (dozer line);
- Road reconstruction where ground disturbance takes place outside existing road prisms and ditches; dependent on the nature of the reconstruction;
- Maintenance of Forest Service roads where ground disturbance takes place outside existing road prisms and ditches;
- Road decommissioning using ground disturbing methods, such as pit and berm, re-contouring, or ripping and seeding;
- Issuance of special use permits for use of existing roads where ground disturbance is authorized outside existing road corridors/ROWs;

- Non-native and invasive weed control using ground disturbing methods;
- Pond maintenance/rehabilitation where ground disturbance occurs outside of previously disturbed pond margins;
- Vernal pool construction.

The Areas of Potential Effect for the above-listed project activities are those geographic areas in which the ground disturbing and/or prescribed fire activities would take place.

Activities proposed in the various alternatives that do not have potential to affect cultural resources, and therefore, are not considered undertakings for purposes of this project include the following:

- Non-commercial thinning or timber stand improvements using "cut and leave;"
- Pine planting in previously treated salvage/sale areas;
- Rehabilitation/closure of temporary roads, landings, and skid trails using non-ground disturbing methods;
- Ongoing maintenance of existing constructed Forest Service roads where ground disturbance does not take place outside existing road prisms and existing drainage features;
- Reconstruction of Forest Service roads where ground disturbance does not take place outside existing road prisms and ditches (dependent on the nature of the reconstruction);
- Road/trail decommissioning using non-ground disturbing methods;
- Maintenance of existing openlands using non-ground disturbing methods;
- Pond maintenance/rehabilitation where ground disturbance does not occur outside of previously disturbed pond margins;
- Non-native invasive plant species control using non-ground disturbing methods;
- Removal of modern trash dumps using non-ground disturbing methods;
- Issuance of special use permits for use of existing roads where no ground disturbance is authorized outside existing road corridors/ROWs.

### *Indirect Effects*

In general, project activities of the kind proposed for the Greasy Creek Project have the potential to indirectly affect cultural resources by encouraging increased visitor use to those areas of the forest in which cultural resources are located. Increased visitor use of an area in which archaeological sites are located can render the sites vulnerable to both intentional damage and unintentional damage. Intentional damage can occur through unauthorized digging in archaeological sites and unauthorized collecting of artifacts from sites. Unintentional damage can result from such activities as driving motorized vehicles across archaeological sites, as well as from other activities, principally related to dispersed recreation, that lead to ground disturbance.

## <u>Analysis of effects by Alternative</u>

### Comparison Methods

The parameters listed below guide the discussion of the expected effects on archaeological sites by alternative. Comparisons of effects on cultural resources among the two alternatives in this analysis are based primarily on the presence of archaeological sites within the Area of Potential Effects that could be affected by the proposed activities.

### Parameters

(1) Only those activities proposed in the various alternatives that are defined as undertakings, as listed above in *Definition of Effects and Area of Potential Effects,* are used in this analysis.

(2) The sites considered in this analysis includes **only** those sites that are considered unevaluated (or eligible) with respect to National Register significance.

***Alternative 1***

At the present time, many of the archaeological sites in the Greasy Creek Project area are suffering adverse effects from the buildup of hazardous fuels and the potential effects of unmanaged forest decline on surface and subsurface archaeological site integrity, generally due to the potential for increased tree mortality and wildfire intensity. Fires occurring in areas with dense concentrations of combustible material have the potential to burn with greater than normal intensity and duration, thereby altering the physical integrity and/or research value of archaeological sites or site components. Resulting denudation can lead to a sharp increase in soil erosion, thus disturbing or leading to a loss of archaeological soil matrices and/or site components. With no change in current management activities and direction, adverse effects (and the potential for them) on a number of the archaeological sites in the Greasy Creek Project area may continue.

***Alternative 2***

Project components that have potential to directly affect the archaeological sites in this group are listed above, under *Definition of Effects and Area of Potential Effects*, and include various timber, prescribed fire, road management, special use, and wildlife management activities.

The Mark Twain National Forest believes that potential adverse effects to cultural resources resulting from Greasy Creek Project activities could be mitigated **provided appropriate measures are properly applied**. In that instance, project activities would not be expected to adversely affect archaeological sites, and the effects on cultural resources of project activities would be as follows:

(1) In those stands and project areas where no historic properties are present, the proposed project activities would have **No Potential to Affect** cultural resources.

(2) In those stands and other project areas in which potentially ground disturbing or other activities with a potential to adversely impact cultural resources would be carried out as listed above, under **Definition of Effects and Area of Potential Effects**, and where historic and/or unevaluated properties are present, and where mitigation measures CR1, CR2, CR3, and CR4 are feasible and implemented, the proposed project activities would be expected to have **No Adverse Effect** [36 CFR 800.4(d)(1)] on cultural resources.

(3) In the case of **Not Eligible** sites whose data-producing potential has been exhausted through data recovery prior to project implementation, and in the case of project activities undertaken in locations where no historic properties are present, project activities would be expected to have **No Effect**.

(4) In the case of **Unevaluated** sites occurring in stands where no activity is proposed, project implementation would be expected to result in a finding of **No Effect** to cultural resources.

(5) Where archaeological sites occur along routes of access, such as old woods roads that have not been maintained, and where site avoidance (CR1) is not feasible, mitigation measure CR4 would be applied with the expectation that a mitigation plan can be developed to result in a finding of **No Adverse Effect** [36 CFR 800.4(d)(1)].

**Cumulative Effects on Heritage Resources**

Because there are not expected to be any adverse effects to historic properties as a result of Greasy Creek Project activities, there are not expected to be any cumulative adverse effects to cultural resources. There would, however, be opportunities in the proposed alternatives to provide for long-term beneficial effects to significant, or potentially significant, archaeological sites.

**Irreversible or irretrievable commitment on resources**

Implementing Alternative 1 may result in irreversible and irretrievable damage to archaeological sites in the Greasy Creek Project area, although such losses would be considered naturally-occurring. Implementing

Alternative 2 is not expected to have any adverse effects to historic or archeological sites due to existing and mitigating practices, planning, and site avoidance.

## ENVIRONMENTAL EFFECTS SUMMARY

This secion summarizes the environmental effects of implementing the the "no action" and "action" alternatives. **Table 3.19** provides a summary of effects for each alternative on the resource areas examined in this chapter.

**Table 3.19. Summary of environmental effects from project alternatives.**

| Resource | Alternative 1 | Alternative 2 |
|---|---|---|
| **Soil and Water Quality** | Possible negative effects from Non-system roads which would be left in place. | Timber harvesting has the potential to adversely impact soil resources; however the general timber harvest units should recover quickly. |
| **Vegetation** | Natural processes would continue, trees would grow older, and the forest would shift towards old growth. Forest health would continue to decline for several years. | A diversity of natural communities, age distributions, and species composition would be restored. |
| **Wildlife** | Continued transition toward old growth habitat would negatively affect many animal and plant species. A few species would benefit from old growth, such as red bat and worm-eating warbler. | Some species would be negatively affected in the short term due to habitat manipulation, others would benefit. Overall, the result would be positive. |
| **T&E Species** | No direct or indirect effects would occur. | This alternative "may affect, not likely to adversely affect". |
| **RFSS Species** | Effects would be minimal and non-significant. | Effects would be minimal and non-significant. |
| **Recreation** | The quality recreation opportunities would remain the same or decrease over time. | Temporary disturbance or displacement of dispersed recreation opportunities would occur, but future opportunities would be enhanced. |
| **Transportation** | The transportation system would remain the same and roads would degrade over time. | Some unneeded roads would be closed, but those remaining would be improved. |
| **Visuals** | No improvement to VQO. Visual variety would decrease over time. | Improved VQO both initially and over time. |
| **Heritage** | The potential for adverse effects on archaeological sites may continue. | No adverse effects are expected where mitigation measures are followed. |
| **Environmental Justice** | Implementation likely would have no effect on low-income or minority populations. | Implementation likely would provide a positive economic effect on low income populations and likely would not impact minority populations. |

## MONITORING

Monitoring in regard to Forest Plan Standards and Guidelines would be carried out according to Chapter 4 - Monitoring and Evaluation of the 2005 Forest Plan and the Monitoring and Implementation Guide. Chapter 4 of the Forest Plan is strategic in nature and provides programmatic direction for monitoring and evaluating Forest Plan implementation. The Monitoring Guide details the methodologies and protocols used to conduct monitoring and evaluation tasks identified in the 2005 Forest Plan for the Mark Twain National Forest. The Monitoring Guide also assigns responsibilities for monitoring and evaluation tasks, and defines where monitoring data is to be stored. The District Ranger is responsible for ensuring that monitoring trips are conducted each year. The Greasy Creek Project area would be examined on seasonal monitoring trips for several years after the onset of project implementation.

# CHAPTER 4 – CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, state and local agencies and non-Forest Service persons during the development of this environmental assessment.

## LIST OF PREPARERS AND CONTRIBUTORS

| Name | Title | Responsibility and Expertise |
|---|---|---|
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| Reggie Bray | Zone Fire Management Officer | Prescribed Fire, Wildfire, Vegetation Management, Air Quality |
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Omaha Tribe of Nebraska and Iowa, Macy, NE

Osage Nation, Pawhuska, OK

Eastern Shawnee Tribe of Oklahoma, Wyandotte, OK

Kickapoo Tribe in Kansas, Horton, KS