

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

Document Structure

The Forest Service has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. The purpose of this proposed action is to improve forest health and vigor, enhance terrestrial and aquatic wildlife habitat, and to reduce hazardous fuel loads in the Crooked Creek Analysis Area. This is needed in order to meet Forest Plan goals and objectives and to limit the adverse effects of oak decline and mortality in the analysis area.

Under NEPA, federal agencies must consider and analyze the environmental effects of agency actions and to disclose these effects to the public. This EA discloses the direct, indirect, and cumulative environmental effects that would result from the proposed action and alternatives. The document is organized into five chapters:

Chapter 1 – Purpose and Need for Action: The chapter includes information on the history of the project proposal, the purpose 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, public, and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

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 and long-term productivity and cumulative effects of each alternative proposed for implementation.

Chapter 4 – Consultation and Coordination: This chapter provides a list of preparers and consulting agencies consulted during the development of the environmental assessment.

Chapter 5 – Appendices: The appendices provide more detailed information to support the analysis presented in the environmental assessment.

Appendix A – References Cited

Appendix B – Glossary of Terms

Appendix C – Soil Characteristics Tables

Appendix D – Economic Analysis Tables

Appendix E – Biological Evaluation and Assessment

Appendix F – Biological Diversity

Appendix G – Detailed Forest Stand Activity Listing by Alternative

Appendix H: Crooked Creek Project Maps

Additional information may be obtained from James L. Turner, Integrated Resource Analyst at (573) 729-6656 or (573) 729-2867 (FAX), or in person at Salem Ranger District, 1301 S. Main, Salem, MO 65560. The Environmental Assessment is also available on the Mark Twain National Forest website at http://www.fs.fed.us/r9/marktwain/projects/crooked_creek/crooked_creek.htm.

Project Location and Background

The Crooked Creek Analysis Area is located on public lands administered by the Salem Ranger District of the Mark Twain National Forest (MTNF). The analysis area is east of Salem, Missouri, in Dent and Crawford Counties. The legal description is Township 35 North, Range 3 West, Sections 7, 9-11, 14-23, 26-29, and 31-34; Township 34 North, Range 3 West, Sections 1-6, 8-10, 16-23, 25-27, and 34-36; and Township 34 North Range 4 West, Sections 8, 9, 13-17, and 22-24. Please refer to the maps in Appendix H. The analysis area is approximately 23,217 acres.

The analysis area is characterized by a topography of gently rolling hills and bedrock outcropping that is typical of the Ozark Highlands. The forest found in the analysis area today is the culmination of years of natural development and active forest management. Like most areas on the Mark Twain National Forest, these hills have had a history of timber harvest and various attempts at cultivation and livestock grazing prior to being abandoned in the early 1900s.

In addition, the Crooked Creek Analysis Area was severely impacted by timber harvest for charcoal production from 1888 to 1923. This charcoal was used to fuel the iron works smelters at the community of Sligo, just west of the analysis area. Aerial photographs of the analysis area, taken in 1939, show a landscape dominated by sparse vegetation on ridges and cleared pastures along major drainages. After the iron works closed, the sparsely forested lands were organized into what is now part of the MTNF. The Civilian Conservation Corps (CCC), local citizens, and United States Department of Agriculture (USDA) Forest Service personnel worked together to re-establish and sustain the developing forest. The analysis area is located within the native area for shortleaf pine (See Figure 1 - 1). While the forest was historically a mixed oak and short-leaf pine composition, the resulting re-growth was primarily black oak, post oak, hickory, and white oak. Later short-leaf pine plantations were established in localized areas.

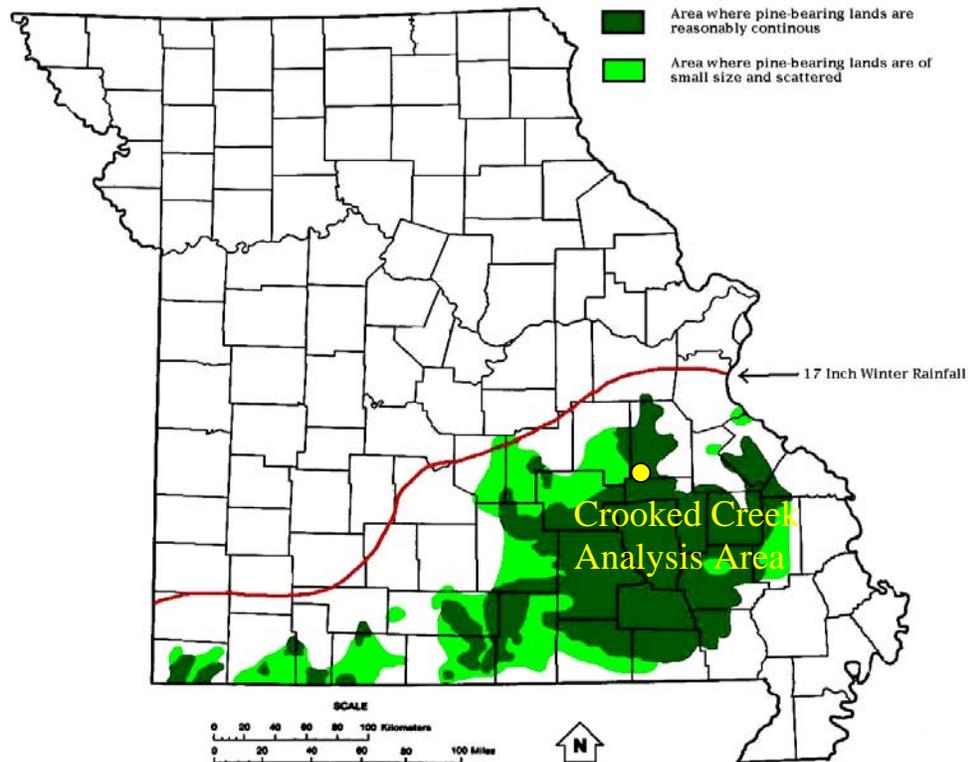


Figure 1 - 1: Native range for shortleaf pine.

The soils in the analysis area are typically cherty, droughty soils derived from sedimentary rocks, mostly limestone and dolomite. Due to the shallow nature of these soils, and the relative age and composition of the vegetation that now occupies the Ozark Highlands, an increasing amount of oak decline is evident throughout the Crooked Creek Analysis Area. Under these conditions, oaks are susceptible to insects and disease (See Figure 1 – 2).



Figure 1 - 2: Dead and dying black and scarlet oak specimens are a common sight in the Crooked Creek Analysis Area. This photo was taken in Compartment 39, Stand 10. (See also Figure 3-4, pg. 3-41).

At this time, approximately 17 % of the Crooked Creek Analysis Area is considered to be at high risk with significant numbers of dead and dying trees. This decline is particularly prevalent where black oak and scarlet oak occur in more or less homogenous stands. Other stands are overcrowded and losing vigor from increased competition for nutrients and growing space.

Purpose and Need for Action

The Salem Ranger District is proposing to improve forest health, enhance wildlife habitats, and provide additional recreational opportunities in the Crooked Creek Analysis Area. The purpose of this proposed action is to improve forest health and vigor, enhance terrestrial and aquatic wildlife habitat, and to reduce hazardous fuel loads in the Crooked Creek Analysis Area. This is needed in order to meet Forest Plan goals and objectives and to limit the adverse effects of oak decline and mortality in the analysis area.

Preliminary analysis of the analysis area indicates that there are certain conditions that warrant action in order to:

1. Manage and mitigate severe oak decline and associated mortality within the analysis area to maintain viable, healthy, and sustainable timber stands through species composition management.
2. Accomplish the direction and desired conditions identified in the Mark Twain National Forest Land and Resource Management Plan (LRMP).

Broad management guidelines for areas of oak decline are discussed in the *Ozark—Ouachita Highlands Assessment (OOHA)* (USDA 1999). More specific management guidelines may be found within federal, state, and private forestry reports; North Central Experimental Station reports and assessments; and Missouri Department of Conservation (MDC) publications (Moser and Melick 2003; Lawrence et al. 2002, USDA 2002a).

The Crooked Creek Analysis Area Project objectives are to:

- Improve forest health and resiliency to improve wildlife habitat.
- Improve wildlife habitat diversity by moving towards the Desired Future Conditions (DFC) for wildlife habitat components identified in the Forest Plan.
- Reduce hazardous fuel loads in analysis area.
- Protect Threatened, Endangered, and Sensitive Species.
- Protect and enhance cultural resources, special areas and specialized habitats.

The Role of the Forest Plan

The LRMP (also known as the Forest Plan), approved in 1986, 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. The site-specific effects of those practices to this project are not part of the Forest Plan FEIS. An environmental assessment will be prepared to analyze site-specified management activities to the Crooked Creek Analysis Area.

The Forest Plan gives management prescriptions designed to accomplish a DFC. The Forest Plan identifies the area in which this project is to occur as Management Area (MA) 3.4-1, 3.4-2 and 3.4-3. The general direction for the management of these areas is:

... to provide a managed forest setting which emphasizes wildlife habitat diversity to maintain and enhance populations of native and naturalized vertebrates...to emphasize recreational opportunities based on consumptive and non-consumptive

use of wildlife and fish...to provide dispersed recreation opportunities featuring a roaded natural recreation environment...to provide for moderate to high production of other resources such as timber products, forage, and minerals. (Mark Twain National Forest LRMP, page IV-115).

The prescription for MA 3.4 also states that any temporary openings created by even-aged silviculture management should not exceed a maximum limit of 40 acres (Mark Twain National Forest LRMP, page IV-118). The definition of an “opening” is an area where the trees are less than 20 feet in height (Mark Twain National Forest LRMP, page IV-38). Some of the treatments described in the proposed actions below will result in temporary openings in excess of 40 acres. The reason for this, in most cases, is that some proposed complete salvage treatments are adjacent to previously created openings where trees have yet to reach a height of 20 feet. The condition of these combined “opening” acreages exceeding 40 acres would exist for a very limited duration, as trees in the existing openings would reach a height of 20 feet in approximately 4 to 7 years. In three particular cases, the mortality is so widespread that complete salvage is proposed in multiple stands that, when combined, will exceed 40 acres. In accordance with the Forest Plan, temporary openings may exceed the 40-acre limit when natural catastrophic conditions occur (Mark Twain National Forest LRMP, page IV-39).

The Forest Plan also provides guidelines for maintaining forest health and conserving biological diversity on National Forest lands. Vertical diversity of plant and animal communities are maintained by managing for natural communities in varying stages of development. These stages, or habitat conditions, help provide diverse habitats and ecosystems necessary to sustain healthy populations of plants and animals for the Crooked Creek Analysis Area. The following proposed actions are designed to enhance these habitats and move the existing condition toward the DFC (please refer to the maps in Appendix H).

Desired Future Conditions and Proposed Action

1. Provide for Healthy, Resilient Forests:

Existing Conditions: We can improve the health, vigor, and resistance to insects and disease of forested stands by improving growing conditions. We have previously discussed the decline of oak stands in the analysis area. Stand conditions in the area indicate a need for modification in management and age class distribution. The planted pine stands have become overcrowded, thus slowing growth of trees in these areas.

Approximately 3948 acres in the analysis area are located within stands designated as having a high risk condition. High risk stands are those which will not survive 10 years or in which, due to decay, insect or disease infestations, mortality, or other factors there will be a net volume loss within 10 years. High risk stands compose approximately 17 % of the total acreage in the analysis area. Some high risk stands in the analysis area exhibit over 25 % mortality in larger trees and/or have greater than 30 % crown dieback resulting from terminal decline symptoms. In addition, approximately 396 acres (2 %) of the analysis area are in stands designated as sparse and 4203 acres (18 %) are in stands designated as low quality.

By modifying the management approach for these stands, their condition may be improved to meet the DFCs prescribed by the Forest Plan. The Salem Ranger District proposes the following actions to meet the need for healthy, resilient forests. The total area for these treatments is approximately 14,305 acres.

The following proposed actions are stated in silvicultural terms that describe the post-treatment condition and composition of project stands. All of these actions, with the exception of pine thinning, are specifically intended to salvage dead and dying trees posing a catastrophic health problem for forest stands in the analysis area.

Proposed Thinning, Sanitation Thinning for Salvage, and Overstory Removal for Salvage:

We propose to thin stands in the analysis area. This treatment would provide more growing space for the remaining trees and promote health and vigor within the stands. Thinning removes only some of the trees in the stand, leaving the healthiest and most vigorous trees to grow. This treatment will be used primarily for pine stands in this project. Sanitation thinning for salvage will be used in mature oak stands to remove high risk overstory trees (primarily black and scarlet oaks) while leaving an acceptable growing stock of healthy trees. Overstory removal for salvage is primarily used in stands where a healthy young understory has developed. This method involves removing most of the remaining mature overstory trees, thus allowing full sunlight and more growing space for the understory. The overstory trees are mainly mature trees showing signs of decline. Approximately 1197 acres of thinning, 562 acres of sanitation thinning for salvage, and 122 acres of overstory removal for salvage are proposed for this project.

Proposed Uneven-aged Management for Salvage: Uneven-aged management with group selection will be used for salvage in mixed oak and oak/pine stands where the black and scarlet oak are declining. Salvaging the declining trees will result in small openings in the canopy from ½ to 2 acres. These openings will help provide more sunlight on the forest floor to promote the regeneration where present. After the completion of salvage activities, small, suppressed, damaged, and undesirable trees would be cut to encourage regeneration establishment. Group selection harvests for salvage are planned on approximately 1746 acres of the analysis area.

Proposed Even-aged Management for Salvage: In some stands, black and scarlet oak are dominant with very few other species present. In these stands, the proposal is to use even-aged salvaging (complete salvage, seed tree salvage, or shelterwood salvage). The type of salvage depends on the distribution and amount of other species in each stand. Complete salvage with reserves is proposed for approximately 931 acres of the analysis area. Approximately 26 acres of seed tree salvage and approximately 1275 acres of shelterwood salvage are also proposed for the analysis area.

Followup Treatments for Even-aged Management stands above: Treatments following salvage harvests are necessary to achieve the desired results.

Natural Regeneration: After the completion of salvage activities, suppressed, damaged, and undesirable trees would be cut to provide and encourage regeneration. Natural regeneration is proposed for 2462 acres.

Pine planting is proposed as the regeneration method for 667 acres. Initiating pine growth in stands containing high percentages of black oak and scarlet oak increases species richness on the site and will improve tree species composition and stand vigor in the long term (FEIS, Oak Decline and Forest Health, USDA Mark Twain National Forest, 2002a, page 3-49). MA 3.4 calls for reforestation by natural reforestation methods (Mark Twain National Forest LRMP, page IV-118). A non-significant Forest Plan amendment allowing pine planting as a reforestation method would be required in conjunction with the Crooked Creek Analysis Area Project. **Planting pine in the analysis area will not alter the current management focus. The emphasis will**

continue to be on maintaining a mix of oak and other hardwoods, shortleaf pine, and grassland.

2. Improve and Maintain Wildlife Habitat:

Provide 0-9 Age Class Habitat:

Existing Conditions: This habitat type is important to 5 of the 9 Management Indicator Species (MIS): White-tailed deer, Eastern wild turkey, Ruffed grouse, Bobcat, and Indigo bunting. Approximately 3.4 % of MAs 3.4-1 and 3.4-2 is woodland habitat in the 0-9 age class and approximately 2.3 % of MA 3.4-3 is composed of this habitat. This is below the DFC of 8-15 % prescribed by the Forest Plan (Mark Twain National Forest LRMP, page IV-103).

Acorn production is important to many forest animals. In the Crooked Creek Analysis Area, black and scarlet oaks are the more abundant oak species, but a high percentage of these oaks exhibiting symptoms of decline are past their life expectancy. As a result, many trees are dying and acorn production has been reduced. Timber harvesting will diversify age classes of these oaks and allow the acorn production to become more consistent over time.

Proposed Actions: The even-aged management activities proposed above would create 0-9 age class habitat.

Provide Open Woodland Habitat:

Existing Conditions: Woodland habitats in oak, oak-pine, and pine forest types with 20 % to 30 % forbs, grass, and shrub ground cover are important habitat types for wildlife. Some of the Threatened and Endangered (T&E), MIS, Neotropical Migratory Birds (NMB), and Regional Forester's Sensitive Species (RFSS) that use this habitat type include: Eastern wild turkey, Bobcat, White-tailed deer, Ovenbird, Royal catchfly, and Indiana bat. Approximately 7.8 % of MAs 3.4-1 and 3.4-2 is the woodland habitat in oak, oak-pine, and pine forest types with 20 % to 30 % forbs, grass, and shrub component. Approximately 4.4 % of MA 3.43 is composed of this habitat. This is below the DFC of 40-50 % prescribed by the Forest Plan (Mark Twain National Forest LRMP, page IV-103).

Proposed Actions: The thinning treatments described above will contribute to the production of grass, forbs, and shrub ground covers. Where appropriate, prescribed burns for open woodland development are proposed for approximately 2445 acres. In addition, the prescribed burns planned for hazardous fuels (see below) will also move the analysis area towards the DFC. These actions would help these stands to move toward the 20 % to 30 % ground cover by forbs, grasses, and shrubs.

Maintain Open and Semi-Open Lands:

Existing Conditions: The Forest Service maintains numerous open areas, semi-open areas, and grazing allotments in order to provide habitat for wildlife. These are scattered throughout the analysis area and occur in a variety of sizes. Over time, brush and other competing vegetation has encroached on these openings. About 7.5 % of MAs 3.4-1 and 3.4-2 is composed of open or semi-open habitat. This is lower than the DFC of 10-20 % prescribed by the Forest Plan (Mark Twain National Forest LRMP, page IV-103). Approximately 6.5 % of MA 3.4-3 is open or semi-open habitat. This falls below the DFC for this MA which is 7-12 %. Objectives of these actions are to improve the distribution of these openings to maximize their benefit to wildlife, maintain a highly nutritional food source for wildlife, and maintain areas with native grasses and provide forage in grazing allotments.

Proposed Actions: We propose hand cutting or mowing approximately 1375 acres and prescribed burns on 2445 acres (includes some of the acres that will be mown or cut) of existing open and semi-open habitat in order to remove competing vegetation. Some of the open and semi-open habitat areas will be burned on a 3 to 4 year rotation to encourage the proliferation of native grasses. In addition, term grazing permits will be issued with allotment management plans (AMP) for three existing grazing allotments.

Improve and maintain aquatic habitat:

Existing Conditions- lakes and ponds: The Forest Service, in partnership with Missouri Department of Conservation, maintains five lakes and ponds for fisheries: Howes Mill Lake, Howes Mill Pond, Howes Mill South, Huzzah cutoff pond number 3, and Gnuse pond. These lakes and ponds are stocked with channel catfish, bluegill, and largemouth bass. There is a lack of hiding cover for fish at these lakes (see maps in Appendix H). The lack of hiding cover, such as woody debris, increases the risk of predation, while reducing opportunities for shade and nesting sites. The Forest Plan gives direction to provide for fisheries management on waters capable of supporting viable fish populations by maintaining and improving cover and spawning structures (Mark Twain National Forest LRMP, page IV-118). Additionally, siltation in Howes Mill Lake has decreased the water depth on the upper end to a point where the lake needs to be drained, deepened, and stocked. A few other problem areas have also been identified: the spillway at Howes Mill South is eroding on the back side; and the rock gabions are being undercut on the spillway at Howes Mill Lake. Thus, there is a need for major lake and pond rehabilitation to maintain and improve fish habitat that is favorable to the growth and development of fish populations.

Proposed Actions: The Forest Service proposes fish stocking, fish habitat improvements (including fish structures, fertilization, liming), and dam maintenance and reconstruction (including draining and deepening Howe's Mill Lake), for the five lakes and ponds managed for flat water fishing opportunities. This action will enhance and maintain existing flat water fishing opportunities for public fishing.

3. Hazardous Fuel Reduction

Existing Condition: Due to the level of tree mortality, wind and ice damage, understory growth, and past fire exclusion, some portions of the analysis area are proposed for fuels treatments. The purpose of these burns is to reduce the potential for stand replacing intensity fires should they occur at a period when burning conditions are more extreme. The amount of fuel loading occurring in natural communities affects how a fire burns and its effects on the landscape. The fire's intensity, and how it behaves in the environment, either enhances or impacts natural resources, and either reduces or threatens harm to property, human life, and the environment. Reducing the fuel loading can reduce the likelihood and intensity of wildland fires while simultaneously enhancing wildlife habitat and enriching native oak-pine woodland vegetation. The Federal Wildland Fire Management Policy and the Forest Plan are the guiding policy documents for fire management on the MTNF.

The Federal Wildland Fire Management Policy directs Federal agencies to achieve a balance between suppression to protect life, property, and resources, and fire use to regulate fuels and maintain healthy ecosystems. The Forest Plan further directs that the fire management policy on National Forest System (NFS) lands is to provide fire protection and fire use programs that are cost effective and responsive to management area objectives. The policy also allows for the use of prescribed fires to meet management direction as appropriate for ecosystems involved and to meet project objectives (Mark Twain National Forest LRMP, page IV 74-76).

Proposed Action: Prescribe burn 5956 acres. Proposed prescribed burning in the Crooked Creek Analysis Area follows direction within the Federal Wildland Fire Management Policy. Each prescribed fire will follow specific prescriptions contained in approved operational plans in compliance with planning and execution elements specified in Forest Service Manual 5140.

4. Connected Actions:

Some actions require other actions in order to be accomplished. These actions will be considered in the environmental analysis of this project.

Fire Lines: Existing roads and natural fire breaks are used whenever possible. New fire line construction is necessary in some areas.

Proposed Road Work: There are 40 Forest Service system roads within the management areas, with a combined length of 52.5 miles. The analysis area contains 36.3 square miles of NFS land, which equates to 1.4 miles of system road per square mile of Forest Service land. The Forest Plan, page IV-123, provides direction on the maximum density of system roads allowed within a 3.4 MA, which is 2-mile/square mile of Forest Service land. The road density for the analysis area is below the Forest Plan's maximum density limit.

National Forest system roads within the analysis area vary from 0.1 miles to over 6 miles in length. The Crooked Creek Analysis Area has 8.4 miles of system roads that need reconstruction before they can be used to access project activities. The other 44.1 miles of system road need routine maintenance, such as replacing surface material, surface blading, improving drainage features, removing brush from right-of-ways, and cleaning culverts.

In addition to system roads, there are non-system roads on NFS land in the analysis area. The condition of these roads is usually fair to poor because no road improvement or maintenance work has ever been done. Approximately 55 miles of non-system roads in the analysis area will be decommissioned and rehabilitated with natural vegetation. These roads will be blocked using earthen berms, rocks, and/or gates. In addition, five illegal trash dumps located along these non-system roads would be cleaned-up.

Decision Framework

Given the purpose and need, the Forest Supervisor of the Mark Twain National Forest will review the proposed action and the other alternatives in order to make the following decisions:

- Whether the proposed action would result in significant environmental effects that would require the preparation of an Environmental Impact Statement, or results in a finding of no significant impact.
- If significant impacts are not anticipated, the Forest Supervisor will determine whether the proposed action will proceed as described above and in the “**Alternatives**” section, as modified by an alternative, or not at all.
- If it proceeds, the Forest Supervisor will determine the mitigation measures and monitoring requirements to be implemented by the Forest Service.

The scope of the decision to be made is confined to a reasonable range of alternatives aimed at implementing the Forest Plan on the area of NFS land described as the Crooked Creek Analysis Area within the 3.4-1, 3.4-2, and 3.4-3 MAs of the Salem Ranger District, Mark Twain National Forest,

Missouri. The decision is not one of land allocation, nor is the analysis intended to look at every possible combination of activities.

Public Involvement

The proposal was first provided to the public and other agencies for comment in a Scoping Report on November 26, 2003. Comments from this scoping are being retained and included in the current analysis. A public scoping report was sent to 294 individuals and organizations at that time. The proposal was also posted at the MTNF website and on the on the forest-wide Schedule of Proposed Actions (SOPA). Approximately 34 responses to this scoping report were received by mail, e-mail, or in-person. All comments received were summarized and evaluated by the project interdisciplinary team and used in the development of issues and alternatives to the proposed action. On April 8, 2004, a letter with a proposal for the Crooked Creek Project was mailed to everyone on the district mailing list and adjacent neighbors to invite timely, substantive comments on the proposed projects as permitted by our revised regulations for notice, comment, and appeal (36 CFR 215). Legal Notice of this 30-day comment period was published April 11, 2004 in the *Rolla Daily News*, Rolla, Missouri. Twelve comments were received, with nine of them timely. These comments were incorporated into this document in the Issues Section below. A listing of the comments can be found in the project file.

Issues

Using the comments received from the public, organizations, and other agencies, the interdisciplinary team developed a list of issues to address. Issues are statements of discussion, dispute or debate that represent points of unresolved conflict regarding specific environmental effects of the proposed action. Issues were identified as those concerns not resolved by one of the following conditions: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level of decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require 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)..." A summary of the scoping process and the disposition of comments received during the scoping period are in the project file.

The Forest Service identified the following significant issues based on comments received during scoping:

Issue 1: Effects of grazing on Fortune Hollow fen area. As per the Forest Plan, a buffer zone of at least 100 feet in radius will be established around the fen area that which be restricted from any grazing activities (Mark Twain National Forest LRMP IV-52). Allotment Management Plans must comply with the Forest Plan and are designed to use cattle grazing to help meet wildlife habitat objectives and to minimize impacts to other resources such as soil, water, and aquatics.

Issue 2: Effects of prescribed burns for hazard fuel reduction on healthy timber and regenerating stands. Exposure risks from prescribed fire to healthy timber and regenerating stands in the 0 - 9 and 10 - 20 yr. age-classes have been examined in previous environmental analyses (see EA, Kaintuck Fuel Reduction Project, 2001a; FEIS, Oak Decline and Forest Health, 2002a). Effects will be described in narrative form in the "Vegetation – Fuels" section of Chapter 3 of this Environmental Assessment.

Prescribed burn mitigation measures to reduce the potential for fire damage to healthy timber and regenerating stands will be implemented under all action alternatives. Firing methods would be to use

spot fire ignition on the interior of the burn working the regenerating stands first by firing the up hill side of each stand and allowing fire to back through each stand. This would be done in the early morning while still in the high end of the prescription (high relative humidities and lower temperatures). Next, ignitions (including aerial) would continue in the afternoon during the low end of the prescription (lower relative humidities and higher temperatures) on the major ridges so that fire can back down the ridges in a mosaic pattern with a low to moderate fire intensity. By keeping the fire at this lower intensity, any potential for damage to healthy timber will be minimal. Strip ignition patterns ignited by hand will be used on the perimeters in such a fashion that will reduce the chance of head fire starting from the control lines.

Issue 3: Maximum size limit on temporary openings. While the Forest Plan establishes a maximum size limit on temporary openings, it also provides for conditions where it is necessary to exceed that limit. According to the Forest Plan:

Temporary opening size in excess of the maximum by management prescription standards and guidelines may occur...Due to natural catastrophic conditions caused by fire, insect and disease, or windstorm when based on an environmental analysis approved by the Forest Supervisor (Mark Twain National Forest LRMP IV-39).

The severe oak decline in the Crooked Creek Analysis Area is indicative of these catastrophic conditions. For this reason, salvage treatments are recommended in the proposed action (Alternative 2) which would result in ten temporary openings that would each exceed 40 acres in size. Alternative 3 is responsive to this issue and does not include complete salvage areas that would create temporary openings in excess of 40 acres. Any complete salvage areas that would produce temporary openings in excess of 40 acres have not been included in Alternative 3.

Issue 4: Reforestation through pine planting. Planting pine, where appropriate, in scarlet oak/black oak stands after timber harvest will improve stand health and vigor by creating a diverse composition of species. This diversity would serve as a deterrent to the type of widespread, catastrophic problems that presently exist as a result of oak decline. However, the prescription for Management Area 3.4 currently restricts reforestation to only natural regeneration treatments (Mark Twain National Forest LRMP, page IV-118). A non-significant forest plan amendment would be required in order to plant pine in harvested stands. Alternative 3 is responsive to this issue and would use only natural regeneration treatments in accordance with the current Forest Plan (i.e. no pine would be planted). As previously stated, **planting pine in the analysis area will not alter the current management focus. The emphasis will continue to be on maintaining a mix of oak and other hardwoods, shortleaf pine, and grassland.**

Relationship to Other Documents

A number of National Environmental Policy Act (NEPA) decisions have been made since June, 1986 (the date in which the LRMP went into effect), which affected all or part of the Analysis Area. Some documents provided for site-specific implementation of the forest plan and some of the documents provided broader programmatic direction.

Site-Specific Projects

Management Area analysis was the first step in the Forest Plan implementation process. These analyses identified needs and opportunities by management areas and were known as Step 2 Analysis. Previous NEPA documents were written for the same kinds of activities (timber harvesting, wildlife habitat restoration or maintenance, prescribed burning, and allotment management) in the same geographical area as this project. The analyses done in these documents did not reveal any significant effects from the proposed activities. Post activity monitoring has verified that the analyses were compliant with the NEPA document and the effects were displayed.

Site-Specific Environmental Analyses

These studies were completed on portions of the Crooked Creek Analysis Area:

- Timber Stand Improvement (Decision Memo (DM), Decision Date: 8/19/89)
- Fortune Hollow Project Set, Opportunity Area 3.4-2 (EA, Decision Date: 4/10/90)
- Pine Post Thinning (DM, Decision Date: 5/21/90)
- Barney Fork Project, Opportunity Area 3.4-3 (EA, Decision Date: 4/26/91)
- Wildlife Habitat Improvement (DM, Decision Date 3/12/91)
- James Branch and Beefsteak Project Sets, Opportunity Area 3.4-1 and 3.4-2 (EA, Decision Date 6/6/91)
- Crooked Tower Project Set, Opportunity Area 3.4-1 (EA, Decision Date: 3/17/92)
- Bates Hollow, Fiebelman Cemetery, Water Fork, and Crooked Creek Projects, Opportunity Areas 3.4-1 and 3.4-2 (EA, Decision Date: 4/20/93)
- Viburnum, Guy Brooks Ridge, Ballfield, Huzzah Hatchery, and Casey Projects, Opportunity Areas 3.4-1 and 3.42 (EA, Decision Date 9/22/94)
- Barney Fork, Management Area 3.4-3 (EA, (5/7/98))
- Barney Fork and Marcoot South Prescribed Burns (Decision Memo (DM), Decision Date: 11/19/03)

Programmatic Documents**Mark Twain National Forest – Land and Resource Management Plan (LRMP) Final Environmental Impact Statement and Record of Decision (Mark Twain National Forest 6/86, as amended).**

The Forest Plan is a programmatic document, which is required by the rules implementing the Forest and Rangeland Renewable Resource Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). The purpose of the Forest Plan is to provide direction for the multiple uses and the sustained yield of goods and services from NFS lands in an environmentally sound manner.

The Forest Plan sets management direction for the Mark Twain National Forest through the establishment of short-term (10-15 years) and long-range goals and objectives through the year 2035. It prescribes the standards, practices, approximate timing and locations needed to achieve goals and objectives. The Plan prescribes the monitoring and evaluation needs necessary to ensure that direction is carried out, measures quality and quantity of actual operations against predicted outputs and effects, and forms the basis for implementing revisions.

The Secretary of Agriculture shall not be considered to be in violation of subparagraph 6(f)(5)(A) of the Forest and Rangeland Renewable Resource Planning Act (RPA) of 1974 (16 USC 1604(f)(5)(A)) solely because more than 15 years have passed without revision of the plan for a unit of the NFS (FY2002 Interior Appropriations Bill, Section 327).

Following the signing of these earlier documents, the Forest Plan has been amended to reflect new information concerning threatened, endangered, and sensitive species. This project analysis reflects those amendments and supplemental information reports to the Forest Plan.

The Mark Twain National Forest Programmatic Biological Assessment (Mark Twain National Forest, September 1998) and Biological Opinion on the Impacts of Forest Management and Other Activities to the Gray bat, Bald Eagle, Indiana bat, and Mead's milkweed on the Mark Twain National Forest, Missouri (USDI, Fish and Wildlife Service, 1999)

Federal agencies are required to comply with provision of the Endangered Species Act (ESA) of 1973, as amended. This includes a requirement to consult with the U.S. Fish and Wildlife Service on

projects, which may affect species federally listed as threatened or endangered (TE). These documents update the original consultation completed for the Forest Plan in 1985. They include species not originally consulted on and describe potential effects to federally listed species of activities that implement the Forest Plan. The Biological Opinion 1) determined that implementation of the Forest Plan would not jeopardize the existence of any of the species considered, 2) exempted the Forest Service from a specified amount of incidental take on three species, and 3) to minimize the impacts of incidental take on the MTNF. The Forest Plan was subsequently amended March 2000 to include the RPM/TC as standards and guidelines. A decision on the proposed amendment for management of Areas of Influence was signed on November 16, 2001.

This analysis is tiered to the following documents:

- The Mark Twain National Forest Land and Resource Management Plan Final Environmental Impact Statement and Record of Decision (6/86), as Amended, including all supplemental information reports.
- Mark Twain National Forest Programmatic Biological Assessment (Mark Twain National Forest, September 1998).
- Biological Opinion on the Impacts of Forest Management and Other Activities to the Gray bat, Bald eagle, Indiana bat, and Mead's milkweed on the Mark Twain National Forest, Missouri (U.S. Fish and Wildlife Service, June 1999).
- Forest Plan Supplemental Information Report dated December 6, 2000 and April 5, 2001 (Update concerning Chip Mills).
- Supplemental Information Report dated June 27, 2001 concerning 2000 Regional Forester's Sensitive Species (RFSS) List.
- Revised Forest Plan Supplemental Information Report on Salamanders, May 21, 2001.
- Oak Decline and Forest Health Final Environmental Impact Statement and Record of Decision (4/02).

The following documents are incorporated by reference:

- Ozark—Ouachita Highlands Assessment (December 1999)
- National Fire Management Plan (January 2001)

CHAPTER 2 – ALTERNATIVES CONSIDERED

ALTERNATIVE DEVELOPMENT

This section describes alternatives to the proposed action and summarizes the environmental consequences of each alternative in relation to the issues. Information in this chapter will provide the decision maker with a range of alternatives to consider for the Crooked Creek Project. It will include the analysis of the proposed activities and their anticipated effects. The process used to develop alternatives, the description of alternatives analyzed in further detail, a comparison of those alternatives and the reasoning for eliminating other alternatives that were considered from further analysis will be explored in this section of the EA.

Formulation of Alternatives

The Interdisciplinary Team analyzed both internal and external comments received during the scoping period. Alternatives were developed to respond to unresolved issues as they related to the purpose and need for this project, laws, regulations, and policies that govern land use on the NFS lands. These alternatives represent different levels and types of management activities. The alternatives, both those considered in detail and those eliminated from further study, display a range of options which could be used to implement the Crooked Creek Analysis Area Project. Management needs and opportunities as determined by on-the-ground investigations were also considered in this process.

Alternatives to the proposed action (Alternative 2) must meet the purpose and need as stated in Chapter 1 and address the key issues described above. A “No Action” (Alternative 1) alternative must be included as one of the alternatives. The IDT recommended that one other alternative be analyzed: this alternative is a modification of the proposed action to meet the desired current Forest Plan direction for restricting openings to 40 acres and using only natural regeneration methods for reforestation. The District Ranger agreed that this alternative, along with the No Action alternative, represent the range of concerns of the Forest Service, local residents, other agencies, and most members of the public that responded to the Forest Service during the public involvement phase.

Descriptions of Alternatives Considered in Detail

The following is a description of alternatives analyzed in detail by the Interdisciplinary Team. After an alternative has been selected and as the project is implemented, actual amounts of activities on the ground (measured in acres or miles) may vary. All changes would be evaluated to ensure that any effects are within the parameters of the effects analyzed in this document and would be documented in the Crooked Creek Analysis Area project record. Pertinent Forest Plan standards and guidelines designed to mitigate the affects of alternative treatments are also listed. All acres listed are approximate. At the end of Chapter 2 is a listing of all activities by stand and maps for each alternative.

Alternative 1 (No Action)

Under this alternative, current management would continue to guide management of the analysis area. The No Action Alternative provides the baseline for comparison against all other alternatives. This is a viable alternative and responds to the concerns of those who want no vegetation management activities to take place. The option for future additional management activities in this area would not be foreclosed.

If this alternative is selected, there will be no attempt to minimize adverse impacts of insects and disease

infestation. The active grazing allotment permits for Casey and Barney Fork would be maintained, but not renewed at the end of their terms. Changes, such as road maintenance, might occur through permanent management direction, natural processes, or other management decisions in the future.

Alternative 2 (The Proposed Action)

This alternative includes those activities proposed in the scoping report that was distributed to the public on November 26, 2003. This alternative responds to the following identified needs: provision for healthy, resilient forests; improvement and maintenance of wildlife habitat; and the reduction of hazardous fuels. The alternative would implement a combination of commercial harvest, non-commercial thinning, reforestation, and prescribed burn treatments to meet these needs.

Commercial harvests are designed to salvage merchantable wood fiber, while moving conditions for the residual stand towards sustaining healthy forest communities. Some trees experiencing the effects of oak decline may not be of a merchantable quality, therefore, some timber would not be removed through commercial harvest. Portions of the analysis area may be open to firewood collection under permit once salvage activities are completed. Reforestation activities are proposed to allow suitable light conditions to promote the development of desired tree seedlings, herbaceous vegetation, and shrubs. The amounts of treatment depend on the amount of even-aged and uneven-aged regeneration proposed. This alternative uses prescribed burning for various primary objectives, including site preparation for seedling development, restoration of open woodlands with native groundcovers such as sedges and forbs, and for reduction of hazardous fuels. These prescribed burning treatments would also improve wildlife habitat, for the short term, and in some cases, i.e. open woodlands, for the long term.

This alternative would move the existing condition of the Forest towards the DFC for wildlife habitat as outlined in the Forest Plan. Specific actions that are proposed can be found in the attached activity listing and maps. Some minor changes in acreages and treatments are different from the original action proposed in the scoping report distributed on November 26, 2003. Below is a summary of actions that would occur in Alternative 2:

Provision for Healthy, Resilient Forests

- Complete salvage on approximately 931 acres.
- Seed Tree salvage on approximately 26 acres.
- Shelterwood salvage on approximately 1275 acres.
- Uneven-aged management for salvage on approximately 1746 acres.
- Overstory removal for salvage on approximately 122 acres.
- Sanitation cuts for salvage on approximately 562 acres.
- Thinning on approximately 1197 acres.
- Reforestation by natural regeneration on approximately 2512 acres.
- Reforestation by pine planting on approximately 667 acres.

Improvement and Maintenance of Wildlife Habitat

- Prescribed burning for open woodland development on approximately 2445 acres.
- Grazing and fertilizer/lime application in 3 allotments on approximately 345 acres.
- Issue term grazing permit on Fortune Hollow allotment and renew term permits on Casey and Barney allotments with management plans that incorporate protection measures that are indicated in the EA.
- Mechanical/hand-cutting, mowing, and waterhole maintenance on approximately 1375 acres.
- Pond maintenance and rehabilitation on five fishing ponds (16 acres): Howe's Mill Lake, Howe's Mill Pond, Howe's Mill South, Huzzah Cutoff Pond # 3, and Gnuse Pond. This

includes draining and deepening Howe's Mill Lake and maintenance work on the Howe's Mill South spillway.

- Improving aquatic habitat and fish stocking on the ponds listed above (16 acres).

Reduction of hazardous fuels

- Prescribed burning on approximately 5956 acres.

Associated or connected actions

- Constructing fire lines for prescribed burns.
- Reopening approximately 25 miles of non-system roads for use as temporary roads.
- Reconstructing approximately 8.4 miles of Forest system roads.
- Decommissioning approximately 55 miles of non-system roads.
- Cleaning up five illegal dump areas.

Alternative 3 (Reduced Complete Salvage with Natural Regeneration Only)

This alternative was developed in response to issues concerning the Forest Plan's maximum size limits on temporary openings and restrictions on regeneration through pine planting. Complete salvage areas that would be adjacent to existing openings, and that would create cumulative, temporary openings in excess of forty acres, are not included in this alternative. Therefore, the area proposed for complete salvage treatments has been reduced to 637 acres from the 931 acres proposed in Alternative 2.

This alternative includes no provision for pine planting as a reforestation approach. All reforestation treatments would be through natural regeneration. The acreage of reforestation activities has been reduced as a result of the reduction in complete salvage acres for this alternative.

The reduction in complete salvage acres would also reduce the need for temporary access. This means approximately two fewer miles of non-system roads would be needed for access than under Alternative 2.

Grazing activities under this alternative would be in accordance with the current AMP. The Barney and Casey allotment term permits would be renewed with existing AMPs. The Fortune Hollow permit would be issued with the last AMP.

Prescribed fire treatments and wildlife habitat improvement activities would be the same as in Alternative 2.

This alternative would move the existing condition of some portions of the analysis area towards the DFC of habitats as outlined in the Forest Plan. Specific actions that are proposed are listed in Table 1, which is attached to this document along with maps of the alternatives.

Alternatives Considered but Eliminated from Further Analysis

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 received in response to the Proposed Action provided suggestions for alternatives that may have been outside the scope of this discussion, are duplicative of the alternatives considered in detail, need to be addressed at a higher level within the organization, are beyond the authority of the Forest Service, or are determined to be components

that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

Reduced prescribed burn acreage – Several comments from the public focused on potential adverse effects from prescribed burns on healthy timber (Issue 2) and private property. The team discussed the possibility of developing an alternative with a reduction in prescribed burn acreage and determined that such a reduction would not meet project goals and objectives for the improving forest health, wildlife habitat, and hazard fuel conditions. In addition, it was decided that potential adverse effects to healthy timber and private property could be effectively mitigated.

Manage areas by prescribing uneven age methods only – There is a mix of salvage methods prescribed for the Crooked Creek Analysis Area to remove trees that show signs of decline or are infected with oak borers and disease. In some cases, the amount of oak decline is severe and only an even-aged method would respond to the need to remove the infested trees. Using an uneven-aged method would leave insects to populate other trees in the area. For this reason, this alternative was not carried further into analysis.

Vegetation management without commercial harvests – An alternative utilizing this approach was analyzed in the Final Environmental Impact Statement for Oak Decline and Forest Health (USDA Mark Twain National Forest, 2002a). The results of this analysis showed that this approach would be less effective for improving forest stand health and would move the existing condition of the Forest towards the Desired Future Conditions outlined in the Forest Plan at a much slower rate than if commercial harvest treatments were applied. Under such an alternative, only high risk stands would be treated. Valuable timber products would not be recovered and active management for a diversity of tree species would be addressed to a lesser degree or not at all. Forest visitor safety and hazardous fuel build-ups would be addressed to a more limited extent. There could also be adverse effects to vegetation and wildlife by not removing more of the declining trees. Reforestation would occur at a slower rate as a result of trees not being removed. For all of these reasons, this alternative was not carried into further analysis.

Mitigation Common to Action Alternatives

The following are mitigation measures in addition to the Forest Plan standards and guidelines. Mitigation measures identified with a “T” pertain to timber salvaging, an “M” refers to mechanical treatments, an “F” pertains to fire, and a “G” refers to grazing.

Mitigation Measures - Heritage Resources (CR):

CR1 (T & M):

Site avoidance is the preferred mitigation action pursuant to the Forest Plan, Section IV-30, 31 [also FSM 2361.21(2)]. Avoidance of cultural resources would be understood to require the retention of such properties in place and their protection from effects resulting from the undertaking [MOU, 2002, Section II, H (2a, 2b)]. Effects would be avoided by implementing the following specific actions where feasible (where not feasible, see Mitigation Measure CR5):

- (1) Establishing buffer zones around those sites in areas where timber salvage activities would take place; buffer zones would be of sufficient size to ensure that the integrity of the characteristics and values which contribute to,
- (2) Routing the non-motorized trail to avoid any archaeological sites or sensitive cultural features that might be in the trail area.
- (3) Locating parking pull-offs and gates to avoid archaeological sites.

- (4) Locating landings, skid trails, and temporary roads away from archaeological sites.
- (5) Locating road re-alignments and sections of roads that would be reconstructed to avoid archaeological sites.
- (6) Locating new wildlife openings and ponds away from archaeological sites.

It should be noted here, that in the case of the large farmstead sites with surrounding field areas and historic field sites, the intent is not necessarily to exclude all activities from the entire enclosed areas within the defined site boundaries. In the case of these sites, "Avoidance" would be taken to mean avoidance of all historic cultural features. Principally, the core areas and stone features (rock piles, stone walls, checkdams, for example) associated with farmsteads would be avoided. Project activities may be carried out in the field interiors so long as cultural features are avoided.

CR2 (F)

1. Firelines

- (a) Those archaeological sites located along existing non-system roads to be used as fire lines would be protected by hand-clearing those sections of the road/fireline that cross sites. Although these roads are generally cleared of combustible debris using a small dozer, those sections of roads crossing archaeological sites would be cleared using leaf blowers and leaf rakes. There would be no removal of soil or disturbance below the ground surface during fireline preparation.
- (b) Archaeological sites and features that may be located along proposed routes of dozer-constructed fire lines, where firelines do not now exist, would be avoided by fireline construction – by routing firelines around archaeological sites. Sites that lie along previously constructed dozer lines from past burns would be protected during future burns by hand clearing those sections of line that cross the sites, rather than re-clearing the lines using heavy equipment.

2. Burn Unit Interior

- (a) Combustible elements at eligible and unevaluated sites in the burn unit interiors would be protected from damage during the burns by removing fuels from the feature vicinity, and, where necessary, by burning out an area around the feature prior to igniting the main burns. Burning out is accomplished by constructing a set of two hand lines, approximately 30 to 50 ft. apart, around the feature and by then burning the area between the two lines while the burn is carefully monitored. A fuel-free zone is thereby created around the combustible elements. Any combustible features that might be located in a burn unit would also be fully documented with photographs and field drawings prior to the burn. A Heritage Specialist would attend the pre-burn briefing and Forest Service personnel would be on each burn squad during the burn.
- (b) Those sites containing above ground features, removing, by hand, any concentrations of fuels that might have built up on the sites and features, would protect non-combustible, cultural features and exposed artifacts. Where such fuel concentrations are not present, no mitigation is required.
- (c) No mitigation measures are proposed for any of the other sites in the burn interior, because it is not expected that the burns proposed for the Crooked Creek Analysis Area would harm these sites.

3. Post-Burn Monitoring

- (a) Post-burn monitoring would be conducted at selected sites to assess the actual effects of the burns on the sites against the expected effects and to check for indirect effects at the sites following the burn. SHPO consultation would be carried out with respect to mitigation for any sites that suffer unexpected damage during the burn, or that suffer damage from indirect effects following the burn.

CR3 (T & M)

Although it is believed at this time that all temporary road and landing locations have been surveyed, additional roads may be necessary when various commercial timber sale units are laid out. In cases in which these activities would take place outside stands not already included in cultural resource surveys, cultural resource surveys would be completed prior to project implementation. Appropriate mitigation measures as noted in CR1, CR2, and CR5 would be applied prior to project implementation to protect any archaeological sites that may be located in these areas. Consultation with the Missouri SHPO would be completed prior to project implementation.

CR4 (T, M & F)

Although the cultural resources surveys completed for this project are designed to locate all archaeological sites that might be eligible for the National Register, such sites may go undetected for a variety of reasons. Pursuant to the provisions found in 36 CFR 800.13, should any previously unrecorded cultural resources be discovered during project implementation, activities that may be affecting that resource would be immediately halted and the resource would be evaluated by a professional archaeologist. Consultation would be initiated with the Missouri State Historic Preservation Officer (SHPO), as well as with the Advisory Council on Historic Preservation, if required, to determine appropriate actions for protecting the resource and for mitigating any adverse effects on the resource. Project activities would not be resumed until the resource is adequately protected and agreed-upon mitigation measures are implemented with SHPO approval.

CR5 (T, M & F)

If it is not feasible to completely avoid an archaeological site (CR1), the following steps would be taken: (1) In consultation with the Missouri State Historic Preservation Officer (SHPO), the site(s) would be evaluated against National Register of Historic Places significance criteria (36 CFR 60.6) to determine if the site is eligible for, or appears to be eligible for, inclusion in the National Register of Historic Places. (2) In consultation with the Missouri SHPO, mitigation measures would be developed which would lessen, or minimize, adverse effects on the site, so that a finding of No Adverse Effect results. (3) The agreed-upon mitigation measures would be implemented prior to initiation of project activities that have the potential to affect the site.

Mitigation Measures - Air Quality (A):**A1 (F)**

Prescribed burning would be completed during weather conditions that facilitate smoke dispersal. The public would be informed of the planned burning days and Forest Service employees would monitor for public safety hazards, if needed, along public travel ways.

Mitigation Measures – Soil and Water (SW):**SW1 (T & M)**

Temporary road and main skid trails would be located on the ground by Forest Service personnel prior to salvage operations, avoiding layouts that concentrate runoff into draws, ephemeral drainages, sinkholes or watercourses.

SW2 (T & M)

Proper grade and water control structures would be constructed and maintained on skid trails. Roads would not drain directly onto skid trails or into stream channels. Specifications that are indicated in the Missouri Department of Conservation's "Missouri Watershed Protection Practice" would be followed.

SW3 (T)

When logging is complete, additional slash would be pulled onto skid trails.

SW4 (T)

Temporary road construction, road maintenance, skidding, and hauling activities will be suspended during wet periods, when excessive rutting and churning of the soil begins, or when runoff from skid trails is turbid and no longer infiltrates within a short distance from the skid trail.

SW5 (T & M)

Reconstructed system roads and temporary road constructions, which have potential to cause severe erosion, would have additional water protection mitigations as follows: Temporary roads that cross drainages would be closed as soon after the harvest or treatment as possible. All crossings would be constructed at right angles to the channel at locations chosen to have the least impact as possible on the stream channel and banks. A slash filter would be placed uphill from any drainage and used as filter at the outside of the water-bar nearest the drainage. If the crossing location is soft, it would be reinforced with aggregate.

SW6 (F)

Prescribed burn units should have as little mechanical disturbance to the soil before and just after burning as possible. Equipment would not use stream channels as "roads." Where stream crossing is unavoidable it would be done in locations that would create the least impact on stream banks and beds.

SW7 (T, F & M)

Stands with soils that have perched water tables would have little to no mechanical disturbance to wet soil.

SW8 (F & T)

All fire lines would be seeded with a cover crop suited to area objectives and would be fertilized, if necessary, with standard fertilizer immediately after construction or as soon afterwards as to allow the best chance of germination. Water bars would be constructed in accordance with the Missouri Department of Conservation's "Missouri Watershed Protection Practice" to minimize water movement along fire lines.

SW9 (T & M)

Trees anchoring stream banks of any distinct channel would not be cut unless they are species that is known to “sprout” from a cut tree’s roots, even if the stream does not require a buffer zone. This includes channels that are the result of road drainage ditches. Road drainage ditches may be cleared, but outflow channels will be cleared only when vegetation impedes water flow.

SW10 (F)

Fire lines created with dozers would not be placed in riparian areas, fens, wetlands, or other sensitive habitats.

SW11 (T & M)

No mechanical disturbance of the soil would occur on slopes greater than 35 %.

SW12 (T & M)

A 50-foot no-cut zone will be place around all fens, seeps and springs. A buffer zone of at least 100 feet in radius would be retained in association with seeps, fens, springs, and any other special features or habitats. Skidding and decking would be prohibited within these buffer zones.

SW13 (T, F & M)

There will be a no cut zone of at least 50 feet from the edge of any sinkhole that currently exists within the activity area, or if one develops before the action is initiated. A buffer of 100 feet will be provided around natural sinkhole ponds. Within this buffer, there will be no commercial harvest of trees, no firewood permits, and no ground-disturbing activity. Prescribed fire would be allowed within the buffer zone.

Mitigation Measures - Vegetation (V):**V1 (F)**

Prescribed burn plans would incorporate burning conditions that best meet specific management area objectives to reduce fuel loads, stimulate forest regeneration, have minimal impact on future timber resources, meet visual standards, and protect sensitive species. Prescribed burns may be conducted according to standards and guidelines under 5100 Fire Management, and as frequently as necessary to meet management objectives as determined through annual evaluations of initial and subsequent burn treatments.

V2 (T & M)

For perennial and intermittent streams, the no cut zone will include the riparian zone as defined by the forest plan, or 50 feet, whichever is greater. Riparian zone includes frequently and occasionally flooded areas.

V3 (T & M)

A 50-foot no-cut zone will be place around all fens, seeps and springs.

V4 (T, M, & F)

A protection zone will be designated around glades. This zone will surround the glade itself, as well as any adjacent grassy areas, rock ledges, exposed bedrock, and/or rock outcrops. Trees, other than post oak and chinquapin oak, may be removed from within this zone, but may only be removed by winching or dragging. No heavy equipment may be used within this zone unless pre-approved by a

biologist/ecologist. Removal of small diameter trees, especially red cedar, is encouraged within this zone.

Mitigation Measures - Wildlife (WL):**WL1 (T & M)**

Retain a minimum of 15 sq. ft. of basal area in complete and seed tree salvage areas, and a minimum of 25 sq. ft. of basal area in shelterwood salvage units, of reserve trees grouped or retained around large snags, large live trees, den trees, and within intermittent drainages to minimize potential for wind throw and provide thermal protection of suitable Indiana bat roost trees. Leave larger, long-lived trees (white oak, post oak, pine or hickory) where opportunities exist. For both cavity trees and snags, retain at least 0.5/ac nineteen inches (19") dbh or greater in size, if available. Retain at least 4.0/ac 11-18" dbh cavity trees and snags, if available. Retain at least 2.0/ac 10 inches (10") dbh or less in size cavity trees and snags, if available.

WL2 (T&M)

In all even-aged salvage (seed tree, and shelterwood seed cut), reserve trees should be left in groups of at least 5 or more trees wherever possible. No snags should be left standing alone within the cut area, but rather, should be surrounded by several live trees. In uneven-age salvages (group selection with improvement cutting), the longer-lived trees (white oak, post oak, hickory, and pine) will be featured leave trees with a range in the diameter distribution. Snags and dens from the red oaks will be left, if available, to meet standards and guidelines.

WL3 (T& M)

In all salvage areas retain all shagbark hickory, shellbark hickory, sycamore, and lightning struck trees (MTNF Biol. Assess. p. 32). Retain, as available and to the maximum extent possible and tree ≥ 26 " dbh unless a human safety hazard. Also, retain some (not all) dead or dying trees ≥ 9 " with at least 10 % exfoliating/defoliating bark, and most den/cull trees.

WL4 (T)

There would be no harvest within 50 feet of a sinkhole or pond.

WL5 (T, M, F, & G)

The discovery of a new site occupied by federally listed species within the analysis area (such as eagle communal night roosts, or Indiana bat maternity sites) at any time during the course of activities described in this EA, will lead to further consultation with the US Fish and Wildlife Service and development of protective measures as determined necessary for protection of the species and its habitat.

WL6 (T, M, & F)

A buffer zone of at least 100 feet in radius will be retained in association with seeps, fens, springs, and any other special features or habitats (other special features to be determined by a biologist). Temporary road construction, skidding and decking and new dozer line construction will be prohibited within these buffer zones.

WL7 (T)

Any active sharp-shinned and Cooper's hawk nests discovered shall be protected when encountered. Within mature pine stands retain 2 mature pine trees per 5 acres to provide potential nest trees.

WL8 (T&M)

During salvage and reforestation treatments, retain butternut dogwood, serviceberry, walnut and other minor components of the stand, particularly soft and hard mast producers.

WL 9 (T&M)

Retain water-holding ruts and puddles where they do not conflict with road maintenance and use activities or create an increased potential for erosion and runoff (MTNF Biological Assessment, USDA Forest Service 1998, p. 34)

WL10 (F)

Prescribed burning activities will be conducted in a manner to ensure that smoke does not accumulate heavily in areas likely to be occupied by Indiana or gray bats. These areas include caves known to support gray or Indiana bats.

WL11 (F)

Hand lighting with drip torches will not occur within 100 feet of a seep or fen. Aerial ignition will not occur within 100 yards of a seep or fen.

WL12 (G)

There will be no grazing within 100 feet of Thorny Hollow fen and Fortune Hollow fen within the Fortune Hollow Allotment.

WL13 (T, M, & F)

Known Indiana bat roost trees that occur within harvest units will be marked as leave trees. Known roost trees that occur within prescribed burn units will be protected by raking the fuel way from the base of the tree before ignition of the burn unit.

Mitigation Measures - Visuals (VS):**VS1 (T & M)**

"Not more than 10 chains (660') of temporary opening may occur along any 40 chains (0.5 mile) of hiker or horse trail during this plan period. Log landings are prohibited within 100' of a recreation trail. Where skidding across a recreation trail is unavoidable it will be done at a right angle and at designated locations."

VS2 (T & M)

Slash adjacent to travel ways within a Sensitivity Level (SL) 1 or 2 will be lopped and scattered to lie within 30" of the ground. Slash adjacent to travel ways within SL 3 with a Variety Class of A or B will be lopped and scattered to lie within 48" of the ground.

VS3 (T & M)

Slash disposal protective measures are specified by stand within contract specifications by Forest Plan regulation. The negative visual impacts will be mitigated concurrently with or immediately after each phase of activity. Protective measures will be completed for each cutting unit before beginning activities in the next sequential block in the same corridor or view shed. The total lapsed time from initiation of activities to completion of obligations specified by a contract or a project prescription shall not exceed one year for any single cutting unit. Emphasis will be placed on completing all work within these areas in a systematic manner within the shortest practical time." (Page IV-31 Forest Plan)

VS4 (T & M)

Harvest edges will be feathered away from the property line where the private land is open.

VS5 (T & M)

All harvest areas will be laid out on the ground in a manner that will reflect natural lines and be visually subordinate to the characteristic landscape

Comparison of Alternatives

The Following table is an overview of proposed actions by activities for each alternative.

Table 2 - 1: Activity Comparison Table

	Alt.1	Alt.2	Alt. 3
<u>Silvicultural Methods</u>	Acres	Acres	Acres
Complete Salvage	0	931	637
Seed Tree Salvage	0	26	26
Shelterwood Salvage	0	1275	1275
Uneven Aged Salvage	0	1746	1746
Overstory Removal for Salvage	0	122	122
Sanitation for Salvage	0	562	562
Thin	0	1197	1197
<u>Reforestation</u>	Acres	Acres	Acres
Natural Regeneration	0	2512	2167
Pine Planting	0	667	0
<u>Prescribed Fire</u>	Acres	Acres	Acres
Open woodland development	0	2445	2445
Hazardous fuel reduction	0	5956	5956
<u>Transportation</u>	Miles	Miles	Miles
Temporary	0	25	23
Reconstruction	0	8.4	8.4
<u>Soil and Water</u>	Each	Each	Each
Dump Clean-up	0	5	5
Non-system Road Decommissions	0	55	55
<u>Range/Wildlife</u>	Acres	Acres	Acres
Grazing	0	345	345
Fertilize	0	345	345
Mechanical-Hand Cut, Mow, and Waterhole Maintenance	0	1375	1375
<u>Fisheries *</u>	Acres	Acres	Acres
Pond Rehab	0	16	16
Stock Fish	0	16	16

* Includes Howe's Mill Lake Deepening, Fish Structures, and Howe's Mill South Spillway Work.

Table 2 - 2: Comparison of the Alternatives in Terms of the Issues

Issue	Measure	Alternative 1	Alternative 2	Alternative 3
Issue 1: Effects of Grazing on Fortune Hollow Fen Area	Acres of fen planned for grazing activities	N/A	0	0
Issue 2: Effects of Prescribed Burns for Hazard Fuel Reduction	N/A	This issue is resolved through mitigation measure V1	This issue is resolved through mitigation measure V1	This issue is resolved through mitigation measure V1
Issue 3: Maximum Size Limit on Temporary Openings	Acres of planned Complete Salvage activities	0	931	637
Issue 4: Reforestation Through Pine Planting	Acres planted with pine	0	667	0

Table 2 - 3: Areas Affected by Alternatives

Acres and Percentage of Area Affected Directly by Timber Related Activities	Alt.1	Alt. 2	Alt.3
	Total Analysis Area (23,217 ac)	0	4,486 (52 %)
MA 3.4-1 (4,117 ac)	0	2,064 (50 %)	1,427 (35 %)
MA 3.4-2 (5,926 ac)	0	4,203 (71 %)	4,010 (68 %)
MA 3.4-3 (2,625 ac)	0	283 (11 %)	91 (3 %)
Acres and Percentage of Area Affected by Prescribed Fire Activities	Alt. 1	Alt. 2	Alt. 3
Total Analysis Area (23,217 ac)	0	1,518 (18 %)	4,582 (54 %)
MA 3.4-1 (4,117 ac)	0	358 (9 %)	2,042 (50 %)
MA 3.4-2 (5,926 ac)	0	1,518 (26 %)	3,487 (59 %)
MA 3.4-3 (2,625 ac)	0	0	1,098 (42 %)

Table 2 - 4: Summary of Effects by Alternative

RESOURCE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Soils	Possible negative effects from wildland fires. Increases in accumulations of light and heavy fuels would cause fires to burn with more intensity.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes to inherent long-term productivity of the land.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes to inherent long-term productivity of the land.
Water	Possible negative effects from wildland fires and no road reconstruction.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes to inherent long-term quality of the water.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes to inherent long-term quality of the water.
Air	Possible negative effects from wildland fires.	Adherence to FP S&Gs, Burn plan and site-specific mitigation measure would result in no appreciable changes to inherent long-term or short-term air quality.	Adherence to FP S&Gs, Burn plan and site-specific mitigation measure would result in no appreciable changes to inherent long-term or short-term air quality.
Fuel Loading	Increased fuel loading, potential for larger wildland fires.	Reduction of fuel loading would decrease potential for large wildland fire within stands treated.	Reduction of fuel loading would decrease potential for large wildland fire within stands treated.
Ecosystem Health and Vigor	Stands continue to be attacked by insects and disease, possibly spreading to other oak and tree species. Increase of shade intolerant species in the under-story would inhibit growth of desirable seedlings.	Infestation by insect and disease would be reduced as infected trees are removed. Provides for the increase diversity of species, which would result in a healthier more productive forest. Provides diverse under-story and vertical structure. Early successional habitat would be created.	Infestation by insect and disease would be reduced as infected trees are removed, although to a lesser extent than Alt. 2. Less species diversity under this alternative without pine planting.
Est. Timber Sale Receipts	0	\$1,791,713	\$1,647,866
Est. Timber Costs	0	\$1,266,245	\$1,001,374

RESOURCE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Est. Volume (Mbf)		14,537	13,505
Wildlife	Habitats would be impacted by changes due to insects and disease. (Stands would move towards old growth condition. At this point, most trees would die and the stand would move towards early succession.) Less species diversity. Improvements in forest health may take longer since stands will not be treated.	Habitats would be managed to reduce the impacts from insect and disease infestation. Stands would move toward the desired future conditions for habitats listed in the FP. No appreciable change to wildlife populations for the long-term.	Habitats would be managed to reduce the impacts from insect and disease infestation. Stands would move toward the desired future conditions for habitats listed in the FP. No appreciable change to wildlife populations for the long-term.
T&E Species	May affect Indiana bat. No opportunity to increase foraging habitat for Indiana bats. Not likely to adversely affect the bald eagle, gray bat, and Hine's emerald dragonfly. No effect to Mead's milkweed.	May affect Indiana bat. No likely to adversely affect the bald eagle, gray bat, and Hine's emerald dragonfly. No effect to Mead's milkweed.	May affect Indiana bat. No likely to adversely affect the bald eagle, gray bat, and Hine's emerald dragonfly. No effect to Mead's milkweed.
RFSS Species	No impacts to Regional Foresters Sensitive Species	No impacts to Regional Foresters Sensitive Species	No impacts to Regional Foresters Sensitive Species
Heritage	No potential to affect heritage resources from management activities. Could be negative impacts due to wildland fire suppression activities on individual heritage resource sites.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes heritage resource sites.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes heritage resource sites.
Visuals	Less visually pleasing views due to large amounts of dead, dying and fallen trees in forested stands.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes to visuals.	Adherence to FP S&Gs and site-specific mitigation measure would result in no appreciable changes to visuals.

RESOURCE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Recreation	Increasing negative effects on dispersed recreation with deadfall and hazard trees. Safety concerns increase for forest users from more hazardous wildland fires.	Safety concerns would be reduced as stands are harvested. In the short-term some areas may not be available for dispersed recreation due to logging operations or prescribed fires. Long-term, many recreation opportunities could be improved as forest diversity increases.	Safety concerns would be reduced as stands are harvested. In the short-term some areas may not be available for dispersed recreation due to logging operations or prescribed fires. Long-term, many recreation opportunities could be improved as forest diversity increases.