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Environmental Assessment

Shoal Project

Mt. Magazine Ranger District
Ozark National Forest
Logan County, AR

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FOR
COMPARTMENTS 23, 27, 28, 31, AND 62
OZARK NATIONAL FOREST
MT. MAGAZINE RANGER DISTRICT
LOGAN COUNTY, ARKANSAS

I. INTRODUCTION

A. 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. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes 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.
- *Comparison of Alternatives, including the Proposed Action:* This section 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 public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Agencies and Persons Consulted:* This 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 analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mt. Magazine Ranger District Office in Paris, Arkansas.

B. PURPOSE AND NEED FOR ACTION

The purpose of this initiative is to:

1. Maintain stand vigor by providing light, nutrients, and water to the majority of stands to help ward off future insect and disease attacks.

2. Provide viability needs in early seral successional habitat (0-5 years old).

3. Begin the process of balancing age classes.

4. Lessen the possibility of catastrophic wildland fires (especially in drought years) by reducing the amount of burnable fuels, increase forage production of grasses and forbs for wildlife, and to restore and maintain native ecosystems that are dependent on periodic fires.

5. Provide quality wildlife habitat to meet Ozark-St. Francis Land and Resources Management Plan (LRMP) standards.

6. Reduce impacts to wildlife and limit erosion potential on certain roads not needed for management in the near future throughout the project area.

7. Provide forest products consistent with land capability, suitability, protection of needs, and other resource values.

8. Control invasive species in the project area.

9. Provide stream habitat management.

10. Manage the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail system.

These actions are needed because:

1. Need To Promote Healthy Forests

Pine boring beetles (e.g., black turpentine beetle, ambrosia beetle) and pine bark beetles (e.g., Ips engraver beetle, southern pine beetle, southern pine sawyer) can attack and overwhelm unhealthy stressed pine forests. Once insect infestations start, it is too late to effectively treat large areas and many acres of trees rapidly die. Prevention is the control method of choice by thinning stands to reduce competition and relieve moisture stress. By keeping the trees healthy, beetles are often exuded from the trees by pitch and are less likely to reach epidemic proportions.

Upland hardwood trees are susceptible to many insects and diseases. The annual combined loss due to insects and diseases is often more than the losses to forest fires. Some losses to insects and diseases are unavoidable. However, most losses can be avoided through proper forest management. Maintaining healthy stands by promoting tree vigor helps to avoid these losses.

2. Need To Improve Wildlife Habitat Through Establishment Of Early Seral Habitat

The Forest provides a wide variety of habitats that support a diversity of wildlife species. One of the most important is the early seral successional habitat (0-5 years old). The overall amount of early successional forest on the Ozark National Forest decreased slightly from 2008 to 2009 (U.S. Department of Agriculture, 2010a). The amount of early successional habitat created on the Forest is tied very closely to the amount of regeneration harvests the Forest conducts in a given year. This type of harvesting has declined over the years and this has driven the decline in early successional habitat. At the current time in the project area, there are no forested acres are in the 0-5 year old age class to provide this early successional habitat.

Four of the Management Indicator Species (MIS) from the Ozark-St. Francis Land and Resources Management Plan (LRMP) are dependent upon early successional habitat. As shown in the paper Management Indicator Species Population and Habitat Trends (U.S. Department of Agriculture Forest Service, 2001), although deer populations appear to be increasing based on harvest data, it is possible that the decline in early seral habitat could alter this trend. There is a need to maintain a portion of the habitat in early stages to maintain quality bear habitat over time. The yellow-breasted chat population appears to be stable or increasing possibly due to prescribed fire or natural events. The uncertainty and unpredictability of these events would not guarantee existence of quality habitat for chat.

3. Need To Balance Age Class

The pine type age classes in this analysis area are not in balance. The age class distribution is weighted heavily in the 41-70 and 71+ year-old age class. Approximately 74% of the pine type acres are in these age classes. If no new acres are regenerated, the majority of the analysis area would get old all at once. Breaking up the age classes now would help prevent mortality occurring all at one time.

4. Need To Reintroduce Fire Into The Ecosystem

Approximately two-thirds of these acres were prescribed burned in 2009. Forest fuels accumulate rapidly in pine stands. In 5 to 6 years, heavy fuel layers can build up from normal growth, posing a serious threat from wildfire to all forest resources. Prescribe fire is the most practical way to reduce dangerous accumulations of combustible fuels. Wildfires that burn into areas where fuels have been reduced by prescribed burning cause less damage and are much easier to control.

In this analysis area, approximately 1931 acres (26% of project acres) are located within the Wildland Urban

Interface (WUI). WUI areas are National Forest land that is within one-quarter of a mile from private land. These areas are at risk of a wildland fire that may occur within the National Forest lands that border these private lands.

This analysis area was once a fire-dominated ecosystem. Frequent fires eliminated shade tolerant species from the understory and provided ample forage for many species of wildlife. Past forest management practices have created a situation where shading and buildup of duff or needle layers has reduced or possibly eliminated grasses and forbs. The loss of these grasses and forbs is reducing the number of small mammals, seed-eating birds, as well as some species such as deer and turkey.

5. Need To Provide Quality Wildlife Habitat To Meet LRMP Standards

Well-managed wildlife openings provide quality wildlife forage for species such as deer and bugging areas for turkeys. The LRMP objective is to have at least forty-six wildlife openings for this project area. Currently, there are thirteen wildlife openings in the project area. New wildlife openings need to be constructed to help meet LRMP objectives.

Two existing wildlife openings need to be enlarged and restored and an additional eleven existing wildlife openings need to be restored to provide more edge, forage, and turkey brood habitat than is currently being produced.

6. Need To Manage The Transportation System While Reducing Wildlife Impacts And Erosion Potential

Certain roads within the project area are no longer needed for management in the near future. Their continued use by the public creates an unfavorable situation for wildlife through unnecessary disturbance and adds to soil loss through erosion.

7. Need To Provide Commodities

One output of the achieving the needs of the project area would be harvesting of timber. The project area is in Management Area 3.A (Pine Woodland), Management Area 3.C (Mixed Forest), and Management Area 3.I (Riparian Corridors). These management areas are classified as suitable for timber management (LRMP, pgs. 2-56, 2-61, and 2-74).

8. Need To Control Invasive Species in the Project Area

Within the Shoal Project area, there are occurrences of nonnative invasive species. Specifically, Sericea lespedeza, *Lespedeza cuneata*, has become the dominant species along roadsides and some sites of privet have already been noted within the project area. Treatment of these nonnative species and others is needed to prevent these species from becoming established and causing negative effects on native plant species.

9. Need To Perform Stream Habitat Improvement Management

It was determined during stream surveys conducted in the summer of 2007 that some project streams were in need of large woody debris according to Objectives 22 and 23 from the LRMP. Wood in the streambed helps to slow the water flow, extend the water supply further into the dry season, and provide additional habitat for amphibians and fish.

Three road/stream crossings within the project area were inventoried in 2007 and were found to be barriers to movement/migration of aquatic organisms within the stream channel. These road/stream crossings are in need of structures that would allow for movement of aquatic organisms through the structure along with large wood and rock that also are moved through the stream system during higher flows.

10. Need To Manage the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail System

Approximately 3.8 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail trails within the northern part of the project area are in extremely poor condition due to drainage issues, high use by all sizes of OHVs, and lack of funding to repair these areas. The sections of trail located along Shoal Creek are lower than adjacent terrain, which restricts the ability to drain deep mud holes located in the trail corridor. There are currently no OHV width restrictors installed on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail.

An additional eight miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail in the southern part of the project areas reflects extensive trail tread drainage issues, high use by all sizes of OHVs, and the lack of funding to repair the trail.

Numerous trail users have expressed concern regarding the impact and increased use of large OHVs (full size four-wheel drive trucks with over-size tires) along the trail system. These same individuals have requested the installation of width restrictors be placed at key points of access to the trail system.

These actions respond to the goals and objectives outlined in the Ozark-St. Francis Land and Resource Management Plan (LRMP), and helps move the project area towards desired conditions described in that plan. This area is included in Management Area 3.A (Pine Woodland), Management Area 3.C (Mixed Forest), and Management Area 3.I (Riparian Corridors). These management areas are described on pages 2-56 – 2-58, 2-61 – 2-62, and 2-71 – 2-76 of the LRMP.

C. PROPOSED ACTION

The Shoal Project area encompasses 7329 acres of National Forest land.

There is approximately 361 acres of private ownership within the stand boundaries of the project area.

The Mt. Magazine Ranger District proposes the following actions shown in Table 1 for Compartments 23, 27, 28, 31, and 62. This area is located approximately five air miles south of Midway, Arkansas, in Logan County (See Vicinity Map, page 5). This area is in the central part of the Mt. Magazine Ranger District located in T6N, R24W and T7N, R24W.

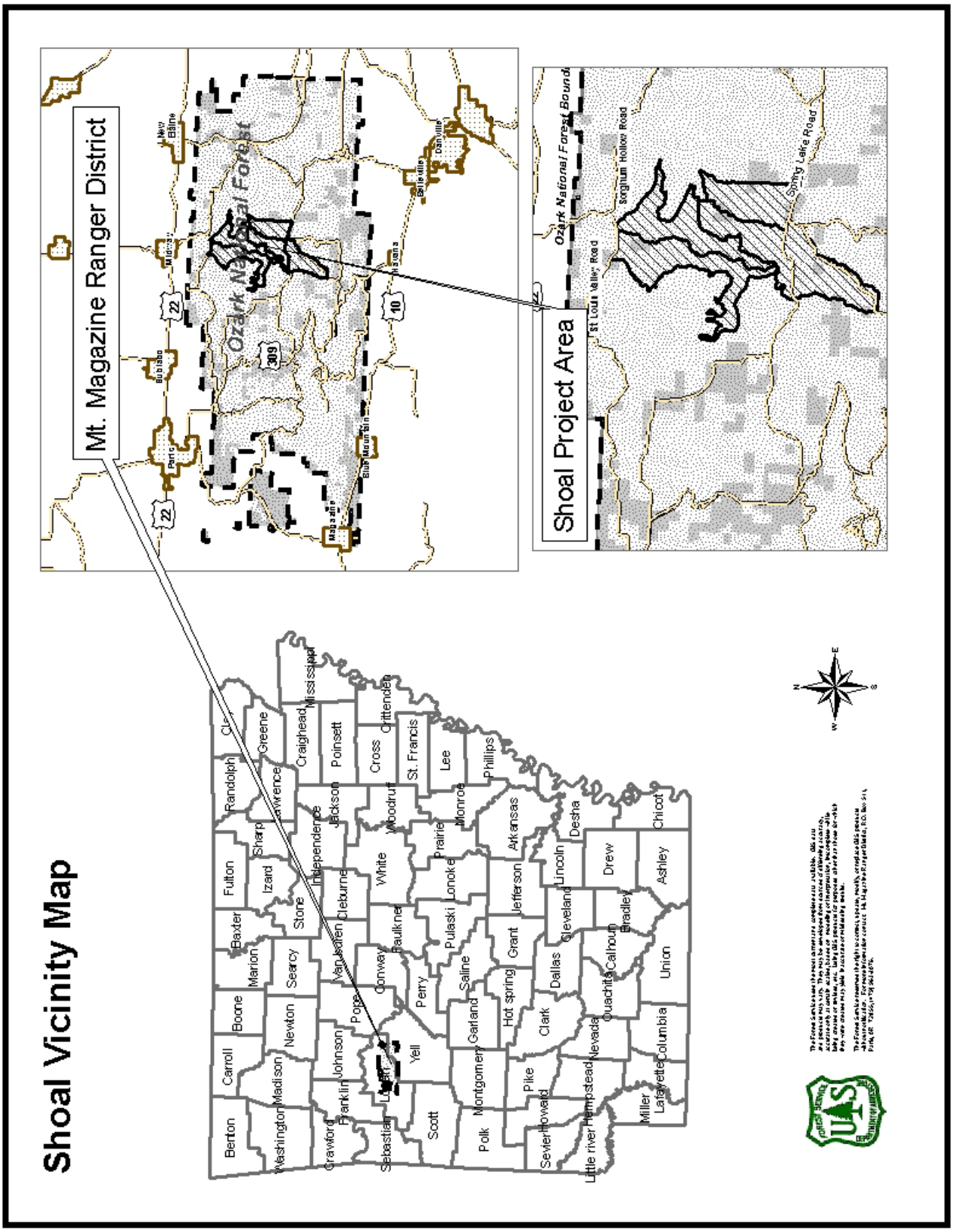


Figure 1. Vicinity Map.

Table 1. Proposed Action.

Treatment Description	Total*
Shortleaf Pine Shelterwood Harvesting	653 Acres
Shortleaf Pine/Hardwood Thinning	813 Acres
Shortleaf Pine/Loblolly Pine Thinning	2398 Acres
Cedar Thinning	7329 Acres
Shortleaf Pine Seedtree Removal	747 Acres
Temporary Road Construction	14.9 Miles
Road Construction	0.2 Miles
Road Reconstruction	15.0 Miles
Road Realignment	1.6 Miles
Road Decommissioning	3.0 Miles
Road Maintenance	11.8 Miles
Road Closure	8.2 Miles
Road Closure Removal	2 Closures
Borrow Pit Development	Up to 5 Acres
Shortleaf Pine Site Preparation	653 Acres
Shortleaf Pine Planting	653 Acres
Shortleaf Pine Release	747 Acres
Non-native Invasive Species Treatment	Up to 700 Acres/Year
Wildlife Opening Construction/Restoration**	7 Openings
Wildlife Opening Enlargement/Restoration***	2 Openings
Wildlife Opening Restoration***	11 Openings
Wildlife Stand Improvement	61 Acres
Wildlife Habitat Improvement/Fuels Reduction Prescribed Burning****	7329 Acres
Stream Habitat Management	34.3 Miles

* Acres and miles are approximations

** Proposed for two restoration treatments on a two-year rotation

*** Proposed for three restoration treatments on a two-year rotation

**** Proposed for three treatments for burning on a three- to four-year rotation

Table 1. Proposed Action, continued.

Treatment Description	Total*
Aquatic Organism Passage Construction	3 Passages
Trail Relocation	3.6 Miles
Trail Decommissioning	2.3 Miles
Trail Width Restrictors and Road Closure	6 Restrictors
Trail Width Restrictors	4 Restrictors
Trail Width Restriction for Vehicles 50” or less	9.3 Miles

* Acres and miles are approximations

D. DECISION FRAMEWORK

The decision to be made is whether to implement the Proposed Action (Alternative 1) or the No Action Alternative (Alternative 2). Rob Kopack, Deputy District Ranger of the Mt. Magazine Ranger District, or his acting line officer has the authority to make this decision.

If a determination were made that the impact is not significant, then a "Finding of No Significant Impact" (FONSI) would be prepared. A Decision Notice would document the decision.

E. RELATED EIS/EA(S) THAT INFLUENCE THE SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

This EA is tiered to the Ozark-St. Francis NF Final Environmental Impact Statement (Ozark-St. Francis FEIS) and the Revised Land and Resources Management Plan (LRMP). The Ozark-St. Francis FEIS and the LRMP can be viewed at local U.S. Forest Service offices. Other documents incorporated by reference in this EA can be viewed at the Mt. Magazine District office in Paris, Arkansas.

F. PUBLIC INVOLVEMENT

Scoping for this project began with the mailing of the proposed action to adjacent landowners and interested citizens on April 5, 2011. This list included letters to nine Native American Tribes and the Arkansas Game and Fish Commission. The scoping package contained a description of the proposed action, a map depicting the proposed action, and a comment form. A total of 75 letters were mailed.

A copy of the proposed action letter was posted that same week on the Ozark-St. Francis National Forests website at http://www.fs.fed.us/oonf/ozark/projects/planning/magproject.html.

This project was also listed in the Schedule of Proposed Actions and posted on the Ozark-St. Francis National Forests website at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5291930.pdf

An interdisciplinary (ID) team of Forest Service individuals whose knowledge and expertise is critical to the management of this area (refer to page 93) also received this scoping.

Two public responses were received from this scoping effort and responses are shown in Appendix E. Both of the public responses were in favor of the proposed actions.

G. ISSUES

Issues serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. Issues are best identified during scoping early in the process to help set the scope of the actions, alternatives, and effects to consider.

Both of the public responses received from public scoping were in favor of the proposed actions. Therefore, no issues were identified for this project.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Shoal Project. It includes a description and map of each alternative considered and also presents the alternatives in comparative form.

A. ALTERNATIVES ELIMINATED FROM DETAILED STUDY

The need to develop a no herbicide alternative for the sake of public health was considered but not developed in detail. Syracuse Environmental Research Associates, Inc. prepared a Risk Assessment for triclopyr, imazapyr, glyphosate, and imazapic (Syracuse Environmental Research Associates, Inc. 2003a, 2003b, 2004a, 2004b). Typical exposures to these chemicals do not lead to estimated doses that exceed a level of concern for either workers or members of the general public at the typical application rate. Therefore, this alternative was not developed in detail.

During the 3 ½ year injunction banning the use of herbicides on the Ozark-St. Francis National Forests, costs of reforestation and timber stand improvement increased significantly (Ebling, Smith; 1982). Areas treated without herbicides required additional treatments or follow-up application to complete the treatment resulting in additional costs. There is no other effective non-herbicide treatment to control fescue and Bermuda grass in wildlife openings. Treatments without herbicide would be ineffective, costly, and would not meet the purpose and need or providing quality wildlife habitat.

An uneven-aged management alternative was considered but not developed in detail because it does not adequately meet parts of the purpose and need, including the need of balancing age classes and restoring native ecosystems dependent on fire. Uneven-aged management would provide a variety of ages within each stand, not a variety of stand ages from new regeneration to old growth across the project area. Uneven-aged management does not allow burning on frequent rotations, since frequent burning would set back existing regeneration each time. Uneven-aged management requires more frequent entries for timber harvest and thus increases effects on soils from roads that are open more often. Even-aged management better meets the purpose and need of this project and with mitigation can meet other concerns such as visual quality.

B. DETAILED DESCRIPTION OF ALTERNATIVE 1 (PROPOSED ACTION ALTERNATIVE)

A summary table (Table 2) showing the following actions is shown beginning on page 13. The Harvest Plan Map is shown on page 17, the Silvicultural Treatment Map is shown on page 19, the Wildlife Habitat Improvement Map is shown on page 21, and the Trail Improvement Map is shown on page 23.

Compartment 23/Stands 1, 8, 20; Compartment 27/Stands 1, 6, 16, 27; Compartment 28/Stands 16, 19; Compartment 31/Stand 11; and Compartment 62/Stands 2, 20, and 30 would be regenerated using the pine shelterwood method of cutting. Approximately 20-30 pine seedtrees would be left per acre. Additionally, leave den trees and mast-producing hardwood would be left at a rate of approximately 10-20 trees per acre. Shelterwood cutting is proposed for approximately 653 acres.

After harvesting and to facilitate site preparation, firewood would be removed in these stands through firewood permits. Mast producing trees 8.0" diameter or larger at 4.5' height would not be cut for firewood unless they are approved by a wildlife biologist or technician. This would be done only to improve mast production on an adjacent tree.

Site preparation of the above stands would be accomplished by directed foliar application and handtool injection. Directed foliar application would be done with a mixture of triclopyr ester (up to 1.0 lbs. of active ingredient/acre) and imazapyr (up to 0.1 lb. of active ingredient/acre). Handtool injection would be done with an application of a mixture of triclopyr amine (up to 1 lb. of active ingredient/acre) and imazapyr (up to 0.1 lb. of active ingredient/acre). The directed foliar application would be used on vegetation up to six feet in height. Handtool injection would be used on selected hardwood trees above 1" in diameter at 4.5' height. Mast producing trees 8.0" diameter or larger at 4.5' height above ground level would not be treated during site preparation unless otherwise approved by a wildlife biologist or technician. See Mitigation Measure #24 for a list of species that would not be treated regardless of size.

Foliar spray would occur between May and October with May, June, September, and October being the optimum period. Injection treatments would occur between May and October with July-August being the optimum period. Refer to Mitigation Measures #23-37 for specific mitigation for site preparation.

Prescribed burning would be done if needed to provide an adequate seedbed in the shelterwood stands. The stands would be evaluated after the chemical treatment has had time to be effective to see if this prescribed burning is necessary. If needed, burning would be thirty or more days following chemical treatment and timed to occur prior to seedfall in the fall season when residual trees would be least susceptible to fire damage.

Planting of shortleaf pine in these stands would be done if natural seedfall does not regenerate these sites. Stocking evaluations would be done one to three years after site preparation to determine stocking. If a stand is not adequately stocked, planting would be done the following winter.

Once pine seedlings are established and a release treatment is deemed necessary, the above stands would be released from competition. Release would be accomplished by directed foliar application and cut surface treatment. Directed foliar application would be done with a mixture of triclopyr ester (up to 1 lb. of active ingredient/acre) and imazapyr (up to 0.1 lb. of active ingredient/acre). Cut surface treatment would be done with an application of a mixture of triclopyr amine (up to 1.0 lb. of active ingredient/acre) and imazapyr (up to 0.1 lb. of active ingredient/acre). These treatments would be applied within a four-foot radius of the selected pine leave tree to be released on an 8' x 8' spacing. Foliar spray would occur between May and October with May, June, September, and October being the optimum period. Injection treatments would occur between May and October with July-August being the optimum period. Refer to Mitigation Measures #23-37 for specific mitigation for release.

All of the above stands would have the seedtrees removed after the stands are certified as being adequately stocked with regeneration. This seedtree removal would total approximately 653 acres.

Compartment 31/Stand 5 and Compartment 62/Stands 8 and 16 are existing shortleaf pine seedling/sapling stands with the seedtrees still in place. These stands contain an adequate stocking of seedling/saplings and the seedtrees are no longer needed to provide regeneration. These stands are proposed for seedtree removal and total approximately 94 acres.

Compartment 31/Stand 5 and Compartment 62/Stands 8 and 16 are existing shortleaf pine seedling/sapling stands. These stands are currently stocked with approximately 700-4300 shortleaf pine saplings/acre and approximately 700-3100 hardwood saplings/acre. Stand vigor is being lost through competition with hardwoods in these stands. Release would be done by directed foliar application and cut surface treatment as discussed above. Release acres in existing seedling/sapling stands total approximately 94 acres.

Non-native invasive plant species would be treated on up to approximately 700 acres per year within the boundaries of Compartments 23, 27, 28, 31, and 62. This action is needed to have flexibility to treat these non-native plant species before they can become established and cause negative effects on native plant species. Species treated could include but is not limited to Tree-of-Heaven, paulownia, mimosa, privet, Sericea lespedeza, kudzu, fescue, etc. This would include any species from the Regional Forester's List of Invasive Exotic Plant Species of Management Concern. Some sites of privet have already been noted within the project area. This would be for future treatment of infestation as sites are identified. Herbicide treatment would be done according to label directions for the target species using triclopyr amine, glyphosate, and/or imazapyr or a combination of these chemicals. Treatment would be done through foliar spraying or stump treatment directly on the target plant. Up to 0.3 lb. of active ingredient per acre of imazapyr, up to 8 oz. of imazapic per acre, up to 1.0 lbs. per acre of triclopyr amine, and up to 2.0 lbs. of active ingredient per acre of glyphosate (1.5 lbs. active acid equivalent) would be applied.

Compartment 31/Stands 3 and 16 would be thinned to a basal area of approximately 50 sq. ft./acre. These stands would have both pine and hardwood thinned and total approximately 144 acres.

Compartment 27/Stands 7, 28, 36, 45; Compartment 28/Stands 2, 4, 10, 15; Compartment 31/Stands 7, 12; and Compartment 62/Stand 3 would be thinned to a basal area of approximately 60 sq. ft./acre. These stands would have both pine and hardwood thinned and total approximately 669 acres.

Compartment 23/Stands 12, 13, and 15 would be thinned to a basal area of approximately 50 sq. ft./acre.

These stands are proposed for shortleaf pine/loblolly pine thinning and total approximately 97 acres.

Compartment 23/Stands 3, 4, 6, 9,10, 17, 19, 23, 24, 25, 27, 29, 31, 32, 33, 34, 35 and Compartment 27/Stands 3, 4, 5, 9, 10, 11, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 29, 30, 31, 33, 38, 40, and 44 would be thinned to a basal area of approximately 60 sq. ft./acre. These stands are proposed for shortleaf pine/loblolly pine thinning and total approximately 2301 acres.

Merchantable cedar would be thinned in all stands of Compartments 23, 27, 28, 31, and 62 totaling approximately 7329 acres.

Road activities proposed include approximately 14.9 miles of temporary road construction, 0.2 miles of road construction, 15.0 miles of road reconstruction, 1.6 miles of road realignment, 3.0 miles of road decommissioning (includes 1.5 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV trail located on FDR 1604), 11.8 miles of road maintenance, 8.2 miles of road closure, and removal of two road closures. Individual road numbers are listed in Table 2. Locations of these road activities are shown on the Harvest Plan Map for Alternative 1 with the exception of temporary road locations. Maps of these road locations are located in the process file.

A borrow pit would be developed south of the project area in Section 12, T6N, R24W. Material from this site would be removed for use during the proposed road work in this project and would remain open for future needs. The pit would be developed using mechanical equipment such as bulldozers and trackhoes. Erosion control measures would be implemented to limit the impacts outside the borrow pit location. Erosion control measures could include hay bales, sedimentation ponds, and construction of diversion ditches.

Seven wildlife openings are proposed for construction located in Compartment 23/Stands 12, 35; Compartment 27/Stands 10 25, 28; Compartment 31/Stand 2; and Compartment 62/Stand 17. Construction would consist of removing the timber on these openings by harvesting during the timber sale or by permit at time of opening construction. These openings would be constructed up to five acres in size. Stumps would be mechanically removed during construction and openings would then receive disking, fertilizing, liming, and seeding with grass seed suitable for wildlife. These openings would receive subsequent routine restoration on a two-year interval as described below. These openings are proposed for two restoration treatments after construction. Access roads into these openings would be blocked after the openings are constructed.

Two existing wildlife openings are proposed for enlargement and restoration located in Compartment 27/Stands 7 and 31. These openings would be enlarged up to five acres in size. Removal of the timber to enlarge the openings would be done by harvesting during the timber sale or by permit at time of opening restoration. Routine restoration would then be performed by brushhogging the openings followed by a chemical treatment with imazapyr, imazapic, triclopyr amine, and/or glyphosate, if needed, to eradicate non-native species and woody species. Each opening would be evaluated before treatment to determine which chemical(s) would be used. Chemical application would occur between March and October using a tractor-mounted sprayer. This would be followed by liming, disking, and planting seed suitable for wildlife on each opening. These openings are proposed for three restoration treatments on a two-year interval. Up to 0.3 lb. of active ingredient per acre of imazapyr, up to 8 oz. of imazapic per acre, up to 1.0 lbs. per acre of triclopyr amine, and up to 2.0 lbs. of active ingredient per acre of glyphosate (1.5 lbs. active acid equivalent) would be applied during mechanical liquid applications.

Eleven existing wildlife openings are proposed for restoration located in Compartment 23/Stands 24, 32; Compartment 27/Stand 18; Compartment 28/Stand 2; Compartment 31/Stand 7; and Compartment 62/Stands 2, 4, 7, 13, 23, and 24. Restoration would be done as described above.

Wildlife stand improvement (WSI) would be done in Compartment 23/Stands 37 and 38 along with Compartment 62/Stands 14 and 24 totaling approximately 61 acres. WSI would be done using handtools and chemical within a six-foot radius of the selected hardwood leave tree. Hardwood leave trees would be chosen on a 12’ x 12’ spacing. Vegetation within the six-foot circle would be chainsawed and the stumps treated with a mixture of triclopyr amine and imazapyr. Cut surface treatment would be done with an application of a mixture of triclopyr amine (up to 1.0 lb. of active ingredient/acre) and imazapyr (up to 0.1 lb. of active ingredient/acre). All eastern red cedar, regardless of size, would be cut but would not be treated with chemical.

Wildlife habitat improvement and fuels reduction prescribed burning is proposed on all compartment acres in Compartments 23, 27, 28, 31, and 62 (7329 acres). Burning during the first rotation would exclude 653 acres in Compartment 23/Stands 1, 8, 20; Compartment 27/Stands 1, 6, 16, 27; Compartment 28/Stands 16, 19; Compartment 31/Stand 11; and Compartment 62/Stands 2, 20, and 30. Subsequent rotations would include all compartment acres (7329 acres). Wildlife habitat improvement and fuels reduction burning is proposed for three treatments on a three to four year rotation. See Mitigation Measures #38-44 for specific mitigation relating to prescribed burning.

Stream habitat management is proposed on approximately 34.3 miles of streams in the project area. The Wildlife Habitat Improvement Map shows the locations of this treatment and Table 2 lists the individual stands. Large wood would be felled or placed in the streambed. Wood would consist of trees over 16.4 feet long and greater than 19.7 inches in diameter. Anywhere from 8-20 trees per mile would be placed in the streams.

Three aquatic organism passages would be installed on three different road/stream locations. These locations are in Compartment 28/Stands 1 and 2 and in Compartment 62/Stand 7. These crossings would be replaced with structures that are equal in width to the stream channel with as big of an opening as possible and would be either bottomless or if the structure has a bottom then the structure would be counter sunk into the stream bottom. The crossings would be replaced as funding becomes available.

Trail width restrictors/road closures would be placed at six locations on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail as shown on the Trail Improvement Map. These sections of trail are located on open system roads (FDR 1604, 96023A, 96023C, 96027A, and 96027B). These width restrictors would close these roads to vehicular traffic but would allow for passage of OHVs with a width of 50 inches or less in width and horses. Wider gates would be installed adjacent to the width limiting restrictors to allow Forest Service access for management purposes when large equipment is necessary. Approximately 7.5 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail would be designated as having a width restriction for vehicles of 50 inches or less in width once trail width restrictors are installed.

Trail width restrictors would be placed at four locations on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail as shown on the Trail Improvement Map. These sections of trail are located on a powerline. These width restrictors would allow for passage of OHVs with a width of 50 inches or less in width and horses. Wider gates would be installed adjacent to the width limiting restrictors to allow Forest Service and utility companies access for management purposes when large equipment is necessary. Approximately 1.8 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail along this powerline would be designated as having a width restriction for vehicles of 50 inches or less in width once trail width restrictors are installed.

Currently, approximately 1.4 miles (three separate sections) of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail are located on the section of FDR 1604 that is proposed for realignment. After realignment of the road is done, these three sections of trail would be relocated to the newly realigned portion of the road as shown on the Trail Improvement Map. Additionally, 2.2 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail located in the northern portion of the project area would be relocated. This section of trail would be relocated to the existing location of FDR 1604, east of the current trail location. Part of the Mt. Magazine OHV Trail is currently located on this section of FDR 1604. Relocation would consist of posting new trail signs along the trail corridor.

Approximately 1.5 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail and FDR 1604 would be decommissioned. These miles of trail/road are the sections that are being relocated to the realigned FDR 1604. Treatment would include blocking access points, installing water bars, and scattering slash as needed on the trailbed.

Approximately 2.3 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail would be decommissioned. These miles of trail are the section of the horse trail/OHV trail that is being relocated to the existing location of FDR 1604 and the Mt. Magazine OHV Trail. Treatment would include blocking access points, installing water bars, and scattering slash as needed on the trailbed.

Table 2. Summary of Alternative 1 Actions. *

SHORTLEAF PINE SHELTERWOOD HARVESTING	**653 Acres** 11,728 CCF *C-23/Stands 1, 8, 20* *C-27/Stands 1, 6, 16, 27* *C-28/Stands 16, 19* *C-31/Stand 11* *C-62/Stands 2, 20, 30*
SHORTLEAF PINE/HARDWOOD THINNING	**813 Acres** 10,912 CCF *Thin to 50 BA* *C-31/Stands 3, 16* *Thin to 60 BA* *C-27/Stands 7, 28, 36, 45* *C-28/Stands 2, 4, 10, 15* *C31/Stands 7, 12* *C-62/Stand 3*
SHORTLEAF PINE/LOBLOLLY PINE THINNING	**2398 Acres** 31,815 CCF *Thin to 50 BA* *C-23/Stands 12, 13, 15* *Thin to 60 BA* *C-23/Stands 3, 4, 6, 9, 10, 16, 17, 19, 23, 24, 25, 27, 29, 31, 32, 33, 34, 35* *C-27/Stands 3, 4, 5, 9, 10, 11, 14, 15, 19, 20, 21, 22, 23, 24, 25, 26, 29, 30, 31, 33, 38, 40, 44* *C-31/Stands 1, 2, 18, 19* *C-62/Stands 1, 4, 6, 7, 9, 11, 17, 18, 21, 22 ,23, 25, 27*
CEDAR THINNING	**7329 Acres** 7,329 CCF *C-23/All Stands* *C-27/All Stands* *C-28/All Stands* *C-31/All Stands* *C-62/All Stands*
SHORTLEAF PINE SEEDTREE REMOVAL	**747 Acres** 4,956 CCF *C-23/Stands 1, 8, 20* *C-27/Stands 1, 6, 16, 27* *C-28/Stands 16, 19* *C-31/Stand 5, 11* *C-62/Stands 2, 8, 16, 20, 30*

*All acres, miles, and volumes are approximations

Table 2. Summary of Alternative 1 Actions, continued.*

TEMPORARY ROAD CONSTRUCTION	**14.9 Miles** *C-23, 27, 28, 31, 62*
ROAD CONSTRUCTION	**0.2 Miles** *FDR 96061C*
ROAD RECONSTRUCTION	**15.0 Miles** *Portions of FDR 1604, 1613, 1624, 1690, 1687E, 96027A, and Spring Lake Road*
ROAD REALIGNMENT	**1.6 Miles** *Portions of FDR 1604 and Barber Ridge Road*
ROAD DECOMMISSIONING (Includes 1.5 miles of trail located on FDR 1604)	**3.0 Miles** *Portions of FDR 1604, 1604A, 96036A, and Barber Ridge Road*
ROAD MAINTENANCE	**11.8 Miles** *Portions of FDR 1624, 1657, 1604A, 1624A, 1687E, 1690A, 96022C, 96023A, 96023B, 96023C, 96023D, 96027A, 96027C, 96027D, 96027E, 96028A, 96028B, 96028C, 96028F, 96062A, 96062B, 96062C, 96062E*
ROAD CLOSURE	**8.2 Miles** *Portions of FDR 1604, 1687E, 96023A, 96023B, 96023C, 96027A, 96027B, 96061C*
ROAD CLOSURE REMOVAL	FDR 1604A, 96031A
BORROW PIT DEVELOPMENT	**Up to 5 Acres** *Section 12, T6N, R24W*
SHORTLEAF PINE SITE PREPARATION Handtools/Chemical/Prescribed Burning	**653 Acres** *C-23/Stands 1, 8, 20* *C-27/Stands 1, 6, 16, 27* *C-28/Stands 16, 19* *C-31/Stand 11* *C-62/Stands 2, 20, 30*
SHORTLEAF PINE PLANTING Handtools	**653 Acres** *C-23/Stands 1, 8, 20* *C-27/Stands 1, 6, 16, 27* *C-28/Stands 16, 19* *C-31/Stand 11* *C-62/Stands 2, 20, 30*

* Acres and miles are approximations

Table 2. Summary of Alternative 1 Actions, continued.*

SHORTLEAF PINE RELEASE Handtools/Chemical	**747 Acres** *C-23/Stands 1, 8, 20* *C-27/Stands 1, 6, 16, 27* *C-28/Stands 16, 19* *C-31/Stands 5, 11* *C-62/Stands 2, 8, 16, 20, 30*
NON-NATIVE INVASIVE SPECIES TREATMENT Handtools/Chemical	**Up to 700 acres/year** *C-23/All Stands* *C-27/All Stands* *C-28/All Stands* *C-31/All Stands* *C-62/All Stands*
WILDLIFE OPENING CONSTRUCTION/RESTORATION**	**7 Openings** *C-23/Stands 12, 35* *C-27/Stands 10, 25, 28* *C-31/Stand 2* *C-62/Stand 17*
WILDLIFE OPENING ENLARGEMENT/RESTORATION***	**2 Openings** *C-27/Stands 7, 31*
WILDLIFE OPENING RESTORATION***	**11 Openings** *C-23/Stands 24, 32* *C-27/Stand 18* *C-28/Stand 2* *C-31/Stand 7* *C-62/Stands 2, 4, 7, 13, 23, 24*
WILDLIFE STAND IMPROVEMENT	**61 Acres** *C-23/Stands 37, 38* *C-62/Stands 14, 24*

* Acres and miles are approximations
** Proposed for two restoration treatments on a two-year rotation
*** Proposed for three restoration treatments on a two-year rotation

Table 2. Summary of Alternative 1 Actions, continued.*

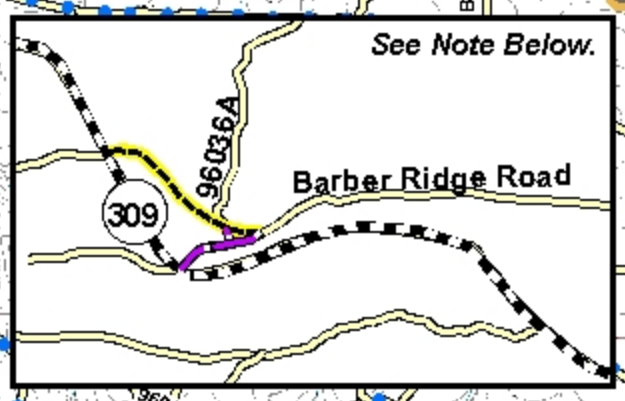
WILDLIFE HABITAT IMPROVEMENT/ FUELS REDUCTION PRESCRIBED BURNING**	**7329 Acres** *C-23/All Stands* *C-27/All Stands* *C-28/All Stands* *C-31/All Stands* *C-62/All Stands* *The following 653 acres would be excluded during the first burning rotation but would be burned in subsequent rotations –* *C-23/Stands 1, 8, 20* *C-27/Stands 1, 6, 16, 27* *C-28/Stands 16, 19* *C-31/Stand 11* *C-62/Stands 2, 20, 30*
STREAM HABITAT MANAGEMENT	**34.3 Miles** *C-23/Stands 1, 2, 3, 5, 6, 12, 13, 16, 19, 20, 25, 27, 29, 31, 32, 33, 34, 35* *C-27/Stands 1, 2, 8, 12, 13, 17, 18, 22, 24, 30, 32, 35, 41, 43, 44* *C-28/Stands 1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19* *C-31/Stands 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20* *C-62/Stands 3, 7, 15, 16, 17, 18, 20, 22, 23, 24, 27, 28*
AQUATIC ORGANISM PASSAGE CONSTRUCTION	**3 Passages** *C-28/Stands 1, 2* *C-62/Stand 7*
TRAIL RELOCATION	**3.6 Miles** *FDR 1604*
TRAIL DECOMMISSIONING	**2.3 Miles** *Portions of Huckleberry Mountain Horse Trail and Mt. Magazine OHV Trail*
TRAIL WIDTH RESTRICTORS AND ROAD CLOSURE	**6 Restrictors** *Located on FDR 1604, 96023A, 96023C, 96027A, 96027B*
TRAIL WIDTH RESTRICTORS	**4 Restrictors** *Located on a powerline (Sections 10,11; T6N, R24W)*
TRAIL WIDTH RESTRICTION FOR VEHICLES 50" OR LESS	**9.3 Miles** *Portions of FDR 1604, 96023A, 96023B, 96023C, 96027A, 96027B, Huckleberry Mountain Horse Trail, Mt. Magazine OHV Trail, and powerline (Sections 10,11; T6N, R24W)*

* Acres and miles are approximations
** Proposed for three treatments for burning on a three- to four-year rotation

Ozark National Forest
Mt. Magazine Ranger District

Shoal Project
Compartments 23, 27, 28, 31, and 62

Harvest Plan Map



Comp.	Stand	Acres	FTCC
23	1	62	3210
23	2	11	4712
23	3	64	3210
23	4	72	3212
23	5	26	3211
23	6	24	3111
23	8	13	3210
23	9	7	3212
23	10	14	3212
23	12	16	3212
23	13	47	3210
23	15	34	3211
23	16	70	3212
23	17	32	3111
23	19	62	3211
23	20	64	3210
23	23	45	3212
23	24	56	3212
23	25	34	3212
23	27	55	3212
23	29	58	3212
23	31	41	3212
23	32	108	3212
23	33	25	3212
23	34	45	3212
23	35	62	3212
23	37	16	4712
23	38	13	5311

Comp.	Stand	Acres	FTCC
27	1	45	3210
27	2	88	5312
27	3	30	3210
27	4	65	3211
27	5	12	3212
27	6	39	3210
27	7	33	3212
27	8	134	5312
27	9	12	3210
27	10	52	3211
27	11	23	3210
27	12	50	5312
27	13	39	5310
27	14	21	3211
27	15	2	3212
27	16	24	3210
27	17	27	5307
27	18	61	5310
27	19	4	3211
27	20	6	3211
27	21	12	3211
27	22	27	3211
27	23	12	3211
27	24	34	3212
27	25	9	3211
27	26	35	3210
27	27	13	3210
27	28	48	3212
27	29	22	3210
27	30	80	3211
27	31	34	3209
27	32	31	5311
27	33	36	3211
27	35	52	5308
27	36	34	3212
27	37	16	5307
27	38	9	3212
27	39	12	5307
27	40	9	3209
27	41	8	5312
27	43	46	3211
27	44	69	3211
27	45	30	3210

Comp.	Stand	Acres	FTCC
28	1	58	3211
28	2	133	3212
28	4	34	3212
28	5	232	5310
28	6	62	3213
28	7	117	5310
28	8	87	3213
28	9	19	4712
28	10	84	3210
28	11	49	4712
28	12	212	4710
28	13	116	5310
28	14	246	5306
28	15	29	3212
28	16	73	3210
28	19	69	3210
28	20	39	4710

Comp.	Stand	Acres	FTCC
31	1	25	3210
31	2	51	3212
31	3	103	3210
31	4	143	5310
31	5	22	3213
31	7	80	3212
31	8	39	5312
31	10	442	5312
31	11	76	3210
31	12	102	3210
31	13	160	1206
31	14	13	3210
31	15	437	5312
31	16	41	3210
31	17	71	3211
31	18	15	3111
31	19	15	3211
31	20	31	1212

Comp.	Stand	Acres	FTCC
62	1	21	3211
62	2	54	3210
62	3	62	1210
62	4	56	3211
62	6	52	3211
62	7	91	3212
62	8	33	3213
62	9	57	3211
62	11	62	3212
62	13	37	3211
62	14	8	5311
62	15	79	4711
62	16	39	3213
62	17	126	3212
62	18	59	3210
62	20	59	3210
62	21	14	3211
62	22	31	3212
62	23	40	3212
62	24	23	5311
62	25	57	3212
62	27	43	3212
62	28	21	3212
62	30	62	3210

Forest Type (FT) & Condition Class (CC)

1206 = Shortleaf Pine/Oak Sparse Sawtimber
1210 = Shortleaf Pine/Oak Mature Sawtimber
1212 = Shortleaf Pine/Oak Immature Sawtimber
3111 = Loblolly Pine Immature Poletimber
3209 = Shortleaf Pine Mature Poletimber
3210 = Shortleaf Pine Mature Sawtimber
3211 = Shortleaf Pine Immature Poletimber
3212 = Shortleaf Pine Immature Sawtimber
3213 = Shortleaf Pine Seedlings/Saplings
4710 = White Oak/Black Oak/Yellow Pine Mature Sawtimber
4711 = White Oak/Black Oak/Yellow Pine Immature Poletimber
4712 = White Oak/Black Oak/Yellow Pine Immature Sawtimber
5306 = White Oak/Red Oak/Hickory Sparse Sawtimber
5307 = White Oak/Red Oak/Hickory Low Quality Poletimber
5308 = White Oak/Red Oak/Hickory Low Quality Sawtimber
5310 = White Oak/Red Oak/Hickory Mature Sawtimber
5311 = White Oak/Red Oak/Hickory Immature Poletimber
5312 = White Oak/Red Oak/Hickory Immature Sawtimber

Barber Ridge Road and FDR 96036A road work shown in inset above. Located app. 2.0 miles west of this location.

Road Reconstruction continues for app. 0.9 miles to intersection with FDR 1626

Legend

- Compartment Boundary
- Stand Boundary
- Private Land
- Pine Shelterwood
- Pine Thinning
- Pine and Hardwood Thinning
- Seedtree Removal
- Cedar Thinning
- Borrow Pit Development
- Existing Road Closure w/i Project
- Proposed Road Closure
- Proposed Road Closure Removal
- Existing Gas Well
- Mt. Magazine OHV Trail
- Mt. Magazine OHV Trail and Huckleberry Mtn. Horse Trail
- Proposed Trail Width Restriction Road Closure
- Proposed Trail Width Restrictor
- Trail and Road Decommissioning
- State Highway
- Roads
- Road Realignment
- Road Reconstruction
- Road Construction
- Road Maintenance
- Road Decommissioning

0 0.3 0.6 1.2 Miles

Ozark National Forest
Mt. Magazine Ranger District

Shoal Project
Compartments 23, 27, 28, 31, and 62

Silvicultural Treatment Map

Comp.	Stand	Acres	FTCC
23	1	62	3210
23	2	11	4712
23	3	64	3210
23	4	72	3212
23	5	26	3211
23	6	24	3111
23	8	13	3210
23	9	7	3212
23	10	14	3212
23	12	16	3212
23	13	47	3210
23	15	34	3211
23	16	70	3212
23	17	32	3111
23	19	62	3211
23	20	64	3210
23	23	45	3212
23	24	56	3212
23	25	34	3212
23	27	55	3212
23	29	58	3212
23	31	41	3212
23	32	108	3212
23	33	25	3212
23	34	45	3212
23	35	62	3212
23	37	16	4712
23	38	13	5311

Comp.	Stand	Acres	FTCC
27	1	45	3210
27	2	88	5312
27	3	30	3210
27	4	65	3211
27	5	12	3212
27	6	39	3210
27	7	33	3212
27	8	134	5312
27	9	12	3210
27	10	52	3211
27	11	23	3210
27	12	50	5312
27	13	39	5310
27	14	21	3211
27	15	2	3212
27	16	24	3210
27	17	27	5307
27	18	61	5310
27	19	4	3211
27	20	6	3211
27	21	12	3211
27	22	27	3211
27	23	12	3211
27	24	34	3212
27	25	9	3211
27	26	35	3210
27	27	13	3210
27	28	48	3212
27	29	22	3210
27	30	80	3211
27	31	34	3209
27	32	31	5311
27	33	36	3211
27	35	52	5308
27	36	34	3212
27	37	16	5307
27	38	9	3212
27	39	12	5307
27	40	9	3209
27	41	8	5312
27	43	46	3211
27	44	63	3211
27	45	30	3210

Comp.	Stand	Acres	FTCC
28	1	58	3211
28	2	133	3212
28	4	34	3212
28	5	232	5310
28	6	62	3213
28	7	117	5310
28	8	87	3213
28	9	19	4712
28	10	84	3210
28	11	49	4712
28	12	212	4710
28	13	116	5310
28	14	246	5306
28	15	29	3212
28	16	73	3210
28	19	69	3210
28	20	39	4710

Comp.	Stand	Acres	FTCC
31	1	25	3210
31	2	51	3212
31	3	103	3210
31	4	143	5310
31	5	22	3213
31	7	80	3212
31	8	39	5312
31	10	442	5312
31	11	76	3210
31	12	102	3210
31	13	160	1206
31	14	13	3210
31	15	487	5312
31	16	41	3210
31	17	71	3211
31	18	15	3111
31	19	15	3211
31	20	31	1212

Comp.	Stand	Acres	FTCC
62	1	21	3211
62	2	54	3210
62	3	62	1210
62	4	56	3211
62	6	52	3211
62	7	91	3212
62	8	33	3213
62	9	57	3211
62	11	62	3212
62	13	37	3211
62	14	8	5311
62	15	79	4711
62	16	39	3213
62	17	126	3212
62	18	59	3210
62	20	59	3210
62	21	14	3211
62	22	31	3212
62	23	40	3212
62	24	23	5311
62	25	57	3212
62	27	43	3212
62	28	21	3212
62	30	62	3210

Forest Type (FT) & Condition Class (CC)

1206 = Shortleaf Pine/Oak Sparse Sawtimber
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5312 = White Oak/Red Oak/Hickory Immature Sawtimber

Legend

- Compartment Boundary
- Stand Boundary
- Private Land
- Roads
- Road Construction
- Road Realignment
- Mt. Magazine OHV Trail
- Mt. Magazine OHV Trail and Huckleberry Mtn. Horse Trail
- Pine Site Preparation - Handtools/Chemical, Prescribe Burning
- Pine Planting - Handtools
- Pine Release - Handtools/Chemical
- Non-Native Invasive Species Treatment (up to 700 Acres/Year)
- Existing Gas Well

N

The Forest Service uses the most current and complete data available. GIS data and products may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results.

The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information contact: Mt. Magazine Ranger District, P.O. Box 511, Paris, AR 72855, (479) 963-3076.

0 0.25 0.5 1 Miles

Ozark National Forest
Mt. Magazine Ranger District

Shoal Project
Compartments 23, 27, 28, 31, and 62

Wildlife Habitat Improvement Map

Comp.	Stand	Acres	FTCC
23	1	62	3210
23	2	11	4712
23	3	64	3210
23	4	72	3212
23	5	26	3211
23	6	24	3111
23	8	13	3210
23	9	7	3212
23	10	14	3212
23	12	16	3212
23	13	47	3210
23	15	34	3211
23	16	70	3212
23	17	32	3111
23	19	62	3211
23	20	64	3210
23	23	45	3212
23	24	56	3212
23	25	34	3212
23	27	55	3212
23	29	58	3212
23	31	41	3212
23	32	108	3212
23	33	25	3212
23	34	45	3212
23	35	62	3212
23	37	16	4712
23	38	13	5311

Comp.	Stand	Acres	FTCC
27	1	45	3210
27	2	88	5312
27	3	30	3210
27	4	65	3211
27	5	12	3212
27	6	39	3210
27	7	33	3212
27	8	134	5312
27	9	12	3210
27	10	52	3211
27	11	23	3210
27	12	50	5312
27	13	39	5310
27	14	21	3211
27	15	2	3212
27	16	24	3210
27	17	27	5307
27	18	61	5310
27	19	4	3211
27	20	6	3211
27	21	12	3211
27	22	27	3211
27	23	12	3211
27	24	34	3212
27	25	9	3211
27	26	35	3210
27	27	13	3210
27	28	48	3212
27	29	22	3210
27	30	80	3211
27	31	34	3209
27	32	31	5311
27	33	36	3211
27	35	52	5308
27	36	34	3212
27	37	16	5307
27	38	9	3212
27	39	12	5307
27	40	9	3209
27	41	8	5312
27	43	46	3211
27	44	63	3211
27	45	30	3210

Comp.	Stand	Acres	FTCC
28	1	58	3211
28	2	133	3212
28	4	34	3212
28	5	232	5310
28	6	62	3213
28	7	117	5310
28	8	87	3213
28	9	19	4712
28	10	84	3210
28	11	49	4712
28	12	212	4710
28	13	116	5310
28	14	246	5306
28	15	29	3212
28	16	73	3210
28	19	69	3210
28	20	39	4710

Comp.	Stand	Acres	FTCC
31	1	25	3210
31	2	51	3212
31	3	103	3210
31	4	143	5310
31	5	22	3213
31	7	80	3212
31	8	39	5312
31	10	442	5312
31	11	76	3210
31	12	102	3210
31	13	160	1206
31	14	13	3210
31	15	437	5312
31	16	41	3210
31	17	71	3211
31	18	15	3111
31	19	15	3211
31	20	31	1212

Comp.	Stand	Acres	FTCC
62	1	21	3211
62	2	54	3210
62	3	62	1210
62	4	56	3211
62	6	52	3211
62	7	91	3212
62	8	33	3213
62	9	57	3211
62	11	62	3212
62	13	37	3211
62	14	8	5311
62	15	79	4711
62	16	39	3213
62	17	126	3212
62	18	59	3210
62	20	59	3210
62	21	14	3211
62	22	31	3212
62	23	40	3212
62	24	23	5311
62	25	57	3212
62	27	43	3212
62	28	21	3212
62	30	62	3210

Forest Type (FT) & Condition Class (CC)

1206 = Shortleaf Pine/Oak Sparse Sawtimber
1210 = Shortleaf Pine/Oak Mature Sawtimber
1212 = Shortleaf Pine/Oak Immature Sawtimber
3111 = Loblolly Pine Immature Poletimber
3209 = Shortleaf Pine Mature Poletimber
3210 = Shortleaf Pine Mature Sawtimber
3211 = Shortleaf Pine Immature Poletimber
3212 = Shortleaf Pine Immature Sawtimber
3213 = Shortleaf Pine Seedlings/Saplings
4710 = White Oak/Black Oak/Yellow Pine Mature Sawtimber
4711 = White Oak/Black Oak/Yellow Pine Immature Poletimber
4712 = White Oak/Black Oak/Yellow Pine Immature Sawtimber
5306 = White Oak/Red Oak/Hickory Sparse Sawtimber
5307 = White Oak/Red Oak/Hickory Low Quality Poletimber
5308 = White Oak/Red Oak/Hickory Low Quality Sawtimber
5310 = White Oak/Red Oak/Hickory Mature Sawtimber
5311 = White Oak/Red Oak/Hickory Immature Poletimber
5312 = White Oak/Red Oak/Hickory Immature Sawtimber

Legend

- Compartment Boundary
- Stand Boundary
- Private Land
- Roads
- Mt. Magazine OHV Trail
- Mt. Magazine OHV Trail and Huckleberry Mtn. Horse Trail
- Stream Habitat Management
- Wildlife Stand Improvement
- Wildlife Habitat Improvement/Fuels Reduction Prescribed Burning
- Exclude from Prescribed Burning First Entry
- Existing Road Closure w/I Project
- Wildlife Opening Construction/Restoration
- Wildlife Opening Enlargement/Restoration
- Wildlife Opening Restoration
- Existing Wildlife Pond
- Existing Gas Well
- Proposed Aquatic Organism Passage

The Forest Service uses the most current and complete data available. GIS data and products may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results.

The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information contact: Mt. Magazine Ranger District, P.O. Box 511, Paris, AR 72855, (479) 963-3076.

0 0.25 0.5 1 Miles

Ozark National Forest
Mt. Magazine Ranger District

Shoal Project
Compartments 23, 27, 28, 31, and 62

Trail Improvement Map

R24W R23W T7N T6N

St. Louis Valley Road · Sorghum Hollow Road · Spring Lake Road · Barber Ridge Road

31 28 62 27 23

1685 1685A 1685B 1685C 1662 1660 1660A 1660C 1604 1604A 1687E 1687F 1614B 1624 1624A 1613 1613B 1657 1607 1607D 1690 1690A 1690B 1627D 1627E 1627A 1612A 1558

96033A 96033B 96033C 96033D 96033E 96033F 96033G 96034C 96062A 96062B 96062C 96062D 96062E 96062F 96023A 96023B 96023C 96023D 96023E 96028A 96028B 96028C 96028D 96028E 96028F 96031A 96022A 96022B 96022C 96076A 96076B 96065A 96065B 96065C 96065D 96065E 96065G 96064A 96064D 96027A 96027B 96027C 96027D 96027E 96027F 96063A 96063B 96063C 96063D 96063E 96063G 96018A 96081A 96025B

1627A

Legend

- Compartment Boundary
- Private Land
- Roads
- Road Realignment
- Mt. Magazine OHV Trail
- Mt. Magazine OHV Trail and Huckleberry Mtn. Horse Trail
- Trail Relocation - Huckleberry Mtn. Horse Trail & OHV Trail
- Trail Decommissioning
- Trail and Road Decommissioning
- Existing Road Closure w/I Project
- Proposed Road Closure
- Proposed Trail Width Restrictor and Road Closure
- Proposed Trail Width Restrictor
- Proposed Trail Width Restriction for Vehicles 50" or less
- Existing Gas Well

N

0 0.25 0.5 1 Miles

C. DETAILED DESCRIPTION OF ALTERNATIVE 2 (NO ACTION ALTERNATIVE)

None of the proposed actions would be implemented.

D. MITIGATION MEASURES

For each alternative, all applicable standards in the Ozark-St. Francis Land and Resources Management Plan would be applied. The following standards and guidelines are incorporated by reference in this environmental assessment:

LRMP -- pages 3-1 to 3-21 (Forestwide Standards), page 3-35 (Management Area 3.A – Pine Woodland), page 3-35 (Management Area 3.C – Mixed Forest), and page 3-37 (Management Area 3.I – Riparian Corridors).

Best Management Practices (BMP) Guidelines for Water Quality Protection (Arkansas Forestry Commission, 2002) and selected Region 8 Timber Sale AT, BT, and CT Clauses would also apply as standard mitigation measures for all proposed actions.

Appropriate mitigation measures from the Scenery Management Guide – Southern Regional National Forests, April 2008 (U.S. Department of Agriculture - Forest Service, 2008) would apply as standard mitigation measures.

Some of the more important of these mitigation measures and standards and guidelines are summarized below along with specific mitigation measures for this project. This list is not all-inclusive. The above documents should be referenced for a complete list.

1) Logging slash would be placed above the ordinary high water mark of any stream (Arkansas Forestry Commission BMP).

2) Concurrent with temporary road construction, install silt barriers at the base of the cut and fill slopes within 50 feet of a stream course (LRMP, p. 3-11).

3) At stream crossings, seed and mulch cut and fill slopes within 50 feet slope distance within 5 days after construction of temporary roads (LRMP, p. 3-11).

4) Apply gravel at temporary road crossings for 35 feet on both sides of the stream channel, when the risk of soil erosion is present and where the crossing substrate requires hardening (LRMP, p. 3-11).

5) On temporary roads, apply gravel on steep grades exceeding 10 percent slope (LRMP, p. 3-11).

6) Soil disturbances within SMZs would be treated with erosion control measures within five days (LRMP, p. 3-11).

7) Streamside management zones (SMZs) would be identified and designated during the appropriate stages of project planning for all defined channels, perennial streams, and springs. Minimum SMZs would be as described below based on the percent of the adjacent slope (LRMP, p. 3-12):

Stream Type	Slope Adjacent to the Channel		
	0-15%	16-35%	36%+
Description	Horizontal Distance from Both Sides of Stream Bank or Lake/Pond		
Perennial & Springs	100’	125’	150’
Defined Channels	50’	75’	100’

- Vegetation within 20 feet of the bank of a perennial stream and 5 feet of a defined channel would not be removed.
- Retain at least 50 square feet per acre of basal area within the SMZs when available.
- No mechanical site preparation is allowed within the SMZs.

- Within SMZs, only non-motorized trails are allowed. Motorized trails are prohibited except at designated crossings or where the trail location requires some encroachment for safety.
- No more than five percent of the mineral soil within the SMZs would be exposed during ground disturbing activities.
- Exceptions to SMZ standards are only allowed after site-specific determinations and with consultation/approval by the appropriate Staff Officer (LRMP, p. 3-12).

8) On all soils dedicated to growing vegetation, the organic layers, topsoil, and root mat would be left intact over at least 85 percent of an activity area (LRMP, p. 3-12).

9) Removal of natural debris from streams would only be allowed where it poses a significant risk to public safety or threatens private property or Forest Service infrastructure (LRMP, p. 3-12).

10) Within the SMZs, cross only at designated crossings identified during planned activities. Cross at a 90-degree angle and utilize temporary structures to maintain bank stability (LRMP, p. 3-13).

11) When temporary culverts or other approved structures are used, they must be removed upon completion of the activity. Streamside management zones disturbances would be restored to a stable, natural condition (LRMP, p. 3-13).

12) Soil and debris would not be deposited in wetlands, springs, or seeps (LRMP, p. 3-13).

13) Logging and roadwork would be restricted during wet soil conditions to minimize resource damage.

14) During harvesting, signs would be posted to caution users of FDR 1604, 1607, 1613, 1624, 1657, 1687E, 1690, St. Louis Valley Road, and Spring Lake Road.

15) Logging slash would not be left over two feet high within 50 feet of FDR 1604, 1607, 1613, 1624, 1657, 1687E, 1690, St. Louis Valley Road, and Spring Lake Road.

    Slash within these zones would both be lopped within 2 feet of the ground and scattered or slash would be dragged out of this zone. Broken trees and leaners within these zones would be dropped to lessen their disturbance.

16) A 100’ buffer of thinning on each side of the Huckleberry Mtn. Horse Trail and/or Mt. Magazine OHV Trail would be implemented in shelterwood areas. These buffers would be thinning to a basal area of no less than 70 sq. ft./acre.

17) In thinning areas adjacent to the Huckleberry Mtn. Horse Trail and/or Mt. Magazine OHV Trail, thinning to a basal area of no less than 70 sq. ft./acre would be adhered to within 100’ on each side of the trail.

18) Slash within these 100’ buffers along the Huckleberry Mtn. Horse Trail and/or Mt. Magazine OHV Trail would be dragged for 50’ and lopped and scattered to a height of 2’ or less for an additional 50’ on each side of a trail.

19) Protect the visual resource by stand shaping and irregular boundaries in the proposed shelterwood stands as needed to achieve the visual quality objective. Take advantage of any opportunities to leave groups of hardwoods in pine regeneration areas.

20) Heritage sites that are determined eligible for the National Register and sites that have undetermined eligibility (listing provided in Appendix D would be protected from any ground-disturbing activities associated with this project. Buffers would be painted around these sites, and heavy machinery would not be allowed within these boundaries. If additional sites are found during implementation of this project, they would be examined and necessary mitigation measures prescribed by the Forest or District Archaeologist, in consultation with the Arkansas SHPO and relevant federally recognized Tribes, would be implemented.

    Sites that have been determined not eligible for nomination to the National Register would not be

protected unless there is a safety concern or traditional cultural practice associated with the site.

21) A review of listings and locations of all known occurrences of proposed, endangered, threatened, or sensitive species (PETS) has been conducted. In addition, field surveys have been made on all stands to be impacted by each of the action alternatives. No critical or essential habitat for any PETS species was identified in these compartments. If any additional PETS species are discovered prior to or during implementation, the project would be halted and a new biological evaluation would be made to determine the effects on the species and its habitat. A Biological Evaluation was prepared for this project and is part of the process file.

    Timber harvest activities would leave, on average, a minimum of six roost trees, snags, or potential roost trees per acre as per the 1998 U.S. Fish and Wildlife Service Biological Opinion for the Indiana Bat (U.S. Fish and Wildlife Service, 1998).

    If Ozark chinquapin were located in a stand to be treated with herbicide, the trees would be placed in a 60-foot buffer, inside which no treatment with herbicides or handtools would occur.

22) Maintain the following average standing dead, existing, and potential hollow den and loose bark trees per acre forest wide:

    - Primary and Secondary Indiana Bat Zones – 9 snags per acre
    - All other areas:
        2 snags per acre greater than 12” dbh; plus
        4 snags per acre
      Total 6 snags per acre

    Snags would be left from the largest size classes and maybe clumped (LRMP, p. 3-6).

23) Mast producing trees 8.0" diameter or larger at 4.5' height above ground level would not be treated during site preparation unless otherwise approved by a wildlife biologist or technician.

24) Exclude herbicide application from designated hardwood key areas.

    The following trees, shrubs, and plants - regardless of size and of treatment method - would not be treated during site preparation or release: black cherry, dogwood, French mulberry, persimmon, serviceberry, plum, Ozark chinquapin, and rough hawkweed.

25) During site preparation and release in all alternatives, treatments with handtools and/or herbicide would not be done within 100 feet of private land.

26) Herbicides and application methods are chosen to minimize risk to human and wildlife health and the environment. Diesel oil would not be used as a carrier for herbicides, except as it may be a component of a formulated product when purchased from the manufacturer. Vegetable oils would be used as a carrier for herbicides when available and compatible with the application proposed (LRMP, p. 3-4).

27) Herbicides are applied at the lowest rate effective in meeting project objectives and according to guidelines for protecting human and wildlife health. Application rate and work time must not exceed levels that pose an unacceptable level of risk to human or wildlife health. If the rate or exposure time being evaluated causes the Margin of Safety or the Hazard Quotient computed for a proposed treatment to fail to achieve the current Forest Service Region 8 standard for acceptability (acceptability requires a MOS > 100 or, using the SERA Risk Assessments found on the Forest Service website, a HQ of < 1.0), additional risk management must be undertaken to reduce unacceptable risks to acceptable levels or an alternative method of treatment must be used (LRMP, p. 3-4).

28) Fuelwood sales would not be made for a minimum of 30 days after treatment in areas where pesticide treatments have been made. Should injection of trees be done, effected trees would not be sold as fuelwood (LRMP, p. 3-4).

29) Weather is monitored and the project is suspended if temperature, humidity, and/or wind do not meet the criteria shown below (LRMP, p. 3-4).

Application Techniques	Temperatures Higher Than	Humidity Less Than	Wind (at Target) Greater Than
Ground			
Hand (cut surface)	NA	NA	NA
Hand (other)	98°	20%	15 mph
Mechanical (liquid)	95°	30%	10 mph
Mechanical (granular)	NA	NA	10 mph

29) Each Contracting Officer's Representative (COR), who must ensure compliance on contracted herbicide projects, is a certified pesticide applicator (LRMP, p. 3-5).

30) A certified pesticide applicator supervises each Forest Service application crew and trains crew members in personal safety, proper handling in application of herbicides, and proper disposal of empty containers (LRMP, p. 3-5).

31) With the exception of treatment by permittees of right-of-way corridors that are continuous into or out of private lands and through Forest Service managed areas, no herbicide is broadcast within 100 feet of private land or 300 feet of a private residence unless the landowner agrees to closer treatment. Buffers are clearly marked before treatment so applicators can easily see and avoid them (LRMP, p. 3-5).

32) Application equipment, empty herbicide containers, clothes worn during treatment, and skin are not cleaned in open water or wells. Mixing and cleaning water must come from a public water supply and be transported in separate labeled containers. (LRMP, p. 3-5).

33) Herbicide mixing, loading, or cleaning areas in the field are not located within 300 feet of private lands, open water or wells, or other sensitive areas (LRMP, p. 3-5).

34) Herbicide would not be used within the appropriate SMZs or within 300 feet of any public or domestic water intake. Selective treatments may occur within SMZs only when a site-specific analysis of actions to prevent significant environmental damage such as noxious weed infestations supports a "Finding of No Significant Impact" (FONSI), and then using only herbicides labeled for both terrestrial and aquatic use within these areas (LRMP, p. 3-5).

35) The risk of herbicide spills would be reduced by securing containers during transport, carrying only enough for a day's work, mixing and cleaning on the work site, proper disposal of containers and preparation of an emergency spill plan (U.S. Department of Agriculture – Forest Service, 1981). This spill plan is part of the process file.

36) Edible berries would not be treated with herbicide.

37) Herbicide application would be suspended by the COR or inspector if rainfall is heavy enough to cause movement of herbicide from target species.

38) Best available smoke management practices (FSM 5140, Arkansas Smoke Management Guidelines, and State Implementation Plans) would be used to minimize the adverse effects of prescribed burning on public health and safety and to protect visibility in Class I Area (Upper Buffalo Wilderness) (LRMP, p. 3-13).

39) Prescribed burning would be conducted in, or adjacent to, counties with forecasted high Air Quality Index (AQI) values (AQI equals orange or higher) only if meteorological conditions indicate that smoke would be carried away from the high AQI area (LRMP, p. 3-13).

40) Conduct all National Forest management activities in a manner that does not result in (1) a significant

contribution to a violation of National Ambient Air Quality Standards or (2) a violation of applicable provisions in the State Implementation Plan (LRMP, p. 3-13).

41) Herbicide treatment areas would not be prescribed burned for at least 30 days after application (LRMP, p. 3-20).

42) In any prescribed burning, the duff layer would remain present on 80 percent of the burn area (LRMP, p. 3-20).

43) Appropriate erosion control strategies would be applied to fire lines in order to minimize soil erosion (LRMP, p. 3-20).

44) If necessary to cross a stream with a fireline, the crossings would be as close to right angles as possible and be stabilized as soon after the fire is controlled as possible (LRMP, p. 3-20).

Monitoring

Implementation monitoring would be accomplished through harvest and contract inspections conducted by certified timber sale administrators and contract inspectors. This would ensure the appropriate standards and guidelines would be implemented to protect soil productivity, water quality and other resources.

For Alternative 1, surveillance monitoring to ensure that herbicide label instructions are being followed would be conducted as part of contract administration. To monitor the offsite movement of herbicides, water samples would be collected and analyzed on 10% of the district's project per year in accordance with the Ozark-St. Francis National Forest's Herbicide Monitoring Plan for Water Quality.

Survival monitoring would be done to determine success of reforestation efforts in regeneration areas.

Monitoring of prescribed burns would be done in accordance to prescribed burning plans. Results of the burns would be monitored and documented.

Those areas that are proposed to have timber harvest and/or prescribed burning would have an additional post-treatment walkover for heritage resource examination. Post treatment walkover would be conducted according to the direct gradient method that has been found highly successful in site discovery (Collins and Bousman 1993, Lockhart, et al., 1995). Landforms that appear to have intact soils and high potential for human use or occupation (e.g. benches, river flats and slopes and floodplain terraces) would be given special attention in an effort to maximize the potential of finding as many sites as possible.

E. COMPARISON OF ALTERNATIVES

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively among alternatives.

Table 3. Comparison of Effects Summary Matrix.*

ACTION	ALTERNATIVE 1	ALTERNATIVE 2
AIR QUALITY		
Emissions Released from Prescribed Burning (in micrograms/cubic meter of air):		
Hand Ignition:		
Particulate Matter 2.5	13.7 µg/m^{3**}	----
Particulate Matter 10.0	16.2 µg/m^3	----
Aerial Ignition:		
Particulate Matter 2.5	27.4 µg/m^3	----
Particulate Matter 10.0	32.3 µg/m^3	----
Lightning, Arson, or Accidental Ignition:		
Particulate Matter 2.5	----	0.13 µg/m^3
Particulate Matter 10.0	----	0.16 µg/m^3
SOIL AND WATER IMPACTS		
Disturbance Acres (skid trails, temporary road construction, road reconstruction, fireline construction)	726 acres	----
% of Total Activity Area	10%	----
SOIL AND WATER IMPACTS, continued		
Gulf Creek and Dee Creek Watersheds		
Percent increase of sediment above undisturbed conditions	318%	272%
Concern Level	Moderate	Low
ECONOMICS		
Present Value Revenues	$ 3,344,561	$ 690,781
Present Value Costs	2,683,385	----
Net Present Value	$ 661,175	$ 690,781
Benefit/Cost Ratio	1.25	----

*All measures are approximations.

III. ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives.

A. SOILS

Existing Condition

The analysis area (Compartments 23, 27, 28, 31, and 62) for soils consists mostly of broad gently sloping ridgetops separated by sloping to moderately steep side slopes, nearly vertical bluffs, and narrow stream valleys. The bluffs are separated by nearly level to gently sloping benches. Soils are stable throughout the project area except for an unstable area in Compartment 28/Stand 14. The unstable area ranges from about 66 feet to 132 feet wide and extends from 700 feet to 1200 feet in elevation. About 50% of the project area is on slopes less than 8%, 20% is on slopes between 8 and 20%, and the remainder is steeper than 20%.

There is a temporary loss in soil productivity on approximately four acres due to previous seedtree harvest in Compartment 31/Stand 5 and Compartment 62/Stands 8 and 16.

Soils are mostly well drained and range from shallow to deep. There are some deep well drained soils on the floodplains and terraces along Big Shoal and Brushy Creeks which have small inclusions of poorly drained hydric soils in depressions. There are some very small ephemeral wetlands that have hydric soils in depressions on benches in Compartment 28/Stands 13 and 16. Appendix B, page 111, contains a map showing the soil types for these compartments.

Effects

Alternative 1

Approximately 9 percent (682 acres) of the harvested area would sustain a temporary reduction in soil productivity due to harvesting operations. An additional 25 acres (<1% of the harvest area) would sustain a temporary reduction in soil productivity due to temporary road construction. Soil productivity would be lost on approximately 10 acres due to road construction, reconstruction, and realignment. Five acres would be taken out of productivity due to the development of a borrow pit. Approximately 4 acres of the project area would sustain a temporary reduction in soil productivity due to fireline construction. Approximately 8 acres of soil would be returned to productivity after proposed roads and trails are decommissioned.

Total expected temporary and permanent reduction of soil productivity would be 726 acres (10% of the activity area), including skid trails, temporary road construction, and fireline construction. Decommissioning roads and trails would reduce the temporary and permanent reduction of soil productivity to 718 acres. Temporary roads, primary skid trails, and landings would be disked, seeded and closed following harvesting to speed the recovery of the soil productivity. Firelines would be bladed and seeded when prescribed burning is completed to speed recovery of soil productivity and to prevent erosion.

Approximately 10 acres of soil would be taken out of production due to realignment and widening during road reconstruction. However, road reconstruction would stabilize these roads and prevent loss of productivity on soils adjacent to these roads and would reduce erosion and sedimentation. Road maintenance and road closure would also prevent the loss of productivity on soils adjacent to the roads by helping to control runoff. Less than 15% of an activity area can sustain a reduction in soil productivity, according to the LRMP standard (FW85 LRMP p. 3-12). If more than 15% of the activity area sustains a reduction in soil productivity, mitigation measures must be installed to reduce the temporary loss in soil productivity below 15%. The documentation for temporary reduction in soil productivity can be found in the analysis file.

Trail relocation and the placement of width restrictors on the trails would reduce sedimentation and erosion in these areas.

Wildlife opening construction/restoration and wildlife opening enlargement/restoration would cause some soil disturbance and a temporary increase in erosion. Disking, seeding, and fertilizing would quickly reduce the impacts on soil productivity and erosion.

Placement of large woody material in streams could cause a slight increase in erosion at points along the streams where trees are felled into the stream, but these areas should revegetate quickly and erosion would decline to natural levels.

Site preparation, planting, and release would have little impact on soils because handtools would be used. Treatment of invasive species, wildlife stand improvement, and wildlife opening restoration is also expected to have little or no impact on soils.

Triclopyr is absorbed by plant roots, but it is not considered effective as a soil-applied herbicide. Triclopyr is adsorbed primarily to organic matter particles in soil. The organic matter content is the primary factor in the degree of soil adsorption. Long-term forest and pasture field studies found very little indication that triclopyr would leach substantially either horizontally or vertically in loamy soils (Syracuse Environmental Research Associates, Inc., 2003b). Microorganisms degrade triclopyr readily. It degrades more rapidly under warm, moist conditions which favor microbial activity. The average half-life for triclopyr in soil is 30 days (Tu et. al. 2001). Triclopyr did not affect the growth of soil microorganisms up to 500 parts per million (U.S. Department of Agriculture – Forest Service, 1984). Triclopyr can be slightly toxic to bacteria, actinomycetes and fungi (Sapundzhieva, 1987 cited in Brown et. al. 1990). The warm temperatures at the time of application and the high density of plant roots are expected to rapidly degrade triclopyr.

Imazapyr is relatively non-toxic to soil microorganisms, aquatic invertebrates, and fish. Effects on bacteria appear to be highly species specific with variations in sensitivity of up to a factor of 100. Imazapyr appears to have the potential to shift bacterial soil populations that contain sensitive species of bacteria. There does not appear to be any basis for asserting that imazapyr is likely to adversely affect microorganisms in soil. If imazapyr were extremely toxic to terrestrial microorganisms that are important for the maintenance of soil suitable for plant growth, it seems reasonable to assume that secondary signs of injury to microbial populations would have been reported (Syracuse Environmental Research Associates, Inc., 2004a). Degradation halftime in soils ranges from 25 to 180 days.

Glyphosate is readily metabolized by soil bacteria and many species of soil microorganisms can use glyphosate as sole carbon source (Syracuse Environmental Research Associates, Inc. 2003a). There is very little information suggesting that glyphosate would be harmful to soil microorganisms under field conditions and a substantial body of information indicating that glyphosate is likely to enhance or have no effect on soil microorganisms. Most field studies involving microbial activity in soil after glyphosate exposures note an increase in soil microorganisms or microbial activity and the application of glyphosate may cause transient increases in soil fungi that may be detrimental to some plants. While the mechanism of this apparent enhancement is unclear, it is plausible that glyphosate treatment resulted in an increase in the population of pathogenic fungi in soil because glyphosate was used as a carbon source by the fungi and/or treatment with glyphosate resulted in increased nutrients for fungi in the soil. There is no indication that the transient enhancement in populations of soil fungi or bacteria would result in any substantial or lasting damage to soil ecology.

Because of the lack of information on the toxicity of imazapic to terrestrial microorganisms, no quantitative risk assessment for this group can be given (Syracuse Environmental Research Associates, Inc., 2004b). Nonetheless, imazapic has been used effectively to control unwanted vegetation in both crop and non-crop applications. If imazapic were extremely toxic to terrestrial microorganisms that are important for the maintenance of soil suitable for plant growth, it seems reasonable to assume that secondary signs of injury to microbial populations would have been reported.

There is a potential for additional temporary loss in soil productivity in the seedtree units that have seedtree removal harvests planned. Four acres of these units have a temporary loss in soil productivity. Nine acres of additional temporary loss of soil productivity is estimated for these units. Seedtree removal harvest is proposed for the 653 acres of shelterwood harvest. Approximately 59 acres of soil in these units is expected to sustain a temporary loss in soil productivity due to the initial harvest. An additional 26 acres of soil is estimated to sustain a temporary loss in soil productivity due to the removal of the seedtrees in the future.

The existing and estimated additional temporary loss in soil productivity equal 85 acres which is 13 percent of the shelterwood harvest and seedtree removal area. The actual amount of the temporary loss of soil productivity is expected to be less because the same skid trails would be used and erosion control measures would speed the recovery of the soil during the interval between the first and second harvest. The cumulative effects are not significant because the existing and estimated temporary loss in soil productivity is within the LRMP standard.

Alternative 2 (No Action)

Road reconstruction, realignment, and maintenance would not occur and roads would continue to erode and be compacted on the floodplain of Shoal Creek. The Huckleberry Mountain Horse Trail and the Mt. Magazine OHV Trail would continue to have areas in extremely poor condition due to high use and drainage issues. Existing soil processes would continue.

B. WATER QUALITY

Existing Condition

Watersheds in the United States are divided into progressively smaller units known as hydrologic units, recognized by the U.S. Geological Survey (USGS) as regions, sub-regions, basin, and sub-basin units. This hierarchical division of watershed boundaries is useful for assigning address-like codes to drainage basins. This project area falls within the Arkansas-White-Red region (11), the Arkansas sub-region (1111), the Lower Arkansas- Fourche La Fave basin (111102), and the Petit Jean sub-basin unit (11110202) (U.S. Geological Survey, 2003). The Ozark-St. Francis National Forest further classifies land areas into two progressively smaller units: watersheds and sub-watersheds. The proposed project falls into the Big Shoal Creek (1111020205) watershed. At the smallest scale, the proposed project is located within the Gulf Creek (111102020501) (18,144 acres) and Dee Creek (111102020502) (20,754 acres) sub-watersheds. These sub-basins or 6th level HUC areas will serve as the analysis area for the proposed project with respect to water resources.

The project area and the sub-basin analysis area support streams and rivers that have a trellised drainage pattern. Trellised drainage patterns typically have short, closely spaced tributaries, which can result in rapid storm responses. There are approximately 36 miles of streams within the project area, which falls within the analysis area that contains approximately 62 miles of streams. The primary streams that are found in the project area are Big Shoal Creek, Brushy Creek, and Gulf Creek plus several unnamed tributaries to these streams.

The project area geology consists of Pennsylvanian age clastic sedimentary rocks of the Atoka, Hartshorne and McAlester formations (McFarland, 2004). These are primarily sandstones and shales that are not particularly good aquifers. Therefore, the base flow contributions necessary to maintain perennial streams are highly variable and associated with seasonal climatic variation.

Climate information obtained for the project area was derived from information for the town of Subiaco, AR (U.S. Department of Agriculture – Natural Resources Conservation Service, 2005). The bars on the graph in Figure 6 indicate average precipitation and the dotted line shows the average temperature. Mid-winter and late summer are found to be the driest portions of the year, this combined with the high temperatures indicated for July and August suggests that stream flow would most likely be the lowest during the late summer.

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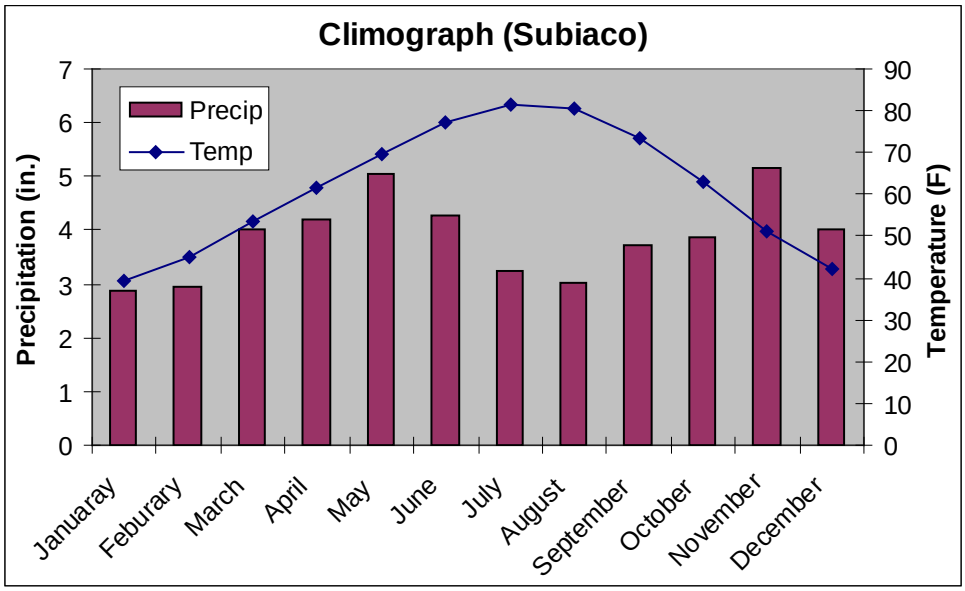
Figure 6 . Climate Information for Water Resource Analysis.



Within the 6th level watershed analysis area, approximately 86% of the land is administered by the Forest Service. This leaves a sizable portion of the land within the watersheds as privately owned. Land use within the Gulf Creek watershed is approximately 98% forested. The balance of the land uses in the Gulf Creek watershed are mainly pastures. In the Dee Creek watershed, approximately 79% of the land is forested and 20% is pasture, leaving 1% as urban, cultivated, and water.

Forested land uses indicate a stable landscape that results in minimal amounts of natural or background erosion, especially for Arkansas (Miller and Liechty, 2001). For many parts of the Ozark-St. Francis NF, the prevalent soil cover contains many rocks and rock fragments which ultimately limit the erosive susceptibility of the soils. Measured erosion for minimally disturbed forest lands rarely exceed 0.25 tons per acre where soil erosion from cropland has been estimated at 3.8 tons per acre (Patric et al., 1984; U.S. Department of Agriculture – Soil Conservation Service, 1989).

Using State Soil Geographic Soil Database (STATSGO) information, the project area soils have been given a slight to moderate rating for woodland erosion and woodland management equipment use (U.S. Department of Agriculture – Natural Resources Conservation Service, 1994). Woodland erosion risk ratings indicate the probability of damage and erosion of soils as a result of timber harvest and site preparation where soils become exposed. Woodland equipment ratings indicate that year round equipment use on these soils is appropriate.

Within the analysis area, roads are found both within the forest boundaries and outside the forest boundaries. There are approximately 103 miles of roads within the analysis area and 36 miles of roads within the project area. Also present within the project area are approximately 20.4 miles of the Huckleberry Mountain Horse Trail and Mt. Magazine OHV Trail. Within the project area, there are approximately 6 stream crossings where the current road system crosses or intersects a stream.

According to the National Wetland Inventory Database, there are some small inclusions of wetlands located along the edges of Big Shoal Creek. These inclusions are likely less than one half acre in size and are directly associated with the adjacent stream.

Floodplains were identified on the forest within the project area. These features were mainly found to occur along Big Shoal Creek and a few of its tributaries. Floodplains and any associated riparian areas occur in narrow strips near the stream channels.

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The proposed project is located in the Arkansas River Valley ecoregion as identified by the Environmental Protection Agency (EPA) as a revision of work produced by Omernick (1987). These are the same ecoregion divisions recognized by the state for use in defining water quality standards. Thus, water quality standards for the project area, and the sub-watershed analysis areas for this project, are determined by the Arkansas Pollution Control and Ecology Commission Regulation 2 – Water Quality Standards for Surface Water (2004). The designated uses assigned to the surface waters in the project area are as follows: for all waters, secondary contact recreation, domestic, industrial and agricultural water supply, seasonal Arkansas River Valley fishery. For surface water where the watershed is greater than 10 square miles, and all lakes and reservoirs, the designated uses are the same as above but include primary contact recreation and perennial Arkansas River Valley fishery. There are no 303d listed streams (impaired water bodies) within these watershed analysis area boundaries.

The U.S. Geological Survey's Ozark Plateaus National Water Quality Assessment Program has studied existing land uses in the region and their impacts on water quality. Trends that show increased nitrogen, phosphorous, and coliform bacteria concentrations occur with increases in agricultural and urban land uses (Davis and Bell, 1998). Forested land use has a much lower concentration of these constituents. This data does not isolate the direct or transient effects of timber harvest on nutrients but it does illustrate the water quality impacts of alternative land uses in the Ozarks and surrounding Arkansas Landscapes.

Effects

Alternative 1

The main issue with respect to forest management activities and water quality are effects to water quality that may result from the proposed project; changes to water quality should not exceed the standards determined for the identified designated uses. The activities which may illicit direct and indirect effects are those of vegetation management, silvicultural site preparation, road construction, and prescribed burning.

In a summary of silviculture activity effects in the Ozark-Ouachita Highlands, Lawson (1986) documented the undisturbed erosion from small watersheds and the amount of sediment produced as a result of vegetation management practices. The undisturbed sites produced about 13.8 lbs/acre of sediment with 70% of this amount attributed to large precipitation events. A seedtree harvest was described to produce three times this amount of sediment during the first year after harvest with 31.3 lbs/acre, three years after the treatment the erosion rates were similar to the undisturbed state. This is roughly equivalent to a 5-gallon bucket of soil. Another study by Lawson and Hileman (1982) investigated the effects of seedtree removal and site preparation burning. The results indicated that there were no statistically significant differences in stream turbidity between seedtree removal sites and undisturbed control sites. Thus, seedtree silvicultural practices in Arkansas would result in the production of sediment, but at levels below those found on typically managed forest lands of the eastern United States. Therefore, the vegetation management practices proposed for this project would result in temporary increases of sediment but at relatively low levels for a short duration.

Using paired watershed studies for regions of the United States, effects of silviculture practices on annual average stream discharge was depicted by Stednick (1996). In this study, the actions necessary for producing measurable increases in water yield from forest in Arkansas was determined to be a 50% reduction in basal area across an entire watershed. This level of vegetation harvest would result in an increase of roughly six inches above normal runoff values for the first year. The recovery period for water yield to return to pretreatment level was found to be a function of vegetation re-growth. For Arkansas, this means that water yields should return to pretreatment level quite rapidly; however; changes to peak flow and storm flow timing may continue if drainage patterns are altered by activities such as road construction. Any changes to runoff timing should not result in impacts to current water uses or quality.

Long-term implications of nutrient loading after timber harvest for streams in the south were described in a study by Lynch and Edwards (1991). In this study best management practices were used that include 100 foot wide perennial buffers, logging slash removed from streams, sale units were monitored by a responsible party, operations ceased during wet weather, roads laid out by professional, roads not exceeding 10% grade, culverts used to cross perennial streams and removed when done, water bars utilized, roads gated,

and filtration strips maintained. The results indicated that nutrients would not exceed water quality standards and that only during the treatment year would nutrients show a significant increase. An important conclusion was the demonstration of the effectiveness of BMPs for controlling nutrient export.

Herbicide use in this alternative is not broadcasted but applied by direct injection, cut surface, or foliar spray. For these purposes, herbicide use is infrequent (1-2 times per 100 yrs.) and direct application methods would minimize off-site movement. Forestwide Standards for herbicide application would be followed as well as appropriate BMPs designed to limit risk to water quality. Monitoring for herbicides used on the forest has been a continuous policy on Ozark-St. Francis National Forests for the last 10 years. Results from this monitoring have not documented any substantial concentrations of herbicides off-site from their application (unpublished reports). Other monitoring suggests that subsequent to runoff producing precipitation events, concentrations of herbicide (triclopyr) in ephemeral streams with BMP protections were very small and well below any sizeable risk concentration (unpublished report). When herbicide fate is measured in runoff water, two common outcomes are apparent. First, measured peak concentrations are of short duration. Second, the highest concentrations occur when buffer strips are not used on streams or where the streams were accidentally over flown during aerial application (Neary and Michael, 1996). No aerial application is planned for this project.

Exposure is determined by such things as application rate, chemical behavior in the environment and biological factors. Herbicides for forestry applications occur annually in amounts roughly equivalent to one tenth of one percent of their use in agriculture settings. Additionally many chemicals used in forestry applications break down fairly rapidly under normal conditions, usually within several weeks. Chemicals can enter streams through a variety of mechanisms - by direct application, drift, mobilization of residues in water, overland flow, and leaching. The most significant transport pathway would be direct application, drift, and mobilization during periods of heavy precipitation and overland flow. The most effective means for reducing this likelihood is to maintain a buffer between the area for use and waterbodies, and to plan appropriately for application time frames.

Herbicide applications to control competing vegetation do not disturb the nutrient rich topsoil layer, do not create additional bare soil, and do not adversely affect watershed condition when used responsibly (Neary and Michael, 1996). By utilizing herbicides, the organic matter is left in place and off-site soil movement does not increase the loss of nutrients following harvest activities compared to the other types of management practices. Maxwell and Neary (1991) concluded in a review that the impact of vegetation management techniques on erosion and sedimentation of water resources occurs in this order – herbicides, fire, then mechanical. They also concluded that sediment losses during inter-rotation vegetation management could be sharply reduced by using herbicides and moderate burning instead of mechanical methods and heavy burning.

Forestry use of herbicides poses a low pollution risk to groundwater because of its use pattern. Herbicide use in forestry is likely to occur only once or twice over rotations of 25 and 75 years. The greatest potential hazard to groundwater comes from stored concentrates, not operational application of diluted mixtures (Neary and Michael, 1996). Regional, confined, groundwater aquifers are not likely to be affected by silviculture herbicides (Neary,1985). Surface unconfined aquifers in the immediate vicinity of herbicide application zones have the most potential for contamination. It is these aquifers which are directly exposed to leaching of residues from the root zone. The only known groundwater contamination incidents of importance (contamination of bedrock aquifers, persisting more than 6 months, concentrations in excess of the water quality standard, etc.) in the southeastern United States, where higher amounts of forestry herbicides are used, involved extremely high rates of application, or spills of concentrates. In these situations, herbicide residue was detected in ground water four to five years after the contamination. These situations are definitely not typical of operational use of forestry herbicides. Proper handling precautions during herbicide transport, storage, mixing-loading, and clean-up are extremely important for preventing groundwater contamination (Neary and Michael, 1996).

Pesticides are common chemicals used in a variety of applications and have been found in surface water, ground water, and in wells. Often these residue concentrations are far below levels harmful to human health and the occurrence is infrequent (Larson et al. 1997). Reports of pesticide contamination of water are usually from agricultural uses or urban applications, but the potential for contamination from a forest vegetation management program exists (Kolpin et al. 1997; Koterba et al. 1993; Michael et al., 2000).

Although short term, low-level stream contamination has been observed for ephemeral to first order streams draining studied sites, levels of herbicides in these streams has been neither of sufficient concentration nor of sufficient residence time to cause observable impacts on aquatic ecosystems (Michael et al., 2000). These studies have confirmed, with a few exceptions, the absence of significant contamination of surface water. Thus, herbicides used properly can help protect water quality in the reduction of sediment in streams while accomplishing forest management goals. It is imperative that pesticides, unless clearly labeled for aquatic uses, must not be applied directly to water, and that pesticides should be used around water resources which are particularly sensitive only after careful considerations of the ramifications (Michael et al., 2000).

From a review of literature surrounding herbicide application and use on forest lands, and monitoring conducted on the Ozark-St. Francis National Forest, it has been determined that the selection of this alternative could potentially result in low levels of herbicide residues entering waterbodies within the project area (SO unpublished reports). However, the levels found in the past and those anticipated for the future, are expected to be very small, and not in excess of the levels of concern established by the EPA. The Ozark-St. Francis National Forests utilize standards for herbicide application which require buffers between treated vegetation and waterbodies, as well as standards to ensure that drift and direct application to waterbodies does not occur. This alternative includes the use of BMP practices and monitoring to ensure environmental quality is maintained.

Roads are the most common source of accelerated erosion on National Forest lands. Road-generated sediment may result from the erosion of cut and fill slopes, ditches, road surfaces, and road maintenance operations. Unpaved roads paralleling and crossing streams pose specific risks to water quality as they often maintain direct linkages with the stream channel. Roads result in three primary effects on forested lands. They can intercept rainfall directly, concentrate flow, and divert or reroute water from traditional hydrologic pathways. Through these actions, road systems mimic the stream channel network, effectively increasing the drainage density of streams in the landscape. This may result in modifications to the timing of water delivery to stream systems; however, this is not expected to produce a substantial nor measurable difference from current conditions. The activities of the proposed action would work toward 'disconnecting' the road system from the stream network.

Temporary road construction, as a result of this action, would create 14.9 miles of roads in the analysis area. Upon completion of harvesting, these roads would be seeded and closed. Approximately 0.2 mile of new road would be constructed for this project to provide access to a proposed borrow pit. Guidance provided in the LRMP and the Arkansas Forestry Commission's Best Management Practices for Water Quality Protection outline the mitigation measures necessary to conduct these activities while controlling contributions to non-point source pollution. The remainder of the road work is road reconstruction, road realignment, road decommissioning, road maintenance, and road closure; which when properly conducted, should result in a net decrease in sediment production, thus a benefit.

The effects of prescribed fire on water yield and timing, erosion, and nutrient cycling depend on fire severity, fuel characteristics, soil moisture, and recurrence interval, and primarily the amount of ground cover removal. Less intense fires result in effects of less magnitude than moderate to severe fire intensity (Marion, 2004). Controlled burns designed to meet fuel reduction, wildlife, recreation, watershed, or ecological objectives are typically planned to be less intense than a wildfire. There is little evidence that water yield increases significantly following prescribed burning.

Erosion following a prescribed burn depends on soil erodibility, slope, precipitation timing, volume, intensity, fire severity, and soil cover remaining. For low intensity fires that avoid complete consumption of the organic layers, erosion has been found to not leave the treated site or be transported to stream channels (Fulton and West, 2002). The organic layer and root mat remains intact after low severity fires.

Erosion from prescribed burning is typically less than road and skid trail construction or intensive site preparation (Golden et. al 1984). Erosion following prescribed fire is mainly created from plowed fire lines as opposed to the general treatment area (Van Lear et. al, 1985). Minor increases in stormflow and nutrients return to pre-treatment levels within 3 years.

Prescribed fire can affect water quality by altering the nutrient cycle within soils and increasing bioavailability of certain nutrients. Prescribed fire alone is not expected to increase nutrient content of runoff.

The direct and indirect impacts from this project are not expected to contribute to degradation of the current water quality. Implementation of the activities associated with this alternative would result in some of the above mentioned effects to water quantity and quality; these effects have been shown from past research to be minimal and short lived in this part of Arkansas. The most likely effects from this alternative, beyond current conditions, are a short-term increase in sediment resulting mainly from road activities and minimal increases in water production. With the application of the Arkansas Forestry Commission's Best Management Practices for Water Quality Protection, current LRMP standards, and any other mitigation measures noted in this EA, the activities of this alternative should not result in sizeable effects to the water resources. Road stabilization through maintenance and reconstruction, erosion control through revegetation of disturbed ground, and streamside management zones around surface water features are typical measures used to ensure the mitigation of adverse effects which may occur.

The activities described in this alternative are not expected to affect wetland areas or floodplains.

For this analysis, the cumulative effects to water resources would be bound by the Dee Creek and Gulf Creek Watersheds, the 6th level watersheds in which the project is located. Cumulative effects result from practices which occur throughout the watershed, on both private and public lands. Activities and land uses identified for areas not administered by the Forest Service were determined from publicly available data. The major non-point source pollution concern that arises from Forest Service activities is that of soil erosion which can potentially result in increased sedimentation of aquatic habitats or threaten water quality as turbidity.

The cumulative effects analysis estimates sediment yield from both public and private lands, the existing road network, and from expected current and future activities. Current and future sediment yield is compared to estimates of an undisturbed landscape (or past condition). An undisturbed landscape is described as an entirely forested watershed without roads. Sediment increases are then calculated as a percent above the undisturbed amount. This value is compared to potential risk values for identifying levels of concern for watershed conditions. These risk indicator values were empirically determined using a relationship between sediment values and the condition of the fisheries from select locations across the area.

The cumulative effects analysis assumes that particular activities occur on public and private lands. The assumption is made that all the activities on public lands as described under each alternative, would occur during a one year time frame, or as an instantaneous event. In practice, these activities are usually spread over a number of years, thus amortizing the potential effects over the life of any resulting projects. Assumptions are included in the determination of the potential risk indicator values; these values were determined on a smaller-scale, ecoregion basis, using community based fish information. Different guilds within the fish communities were analyzed for predictive patterns of response to sediment loading. The most responsive patterns were used to set the risk level values. This allows for a determination of the 'worst case' scenario, providing a conservative understanding of effects to the water resources and designated use fisheries.

There are two risk values for every 6th level watershed; the first separates the low and moderate concern level and the second separates the moderate and high concern level. A low concern indicates a minimal risk to water quality, or no expected adverse effects to water resources or the designated uses. A moderate concern indicates that care should be taken designing and implementing the project to avoid adverse effects and that additional aquatic monitoring should occur prior to project implementation. Proper application of all forest plan standards and Arkansas Forest Commission BMPs should be verified for implementation. Assuming these guidelines are correctly applied; this project would result in minimal risks to water quality; if these standards are not applied then a greater risk to water quality results. A high concern signals that the water resources may be threatened by the current or future state of the watershed. Proposed activities should only be conducted with the application of appropriate forest plan standards and BMPs. Short-term adverse effects to water resources may result from activities captured in the effects analysis, both on public as well as private lands. Additional monitoring is necessary to determine that no adverse effects to the water resources are the result of Forest Service activities; this includes monitoring for adequate BMP compliance.

Under high-risk concerns, projects should seek a no net increase of sediment levels through restoration opportunities throughout the watershed.

The water resource cumulative effects analysis was completed based on the activities described in this document. All supporting material for this model has been included in the project planning files. The results of this analysis are displayed in Table 4. The Gulf Creek (111102020501) and Dee Creek (111102020502) Watersheds are currently determined to have a low concern level. The Proposed Action estimates the concern level as moderate for the future watershed condition.

Table 4. Results of the Water Resource Cumulative Effects Analysis.

	Percent increase of sediment above undisturbed conditions					
	Current		Future			
			Alternative 1		Alternative 2	
6th Level Watershed Analysis Area	% increase	Concern Level	% increase	Concern Level	% increase	Concern Level
Gulf Creek and Dee Creek	270	Low	318	Moderate	272	Low

The activities proposed by the Forest Service for the proposed action would result in additional sediment production from the landscape, but from a watershed perspective, contribute only a small (if any) increase to the overall estimated sediment yield. The Proposed Action produces a moderate concern level for the watersheds. It is most likely that these activities would take place over a 3 to 5 year period instead of instantaneously as predicted by the analysis, thus reducing acute effects. The use of LRMP standards and Arkansas Forestry Commission BMPs is expected to reduce the impacts of the proposed activities. Monitoring in the form of subsequent fisheries evaluation and BMP compliance checks should be adequate to discern any adverse effects that may result from the implementation of the proposed action.

Alternative 2

There would be no direct effects from this alternative because no activities would result from the selection of this alternative. The current trends and conditions are expected to continue. Indirect effects would continue to result from the existing conditions of the project area. The effects of vegetation on water yield within the watershed would continue through evapotranspiration processes. Roads that do not receive necessary maintenance would continue to pose a chronic threat to water quality as problem erosion areas would continue to exist, or worsen.

Roads are the most common source of accelerated erosion on National Forest lands. Roads generate sediment from the erosion of excavated surfaces, ditches, and road maintenance operations. Raw ditch lines and roadbeds would be a continual source of sediment, usually due to lack of maintenance, inadequate maintenance, excessive ditch line disturbance, or poorly timed maintenance. As a result of Alternative 2, roads in need of maintenance and reconstruction would not receive the necessary upgrades to minimize resource conditions. Unpaved roads paralleling and crossing streams would continue to pose specific risks to water quality as they often maintain linkages with the stream channel.

C. AIR QUALITY

Existing Condition

The boundaries of the analysis area for air quality are roughly the smoke sensitive receptors listed in Table 7 below.

The climate in the area is defined by hot humid summers with temperatures ranging from 70 to 94 degrees Fahrenheit (Weatherbase, 2011). The autumns are warm and moist with average temperatures ranging from 51 to 75 degrees Fahrenheit. The winters can be cold, with temperatures ranging from 32 to 55 degrees Fahrenheit. The springtime is cool and moist with temperatures ranging from 50 to 75 degrees Fahrenheit. The monthly precipitation ranges from a low in the winter of 2.2 inches to a high of 5.6 inches in the spring.

The major physiographic features influencing the climate, air movement, and dispersion of smoke in this area are Huckleberry Mountain and Big Shoal Creek. The west slopes of Huckleberry Mountain and the slopes surrounding Shoal creek encompass the majority of the proposed burn areas. Other small-entrenched valley areas also occur throughout the proposed burn areas in all directions. The River Valley boarders the north edge of the proposed burn areas from east to west. This valley can act as a cold sink and can trap smoke or channel smoke east along Big Shoal Creek drainage. This may cause it to disseminate downstream or down valley into some nearby towns.

Table 5 shows the National Ambient Air Quality Standards set by the Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards (OAQPS), for six principle pollutants called criteria pollutants (U.S. Environmental Protection Agency, 2011b). The State of Arkansas uses the same standards for the criteria pollutants as EPA.

Table 5. National Ambient Air Quality Standards for the Six Criteria Pollutants.

Pollutant	Averaging Time	Primary Standards* Level	Secondary Standards** Level
Carbon Monoxide (CO)	8-hour	9.0 ppm (10 mg/m^3)	N/A
	1-hour	35.0 ppm (40 mg/m^3)	N/A
Nitrogen Dioxide (NO_2)	Annual (Arithmetic Mean)	0.053 ppm (100 µg/m^3)	Same as Primary

Units of measure: µg/m^3 – Micrograms per cubic meter of air.
ppm – Parts per million by volume.

*Primary Standard – This is a standard set by the Environmental Protection Agency (EPA) to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

**Secondary Standard – This is a standard set by EPA to protect public welfare. This includes, but is not limited to decreased visibility, damage to animals, crops, vegetation, and buildings.

Table 5. National Ambient Air Quality Standards for the Six Criteria Pollutants, continued.

Pollutant	Averaging Time	Primary Standards*	Secondary Standards**
Ozone (O_3)	8-hour	0.075 ppm	Same as Primary
	1-hour	0.12 ppm	Same as Primary
Particulate Matter with diameters of 10 micrometers or less (PM-10)	24-hour	150.0 µg/m^3	Same as Primary
Particulate Matter with diameters of 2.5 micrometers or less (PM-2.5)	Annual (Arithmetic Mean)	15.0 µg/m^3	Same as Primary
	24-hour	35.0 µg/m^3	Same as Primary
Sulfur Dioxide (SO_2)	Annual (Arithmetic Mean)	0.03 ppm	N/A
	24-hour	0.14 ppm	N/A
	1-hour	75 ppb	N/A
Lead (Pb)	Rolling 3-Month Average	0.15 µg/m^3	Same as Primary

Units of measure: µg/m^3 – Micrograms per cubic meter of air.
ppm – Parts per million by volume.
ppb _ Parts per billion by volume.

*Primary Standard – This is a standard set by the Environmental Protection Agency (EPA) to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

**Secondary Standard – This is a standard set by EPA to protect public welfare. This includes, but is not limited to decreased visibility, damage to animals, crops, vegetation, and buildings.

Of the six criteria pollutants, the ones of concern for this project are PM-10 and PM-2.5. Although Ozone, Nitrogen Dioxide, Sulfur Dioxide, and Lead are important, the levels associated with this type of project are typically well below NAAQS (Sandberg and Dost 1990). 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.

In general, the air quality in the analysis area is good (U.S. Department of Agriculture Forest Service, 1999). Episodes of regional haze occur mainly in the spring and summer.

Lands designated as Class I Areas under the Clean Air Act Amendments of 1977 are afforded the highest level of protection from air pollutants in the nation (U.S. Environmental Protection Agency, 2011c). These lands consist of national wildernesses (Forest Service), parks (National Park Service) and wildlife refuges (U.S. Fish & Wildlife Service) in existence at the time the amendment was passed. The Clean Air Act identifies areas that are designated as Class I as "A geographic area designated for the most stringent degree of protection from future degradation of air quality." The closest Class I areas to the proposed burns are Caney Creek Wilderness area, located about 60 miles southwest of the proposed burn areas and Upper Buffalo Wilderness, located approximately 75 miles north of the proposed burn areas. (U.S. Department of

Interior - National Park Service, 2011).

All other lands in the nation, including the proposed project area, lie within lands designated as Class II with respect to the air resource (U.S. Environmental Protection Agency, 2011c). The Clean Air Act defines a Class II area as, "A geographic areas designated for a moderate degree of protection from future degradation of the air quality."

All proposed activities are within Logan County. As of April 21, 2011 Logan County was in attainment for all the six EPA criteria air pollutants (U.S. Environmental Protection Agency, 2011a). EPA defines attainment areas as "A geographic area in which levels of a criteria air pollutant meets the health-based primary standard (national ambient air quality standard, or NAAQS) for the pollutant." 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."

The closest non-attainment area to the proposed burn sites for CO is Las Vegas, NV. This is approximately 1,360 miles to the west of the proposed burn area. The closest non-attainment area to the proposed burn sites for PM-10 is Anthony, New Mexico, approximately 930 miles to the southwest of the proposed burn area. The closest non-attainment area to the proposed burn sites for PM-2.5 is Birmingham, Alabama, approximately 413 miles to the southeast of the burn areas. These determinations are based on the Environmental Protection Agency's (EPA) data and maps as of April 21, 2011 (U.S. Environmental Protection Agency, 2011a).

The main existing sources of PM-10 and PM-2.5 within the analysis area are from local wood burning home units, burning on private and federal lands, fugitive dust from unsurfaced roads, and combustion engines (such as those found in motor vehicles).

Based on LRMP direction, priorities for the air resource in the analysis area are to meet NAAQS and to protect Air Quality Related Values (AQRVs) in the Class I Area, Upper Buffalo Wilderness (LRMP, p. 2-14). The AQRV used for Caney Creek and Upper Buffalo Wilderness Class I areas is visibility. Although there is no direct standard for visibility associated with the NAAQS, when the levels of the criteria pollutants are below the NAAQS, this too should maintain the visibility quality in the Class I areas.

Effects

Alternatives 1 and 2

All analysis for the proposed project will be based on potential impacts to the identified smoke sensitive receptors with respect to the NAAQS levels for PM-10 and PM-2.5.

All prescribed burning activities would follow guidelines in the Arkansas Smoke Management Guidelines (Arkansas Forestry Commission, 2007). The purpose of these guidelines is to assure adherence to air quality standards and to manage smoke from prescribed fire to keep the smoke's impact on people and the environment within acceptable limits established by the Clean Air Act. A burning plan is developed prior to implementation that considers wind direction and other smoke dispersal factors. The burning plan would be prepared for each burn to ensure that the combustion products (smoke) are minimized in smoke-sensitive areas. Burning would only occur when conditions are right for adequate smoke dispersal.

The Simple Approach Smoke Emissions Model (SASEM), version 4.1, was used to estimate the PM-10 and PM-2.5 emissions for the proposed burning. Maximum acreage shown in Table 6 is the most acreage that would be burned in a single period by that ignition type. The hand acres shown are not the total amount of proposed burning acres for this project, rather, the largest single block that would be burned by hand ignition. This gives the maximum effects expected by this ignition type. Ignition types would be decided when burning is done.

Table 6. Emissions by Alternative by Ignition Type.

Alternative	Ignition Type	Maximum Acres to be Burned in the Burn period	Burn Period In Hours*	PM-10 Emissions ($\mu g/m^{3)}$	PM-2.5 Emissions ($\mu g/m^{3)}$
1	Hand	750	8	16.2	13.7
	Aerial	1500	8	32.3	27.4
2 (No Action)	**	5	12	0.16	0.13

*The number of hours active flames are present.

**The ignition type for this alternative is assumed to be lightning, arson, or accidental. The number of acres burned and the burn period are based on one previous wildfire that occurred near the proposed project area.

Comparing the PM-10 and PM-2.5 emission outputs in Table 6 against the 24-hour average NAAQS identified in Table 5, all alternatives meet NAAQS.

The proposed project would be implemented in an attainment area and, thus, would comply with the general conformity regulation.

Table 7 shows the smoke sensitive receptors that were used in the SASEM model to analyze the impacts of the 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.

If climatic conditions change quickly, some travel ways, such as State Highway 22, may experience decreases in visibility. These impacts can be mitigated with the use of flaggers, notification of state highway and local police departments, signing and other mitigation measures.

Table 7. Smoke Sensitive Receptors.

Smoke Sensitive Receptor	Distance from Receptor to Fire In miles	Direction from Receptor To Fire
State Highway 22	2.0	South
Midway	2.1	South
New Blaine	4.6	Southwest
Mt. Magazine State Park	5.0	S. Southwest
Delaware	11.0	West
Interstate 40	11.25	South
Dardanelle	15.7	West
Russellville	17.6	W. Southwest

The closest Class I Areas of concern with respect to Regional Haze compliance is the Caney Creek and Upper Buffalo Wilderness Areas. As previously identified, the level of potential PM-2.5 and PM-10 would be well below the lower limit accepted by the EPA, and the activities would occur in an attainment area. Considering these two factors and due to the lack of State-specific direction on implementing the Regional Haze Regulation, it is believed that the intent of the regulation in protecting visibility within Caney Creek and Upper Buffalo Class I Areas is being met.

Air quality cumulative effects includes, but is not limited to activities such as operation of combustion engines (i.e. vehicles, lawn mowers, turbines etc.), use of fireplaces, dust from surfaced and unsurfaced roads, wildfires, industrial emissions, etc. These activities, combined with the proposed burning and the implementation of the mitigation measures, are not expected to exceed the NAAQS. The implementation of the proposed projects would not move Logan County towards non-attainment with the implementation of the identified mitigation measures. If an exceedance should occur, the Forest Service would work with the Arkansas Department of Environmental Quality to develop a State Implementation Plan that would allow the state to make reasonable progress towards meeting NAAQS and allowing the Forest Service to continuing using prescribed fire as a tool.

The prescribed treatments should not detrimentally impact the quality of air in the analysis area based on these factors: (1) the most recent of EPA-air quality data for Logan County, (2) PM-2.5 and PM-10 emissions from the proposed burning being below the acceptable limit set by EPA, (3) Forest Service compliance with NAAQS, and (4) meeting general conformity and meeting the intent of the Regional Haze regulation. The prescribed burning in Alternative 1 is expected to have negligible short-term effects (less than 12 hours), on air quality.

D. CLIMATE CHANGE

Existing Condition

Research and analysis of evidence dating many years ago show intervals of warming and cooling on earth. The current warming trend is particularly important because it is proceeding at an unusual rate. Assessments by the Intergovernmental Panel on Climate Change (IPCC) suggest that the Earth's climate has warmed between 0.6 and 0.9 degree Celsius over the past century and that human activity affecting the atmosphere is "very likely" an important driving factor. (U.S. Department of Energy, Energy Information Administration; 2008).

The following information is from the National Climatic Data Center's website (National Climatic Data Center, 2011): Many chemical compounds present in Earth's atmosphere behave as greenhouse gases. These are gases which allow direct sunlight (relative shortwave energy) to reach the Earth's surface unimpeded. As the shortwave energy (that in the visible and ultraviolet portion of the spectra) heats the surface, longer-wave energy (heat) is reflected to the atmosphere. Greenhouse gases absorb this energy, thereby allowing less heat to escape back to space, and 'trapping' it in the lower atmosphere. Many greenhouse gases occur naturally in the atmosphere, such as carbon dioxide, methane, water vapor, and, nitrous oxide, while others are synthetic. Those that are man-made include the chlorofluorocarbons, hydrofluorocarbons and perfluorocarbons, as well as sulfur hexafluoride. Atmospheric concentrations of both the natural and man-made gases have been rising over the last few centuries. As global population increases and reliance on fossil fuels (such as coal, oil and natural gas) is firmly solidified, emissions of these gases continue to rise. While gases such as carbon dioxide occur naturally in the atmosphere, through our interference with the carbon cycle, we artificially move carbon from solid storage to its gaseous state, thereby increasing atmospheric concentrations (National Climatic Data Center, 2011).

The principal greenhouse gases that enter the atmosphere because of human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases (U.S. Environmental Protection Agency, 2011d). Atmospheric carbon dioxide concentration is now higher than at any time in the past 10 million years (Kennedy and Hanson, 2006). Humankind has altered the natural carbon cycle by burning coal, oil, natural gas and wood and since the industrial revolution began in the mid 1700s, each of these activities has increased in scale and distribution. Prior to the industrial revolution, concentrations were fairly stable at 280 parts per million

(ppm). Today, they are around 370 ppm, an increase of well over 30 percent (National Climatic Data Center, 2011). In 2006, carbon dioxide emissions from the United States accounted for about 20 percent of the amount added to the atmosphere globally. Fuel combustion accounted for 94.0 percent of U.S. carbon dioxide emissions in 2007; this figure represents approximately 85.4 percent of the nation's total greenhouse gas emissions that year. Changes in land use and forestry practices can also emit carbon dioxide through conversion of forest land to agricultural or urban use or can act as a sink for carbon dioxide (U.S. Environmental Protection Agency, 2011d).

Numerous processes collectively known as the "carbon cycle" naturally regulate concentrations of carbon dioxide in the atmosphere. Natural processes, such as plant photosynthesis, dominate the movement ("flux") of carbon between the atmosphere and the land and oceans. Carbon sequestration is the process by which atmospheric carbon dioxide is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage and roots) and soils. The sink of carbon sequestration in forests and wood products helps to offset sources of carbon dioxide to the atmosphere, such as deforestation, forest fires and fossil fuel emissions. Carbon accumulation in forests and soils, however, eventually reaches a saturation point, beyond which additional sequestration is no longer possible. This happens, for example, when trees reach maturity, or when the organic matter in soils builds back up to original levels before losses occurred (U.S. Environmental Protection Agency, 2011d). While natural processes can absorb some of the net 6.2 billion metric tons (7.2 billion metric tons less 1 billion metric tons of sinks) of anthropogenic (human-caused) carbon dioxide emissions produced each year (measured in carbon equivalent terms), an estimated 4.1 billion metric tons are added to the atmosphere annually. This positive imbalance between greenhouse gas emissions and absorption results in the continuing increase in atmospheric concentrations of greenhouse gases. (U.S. Department of Energy, Energy Information Administration; 2008).

In computer-based models, rising concentrations of greenhouse gases produce an increase in the average surface temperature of the Earth over time. Rising temperatures may, in turn, produce changes in precipitation patterns, storm severity, and sea level commonly referred to as "climate change" (U.S. Department of Energy, Energy Information Administration; 2008). Projected climate change impacts include air temperature increases, sea level rise, changes in timing, location and quantity of precipitation and increased frequency of extreme weather events such as heat waves, droughts, and floods. These changes would vary regionally and affect renewable resources, aquatic and terrestrial ecosystems, and agriculture. Changes in temperature and precipitation would alter the growth patterns and distribution of plant and animal species. There are uncertainties regarding the timing and extent magnitude of climate change impacts, but continued increases in human greenhouse gas emissions would likely lead to increased climate change.

Effects

Alternative 1

Forests and soils have a large influence on atmospheric levels of carbon dioxide. The carbon stored in live biomass, dead plant material and soil represents the balance between carbon dioxide absorbed from the atmosphere and its release through plant respiration as well as decomposition and burning.

With these alternatives, some of the carbon currently sequestered in vegetation and soils would be released back to the atmosphere. In the short-term, greenhouse gas emissions and alteration to the carbon cycle would be caused by hazardous fuel reduction activities, harvests, and thinning of overstocked stands. In the long term, however, these actions would also increase the forest's ability to sequester additional carbon, improve the forest's resilience to the potential impacts of climate change, and decrease the potential for uncharacteristically severe wildfires. Harvest would remove some of the mature stems with diminished ability to sequester additional carbon; some of the carbon sequestered in harvested stems would continue to be stored in manufactured wood products. Residual stems and regeneration in the proposed project area would continue to sequester and store carbon.

Wildfires may still occur in the proposed project area; however, because fuel loads would have been reduced with this alternative, there would be a lower risk of uncharacteristically severe wildfire for the treated acres than the current condition poses. The reduced risk has a two-fold effect on greenhouse gas emissions or the

carbon cycle:

- There is a direct beneficial effect on climate change of decreased greenhouse gas emissions from the treated acres because the risk of acres being burned by uncharacteristically severe wildfires would be reduced.
- There is an indirect beneficial effect because live stands of trees would retain higher capacity to sequester carbon dioxide compared to stands killed by uncharacteristically severe wildfires, especially if not immediately reforested.

Although it is possible to estimate the quantity of greenhouse gas emissions prescribed burns associated with this project may release, there is no certainty about the actual intensity of the project's individual effects on global climate change. As greenhouse gas emissions are integrated across the global atmosphere, it is not currently possible to ascertain the degree of indirect effects or cumulative impacts this project would have on a global climate.

Alternative 2

It is currently not possible to predict the actual effects of a project on global climate change, so a baseline comparison cannot be made using the no action alternative relative to climate change.

Much of the project area is currently susceptible to climate change events such as prolonged drought due to the stressed conditions of individual trees. Tree crowns and roots have little or no room to expand and stems in crowded stands compete for water and nutrients. Under these conditions, trees are much more likely to die due to added stress from climate change events. If overstory trees die, sustainability of overstory tree species would be in question due to the lack of advanced oak and pine regeneration in the understory and the rapid growth rates of other species such as maple, gum, and elm.

Because fuel loads within the proposed project area would not be reduced, the potential for an uncharacteristically severe wildfire would persist and increase as fuels are added to the forest floor through natural processes. In such an event, the quantities of carbon dioxide and other greenhouse gas emissions released into the atmosphere would be expected to be greater than those that would have been released under the controlled conditions of a prescribed burn or in an area where fuel reduction treatments had been conducted. The actual quantity of emissions released would depend on the acreage burned, tons of fuel consumed, and the amount of time required to suppress the wildfire.

Harvest of trees that have reached or passed maturity would not occur. The ability of those trees to sequester additional carbon from the atmosphere would continue to be less than that of younger stands of trees. No wood products such as wood flooring, furniture and lumber that would store carbon would be obtained from the proposed project area.

E. VISUAL QUALITY

Existing Condition

The Shoal project area is generally bounded geographically by St. Louis Valley Road to the north, FDR 1613 to the east, Spring Lake Road and FDR 1690 to the south, and Gulf Creek drainage to the west. This area will be used as the analysis area for visual quality. The area contains deep valleys and high ridges, some of which are demarcated by steep bluff lines.

The analysis area is located in a rural area that is mostly forested land with some pastures occurring on private land. The predominate tree species is shortleaf pine with eastern red cedar, loblolly pine and hardwood species.

Visual quality within the Ozark–St. Francis National Forest is measured and managed through the use of the Scenery Management System. This system uses scenic integrity as a measure of the degree to which a

landscape is visually perceived to be "complete." The highest scenic integrity ratings are given to those landscapes, which have little or no deviation from the character valued by constituents for its aesthetic appeal. Scenic integrity is used to describe an existing situation, standard for management, or desired future conditions.

Three of the four categories of Scenic Integrity Objectives (SIO) listed in the Ozark-St. Francis Land and Resource Management Plan (LRMP, p. G-4) occur in the compartments (see Scenic Integrity Objective Map on page 97). They are as follows:

> High – (Appears Unaltered) Scenic integrity refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
>
> Moderate – (Slightly Altered) Scenic integrity refers to the landscapes where the valued landscape character "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed.
>
> Low – (Moderately Altered) Scenic integrity refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed, but also compatible or complimentary to the character within.

Landscape viewing can be subdivided into distance zones for classification, analysis, and simplification of inventory data. Distance zones are defined as: immediate foreground (0' to 300'), foreground (300' to ½ mile), middle ground (1/2 mile to 4 miles), and background (4 miles to horizon).

There are no natural features, such as overlooks, viewpoints or balds which would provide a sweeping view of this project area. Visual impacts that would be visible to the public and which could be objectionable are limited to those which are located along the major travel routes and designated trails.

The project area may be viewed from a variety of locations along Spring Lake Road and other roads providing access to or through the area. The majority of the area has a High Scenic Integrity Objective, including the area that Spring Lake Road passes through.

Portions of FDR 1604, 1613, 1624, 1657, 96027A, and 96027B are designated OHV routes and as a result are more sensitive to visual impacts than would otherwise be the case since a primary purpose of OHV recreation is viewing scenery. These roads pass through areas designated as Scenic Integrity High, except for approximately one mile of FDR 1604 passing through a Moderate Scenic Integrity Objective.

The remaining roads within the project area are not considered visually sensitive.

Effects

Alternative 1

The project would create temporary visual impacts in the area by opening stands through the application of regeneration harvest and thinning. There would be temporary evidence of harvest activity as seen from Spring Lake Road, FDR 1604, 1613, 1624, 1657, 96027A, an 96027B.

Visual effects would be reduced by the application of the appropriate mitigation measures described on page 27. Additionally, within one season, leaf fall and re-growth of vegetation would assist in masking management activities from major travel routes. Temporary browning from slash and dead tops left from unused portions of harvested trees may be initially evident; however, measures for dealing with slash and dead tops left from harvest would be implemented along all High sensitivity roadways and OHV travel routes

affected as described on page 27.

A combination of harvest methods along with prescribed burning and site preparation would create visual diversity by increasing visual penetration into adjacent stands. Edge treatment, as specified on page 27, would lessen the contrast between areas harvested as a result of this project and surrounding areas not treated. This edge treatment would allow areas of reduced canopy cover to appear as naturally thin areas and not as a human-caused change in the landscape.

Site preparation and release with herbicides would create a browning then a graying effect that can last from one to several seasons or years. Visual effects from this disturbance would fade quickly.

Temporary roads created during the sale would be blocked and seeded after the sale. Visual effects from this disturbance are not considered significant and are a common part of the landscape in the area of the project.

Prescribed burning is proposed in stands that are of visual concern. These stands have SIOs of High, Moderate, and Low. Evidence of prescribed burning in the understory would be apparent along OHV routes and Spring Lake Road. Some understory vegetation would be temporarily removed or blackened but would begin to sprout back within the next growing season. Periodic burning would be implemented to enhance and maintain the newly opened part of the forest to be treated by thinning and seedtree removal. A park-like appearance, allowing views into forest, should result from these actions as well as promoting numerous flowering plants and a variety of flowering tree species. Visual diversity of species, color and texture of vegetation would be enhanced with this activity. Negative effects on the visual resource from prescribed burning would be temporary. The changing of the shrubby understory vegetation to an herbaceous understory would be visually beneficial.

Active management of the forest within the travel corridors is desirable for visual management and the short-term impacts of vegetation management may be mitigated through careful application of mitigation techniques adopted by the Forest Service and specifically tailored for use in Southern forests. The Forest Service would apply the Regional Standards from the Scenery Treatment Guide (matrix) for Southern Forests (U.S. Department of Agriculture – Forest Service, 2008) for visual impact mitigation based upon the Scenic Integrity Objective of the area and the specific vegetative treatment selected for the area. For roads that are constructed or reconstructed that are to remain open, mitigation including not leaving high stumps near the roadway, chipping of tops and slash left over from the treatment, pulling back large slash away from the roadway, and reseeding of disturbed roads shoulders with a erosion control seed mix that contains native wildflowers would be implemented. Another measure from the Regional Standards is to use prescribed fire to reduce left over slash. All harvest areas are proposed for prescribed burning.

All activities proposed would meet Scenic Integrity Objectives by applying appropriate mitigation measures.

Alternative 2

Views from Spring Lake Road, FDR 1604, 1613, 1624, 1657, 96027A, and 96027B would continue to change as a result of natural processes. Natural processes would continue to create openings. Tree growth would slow and visual penetration into stands would continue to be diminished. Blooming of understory trees such as dogwood and native ground dwelling plants would become less evident.

F. RECREATION

Existing Condition

The analysis area for recreation is the area included in Compartments 23, 27, 28, 31, and 62.

Recreationists currently use open roads, designated trails, and non-designated trails within the analysis area

for access to hunting locations, horseback riding and OHV use, hiking, mountain bike riding, and dispersed camping. Horseback riders also use closed roads and the general forest within the analysis area. Approximately 13.6 miles of the existing Huckleberry Mtn. Horse Trail/ Mt. Magazine OHV Trail is located in the analysis area. Approximately 6.8 miles of the Mt. Magazine OHV Trail (does not overlap horse trail) is located in the analysis area. .

The Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail enters the northern part of the project area and continues southward until it intersects with FDR 1604. The horse trail/OHV trail then continues southward on FDR 1604 until it intersects with Spring Lake Road. Approximately 3.8 miles of these trails are in extremely poor condition due to drainage issues, high use by all sizes of OHVs, and lack of funding to repair these areas. The sections of trail located along Shoal Creek are lower than adjacent terrain, which restricts the ability to drain deep mud holes located in the trail corridor. There are currently no OHV width restrictors installed on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail.

Approximately eight miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail are located in the south/southeastern portion of the analysis area. This portion of trail also reflects extensive trail tread drainage issues, high use by all sizes of OHVs, and the lack of funding to repair the trail.

Numerous trail users have expressed concern regarding the impact and increased use of large OHVs (full size four-wheel drive trucks with over-size tires) along the trail system. These same individuals have requested the installation of width restrictors be placed at key points of access to the trail system.

Hunting for whitetail deer and eastern wild turkey is a popular recreational activity in this area. Limited hunting of squirrel and quail also occurs. Dispersed hunter camps are located throughout these compartments.

Several wildlife ponds are located in the project area but do not provide for fisheries.

Additional recreation activities within the analysis area include driving for pleasure, berry picking, and firewood gathering.

The Recreation Opportunity Spectrum (ROS) provides a framework for defining classes of outdoor recreation opportunity environments (U.S. Department of Agriculture – Forest Service, 1986). There are six ROS designations ranging from primitive to urban classifications. The analysis area contains two of these designations: Roaded Natural (RN) and Semi-Primitive Motorized (SPM). See Appendix A for a map showing these designations.

The following defines these ROS designations:

- Roaded Natural (RN) settings are located within a half mile of a road and usually provide higher levels of development such as campgrounds, picnic areas, and river access points.

- Semi-Primitive Motorized (SPM) settings are characterized by a naturally appearing environment. Concentration of users is low. Motorized use is permitted.

Objectives of trail management provide trails that meet their Trail Management Objectives (TMOs), are consistent with the applicable land management plan, provide opportunities for satisfying recreation experiences, harmonize with and provide opportunities for enjoyment of the national forest or grassland setting, and minimize maintenance costs.

TMOs include travel management strategies. There are two categories ranging from allowed to restricted uses of the trail system. Allowed includes what the trail is managed for, what is an accepted use and what is discouraged. Restricted includes what is eliminated or prohibited along the trail system.

Managed use of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail within the project area north of Spring Lake Road is for pack and saddle. Accepted uses on this portion of trail are for wheeled OHVs equal to or less than 50 inches in width and hiker/pedestrian use. There are four prohibited uses as specified in

the TMO for this route, one of which is for OHVs greater than 50 inches in width.

Managed use on the portion of trail south of Spring Lake Road within the project area is for OHVs less than 50 inches in width. Accepted uses include hiker/pedestrian and pack/saddle. There are eight prohibited uses as specified in the TMO for this route, one of which is for OHVs greater than 50 inches in width.

Effects

Alternative 1

Applying mitigation measures as discussed in the Visual Quality section of this EA would reduce effects from the proposed treatments.

During harvesting, signs would be posted to caution road users and recreationists of logging activities occurring in the area. Slow moving vehicles and heavy equipment may delay people driving for pleasure, hunters, campers, horseback riders, OHV users, and local residents.

During harvest operations, the evidence of human activity in the area would increase due to the activity associated with logging. This activity may temporarily displace hunters and other recreationists. Following harvest, logging activities and equipment would leave the area and disruption would cease.

Implementation of district trail harvesting standards along a developed trail system would be implemented. These mitigation measures are described beginning on page 27.

Firewood gathering opportunities would increase following the timber sale.

Prescribed burning for site preparation and/or wildlife habitat improvement/fuels reduction is proposed within the project area. The temporary charred appearance of the stands after prescribed burning is accomplished may detract from the recreation experience of users. This charred appearance would be progressively less evident over one to two seasons.

Hunting is a popular recreational activity as mentioned above. Habitat capacity for game species such as deer and turkey are increased for this alternative due to the proposed activities such as wildlife opening construction, enlargement, and restoration. Hunting opportunities are expected to increase as well. Visual penetration into stands would improve after harvesting, which may benefit hunters in spotting game animals.

Trail width restrictors would be placed at six locations on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail as shown on the Trail Improvement Map. These sections of trail are located on open system roads. These width restrictors would close these roads to vehicular traffic but would allow for passage of OHVs with a width of 50 inches or less in width and horses. Wider gates would be installed adjacent to the width limiting restrictors to allow Forest Service access for management purposes when large equipment is necessary.

Approximately 7.5 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail would be designated as having a width restriction for vehicles of 50 inches or less in width once trail width restrictors are installed.

Trail width restrictors would be placed at four locations on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail as shown on the Trail Improvement Map. These sections of trail are located on a powerline. These width restrictors would allow for passage of OHVs with a width of 50 inches or less in width and horses. Wider gates would be installed adjacent to the width limiting restrictors to allow Forest Service and utility companies access for management purposes when large equipment is necessary.

Approximately 1.8 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail along this powerline would be designated as having a width restriction for vehicles of 50 inches or less in width once trail width restrictors are installed.

FDR 1604 is being realigned as discussed under the Transportation section of this EA. Currently,

approximately 1.4 miles (three separate sections) of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail are located on this section of FDR 1604. After realignment of the road is done, these three sections of trail would be relocated to the newly realigned portion of the road as shown on the Trail Improvement Map, totaling 1.4 miles. The remainder of the trail to be relocated is the 2.2 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail located in the northern portion of the project area. This section of trail would be relocated to the existing location of FDR 1604, east of the current trail location. Part of the Mt. Magazine OHV Trail is currently located on this section of FDR 1604. Relocation would consist of posting new trail signs along the trail corridor. Total relocation of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail would be 3.6 miles.

Approximately 1.5 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail and FDR 1604 would be decommissioned. These miles of trail/road are the sections that are being relocated to the realigned FDR 1604. Decommissioning these sections of trail would return the original trail corridor to a more natural state. Treatment would include blocking access points, installing water bars, and scattering slash as needed on the trailbed.

Approximately 2.3 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail would be decommissioned. These miles of trail are the section of the horse trail/OHV trail that is being relocated to the existing location of FDR 1604 and the Mt. Magazine OHV Trail. Decommissioning these sections of trail would return the original trail corridor to a more natural state. Treatment would include blocking access points, installing water bars, and scattering slash as needed on the trailbed.

Temporary road construction, road maintenance, road realignment, and road reconstruction would improve access for hunters, OHV and horseback riders. Following timber sale activities, temporary roads would be closed and returned to forest production. This would eliminate access provided by these roads, but the effect would be minimal since these roads did not exist prior to the timber sale.

Road closure and road decommissioning may detract from the hunting experience of some hunters who cannot or prefer not to walk. Road closures and road decommissioning could enhance some hunters' experiences that prefer solitude while hunting. The area would still be available to hunt by means other than motorized access. Road closures and road decommissioning would serve to protect wildlife from vehicular disturbance and provide additional wildlife food sources. The area would still be available to hunt by means other than motorized access.

Road closure and road decommissioning of existing system roads may detract from dispersed OHV use, travel by horseback riders, and those driving for pleasure within the analysis area.

Road construction and road closure removal would not have an impact on recreation uses of this area.

All activities proposed would meet ROS designations by applying appropriate mitigation measures.

All activities proposed would meet TMO designations by applying appropriate mitigation measures such as width restricting devices.

Alternative 2

Traditional dispersed recreation uses would continue. Berry picking would decline over the next 10 years due to a drop in berry production.

Use of non-designated OHVs greater than 50 inches would continue. Development of non-designated horseback riding trails would continue. Resource damage along routes proposed for closure, relocation and/or width restrictors would continue to increase in intensity.

G. HERITAGE RESOURCES

Existing Condition

The analysis area for heritage resources is the area included in Compartments 23, 27, 28, 31, and 62.

Information concerning possible heritage resources within the project area was obtained from the Master Site and Project Tracking Atlas, field-going personnel, historical maps, land acquisition files, and project and site records at the Mt. Magazine Ranger District Office and Supervisor's Office.

Archeological survey of the entire Mt. Magazine Ranger District has been completed. Reports of the inventory were submitted to the State Historic Preservation Officer and the relevant federally recognized Tribes in 2008 and 2009 (Project Nos. 08-10-06-01 Mt. Magazine Assessment and 09-10-06-01 Mt. Magazine Assessment Addendum).

The completion of inventory for the District enables projects to be planned so as to avoid impacts to archeological sites. Under the provisions of the 2005 (signed 2006) Programmatic Agreement (PA) between the Ozark-St. Francis National Forests, the Arkansas State Historic Preservation Office, and the relevant federally recognized Tribes, proposed projects located in areas that have been previously surveyed and where no cultural resources would be disturbed or impacted may be documented internally as a Heritage Categorical Exclusion. A resurvey of the area is not required by the PA or by the National Historic Preservation Act. However, in areas with higher probabilities of containing sites, additional testing may be conducted during the planning phase to ensure that no additional sites would be impacted. This fieldwork is conducted under the supervision of the District or Forest Archeologist and pursuant to the work standards established in the PA. Accordingly, in 2010, higher liklelihood areas and selected sites of the Shoal Project area were re-visited by the District Archeologist and District Silvicultural Technician/Archeological Technician. No additional sites were recorded.

A total of 18 sites are located within the project area. These include 13 historic sites, four prehistoric sites, and one site with both historic and prehistoric components. Three sites are recommended eligible for nomination to the National Register of Historic Places and 15 sites are recommended not eligible.

Sites recommended eligible for nomination to the National Register and those with undetermined eligibility would be protected from any ground disturbing activities associated with this project. No protection is required for sites recommended not eligible; however, above-surface features would be protected if feasible.

Historic sites located near or within project boundaries include numerous remains of farms and houseplaces and a historic store. Prehistoric sites include two rock shelters, a lithic scatter, and a prehistoric isolate.

A complete listing of sites, site types, and their eligibilities is found in Appendix D.

Effects

Alternative 1

As noted above, 18 sites are located within or near project boundaries. The project has been designed so that all sites that are recommended eligible for the National Register of Historic Places and sites for which eligibility is undetermined lie outside any planned ground-disturbing activities. Rock alignments associated with historical farmstead sites and the extensive cleared and plowed fields surrounding them would be avoided where feasible.

Historic site areas which contain no organic cultural material would undergo prescribed burning. Past research has shown that sites such as these would not be affected by a low-intensity prescribed burn.

Should any additional sites be found during project implementation, they would be examined by a professional archeologist (Mitigation Measure 20), who would prescribe necessary mitigation measures, in consultation with the Arkansas SHPO and the relevant federally recognized Tribes.

Based on these findings, all sites would be preserved intact and no significant effects would be produced upon significant historical or prehistoric sites that may be eligible for nomination to the National Register of Historic Places.

Alternative 2

This alternative would have no effect on heritage resources. No additional surveys would be conducted.

H. MINERALS

Existing Condition

The majority of the project area is under lease to private individuals for gas exploration at this time. This area is in the B-44 Field, established by the Arkansas Oil and Gas Commission and recognized by the Bureau of Land Management (BLM).

There are three producing gas wells in the north part of the project area. There are an additional seven producing wells within a half-mile of the northern project boundary.

The Mt. Magazine Ranger District currently has three approved Application for Permit to Drill (APD) for locations within one-half mile of the northern part of the project area. The APD is approval from the BLM to drill into Federal minerals on Forest Service land. There are no approved APDs (well approved but not drilled) within the project area.

Even though the majority of the area is under lease, no Notice of Stakings (NOS) have been received for this area as of July 2011. A NOS informs the Forest Service that a gas well is being staked on Forest Service land.

Effects

Alternative 1

Requests for surface occupancy through an APD to withdraw minerals that are legally entitled to the leaseholder within the project area would be approved according to the President's Energy Initiative. Prior to approval, an on-site meeting with the operator, BLM, and Forest Service specialists would take place. The APD would be reviewed for compliance with all Federal regulations. Access road, gas well pad and pit, and pipeline locations would be determined based on the surrounding area, existing roads, and topography. The best location for these items would be chosen that would address environmental concerns as well as accommodate the operator's right to entry for mineral withdrawal under the lease. The rehabilitation of areas would be done in a timely manner with direction given individually for each site.

If a well is deemed a producer, a gathering pipeline would be needed to connect the gas well to an existing transmission pipeline. These gathering pipelines would generally be buried within or parallel to an existing road or utility corridor.

It is likely that APDs would be received for the project area in the future. This is based on current gas well drilling activity in the vicinity of this area. As APDs are received, they would be evaluated on their own merit to minimize impacts to the area, including cumulative impacts. Whenever possible, the existing access roads and gas pipelines would be utilized by multiple drilling areas. This is the practice that has been followed in the past and reduces the number of linear miles of roads and pipelines on the ground.

As wells become unprofitable, they are generally abandoned by the producer, at which time the area is rehabilitated to meet Forest Service standards.

If no additional gas reserves are found within the B-44 field and the price of gas were to go down, it is likely that over the next several years gas well drilling activity may decrease.

Cumulative effects to vegetative resources from potential future gas well development in the area would be from conversions of small areas of forest to permanent openings. Each new gas well would entail a small (approximately one to two acre) permanent opening where the native vegetation would be removed.

In following the President's Energy Initiative, the Forest Service must continue to honor access to the minerals under existing leases and look at potential areas that can environmentally accommodate additional leases.

Alternative 2

All requests for gas exploration would be reviewed and analyzed on an individual basis with a Decision Memo or Decision Notice prepared for each request. This would impact time and personnel resources in order to continue to follow the President's Energy Initiative in responding in a timely manner to all APDs.

I. TRANSPORTATION

Existing Condition

There are approximately 40 miles of existing roads in the analysis area for transportation that consists of Compartments 23, 27, 28, 31, and 62. Approximately 13.9 miles of these roads are currently closed. Appendix C, Transportation System, displays the road numbers, mileage, and status for existing roads.

A Roads Analysis Report (RAPS) was done for this project (U.S. Department of Agriculture Forest Service, 2010b). The Shoal Creek Watershed Roads analysis area is approximately 22,162 acres in size and is located in the Arkansas River watershed (map located in project file). This analysis focuses on one sub-level watershed (6^{th} Order) within the Dardanelle Reservoir watershed. Within these sub-level watershed, Level 1-5 roads and unclassified roads were assessed to determine the future road network. Findings from this analysis were used in developing transportation needs for the Shoal Project.

Forest Development Roads (FDR) 1624, 1657, 1604A, 1624A, 1687E, 1690A, 96022C, 96023A, 96023B, 96023C, 96023D, 96027A, 96027C, 96027D, 96027E, 96028A, 96028B, 96028C, 96028F, 96062A, 96062B, 96062C, and 96062E suffer from a lack of surface aggregate and have areas of weak sub-grade, poor drainage, and woody vegetation encroaching into the roadway.

Approximately 4.6 miles of Spring Lake Road is in need of reconstruction to withstand traffic associated with timber harvesting.

FDR 1604, 1613, 1624, 1690, 1687E, and 96027A are in need of reconstruction to withstand traffic associated with timber harvesting. Total miles in need of reconstruction are approximately 10.4 miles.

Currently, the sight distance on State Highway 309 to the south of the intersection with Barber Ridge Road is approximately 100 feet. Barber Ridge Road would be used for timber hauling and is in need of realignment. This short sight distance makes it unsafe when pulling out on to State Highway 309.

Approximately 1.4 miles of FDR 1604 is located in a major drainage and is need of realignment.

Approximately 0.1 miles of Barber Ridge Road and FDR 96036A would no longer be needed for resource management after Barber Ridge Road is realigned as discussed above.

Approximately 1.4 miles of FDR 1604A is not needed for resource management.

FDR 1604 is a system road that is also part of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail. Approximately 1.5 miles of this road is being relocated to the realigned FDR 1604. These 1.5 miles would be in need of decommissioning after this section is realigned.

FDR 1604, 96023A, 96023B, 96023C, 96027A, and 96027B are system roads that are also part of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail. Approximately 7.5 miles of these roads/trails are heavily impacted by OHV use with little to no funding to maintain/repair damage done by motorized uses. These sections of trail are located on open system roads.

Approximately 0.5 miles of FDR 1687E is no longer needed for management in the near future. Continued use by the public of this road creates an unfavorable situation for wildlife through unnecessary disturbance and adds to soil loss through erosion.

FDR 1624 is currently closed but can be accessed from adjacent private land.

Borrow material is needed for use during the proposed road work in this project. Currently, there are no borrow pits located in the vicinity of this project on Forest Service land.

Several additional system roads provide access into the interior of these compartments. These roads are listed in Appendix C and are shown on the Existing Road System Map in Appendix A.

Field visits were made documenting the current condition of closed roads and roads proposed to be closed. This documentation is part of the process file.

Effects

Alternative 1

Temporary road construction would provide access to harvesting areas during the timber sale. These roads would be blocked and seeded once the sale is completed.

Forest Development Roads (FDR) 1624, 1657, 1604A, 1624A, 1687E, 1690A, 96022C, 96023A, 96023B, 96023C, 96023D, 96027A, 96027C, 96027D, 96027E, 96028A, 96028B, 96028C, 96028F, 96062A, 96062B, 96062C, and 96062E would receive road maintenance.

These 11.8 miles of road maintenance would consist of brushing of roadsides, removal or repair of minor slides or slumps, cleaning of roadside ditches and drainage devices, spot aggregate placement, and blading of the travel way. During and after use of the roadway, the roadway would be maintained in no less than the same condition that existed prior to timber harvesting. All disturbed areas would be mulched and seeded along with the use of hay bales for erosion control where needed. Once these activities are complete, roads that are currently closed would be re-closed.

Logan County has jurisdiction over Spring Lake Road. Under a project agreement with the County Judge, the Forest Service can reconstruct such roads in need of improvement. Road reconstruction of approximately 4.6 miles of Spring Lake Road would result in improvement or realignment of the existing roadway. This activity would involve but not be limited to clearing the existing vegetation back to daylight the road, replacement of failing drainage structures such as culverts and adding additional structures to facilitate drainage. Geotextile and oversize aggregate may be added to improve the bearing strength of the sub-base. Borrow material would be used when needed to raise the road grade and to cover exposed rock. The travelway would be resurfaced with gravel as needed. All disturbed areas would be mulched and seeded along with the use of hay bales for erosion control where needed.

Road reconstruction of approximately 10.4 miles of FDR 1604, 1613, 1624, 1690, 1687E, and 96027A would be performed as described above for Spring Lake Road. Some road realignment may be needed to mitigate

the road steepness and/or alignment with ground features.

Approximately 0.2 miles of Barber Ridge Road would be realigned to allow a further sight distance when pulling onto State Highway 309. Relocating this intersection to the proposed location would increase the sight distance to approximately 800 to the south.

Approximately 1.4 miles of FDR 1604 would be realigned to position the road out of a major drainage. Realignment would include installing rolling dips and ditches and applying surfacing.

Approximately 0.1 miles of Barber Ridge Road and FDR 96036A would be decommissioned along with approximately 1.4 miles of FDR 1604A. Decommissioning would include reestablishing former drainage patterns, stabilizing slopes, blocking the entrances, installing water bars, removing culverts, removing unstable fills, pulling back road shoulders, scattering slash on the roadbed, and restoring natural contours.

Approximately 1.5 miles of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail and FDR 1604 would be decommissioned. These miles of trail/road are the sections that are being relocated to the realigned FDR 1604. Decommissioning would return the original road/trail corridor to a more natural state. Treatment would include blocking access points, installing water bars, and scattering slash as needed on the road/trailbed.

FDR 1604, 96023A, 96023B, 96023C, 96027A, and 96027B are system roads that are also part of the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail. Approximately 7.5 miles of these roads are proposed to be closed to vehicular traffic greater than 50 inches in width. Trail width restrictors would be placed at six locations on the Huckleberry Mtn. Horse Trail/Mt. Magazine OHV Trail as shown on the Trail Improvement Map. These sections of trail are located on open system roads. These width restrictors would close these roads to vehicular traffic but would allow for passage of OHVs with a width of 50 inches or less and horses. Wider gates would be installed adjacent to the width limiting restrictors to allow Forest Service access for management purposes when large equipment is necessary.

Approximately 0.5 miles of FDR 1687E is being proposed for closure. When sale activities are completed, this portion of the road would not need to be left open for resource management. This portion of the road would not receive routine maintenance once the sale activities are completed and would be seeded with wildlife seed mixtures and blocked. Closing this road would protect wildlife from vehicular disturbance, provide additional wildlife food sources, and reduce erosion from this road. The remaining open portion of the road would still provide access to the swimming hole along Shoal Creek located south of the private land in Compartment 31.

Three road closures are proposed on FDR 1624. These closures would not result in new road closure miles since FDR 1624 is currently closed. The three road closures on FDR 1624 would prevent access onto this road from adjacent private land, helping to enforce the currently closed condition of this road.

FDR 96031A is currently blocked at the intersection of FDR 1687E. A road closure is proposed for FDR 1687E above the point of closure for FDR 96031A, making the current closure of FDR 96031A unnecessary since the FDR 1687E closure would close both roads. The existing closure on FDR 96031A would be removed.

FDR 1604A is currently blocked approximately 0.4 miles from the intersection of FDR 1604A. This block would be removed and the last 1.2 miles of this road would be decommissioned as described above.

A borrow pit would be developed up to five acres in size. Borrow material from this site would be removed for use during the proposed road work in this project. The borrow pit would remain open for future needs. Erosion control measures would be implemented to limit the impacts outside the borrow pit location. Erosion control measures could include hay bales, sedimentation ponds, and construction of diversion ditches.

FDR 96061C would be constructed to provide access to the proposed borrow pit. Construction would consist of clearing and grubbing, constructing natural drainage crossings; v, wing, and lead-off ditches;

rolling dips; and installing culvert pipes as needed. Borrow material would be used as needed to raise the road grade and cover exposed rock. All disturbed areas would be seeded and mulched along with other erosion control measures. This road would be closed with a road closure device.

System roads that are currently closed would be reclosed following sale activities. See Appendix C, page 113, for specific road numbers.

Alternative 2

No road work would be done. Roads that currently need road work would continue to deteriorate. Some deterioration can also be expected to portions of roads from natural processes such as erosion and plant encroachment into the road right-of-way.

J. VEGETATION

Existing Condition

The analysis area for vegetation is stands included in Compartments 23, 27, 28, 31, and 62.

The project area is in Management Area 3.A (Pine Woodland), Management Area 3.C (Mixed Forest), and Management Area 3.I (Riparian Corridors). These management areas are classified as suitable for timber management (LRMP, pgs. 2-56, 2-61, and 2-74).

The Forest Type Map on page 101 displays the distribution of forest cover types by pine and hardwood types.

Table 8 illustrates the acreages of different age classes in the forested acres in these compartments. The surrounding compartments are similar in age class distribution to these compartments.

Table 8. Acreage in Each Age Class (as of 2011) by Forest Type.

Age Class	% Total Acres	Pine-Pine/Hardwood Acres	Hardwood-Hardwood/Pine Acres
0 - 10	1%	72	0
11 - 20	2%	131	0
21 - 40	14%	996	31
41 - 70	24%	1611	169
71 -100	55%	1748	2287
100+	4%	13	271
	TOTAL	4571	2758

Stands in which at least 70% of the dominant and codominant crowns are either pine species or hardwood species are classified as such. Stands in which 51-69% of the dominant or codominant crowns are either pine species or hardwood species are classified as mixed pine/hardwood or mixed hardwood/pine stands.

The project area has a dominant cover made up of even-aged stands, ranging from 6-115 years of age (in 2011). See page 103 for the Age Class Distribution Map. The pine type age classes in this analysis area

are not in balance. Approximately 74% of the pine and pine/hardwood type acres are in the 41-70 and 71+ year old age classes.

Appendix A contains a Stand Map (page 105) for these compartments.

Table 9 shows the current stand conditions for stands in the project area. All stands are being proposed for some type of activity ranging from harvesting, site preparation, wildlife habitat improvement/fuel reduction prescribed burning, etc. See Table 2 for a list of proposed actions.

The following codes are used in the table:

* Forest type codes:
12 = Shortleaf Pine/Oak
31 = Loblolly Pine
32 = Shortleaf Pine
47 = White Oak/Black Oak/Yellow Pine
53 = White Oak/Red Oak/Hickory

** Condition class codes:
06 = Sparse Sawtimber
07 = Low Quality Sawtimber
08 = Low Quality Sawtimber
09 = Mature Poletimber
10 = Mature Sawtimber
11 = Immature Poletimber
12 = Immature Sawtimber
13 = Adequately Stocked Seedling/Saplings

Table 9. Current Stand Conditions.

Compartment	Stand	Acres	Forest Type*/ Condition Class	Age	Pine Basal (sq. ft./acre)	Hardwood Basal (sq. ft./acre)	Site Index
23	1	62	3210	90	102	6	70
23	2	11	4712	61	0	77	70
23	3	64	3210	98	98	6	70
23	4	72	3212	48	159	18	60
23	5	26	3211	38	43	10	60
23	6	24	3111	26	180	0	60
23	8	13	3210	90	100	10	60
23	9	7	3212	68	140	7	60
23	10	14	3212	66	93	7	70
23	12	16	3212	55	63	26	50
23	13	47	3210	73	145	5	50
23	15	34	3211	22	113	8	50
23	16	70	3212	49	137	2	60
23	17	32	3111	29	148	5	70

Table 9. Current Stand Conditions, continued.

Compartment	Stand	Acres	Forest Type*/ Condition Class	Age	Pine Basal (sq. ft./acre)	Hardwood Basal (sq. ft./acre)	Site Index
23	19	62	3211	22	153	6	60
23	20	64	3210	95	90	13	60
23	23	45	3212	50	126	20	60
23	24	56	3212	49	144	2	60
23	25	34	3212	48	86	32	60
23	27	55	3212	59	118	15	60
23	29	58	3212	52	148	10	60
23	31	41	3212	48	98	30	60
23	32	108	3212	48	158	1	60
23	33	25	3212	50	130	8	60
23	34	45	3212	48	144	8	60
23	35	62	3212	49	150	0	60
23	37	16	4712	48	27	43	70
23	38	13	5311	57	3	37	60
27	1	45	3210	88	90	15	60
27	2	88	5312	85	36	20	70
27	3	30	3210	84	137	7	60
27	4	65	3211	26	133	3	70
27	5	12	3212	53	130	23	60
27	6	39	3210	88	64	30	60
27	7	33	3212	67	130	7	70
27	8	134	5312	88	13	104	70
27	9	12	3210	70	113	3	70
27	10	52	3211	47	118	14	70
27	11	23	3210	82	77	27	60
27	12	50	5312	82	0	90	70
27	13	39	5310	105	13	73	70
27	14	21	3211	29	123	3	70
27	15	2	3212	70	165	0	60
27	16	24	3210	85	118	23	70
27	17	27	5307	85	17	37	60
27	18	61	5310	85	7	113	70
27	19	4	3211	26	93	13	60
27	20	6	3211	26	150	3	60
27	21	12	3211	27	173	0	60
27	22	27	3211	38	173	13	70

Table 9. Current Stand Conditions, continued.

Compartment	Stand	Acres	Forest Type*/ Condition Class	Age	Pine Basal (sq. ft./acre)	Hardwood Basal (sq. ft./acre)	Site Index
27	23	12	3211	26	120	0	60
27	24	34	3212	46	138	0	60
27	25	9	3211	26	90	3	60
27	26	35	3210	83	133	3	60
27	27	13	1210	90	60	26	60
27	28	48	3210	62	116	20	60
27	29	22	3210	90	110	20	60
27	30	80	3211	26	103	13	60
27	31	34	3209	46	163	5	70
27	32	31	5311	30	0	60	60
27	33	36	3211	27	160	3	60
27	35	52	5308	80	15	73	60
27	36	34	3212	46	153	0	60
27	37	16	5307	85	40	27	60
27	38	9	3212	46	110	10	60
27	39	12	5307	85	25	45	60
27	40	9	3209	46	103	30	60
27	41	8	5312	85	13	60	60
27	43	46	3211	26	34	8	65
27	44	63	3211	26	150	3	64
27	45	30	3210	82	110	20	66
28	1	58	3211	22	76	32	70
28	2	133	3212	77	87	25	70
28	4	34	3212	62	167	13	70
28	5	232	5310	115	9	104	50
28	6	62	3213	21	16	30	60
28	7	117	5310	84	30	82	50
28	8	87	3213	21	20	37	60
28	9	19	4712	64	33	93	70
28	10	84	3210	92	97	60	70
28	11	49	4712	76	20	97	70
28	12	212	4710	92	18	95	60
28	13	116	5310	99	80	40	70
28	14	246	5306	93	1	99	60
28	15	29	3212	76	85	45	60
28	16	73	3210	94	120	50	60

Table 9. Current Stand Conditions, continued.

Compartment	Stand	Acres	Forest Type*/ Condition Class	Age	Pine Basal (sq. ft./acre)	Hardwood Basal (sq. ft./acre)	Site Index
28	19	69	3210	92	80	65	70
28	20	39	4710	94	80	73	60
31	1	25	3210	70	100	33	100
31	2	51	3212	51	178	13	70
31	3	103	3210	95	124	17	50
31	4	143	5310	93	6	101	40
31	5	22	3213	12	30	23	50
31	7	80	3212	67	71	49	80
31	8	39	5312	91	10	60	70
31	10	442	5312	85	3	93	60
31	11	76	3210	90	100	23	60
31	12	102	3210	93	94	56	60
31	13	160	1206	91	38	68	60
31	14	13	3210	105	60	7	50
31	15	437	5312	91	11	77	50
31	16	41	3210	85	137	23	50
31	17	71	3211	18	72	10	50
31	18	15	3111	25	173	3	60
31	19	15	3211	32	133	7	60
31	20	31	1212	73	58	63	70
62	1	21	3211	29	118	6	60
62	2	54	3210	81	95	22	70
62	3	62	1210	85	79	60	70
62	4	56	3211	26	154	8	70
62	6	52	3211	24	150	3	70
62	7	91	3212	57		4	60
62	8	33	3213	6	22	12	60
62	9	57	3211	26	147	6	70
62	11	62	3212	49	109	1	70
62	13	37	3211	18	38	38	60
62	14	8	5311	58	0	75	60
62	15	79	4711	42	40	50	50
62	16	39	3213	9	20	12	60
62	17	126	3212	47	111	16	60
62	18	59	3210	84	112	22	60
62	20	59	3210	91	92	24	50

Table 9. Current Stand Conditions, continued.

Compartment	Stand	Acres	Forest Type*/ Condition Class	Age	Pine Basal (sq. ft./acre)	Hardwood Basal (sq. ft./acre)	Site Index
62	21	14	3211	26	157	7	60
62	22	31	3212	63	73	20	70
62	23	40	3212	49	90	5	70
62	24	23	5311	49	7	70	70
62	25	57	3212	49	117	19	70
62	27	43	3212	49	100	22	70
62	28	21	3212	65	110	30	60
62	30	62	3210	91	84	15	70

The mid-story and ground vegetation components and densities in these stands are typical of those found in the cover types of the area. The species composition in the mid-story consists of oak, hickory, dogwood, persimmon, sassafras, sweetgum, locust, blackgum, elm, pine, redcedar, and red maple. Common shrubs and vines found include French mulberry, hawthorns, blueberries, viburnums, greenbriers, blackberry, honeysuckle, and grape. Grasses and other herbaceous vegetation in the understory include bluestem, foxtail, nutsedge, poison ivy, greenbrier, Desmodium, and panicums.

Canopy closure and buildup of duff or needle layers is reducing or possibly eliminating grasses and forbs in the majority of the analysis area.

In the analysis area, the fire ecosystem currently falls into the Condition Class II category. Condition Class II fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This historical fire regime results in moderate changes to one or more of the following: fire size, intensity, and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Where appropriate, these areas need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.

In this analysis area, approximately 1931 acres (26% of project acres) are located within the Wildland Urban Interface (WUI). WUI areas are National Forest land that is within one-quarter of a mile from private land. These areas are at risk of a wildland fire that may occur within the National Forest lands that border these private lands. They are a priority for wildfire fuel reduction treatments due to the lives and property that need to be protected.

Sericea lespedeza, *Lespedeza cuneata*, is a non-native invasive plant that has become well established throughout the district. Sericea has become the dominant roadside species along many forest roads, including roads within the project area. Some sites of privet have been noted within the project area.

Effects

Alternative 1

Shelterwood cutting is generally accepted within the scientific community as being an appropriate

regeneration harvest cutting method for shortleaf pine when establishment of an even-aged stand is the desired future condition (Baker, 1991). Shelterwood cutting would utilize the seed source already in place. These stands have seedtrees that are of good quality and form and distribution of sawtimber trees is uniform across the stands. Past experience on the Mt. Magazine District has shown that stands with an adequately distributed number of well-formed sawtimber trees with good seed carrying capacity provide a sufficient number of seedlings to meet stocking requirements. These stands meet these requirements.

The desired future condition of these stands is vigorous, well-stocked shortleaf pine seedling/sapling stands similar in composition to the existing stands. Current composition of these stands range from 70% to 94% shortleaf pine. The objective is to maintain this pine type composition with at least a 70% pine and 30% hardwood stocking. After harvest and site preparation, the proposed stands would change from a mature pine condition class to an early successional stage consisting of a mix of natural shortleaf pine seedlings; hardwood sprouts, seedlings, poletimber, and sawtimber; and grasses and forbs.

Hard mast trees with diameters of 8.0 inches or larger at 4.5 feet height and black cherry, dogwood, French mulberry, persimmon, serviceberry, plum, and Ozark chinquapin would not be treated during site preparation. Hardwood key areas also would not be treated. This would contribute to the hardwood composition objective defined above.

Regenerating these stands would provide diversity in the lower age class by increasing the number of acres in the 0-10 year age class. Before implementation in 2011, <1% of the forested acres would be in the 0-10 year age class, with these acres being 6 and 9 years of age. Regenerating 653 acres by shelterwood harvest would improve habitat quality by providing early seral stands of a younger age class. The percentage of early seral acres after implementation in 2011 would increase the forested acres in this age class by 9% due to shelterwood regeneration. Early seral habitat would be provided for the next ten years on these 653 acres as they reach 10 years of age.

Approximately 74% of the pine/pine-hardwood acres are in the 41-year old and older age classes. Regenerating 653 acres of shortleaf pine would help break up these age classes preventing a large part of the area from getting old at one time. The percentage would fall to 60% following implementation. Breaking up the age classes now would help prevent mortality occurring all at one time.

The forest type of the shelterwood stands would not change. The percentage of hardwoods would increase in the harvested stands initially. As the shortleaf pine mature, a percentage of the smaller hardwood component would be lost due to competition and control. Approximately 10-20 leave den trees and mast producing hardwoods per acre would be left when the stand is regenerated. This hardwood component would remain in the stands.

Prescribed burning for site preparation and wildlife habitat improvement/fuels reduction is proposed in this alternative. Light to moderate intensity burns would temporarily reduce woody species coverage in the stands. Almost all of the hardwood species, most of the shrubs, and most of the vines are fire-adapted. While these may be top-killed by the burn, rootstocks would not be affected and resprouting would occur. Hardwood vegetation is expected to return to pre-burn levels in 5-7 years.

The temporary control in hardwood sprouts after site preparation burning would allow pine seedlings to become established in the regeneration areas. Seedbed site preparation by prescribed burning for shortleaf has been observed to increase seedling establishment one to five times that of unburned controls (Shelton and Wittwer, 1992).

Prescribed burning would reduce the risk of serious wildfire potential to the Wildland Urban Interface areas on 26% of the project acres.

The shelterwood stands would be planted with shortleaf pine if natural seedfall does not regenerate the sites. These non-stocked areas would change to a stocked condition following planting.

Stands that are proposed for thinning are overstocked resulting in a competition for water, sunlight, and nutrients. These trees are reaching or have reached maturity level and are becoming more susceptible to insect infestations, oak hypoxylon canker, and stress.

Pine boring beetles (e.g., black turpentine beetle, ambrosia beetle) and pine bark beetles (e.g., Ips engraver beetle, southern pine beetle, southern pine sawyer) can attack and overwhelm unhealthy stressed pine forests. Once insect infestations start, it is too late to effectively treat large areas and many acres of trees rapidly die. Prevention is the control method of choice by thinning stands to reduce competition and relieve moisture stress. By keeping the trees healthy, beetles are often exuded from the trees by pitch and are less likely to reach epidemic proportions.

Upland hardwood trees are susceptible to many insects and diseases. The annual combined loss due to insects and diseases is often more than the losses to forest fires. Some losses to insects and diseases are unavoidable. However, most losses can be avoided through proper forest management. Maintaining healthy stands by promoting tree vigor helps to avoid these losses.

Thinning would reduce the basal area in these stands and increase growth, vigor, and sustainability of the remaining trees. Thinning would relieve moisture stress while allowing space for new pine and hardwood seedlings to become established. Vigorous growth would produce timber that is of good quality for future supply.

Opening up these stands would increase the amount of sunlight reaching the forest floor and improve conditions for early seral stage plants such as bluestem grasses and various forbs. This would improve early seral plants on 44% of the forested acres.

Stands proposed for cedar thinning contain patches of thick cedar causing the crowns of these trees to grow together. This has prevented sunlight from reaching the forest floor creating bare ground under these cedar trees. Thinning these stands would reduce the trees per acre and increase growth and vigor of the remaining trees. Opening up these stands would increase the amount of sunlight reaching the forest floor and improve conditions for ground level plants such as bluestem grasses and various forbs.

Release treatment would be selective, treating a four-foot radius around each desired leave tree. Approximately 21% of each stand would remain untreated because vegetation would only be treated on an 8' x 8' spacing. The vegetation within the four-foot treated circle would be suppressed and the desired shortleaf pine or hardwood leave tree would gain sufficient height growth to exceed the competing vegetation. This release would allow forbs and grasses established last entry to continue to thrive in these stands contributing to plant and animal diversity and insuring them viability until the next entry.

Removing the seedtrees in stands proposed for seedtree removal may create linear openings in the stands as the seedtrees are skidded out. Grasses and forbs and eventually tree species would reclaim these open areas. Shortleaf pine seedlings may be damaged or eliminated in this removal but this would not decrease the stocking level below stocking standards.

During wildlife stand improvement, vegetation within a six-foot radius of the selected hardwood leave tree would be treated on a 12’ x 12’ spacing. The treated vegetation would be suppressed and the desired hardwood leave tree would gain sufficient height growth to exceed the competing vegetation.

Wildlife opening construction and wildlife opening enlargement would change the area of the openings from the existing forested condition to an open area consisting of grasses and forbs. Brush species could sprout back but the openings would return to a grass/forb condition once restoration is repeated on a two-year rotation.

In the wildlife openings proposed for restoration, vegetation would change from the existing brushy condition to one of improved forage preferred by wildlife. Brush species could sprout back but the openings would return to a grass/forb condition once restoration is repeated on a two-year rotation.

Road maintenance would include the cutting back of encroaching brush from the road right-of-ways. Vegetated areas would be disturbed when roads are bladed and ditches are reworked. Brush and vegetation would eventually reclaim these disturbed areas.

Temporary road construction would change these corridors from a forested condition to a grassy condition.

Following the sale, these roads would be blocked and vegetation would be allowed to reclaim these corridors with time.

Road construction would change these miles of corridor from a forested condition to an open corridor that may include grasses on the edges of the road.

Road reconstruction that includes widening of the roads would remove existing trees. These corridors would become part of the roadway and may include grasses on the edges of the road.

Road realignment of 1.6 miles of road would change these corridors from a forested condition to open corridors that may include grasses on the edges of the road.

Road decommissioning would restore these roadways back to a more natural state. Decommissioning would include reestablishing former drainage patterns, stabilizing slopes, blocking the entrances, installing water bars, removing culverts, removing unstable fills, pulling back road shoulders, scattering slash on the roadbed, and restoring natural corridors. Vegetation would reclaim these corridors over time.

Road closure of system roads would include seeding with wildlife-preferred seed mixtures and over time would provide a more grassy condition along these roadways.

The removal of the existing closure on FDR 96031A would not have an effect on vegetation. A new closure would be placed on FDR 1687E that would also keep FDR 96031A closed.

Trail decommissioning treatments would return the trail to a more natural state over time. Grasses would take over and eventually shrubs and tree species.

Trail relocation would not have an effect on vegetation since the trail is being moved to a corridor already being used as a trail.

Placing trail restrictors on the proposed trails would reduce the impact from larger vehicles on the trails. Vegetation would naturally become re-established over time along the trail edge.

The development of a borrow pit would change this site to an open area with little to no vegetation. Erosion control measures would be implemented to limit the impacts outside the borrow pit location.

Treatment of non-native invasive species would reduce intra-species competition encouraging native grasses and forbs to fill in the available habitat. Species that would be treated include but is not limited to Tree-of-heaven, paulownia, mimosa, privet Sericea lespedeza, kudzu, fescue, etc. This would include any species from the Regional Forester's List of Invasive Exotic Plant Species of Management Concern.

Stream habitat management is proposed on approximately 34.3 miles of streams in the project area. Large wood would be felled or placed in the streambed. Anywhere from 8-20 trees per mile would be placed in the streams. Small openings created by this tree removal would be vegetated by grasses and shrubs and eventually by seedlings and saplings.

Alternative 2

Implementing the no action alternative would allow continued growth of the vegetation. There would be little or no substantial short-term effect on vegetation in this alternative. However, if the no action alternative were followed indefinitely, then there would be a long-term effect. In the stands which are presently 70 years of age and older, there would be a loss in growth rates and a higher rate of mortality. As the pine trees die, they would be replaced by hardwood species, principally oak and hickory, which are now present in the midstory. Average site indices for the area are 60-70 for shortleaf pine. This is equivalent to 50-60 for upland oak (primarily black oak, blackjack oak, post oak, and a small component of white oak), usually of poor merchantable quality on these sites. The primary value of these species would be for wildlife habitat, but typically, mast production is not consistent on the sites in this area.

Additional acreage would not be added to the 0-10 year old age class. Therefore, plant diversity would not increase.

The basal areas in the younger stands would continue to increase. This would result in crown closure that would gradually reduce and eventually eliminate populations of early stage understory plants and the animal species associated with these vegetative communities. Plant species composition would be restricted to plants that can tolerate heavy shade resulting in a decrease of diversity.

Heavy stem density in the canopy would also result in increased stress/competition leading to a higher incidence of mortality due to insects and disease, loss of vigor and eventually stagnation.

Brush species along roadways would continue to encroach into the right-of-ways. Erosion would continue on system roads and trails.

Wildlife openings would grow up in unfavorable grass and brush species and eventually be taken over by pine and hardwood stems.

The exclusion of prescribed burning would cause the buildup of duff and needle layers to continue in the project area. This would reduce the number of small mammals, seed-eating birds, as well as some species such as deer and turkey. The lack of controlled prescribed burning would increase the chances of a catastrophic wildfire in this area. The possibility of wildfires within the WUI would increase.

Non-native invasive plant species would continue to become established in the project area.

K. WILDLIFE

Existing Condition

Wildlife, fish and plant species and their habitats in the project area are managed in cooperation with the Arkansas Game and Fish Commission (AG&F) and the Arkansas Natural Heritage Commission (ARNHC). The state wildlife management agencies main responsibilities are to set policy for hunting and fishing regulations and law enforcement programs. The project area is part of the Mt. Magazine Wildlife Management Area.

The Natural Heritage Commission is responsible for collecting and maintaining information on rare plants, animals and natural communities in Arkansas. The Forest Service is responsible for managing fish and wildlife habitat conditions on National Forest lands. The following discussion focuses on the habitat conditions that support wildlife populations and fisheries.

The aquatic fauna in the project area is very diverse. The richness and diversity of this area is the result of several factors including long geological history of favorable climates and habitats, a lack of glaciation during the Pleistocene era, and a wide variety of aquatic habitats in the Boston Mountain eco-region. The streams within the eco-region are typically clear, extremely high gradient, and riffle and pool habitat dominated systems with gravel, cobble, boulder, and bedrock dominated substrates of sandstone, shale, and limestone. The Ouachita Highlands eco-region does not have as many karst features as some of the other eco-regions in northwest Arkansas, but there are still many caves, springs, and seeps within the system. Streams within the Ouachita Highlands eco-region are classified as nutrient poor systems with much of the energy derived from an allochthonous food chain.

The Mt. Magazine Ranger District reflects conditions that are seen Forest wide in relation to age classes of forest stands. The project analysis area contains a high proportion of late seral wildlife habitat, and lacks open woodland capable of supporting diverse understory grass and herbaceous vegetation. Under the National Forest Management Act (NFMA) regulations, adopted in 1982, selection of management indicator species (MIS) during development of forest plans is required (36 CFR 219.19 [a]). Management Indicator Species (MIS) are selected “because their population changes are believed to indicate the effects of

management activities" (36 CFR 219.19 [a] [1]). They are used during planning to help compare effects of alternatives (36 CFR 219.19 [a] [2]) and as a focus for monitoring.

Table 10 shows Ozark National Forest MIS species pertinent to the Mt. Magazine Ranger District, the habitat type they represent, and population trends (Arkansas Game and Fish Commission - 2001, 2006, 2007a, 2007b; U.S. Department of Agriculture, 2001, 2007; and NatureServe 2010). From the Forest MIS list, 15 species have potential habitat based on occurrence records and/or habitat requirements within the analysis area and will be addressed.

Table 10. MIS Species, Habitat Requirements, and Population Trends.

Species	MIS Type	Habitat Requirements	Population Trend
Northern bobwhite	ecological indicator	pine and oak woodland and native grasslands	decreasing
Whitetail deer	demand	mosaic of forest age classes	stable to increasing*
Black bear	demand	remote habitat with mature forest component with intermixed 0-5 year old regeneration	stable to increasing*
Wild turkey	demand	mature forest with open areas containing grasses/forbs/soft mast	stable to decreasing*
Prairie warbler	ecological indicator	regenerating forest communities	decreasing
Brown-headed nuthatch	ecological indicator	open pine forest and woodlands	stable to decreasing
Cerulean warbler	ecological indicator	communities associated with mature hardwood forest with complex canopy structures, and dry-mesic oak Forest communities	stable to decreasing
Northern parula	ecological indicator	communities associated with forests in riparian areas	stable
Ovenbird	ecological indicator	dry-mesic oak forests	stable to increasing
Red-headed woodpecker	ecological indicator	oak woodland overstories	stable to decreasing
Pileated woodpecker	ecological indicator	large snags	stable to increasing
Scarlet tanager	ecological indicator	mature dry-mesic oak forest communities	stable
Acadian flycatcher	ecological indicator	mature mesic hardwood forest communities	stable to increasing
Smallmouth bass**	demand	cool water stream communities	increasing
Largemouth bass**	demand	quality pond and lake habitat	stable

** Information from AGFC harvest data*
*** Also addressed under the Fisheries Section of this EA*

In 1996, the Southern Region of the USDA Forest Service adopted "The Southern National Forest's Migrant and Resident Landbird Conservation Strategy" (Gaines and Morris 1996) to improve monitoring, research, and management programs affecting forest birds and their habitats. A region wide program of monitoring avian populations based on point-counts was initiated as part of this strategy. The results of this monitoring effort are reported in General Technical Report – NRS-9 (U.S. Department of Agriculture, 2007), and summarized for MIS avian species on the Ozark National Forest in supporting documentation (Taylor, 2011b). Data collected from 1992 to 2004 is utilized. Sampling strategy and point-count methodology is described in detail in Gaines and Morris (1996).

The analysis area is a mature forest matrix generally composed of a shortleaf pine sub-matrix and an oak-hickory sub-matrix. Currently on federal lands, approximately 2,727 acres or 37% of the analysis area is composed of hardwood/hardwood-pine forest types of an age capable of producing abundant hard mast for wildlife. Pine/pine-hardwood forest types comprise approximately 4,571 acres or 62% of the analysis area. Grassland/open areas on federal lands in the analysis area comprise approximately 0.5% of the total area, primarily consisting of permanently maintained wildlife openings, powerline right-of-ways, gas well pads, and roadsides.

Hard mast capability is well-distributed across the landscape. The majority of the analysis area's hardwood forest types are currently of mast-producing age. These age classes are those which are 41+ years of age. These stands are found within stream corridors and on all aspects with the best representation found on the north and east slopes. Hard mast-producing trees are also represented within the shortleaf pine sub-matrix, but to a lesser degree.

The mast needs of many forest animals are met when at least 20 percent of 640 acres (one square mile) is occupied by well-distributed mast-producing hardwood trees (Wildlife Habitat Management Handbook, 204.1).

At present, approximately 1% of the public lands in the project area (forest and woodlands) are in an early seral condition (0-10 years of age). Most of this representation of the 0-10 year age classes is the result of past timber harvest.

The analysis area reflects conditions that are seen Forest wide in relation to age classes of forest stands. The analysis area contains a high proportion of late-seral wildlife habitat, and lacks open woodland capable of supporting diverse understory grass and herbaceous vegetation as shown in Table 11.

Table 11. Forest Age Class Distribution by Alternative (Public Lands).

	Alternative 1		Alternative 2	
Age Classes (years)	**Proposed Action Acres**	**% Total Acres**	**No Action Acres**	**% Total Acres**
grass/forb*	82	1%	40	0.5%
0-10	726	10%	72	1%
11-20	131	2%	131	2%
21-40	1027	14%	1027	14%
41-70	1780	24%	1780	24%
71-100	3382	46%	4035	55%
100+	284	4%	284	4%

** Grass/forb acres are represented by existing road and utility right-of-ways, and existing and proposed wildlife openings. Grass/forb habitat is interspersed amongst forest stands shown in the preceding table in the 0-10 year through 100+ age classes.*

The majority of pine forest types in the analysis area are currently in age classes >71 years of age (approximately 39%). These stands are represented on all aspects, ridgetops and bottomland areas.

There are 13 permanent wildlife openings within these compartments. See the Existing Improvements Map on page 107. The LRMP objective is to have at least 4 well distributed 1-5 acre openings per 640 acres of land (LRMP- FW34, p. 3-6). The LRMP minimum objective for permanent wildlife openings in this project area is 31 and is not being met at this time.

Currently, there are 30 permanent ponds in the project area. Several intermittent streams provide seasonal water for the project area along with Shoal Creek, a perennial stream. A goal of the LRMP is to provide at least two permanent water sources per 640-acre habitat unit (LRMP, p. 4-7). No additional ponds are needed to meet the goal of the LRMP. Water is seasonally widespread enough throughout the area to meet seasonal availability needs of most wildlife species.

Effects

Alternative 1

Effects to wildlife and MIS from implementation of the action alternative are analyzed in detail in a reference paper compiled for the Pleasant Hill and Mt. Magazine Ranger Districts (Taylor, 2011b). This paper is part of the project analysis file.

With implementation of Alternative 1, approximately 653 acres would be converted, through harvest and subsequent regeneration, from the 71-100 year age classes to the 0-10 year age class. Browse and early-successional forest habitat would be provided in these regeneration areas for a variety of wildlife species. Viability of disturbance-dependent avian species would be enhanced. Avian species requiring both large and small areas of early successional vegetation and forest edge would benefit. Implementation of shelterwood regeneration systems would result in 10% of the public land-base within the analysis area compartments in early successional forest habitat, as opposed to 1% under current conditions. In addition, approximately 42 acres in the 41-100 year age classes would be converted to grass/forb habitat (wildlife openings). This would result in 1% of the public land-base within the analysis area being in grass/forb habitat, as opposed to 0.5% under current conditions.

With implementation of Alternative 1, approximately 24% of the pine forest type would remain in the >71 year age classes.

Overall, in both pine and hardwood forest types, implementation of Alternative 1 would result in an approximate 9% reduction of forest habitat that is greater than 71 years old. Following implementation of this alternative, approximately 50% of the forested (both pine and hardwood) public land base within the analysis area compartments would remain in the 71-100+ year age classes. When considering recruitment of stands from the 41-70 year age classes (approximately 1780 acres or 24% of analysis area land base) in the next 1-30 years, and examination of distribution of stand age classes, fragmentation of interior forest habitat is not anticipated.

Timber Harvest and Wildlife Habitat Improvement.

Effects of implementation of the action alternative are described in Taylor (2011b), in relation to the subsections Early Successional Habitat, Soft Mast Production, and Hard Mast Production. Indirect negative effects to wildlife species dependent upon older seral stages and habitat requirements associated with closed canopy conditions would occur. Thinning to help restore woodland conditions and creation of wildlife openings to improve herbaceous diversity would cause positive indirect impacts to wildlife. Short-term early-successional habitat in regenerated forest stands would occur, thereby causing positive indirect effects to disturbance-dependent and early successional obligate wildlife species. Use of thinning and regeneration harvest would improve production of soft mast. Increases in abundance of soft mast utilized by a variety of wildlife species as a reliable seasonal food source would occur. Regeneration silvicultural treatments would provide age class diversity and maintain oak in the ecosystem as a source of hard mast for wildlife species.

Oak species would be expected to be maintained as a component of the forest ecosystem in the long term. This alternative would cause positive indirect impacts to wildlife species. Diverse and high quality habitats supporting well-distributed and viable populations of all native and desired non-native plants and animals would meet desired conditions for fish and wildlife as specified in the LRMP. Disturbance regimes within terrestrial habitats providing a stable and sustained flow of both early and late-successional habitats over time would meet desired conditions for fish and wildlife habitat as specified in the Forest LRMP. Herbicide use (as proposed with Alternative 1) is an important tool often used in woodland restoration thinning and wildlife opening construction and restoration to prevent sprouting of woody species and therefore allowing for greater understory herbaceous vegetation abundance and diversity.

Silvicultural Treatments

These practices, which include release and tree planting are beneficial to wildlife in the long-term. These practices provide indirect beneficial effects to wildlife by insuring long-term perpetuation of hard mast-producing trees and shortleaf pine in the ecosystem.

Prescribed Fire

Implementation of prescribed fire may cause some direct mortality to small mammals and herpetofauna in the short-term. However, Kirkland et al. (1997) found that fire effects upon small mammals in oak-dominated forests are transitory. Quantitative differences between burned and unburned habitats were found to disappear within eight months following the burn. Rapid recovery of populations of small mammals in burned forests may be due to the rapid regrowth of ground cover from surviving rootstocks. Research found there were few discernible differences in small mammal and herpetofauna populations between burned and control areas, supporting the contention that prescribed fire in the project area had little overall impact on the terrestrial vertebrate fauna. In addition, immediate impacts of the burn on small mammals are slight as many species exhibit varying degrees of fossorial habits (Ford et al., 1999). In a study within the upper piedmont of South Carolina, Kilpatrick (et. al. 2004) found that prescribed burning and thinning for fuel reduction had minimal effects on herpetofauna in upland pine plantations. Prescribed burning has been found to change the composition of woody species seedlings. Due to reduction in the number of shade-tolerant species from prescribed burning, greater equitability among tolerant and intolerant species seedlings occurred. Mechanical removal of understory vegetation followed by prescribed fire provided both greater equitability among species and higher levels of photosynthetically active radiation reaching the forest floor (Dolan, 2004). Prescribed burning and sub-canopy removal are important tools in improving conditions for oak seedling establishment while reducing competition from shade-tolerant species. Shelterwood/Oak-Restoration harvest followed by prescribed fire simulates the combined events of overstory disturbance followed by fire; these are related events that have shaped the composition of oak ecosystems for millennia (Van Lear, 2000).

Herbicide Use

Herbicide use is also an important tool for benefiting pine regeneration by providing for these species presence in the ecosystem in the long term. Herbicide use is also an important tool for maintaining and improving grass/forb habitat for wildlife. Effects of herbicide toxicity data and dosage estimates for triclopyr, imazapic, imazapyr, and glyphosate proposed for use in this action alternative indicate that there is only a very low risk to wildlife, both from realistic and extreme exposures. Monitoring for herbicide concentrations following use has been a continuous policy of the Ozark-St. Francis National Forests. Results have not documented any significant concentrations of herbicides or off-site movement. In a study regarding the use of herbicides in forestry applications (Michael, 2001), the author found that maximum pesticide concentrations observed in water have been much lower than the maximum levels which the Environmental Protection Agency (EPA) considers safe for consumption on a daily basis over a lifetime (HAL). In some studies, the author reviewed maximum herbicide concentrations observed in ephemeral to first-order streams exceeded the lifetime HAL, but found that they last only a few hours and the highest concentrations did not exceed EPA's 1-day HAL. Even with the widespread use of pesticides in North America, those typically used in forestry vegetation management programs have not been identified in surface or ground water at sufficiently high concentrations to impair drinking water quality. Their rapid break-down by physical, chemical, and biological routes coupled with current use patterns precludes the development of significant water contamination problems unless they are applied directly to water. Additionally, mitigation measures normally employed through State Best Management Practices (BMPs) further restrict herbicide's effects

outside the boundaries of its application. On February 23 and 24, 2009 analysis of risk was performed for the chemicals glyphosate, imazapic, imazapyr, triclopyr amine, and triclopyr ester at the proposed rate of application in SERA risk assessments prepared for the USDA Forest Service. In a variety of human health and environmental health scenarios (including a variety of wildlife scenarios) most Hazard Quotients were projected to be below the Forest's maximum acceptable standard of 1.0. Application of mitigation measures shown previously in this document and adherence to Forest Standards for herbicide use and chemical labels for application would negate hazard quotients > 1.0 related to drift, accidental spills and run-off. Parameters and output from these analyses are available as part of the process record at the Mt. Magazine Ranger District Office.

Glyphosate is not soil active and has low toxicity to animals. Lab studies conducted specifically on bobwhite quail also demonstrate extremely low toxicity. Typical hazard quotients for foliar and cut surface application for glyphosate to wildlife are less than 1.0.

Imazapic is weakly absorbed in basic soils, but absorption increases in acidic soils. This herbicide has low toxicity to animals. Hazard quotients calculated for risk to terrestrial wildlife are all less than 1.0 (see process record for specific numbers).

Imazapyr has very low toxicity to mammals or other animals, however it can be soil active particularly during spring leaf expansion. Application after mid-September may yield soil activity the following spring. All HQ's are well under 1.0, (see process record for specific numbers) with the exception of effects to aquatic plants. Any non-target plants if occurring in proximity to treated plants, could be killed and this could indirectly affect habitat for MIS on a very small scale.

Triclopyr Amine and Triclopyr Ester have low bioconcentration potential and single dose toxicity to mammals is low although prolonged or repeated exposure may cause skin irritation in mammals (MSDS dated 1/17/2001). Typical hazard quotients associated with both foliar and cut surface application of triclopyr for wildlife are less than 1.0, with the exception of the longer-term (90 days) exposure of a large mammal to contaminated vegetation on site (see process record for specific numbers). These upper bound HQs are not a concern because:

- The scenario assumes a diet composed of 100% contaminated vegetation or insects from the site which is highly unlikely. The long-term HQ assumes that vegetation is consumed on the same site for 90 days which is also unlikely.
- The HQs deal with individuals, not populations.
- The amount of non-target vegetation subject to spray deposition is very small and animals are unlikely to be eating vegetation treated with cut surface application of chemical in WSI, wildlife opening and site preparation areas.

Direct effects, occurring at time of application, to birds or large mammals are unlikely, since these species are likely to move from the area when project activities are implemented. Although direct effects to amphibians are more likely since contact with herbicide could be absorbed through the skin and effect metabolic activity, amphibians are likely to be under logs, rocks or leaves, making direct contact with chemicals less likely. Direct effects to other non-target plants occurring in these habitats could occur. Application methods, including direct application to target foliage, or to application to cut surfaces, would minimize the possibility for spills and/or direct contamination to non-target species.

Indirect effects to MIS birds or mammals could occur if these species were to ingest foliage or seeds contaminated with any of the chemicals proposed in Alternative 1, however, none of the chemicals would bioaccumulate in organisms. Indirect effects to MIS and habitats treated with all chemicals are likely to be negligible given that applicators treat target organisms only and that mitigation measures and forest-wide standards would be used.

There are likely to be few negative cumulative effects to MIS species over time as a result of implementing Alternative 1. None of the herbicides proposed for use would bioaccumulate or have lengthy half lives in the environment. Related to cumulative impacts, the Mt. Magazine District is proposing in this NEPA analysis to apply herbicide in the analysis area on up to 700 acres annually to treat non native invasive species (NNIS). Realistically, for the reasonably foreseeable future, this may amount to 300-700 acres of herbicide treatment

in the analysis area for NNIS over the next five years. In addition, no other herbicide projects are known from the Ozark National Forest or the vicinity at present, though some herbicide use is likely to occur on private lands particularly in association with agricultural production. Efforts to maintain early seral habitat and restore herbaceous species biodiversity in WSI areas, and TSI treatments and site preparation treatments to benefit pine regeneration and hard mast producing species are also likely to cumulatively benefit associated MIS species.

The past and proposed use of herbicides would have no negative direct, indirect or cumulative effects on water quality or wildlife with adherence to Forest Wide Standards FW19 - FW 32 in the LRMP. Proposed herbicide use would have beneficial effects on species using early-successional habitat. This would occur by allowing creation and restoration of wildlife openings, reduction of overstory and midstory canopy in WSI areas, and promoting pine regeneration through site preparation practices.

Road Work

No negative long-term impacts to wildlife would occur through proposed road construction, road reconstruction, road maintenance or temporary roading. Closure of roads following use would reduce disturbance to wildlife. Reconstruction, realignment, and maintenance of roads would lead to improved water quality by reducing existing erosion, through use of improved road design features. Application of BMPs and LRMP forest-wide standards (FW-72 – FW-76, FW-78, FW-79, FW-81, FW-82, and FW-87 – FW-90) would be utilized for all road related work. Unmaintained and unauthorized non-system roads are one of the most common sources of accelerated erosion on National Forest lands. The proposed action would serve to assist in "disconnecting" the road system from the stream network. Road maintenance would help preclude entrainment of sedimentation in creeks from poor quality roads. This would cause positive indirect impacts to water quality and aquatic species. Open road density in the project area would in most cases be reduced by road decommissioning and closure of roads with gates – allowing administrative access only. This would serve to reduce potential erosion, providing positive indirect impacts to water quality and aquatic species. Gating areas, including some large blocks, would provide habitats for species sensitive to human disturbance and provide opportunity for more remote wildlife-related recreation opportunities.

Trail Improvement

No negative long-term impacts to wildlife would occur through proposed trail improvements and relocation. Restricting trail use to vehicles less than 50 inches in width, and relocating sections of trail out of areas with drainage/erosion issues would reduce sedimentation into streams. The proposed action would serve to reduce erosion/sedimentation and assist in "disconnecting" trail systems from the stream network.

In summary, the action alternative is predicted to have negative short-term effects to 9 of 15 management indicator species analyzed. Negative impacts would be primarily short-term disturbance of individual animals and potential loss of nests. Viability of populations as a whole would not be reduced (Taylor, 2011b).

The use of proposed management actions as described in this Environmental Assessment would be of long-term benefit to MIS that rely upon forest ecosystems, particularly pine/oak ecosystems, for habitat. In summary, Alternative 1 (Proposed Action) is predicted to have positive long-term effects to 15 of 15 management indicator species analyzed. Although some individual negative long-term effects are predicted, populations of all MIS would be expected to remain viable in the analysis area, the Ouachita highlands and on the National Forest (Taylor, 2011b).

Alternative 2 (No Action)

Currently approved management actions would be maintained under this alternative.

Effects to wildlife and MIS from implementation of the no action alternative are analyzed in detail in a reference paper compiled for the Pleasant Hill and Magazine Ranger Districts (Taylor, 2011b). This paper is part of the project analysis file.

Timber Harvest and Wildlife Habitat Improvement.

Effects of implementation of the no action alternative are described in Taylor (2011b), in relation to the subsections Early Successional Habitat, Soft Mast Production, and Hard Mast Production. Indirect beneficial effects to wildlife species dependent upon older seral stages, and habitat requirements associated with closed-canopy conditions would occur. Thinning to help restore woodland conditions and creation of wildlife openings to improve herbaceous diversity would not occur. Short-term early successional habitat in regenerated forest stands would not occur, thereby causing negative indirect effects to disturbance-dependent and early successional obligate wildlife species. Lack of use of thinning and regeneration harvest would not allow for improved production of soft mast. Increases in abundance of soft mast, utilized by a variety of wildlife species as a reliable seasonal food source would not occur. Regeneration silvicultural treatments would not be implemented to provide age class diversity in pine and to a lesser extent maintain oak in the ecosystem as a source of hard mast for wildlife species. Oak species would be expected to become a minor component of the forest ecosystem in the long term without significant forest stand disturbance or treatments that favor oak regeneration. This alternative would cause negative indirect impacts to wildlife species. LRMP recommendations of diverse, high quality habitats supporting well-distributed and viable populations of all native and desired non-native plants and animals would not be met. Natural disturbance regimes within terrestrial habitats providing a stable and sustained flow of both early- and late-successional habitats over time would not meet desired conditions for fish and wildlife habitat.

Silvicultural Treatments

Silvicultural practices, including pine release and planting of pine (as necessary) would not occur. Lack of improvement of stands containing beneficial tree species for wildlife would not occur, thereby causing indirect adverse impacts.

Prescribed Fire

Prescribed fire would not be implemented in the project analysis area with adoption of this alternative. Benefits to wildlife from: sustaining oak in the ecosystem for hard mast production; restoring woodlands for increased herbaceous diversity and density; maintaining pine as a significant component in the ecosystem; maintaining other fire-dependent or adapted species and habitats; and abatement of non-native invasive plant species would not occur. Lack of use of prescribed fire would not allow for improved production of soft mast. Increases in abundance of soft mast utilized by a variety of wildlife species as a reliable seasonal food source would not occur. This would cause negative indirect impacts to wildlife species. LRMP (USDA, 2005) recommendations of diverse, high quality habitats supporting well-distributed and viable populations of all native and desired non-native plants and animals would not be met. Natural disturbance regimes within terrestrial habitats providing a stable and sustained flow of both early- and late-successional habitats over time would not meet desired conditions for fish and wildlife habitat.

Herbicide Use

Herbicide use for site preparation in pine shelterwood harvest areas is an important tool for benefiting pine regeneration, by reducing interspecies competition and providing for this species presence in the ecosystem in the long term. Herbicide use for completion of WSI and wildlife opening construction/restoration is an important tool for improving grass/forb habitat for wildlife. Without use of this tool, benefits to pine regeneration and wildlife would not occur.

Road Work

Road maintenance, road decommissioning and closure of roads to administrative use only would not occur. The “No Action” alternative would not serve to disconnect the road system from the stream network. Road maintenance at levels expected to occur with the action alternatives would not occur, thereby allowing entrainment of sedimentation to continue in creeks from poor quality roads. This would cause adverse indirect impacts to water quality and aquatic species. Open road density in the project area would remain status quo, thereby allowing potential erosion to cause adverse indirect impacts to water quality and aquatic species.

Trail Improvement

Trail improvement and relocation would not occur with implementation of the “No Action” alternative. Restricting trail use to vehicles less than 50 inches in width, and relocating sections of trail out of areas with

drainage/erosion issues would not occur. Entrainment of sedimentation into creeks from erosion caused by large OHVs and poorly located trails would continue. This would cause adverse indirect impacts to water quality and aquatic species.

There would be no change short term in the amount of closed-canopy forest habitat from current levels under the No Action Alternative. Species requiring interior/closed canopy forest habitat would be expected to remain stable or increase within the project analysis area. Species requiring forest openings, edges between different successional stages, and herbaceous/shrub browse would be expected to remain stable or decrease long term within the project analysis area.

Habitat components would continue to be less than specified in the LRMP within the project analysis area. Objectives as described in the LRMP (USDA, 2005) for bobwhite quail, whitetail deer, eastern wild turkey, black bear and largemouth/smallmouth bass (OBJ.10, OBJ.11, OBJ. 12, OBJ. 13, and OBJ. 15 respectively) would not be met in the project analysis area with implementation of the no action alternative. The objective for non-native invasive species treatment (OBJ. 9) would not be met in the project analysis area. The objective for insect and disease management through thinning and regeneration of oak and pine (OBJ. 8) would not be met in the project analysis area.

LRMP minimums for wildlife openings would not be met. The existing wildlife openings would change into young forest habitat. Species such as deer, turkey, and bear would not benefit from these areas.

L. FISHERIES

Existing Condition

The analysis area for fisheries effects is comprised of all streams and waterbodies within and downstream of Compartments 23, 27, 28, 31, and 62 within the Shoal Creek Watershed. The major streams in the project area include Big Shoal Creek, Gulf Creek, and Brushy Creek. The entire project area falls within the Arkansas River Valley ecoregion.

Field visits were made to the project area to collect habitat and species composition information to determine potential project activities that could be included in the alternatives and to evaluate the potential for effects from all the proposed management activities. The Shoal Creek Watershed was inventoried in the summer of 2005 (Nuckols et al., 2006). Gulf Creek and Brushy Creek were not surveyed during the field visits but observers did note a lack of large woody debris in these channels. Shoal Creek was inventoried as part of the survey.

Table 12 displays the habitat collected in the summer of 2005 with the number of pieces of large woody debris per mile and the pool/riffle ratio for Spring Creek (Nuckols et. al, 2006).

Table 12. Stream Habitat Collected in the Project Area.

Stream Name	Large Woody Debris (pieces/mile)		Pool/Riffle Ratio
	>3.3 feet long >3.9 inches diameter	>16.4 feet long >19.7 inches diameter	
Shoal Creek	0	0	70/30

This stream showed a lack of overall large woody debris in both the larger size class (greater than 16.4 feet long and greater than 19.7 inches in diameter) and the smaller size class (greater than 3.3 feet long and greater than 3.9 inches in diameter) compared to the objectives set aside in the LRMP.

Regulation 2 of the Arkansas Pollution Control and Ecology Commission states: "High quality streams of the Arkansas River Valley ecoregion would support diverse communities of indigenous or adapted species of fish and other forms of aquatic life. Fish communities are characterized by a substantial proportion of sensitive species; a sunfish and minnow dominated community exists but with substantial proportions of darters and catfish (particularly madtoms)" (Arkansas Pollution Control and Ecology Commission, 2004.)

Table 13 shows the Key and Indicator species listed by the Arkansas Pollution Control and Ecology Commission under Regulation Number 2 for the Arkansas River Valley ecoregion.

Table 13. Key and Indicator Species.

Key Species	Indicator Species
Bluntnose minnow	Orangespotted sunfish
Golden redhorse	Blackside darter
Yellow bullhead	Madtoms
Longear sunfish	
Redfin darter	
Spotted bass	

Shoal Creek was the only stream that fish surveys were completed on during the field visits to the watershed. Table 14 displays the fish species and number of fish that were captured. Several of the key species for the ecoregion were found during the sampling of Shoal Creek. An Index of Biotic Integrity (IBI) was done for the fish sample from Shoal Creek. This IBI was developed by the Arkansas Department of Environmental Quality (ADEQ) for the Arkansas River Valley eco-region. An IBI is a scientific tool used to identify and classify water quality within a waterbody based on biological species information. The IBI score for Shoal Creek was in the fair range. The reason this stream did not score in the good range was the lack of sunfish and bass within the samples and the overabundance of central stonerollers in the sample. This stream is still in good shape overall because it has a large diversity of species.

Table 14. Fish Species Captured in Shoal Creek.

Fish Species	Total Individuals	Relative Abundance (%)
Bigeye Shiner	5	3
Bluntnose Minnow	7	4
Central Stoneroller	80	52
Creek Chub	12	8
Green Sunfish	1	<1
Greenside Darter	4	3

Table 14. Fish Species Captured in Shoal Creek, continued.

Fish Species	Total Individuals	Relative Abundance (%)
Bluegill	2	1
Largemouth Bass	3	2
Longear Sunfish	1	<1
Northern Hog Sucker	4	3
Orangethroat Darter	17	11
Redfin Darter	1	1
Slender Madtom	18	12

Smallmouth bass was selected as a MIS due to popularity as a sport fish and as an indicator of high quality stream habitat. It is an inhabitant of cool, clear mountain streams with permanent flow and rocky bottoms. It is more intolerant to habitat alteration than any of the other black basses, and is especially intolerant of high turbidity and siltation. The species was not found during surveys of streams in the project area. Fishes of Arkansas does show a collection record for the project area for smallmouth bass but the record is pre-1960.

Largemouth bass was selected as a MIS due to popularity as a sport fish and as an indicator of high quality pond and lake habitat. It is an inhabitant of clear, quiet waters in natural and manmade lakes and ponds, and in the backwaters and pools of streams and rivers. It is of high turbidity and siltation and is often found during most of the day near logs or other cover in deep water. The species was found during surveys but not in the normal lake/pond habitat.

Effects

Alternative 1

Streams are dynamic systems and are in a continuous state of change. Natural sedimentation would continue to occur from bank erosion and heavy rain events. In addition, sedimentation from private lands within the watershed would be expected to continue but is outside the control of the agency.

Data collected from the Shoal Creek watershed would suggest that water quality has remained fair in the project area. Past management activities have included timber harvesting, silvicultural treatments, road construction and reconstruction, wildlife habitat improvement, and prescribed burning. National Forest management on these drainages has been ongoing since the early 1940s and water quality problems have not been noted.

Based on the analysis in the Soil and Water effects sections, along with the incorporation of the mitigation measures beginning on page 26; there would be no substantial effect on any stream (or aquatic species utilizing them) in the Shoal Creek watershed.

There may be minimal increases in water yields. Since the streams in the analysis area are intermittent, any minimal increase in water yield would provide at the most, very limited benefits to fish populations. Increased water yields, particularly during the summer and fall, could benefit the fish populations in these streams by providing more through-gravel flow, increased nutrients, and more available aquatic habitat. However, since any increases are expected to be minimal and short term, there would not be any observable benefit to the fish population in the effected streams. Similarly, since any increases in yield would be small, there would

not be any adverse effect from increased flow, such as increases in stream bank erosion or scouring.

The addition of the large woody debris would lead to greater habitat complexity which could lead to greater retention of water through the summer months. The addition of the large woody debris from the activities proposed in Alternative 1 would create more in stream habitat for all species, which could increase the biomass and productivity within these systems.

With this alternative, forest standards from the LRMP and Best Management Practices (BMPs) guidelines in Section VI of the Arkansas Forestry Commission's BMPs for Water Quality Protection would be implemented and followed.

BMPs used for streamside management areas are similar on the Ozark and Ouachita National Forests. Clinginpeel (1989) and Neihardt (1992) measured the effectiveness of Best Management Practices on the Ouachita National Forest in Arkansas and Oklahoma. Clinginpeel focused on BMPs for streamside management areas (SMAs) and for road crossings of intermittent and ephemeral streams. The measured parameters in both studies were sediment, turbidity in Jackson Turbidity Units (JTUs), conductivity, alkalinity, pH, nitrites, nitrates, sulfates, and chlorides. Additional parameters in Neihardt's study were total dissolved solids, hardness, turbidity in Nephelometric Turbidity Units (NTUs), acid, and several metals.

Clinginpeel found that sulfates differed significantly above and below stream crossings, but actual differences were small (1.84 mg/l and 1.94 mg/l, respectively). Above and below measurements at SMAs were statistically different for turbidity (16.1 JTUs and 19.5 JTUs, respectively) and pH (6.13 pH and 6.32 pH, respectively), but remained within State standards. All the other parameters were unchanged. Neihardt found that turbidity measured in JTUs was statistically different, but turbidity measured in NTUs was not. Both investigators concluded that forestry BMPs, as implemented on the Ouachita National Forest, effectively maintained water quality within State standards.

In a separate study, Clinginpeel (1993) evaluated the effectiveness of BMPs for silvicultural herbicide application on the Ouachita National Forest from Fiscal Years 1989 through 1993. Again, stormwater samples were collected above and below treated areas from streams in potentially impacted areas, and analyzed for positive readings of Garlon, Velpar, and Roundup. In all, 348 water samples were collected from 168 sites. Sixty-nine samples, or 19.8 percent, tested positive for herbicides, but all positive samples were less than one-quarter the EPA limit for the specific herbicide and the toxic limit for fish. He concluded that the BMPs tested effectively protected water quality and fisheries (Clinginpeel, 1989, 1993 and Neidhardt, 1992).

The replacement of road/stream crossings that are known barriers to aquatic organism migration would increase connectivity for the populations of aquatic organisms that live within the watershed. This would increase the genetic variability of the population as well as increase the ability to utilize for individuals to utilize different habitats during different times of the year.

Smallmouth bass has a low tolerance for sedimentation. The timber harvesting, silvicultural treatments, temporary road construction, system road reconstruction and construction, wildlife habitat improvement, prescribed burning, and other proposed activities may cause a temporary increase in sediment, but would be minimal because BMPs and forest standards would be followed during the activities. The use of herbicide in the project area would have no effect on smallmouth bass as long as label directions and agency protocols are followed. The addition of large woody debris to the streams would create greater stream complexity which could provide more habitat and greater amounts of food biomass for smallmouth bass within the project area. Given forest-wide standards and riparian standards, the activities associated with this project should keep smallmouth bass populations at current levels or increase the relative abundance of the species in the watershed.

Largemouth bass species have a low tolerance for sedimentation. The timber harvesting, silvicultural treatments, temporary road construction, system road construction and reconstruction, wildlife habitat improvement, prescribed burning, and other proposed activities may cause a temporary increase in sediment, but would be minimal because BMPs and forest standards would be followed during the activities. The use of herbicide in the project area would have no effect on largemouth bass as long as label directions and agency protocols are followed. The addition of large woody debris to the streams would create greater

stream complexity which could provide more habitat and greater amounts of food biomass for largemouth bass in larger streams downstream of the project area as the large wood moves through the system. Given forest-wide standards and riparian standards, the activities associated with this project should increase largemouth bass populations in the watershed.

The effects of the proposed action, both individually and cumulatively, are not expected to have any considerable effects on the water quality within the project area. There would be no effect on fish or other aquatic species from the proposed actions in Alternative 1.

Alternative 2 (No Action)

No activities are planned or implemented with this alternative; therefore, no change would occur in stream conditions that would be attributable to management actions proposed here. Streams are dynamic systems and are in a continuous state of change. Natural sedimentation would continue to occur from bank erosion, from existing roads and trails, as well as heavy rain events.

Because no activities are planned with this alternative, aquatic MIS species would not be affected. Smallmouth and largemouth bass populations would stay at current levels within the watershed or could drop do to the lack of road and trail maintenance that would not be completed as part of the project and the roads and trails that would not be closed. This would be caused by the increase in sediment from these sources as they get increasingly more traffic. It also could be caused by the lack of habitat improvements from the lack of large wood in the stream system and the lack of aquatic connectivity caused by the fish passage barriers.

M. PROPOSED, ENDANGERED, THREATENED AND SENSITIVE SPECIES

Existing Condition

Forest Service Manual (FSM) Section 2672.41 requires a biological evaluation (BE) and/or biological assessment (BA) for all Forest Service planned, funded, executed, or permitted programs and activities. The objectives of this BE are to: 1) ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native species or contribute to trends toward federal listing, 2) comply with the requirements of the Endangered Species Act (ESA) so that federal agencies do not jeopardize or adversely modify critical habitat (as defined in ESA) of federally listed species, and 3) provide a process and standard to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process.

Federally listed threatened and endangered species, species proposed for federal listing, and Southern Region sensitive species that may potentially be affected by this project were examined using the following existing available information:

1. Reviewing the list of TES plant and animal species known or likely to occur on the Ozark-St. Francis National Forest, and their habitat preferences. This review included the U.S. Fish and Wildlife Service current list of endangered, threatened, and proposed species for Arkansas as of Feb. 23, 2009, the forest-wide list as of Oct. 8, 2007 and the current Southern Region Sensitive Species list for the Forest, dated August 8, 2007.
2. Consulting element occurrence records (EORs) for TES species as maintained by the Arkansas Natural Heritage Program (ARNHP).
3. Consulting with individuals in the private and public sector who are knowledgeable about the area and its flora and/or fauna.
4. Reviewing sources listed in the reference portion of this report.
5. Reviewing the results of field surveys that have been conducted in the area.

Most TES species known to occur on the Forest have unique habitat requirements, such as glades, barrens, rock outcrops, bogs, caves, and natural ponds. Appendix A of the BE lists all 63 TES species currently known or expected to occur on or near the Ozark-St. Francis National Forest. All species on the list were considered during the analysis for this project.

A "step down" process was followed to eliminate species from further analysis and focus on those species that may be affected by proposed project activities. Species not eliminated are then analyzed in greater detail. Results of this "step down" analysis process are displayed in the Occurrence Analysis Results (OAR) column of the table in Appendix A of the BE. First, the range of a species was considered. Species' ranges on the Forest are based on county records contained in such documents as An Atlas and Annotated List of the Vascular Plants of Arkansas, and NatureServe Explorer, but are refined further when additional information is available, such as more recent occurrences documented in scientific literature or in Natural Heritage databases. Many times, historic range information clearly indicates a species will not occur in the analysis area due to the restricted geographic distribution of most TES species. When the analysis area is outside a known species range, that species is eliminated from further consideration by being coded as OAR code "1" in the Appendix A table. For the remaining species, after this first step, results from past surveys, knowledge of the analysis area and potential for suitable habitat were considered.

These resources and information were compiled to produce a site-specific biological evaluation for this project (Taylor, 2011a).

Species Identified as Being in the Action Area or Potentially Affected by the Action

From past field surveys and knowledge of the area, and given the proposed action, those species which are analyzed and discussed further in this document are those that: a) are found to be located in the activity area (OAR code "5"), b) were not seen during the survey(s), but possibly occur in the activity area based on habitat observed during the survey(s) or field survey was not conducted when species is recognizable (OAR code "6"), and c) aquatic species known or suspected downstream of the project/activity area, but where project effects would be immeasurable or insignificant (OAR code "7").

As a result of this process, the following species occur as documented by field surveys or may potentially occur in the activity area based on habitat observations:

Table 15. Threatened, Endangered, or Sensitive Species Occurrences in the Shoal Project.

OAR Code	Scientific Name	Common Name	Taxa	Status
6	*Aimophila aestivalis*	Bachman's sparrow	Bird	Sensitive
6	*Haliaeetus leucocephalus*	Bald eagle	Bird	Sensitive
6	*Corynorhinus townsendii ingens*	Ozark big-eared bat	Mammal	Endangered
6	*Myotis grisescens*	Gray bat	Mammal	Endangered
6	*Myotis leibii*	Eastern small- footed bat	Mammal	Sensitive
6	*Myotis sodalis*	Indiana bat	Mammal	Endangered
6	*Lirceus bicuspicatus*	An isopod	Isopod	Sensitive
6	*Amorpha Ouachitensis*	Ouachita leadplant	Plant	Sensitive
6	*Callirhoe bushii*	Bush's poppymallow	Plant	Sensitive
5	*Castanea pumila var. ozarkensis*	Ozark chinquapin	Plant	Sensitive

Table 15. Threatened, Endangered, or Sensitive Species Occurrences in the Shoal Project.

OAR Code	Scientific Name	Common Name	Taxa	Status
6	*Cypripedium kentuckiense*	Southern lady's slipper	Plant	Sensitive
6	*Delphinium newtonianum*	Moore's larkspur	Plant	Sensitive
6	*Solidago ouachitensis*	Ouachita mountain goldenrod	Plant	Sensitive
6	*Tradescantia ozarkana*	Ozark Spiderwort	Plant	Sensitive
6	*Valerianella nuttallii*	Nutall's cornsalad	Plant	Sensitive

Table 15 shows one plant species (Ozark chinquapin) was identified within the analysis area (OAR code "5").

Fourteen species were not seen during field surveys, but possibly occur in the analysis area based on habitat observed or the field surveys were conducted when the species is not recognizable (OAR code"6");

Effects

Alternative 1

The analysis of possible effects to species identified as known or expected to occur in the vicinity of the proposed project, or likely to be affected by the action, includes the following existing information:

1. Data on species/habitat relationships.
2. Species range distribution.
3. Occurrences developed from past field surveys or field observations.
4. The amount, condition, and distribution of suitable habitat.

Effects to species include anticipated effects from implementation of the proposed action. Predicted effects to species shown in the table above are described in the Biological Evaluation for the Shoal Project (Taylor, 2011a).

Ozark big-eared bat

The proposed action was designed to totally incorporate all Forest-wide standards and direction provided by the USFWS related to the conservation of all listed bat species.

There are no foreseeable additional activities in the area (not associated with this project) that would directly or indirectly affect the Ozark big-eared bat population as a whole, or cause additive or synergistic adverse cumulative impacts in conjunction with the proposed action.

With implementation of Forest-wide standards from the LRMP which were developed in coordination with the USFWS during the revision process, the determination of effect for the Ozark big-eared bat related to this proposed project is: "may affect – not likely to adversely affect."

Gray bat

There are no foreseeable additional activities in the area (not associated with this project) that would directly or indirectly affect the gray bat population as a whole, or cause additive or synergistic adverse cumulative impacts in conjunction with the proposed action.

With implementation of Forest-wide standards from the LRMP which were developed in coordination with the

USFWS during the revision process, the determination of effect for the Gray bat related to this proposed project is: "may affect – not likely to adversely affect."

Indiana bat

There are no foreseeable additional activities in the area (not associated with this project) that would directly or indirectly affect the Indiana bat population as a whole, or cause additive or synergistic adverse cumulative impacts in conjunction with the proposed action.

With implementation of Forest-wide standards from the LRMP which were developed in coordination with the USFWS during the revision process, the determination of effect for the Indiana bat related to this proposed project is: "may affect – not likely to adversely affect."

Implementation of this proposed project may benefit Ozark big-eared bat, gray bat and Indiana bat by providing habitat improvement. Because there are no other threatened or endangered species or associated habitat present the proposed project would have no effect on any other listed or proposed species (Taylor, 2011a).

Sensitive Species

For sensitive species, (Bachman's sparrow, bald eagle, Eastern small-footed bat, lirceus isopod, Ouachita leadplant, Bush's poppymallow, Ozark chinquapin, Southern lady's slipper, Moore's larkspur, Ouachita mountain goldenrod, Ozark spiderwort,and Nuttall's cornsalad) direct negative impacts to individuals of these species may occur through implementation of the project. No negative indirect or cumulative impacts are expected for these species from implementation of the project. For all Region 8 sensitive species, implementation of the proposal would not lead to the federal listing of these species under the Endangered Species Act. Furthermore, there would be no loss of population viability for these species due to implementation of this project.

Implementation of this proposed project would indirectly benefit sensitive species which require open (unshaded) and/or fire-dependent habitats. These sensitive species include Bachman's sparrow, Ouachita leadplant, Bush's poppymallow, Moore's larkspur, Ozark spiderwort, and Nuttall's cornsalad. Because there were no other sensitive species or habitat for such species present, the project would have no impact on any other Southern Region sensitive species (Taylor, 2011a).

Alternative 2 (No Action)

No negative adverse effects would occur to federally listed threatened and endangered species populations (Ozark big-eared bat, gray bat and Indiana bat). Potential positive effects to these species through habitat improvement would not occur.

No negative adverse effects would occur to Region 8 sensitive species (Bachman's sparrow, bald eagle, Eastern small-footed bat, lirceus isopod, Ouachita leadplant, Bush's poppymallow, Ozark chinquapin, Southern lady's slipper, Moore's larkspur, Ouachita mountain goldenrod, Ozark spiderwort,and Nuttall's cornsalad). Potential positive effects to species which require open (unshaded) and/or fire-dependent habitats would not occur. These sensitive species include Bachman's sparrow, Ouachita leadplant, Bush's poppymallow, Moore's larkspur, Ozark spiderwort, and Nuttall's cornsalad.

N. HUMAN HEALTH FACTORS

Existing Condition

The analysis area for human health factors is the area comprised of Compartments 23, 27, 28, 31, and 62. There are no risks to human health from the use of herbicides or cutting tools in the project area. Dead and dying trees along traveled roadways and in camping/hunting areas in the analysis area may give pause for concern for forest workers and visitors. Falling trees and limbs can cause personal injury and damage

personal property. Accumulations of forest litter in the analysis area creates a potential for wildfires.

Alternative 1

Alternative 1 proposes the use of triclopyr ester, triclopyr amine and imazapyr for site preparation and release. Imazapyr, imazapic, triclopyr amine, and glyphosate is proposed for use in non-native invasive species treatment and wildlife opening restoration. Triclopyr amine and imazapyr is proposed for use in wildlife stand improvement.

The most current Human Health and Ecological Risk Assessments available for each of the chemicals being proposed for use in this alternative were reviewed during the preparation of this document (Syracuse Environmental Research Associates 2003a, 2003b, 2004a, 2004b). These assessments describe in narrative form the relative level of risk for human and ecological factors for a given application rate of the herbicide. These assessments are supported by the accompanying risk assessment worksheets which document the calculations used in the assessments. If needed, worksheets can also be used to analyze the level of risk for specific application rates.

The proposed application rates for each herbicide in this alternative fall at or below the range of rates examined in these risk assessments. The proposed rate of triclopyr (0.75 a.i./acre) is below or equal to the amount of active ingredient (a.i.) per acre analyzed in the risk assessment. The lowest rate analyzed in the imazapyr risk assessment was 0.45 lbs. a.i./ac.; the highest rate proposed in this alternative is 0.3 lbs. a.i./ac. Glyphosate treatment in this alternative is proposed for up to 1.5 lbs. acid equivalent (a.e.)/ac. being applied, the risk assessment analyzed 2.0 lbs. a.e./ac. Imazapic treatment in this alternative is proposed for up to 0.125 lbs. a.e./acre being applied. The risk assessment analyzed 0.1 lbs. a.e./acre with a range of 0.0325 to 0.1875 lbs. a.e./acre. Therefore, no additional worksheets were prepared for any of these herbicides.

The Hazard Quotient (HQ) is a measure of the relative hazard of a proposed action. Risk assessment worksheets calculate the HQ. The risk assessment uses the HQ to address acute exposure, which could result in direct or indirect effects, and chronic exposure, which could result in cumulative effects. The U.S. Department of Agriculture - Forest Service, Southern Region standard for acceptable level of risk requires a HQ less than 1.0. For human safety, the risk assessments examine the level of risk to workers applying herbicide and to the general public. Workers could be exposed during accidents or general exposure during herbicide application. The general public could be exposed by direct spray of individuals in treatment areas; skin contact with contaminated vegetation; or consumption of contaminated fish, fruit, vegetation, or water. HQs are calculated for exposed women and children as they are considered to have the most potential for adverse effects, and represent the worst-case scenario when analyzing potential for human health effects.

The risk characterization for the herbicides being proposed for use are:

Triclopyr

There is no indication that workers would be subject to hazardous levels of triclopyr at the typical application rate of 1.0 lb./ac. and under typical exposure conditions. Nonetheless, at the upper range of exposures, all application methods exceed the level of concern based on the chronic reference dose (RfD) but not the acute RfD. Thus, for workers who may apply triclopyr repeatedly over a period of several weeks or longer, it is important to ensure that work practices involve reasonably protective procedures to avoid the upper extremes of potential exposure. At higher application rates, particularly rates that approach the maximum application rate of 10 lbs./ac., measures should be taken to limit exposure. These measures would need to be developed on a case-by-case basis depending on the specific application rates that are used and the type of the applications that are employed.

For members of the general public, the risk characterization for triclopyr is thus relatively unambiguous at the typical application of 1.0 lb/acre: based on the available information and under the foreseeable conditions of exposure, there is no route of exposure or exposure scenario suggesting that the general public would be at risk from longer-term exposure to triclopyr (Syracuse Environmental Research Associates 2003b). Even at the maximum projected application rate of 10 lbs/acre, the only longer-term scenario that exceeds the level of the concern is the consumption of contaminated fruit. This is a standard scenario used in all Forest

Service risk assessments and is extremely conservative – i.e., it assumes that fruit that has been directly sprayed is harvested and consumed for a prolonged period of time and that the contaminated fruit accounts for 100% of the individuals consumption of fruit. Under these extreme conditions, the level of concern is exceeded by a factor of 5 at the upper range but not the central estimate of exposure. Several acute exposures also lead to hazard quotients that are above the level of concern at the upper range of exposure. Two dermal exposures to triclopyr (ester formulation) – i.e., accidental spray of a woman over the lower legs as well as dermal contact with contaminated vegetation by a woman – exceed the level of concern at the central estimate of exposure. The use of the highest application under consideration – i.e., 10 lbs/acre – alters the risk characterization for acute exposures terms of dermal exposures and the spill into a pond. At an application rate of 10 lbs/acre, both triclopyr ester and triclopyr amine formulations would exceed the level of concern for all dermal exposure scenarios at the upper range of exposure as well as some central estimates of exposure. Again, all of these dermal exposure assessments are extremely conservative and designed to identify which possible types of exposure would be most hazardous. For triclopyr, such scenarios include dermal contact and accidental spills into water.

Imazapyr

Typical exposures to imazapyr do not lead to estimated doses that exceed a level of concern for either workers or members of the general public at either the typical (0.45 lb/ac) or highest application rate (1.25 lb/ac) (Syracuse Environmental Research Associates, 2004a). Although there are several uncertainties in the exposure assessments for workers and the general public, the upper limits for hazard quotients associated with the longer-term exposures are sufficiently below a level of concern that the risk characterization is relatively unambiguous. Based on the available information and under the foreseeable conditions of application, there is no route of exposure or scenario suggesting that the workers or members of the general public would be at any substantial risk from longer-term exposure to imazapyr even at the upper range of the application rate considered in this risk assessment.

Mild irritation to the eyes can result from exposure to relatively high levels of imazapyr. From a practical perspective, eye irritation is likely to be the only overt effect as a consequence of mishandling imazapyr. This effect can be minimized or avoided by prudent industrial hygiene practices – e.g., exercising care to reduce splashing and wearing goggles – during the handling of the compound.

Glyphosate

The risk characterization for both workers and members of the general public for glyphosate is reasonably consistent in unambiguous (Syracuse Environmental Research Associates, 2003a). For both groups, there is very little indication of any potential risk at the typical application rate of 2 lbs a.e./acre. Even at the upper range of plausible exposures in workers, most hazard quotients are below the level of concern.

For workers, the highest hazard quotient – i.e., 0.2, the upper range for workers involved in broadcast ground spray – is below the level of concern by a factor of about 5. The highest hazard quotient for any accidental exposure scenario for workers - i.e., 0.006 for the upper range of the hazard quotient for spill over the lower legs for one hour - is lower than the level of concern by a factor of over 150. Confidence in these assessments is reasonably high because of the availability of dermal absorption data in human as well as worker exposure studies. The Forest Service may apply glyphosate at a maximum rate of 7 lbs a.e./acre, a factor of 3.5 higher than the typical application rate of 2 lbs a.e./acre. This has essentially no impact of the risk characterization for workers. The highest hazard quotient for the typical application rate is 0.2. For an application rate of 7 lbs a.e./acre, the corresponding hazard quotient would be higher by a factor of 3.5 or 0.7, which is still below the level of concern.

From a practical perspective, the most likely accidental exposure for workers that might require medical attention involves accidental contamination of the eyes. Glyphosate and glyphosate formulations are skin and eye irritants. Quantitative risk assessments for irritation are not normally derived, and, for glyphosate specifically, there is no indication that such a derivation is warranted. Glyphosate with the POEA surfactant is about as irritating as standard dishwashing detergents, all purpose cleaners, and baby shampoos. As with the handling of any chemical, including a variety of common household products, reasonable care should be taken to avoid contact of skin and eyes.

The only area of remarkable uncertainty involving worker exposures concerns the potential health effects during brown-and-burn operations. The combustion of wood and wood by-products may produce a number

of toxic compounds. This is a concern with brown-and-burn operations but does not pertain to the use of glyphosate or any other herbicide. The potential effects of combustion products is common to all risk assessments of materials that might be subject to burning. With the exception of some plastics, the combustion products of which are known to pose a risk to fire fighters, the combustion products of most chemicals have not been examined in detail. The necessity of addressing this data gap must be weighed against the need to address other data gaps on glyphosate and other chemicals. The combustion products of burning wood and vegetation are respiratory irritants as well as carcinogens, and exposure to these combustion products should be avoided. There is no basis for believing that the presence of low or even high levels of glyphosate residues would have a significant impact on this hazard.

For members of the general public, none of the longer-term exposure scenarios exceed or even approach a level of concern. Although there are several uncertainties in the longer-term exposure assessments for the general public, the upper limits for hazard indices are below a level of concern by factors of about 25 (longer term consumption of contaminated fruit) to over two million (2,500,000 for longer-term consumption of fish by the general population). The risk characterization is thus relatively unambiguous: based on the available information and under the foreseeable conditions of application and exposure, there is no route of exposure or exposure scenario suggesting that the general public would be at risk from longer-term exposure to glyphosate. As with the hazard characterization for workers, an application rate of 7.5 lbs a.e./acre makes no difference in the assessment of potential risks. At this application rate, the highest hazard quotient would be about 0.14 [0.04 × 3.5], which is still below a level of concern by a factor of about 7.

One acute exposure scenario does exceed the level of concern at the upper range at the typical application rate of 2 lbs a.e./acre. The exposure scenario for the consumption of contaminated water after an accidental spill into a small pond results in an excursion above the RfD at the upper limit of exposure – i.e, a hazard quotient of 2. This exposure scenario is extreme to the point of limited plausibility. This sort of scenario is routinely used in Forest Service risk assessments as an index of the measures that should be taken to limit exposure in the event of a relatively large spill into a relatively small body of water. For glyphosate, as well as for most other chemicals, this exposure assessment indicates that such an event would require measures to ensure that members of the general public do not consume contaminated water.

At the highest application rate that might be used in Forest Service programs, the accidental spill scenario is the only other scenario that results in a hazard quotient above unity. At this application rate, the associated dose is about 14 mg/kg, which is still below the dose of 184 mg/kg associated with no apparent overt effects in humans by a factor of over 10.

Imazapic

Typical exposures to imazapic do not lead to estimated doses that exceed a level of concern. For workers, no exposure scenarios, acute or chronic, exceed the RfD even at the upper ranges of estimated dose. For members of the general public, the upper limits for hazard quotients are below a level of concern except for the accidental spill of a large amount of imazapic into a very small pond. Based on the available information and under the foreseeable conditions of application, there is no rout of exposure or scenario suggesting that workers or members of the general public would be at any substantial risk from longer-term exposure to imazapic.

There is very little information available on the interaction of these herbicides with other compounds. These herbicides are not persistent in the environment or in the human body, so a member of the public or a worker is not likely to be chronically exposed through the Forest Service's program nor receive simultaneous exposures from this herbicide in any other program.

A well-ventilated, fully, developed fire in a wood stove or fireplace where temperatures can reach 800-1000°C can produce virtually complete decomposition of triclopyr (Bush et. al., 1987). Under conditions of rapid flaming combustion, triclopyr decomposed readily, with high temperatures causing almost complete decomposition. Fires producing incomplete combustion (temperatures<5Oo"C) can result in the evolution of trace pesticide residues in smoke and combustion gases. However, the levels of herbicide residue evolved and potentially absorbed systemically are well below levels that are judged by regulatory agencies to be safe to ingest on a daily basis.

Worker exposure assessments and field studies of triclopyr and imazapyr have shown that risk from

herbicide exposure to forest workers under “brown and burn” conditions is small, even if the fire occurs immediately after herbicide application, as might occur in a wildfire (Bush et.al, 1998). Thus, use of herbicides in combination with fire in site preparation, under-story vegetation management, or creating wildlife habitat/openings does not increase human exposure over risks associated with fire alone.

Injuries to the back, hand, and skin predominate in accidents involving vegetation management. Vegetation management activities with the greatest risks to the average worker in a 25-year career are those connected with site preparation. This is evidenced by high workers’ compensation insurance rates for this type of work. There would be no effect to the forest visitor from mechanical methods since the visitor would not be present when this work is done.

Prescribed burning for fuels reduction would reduce the risk of wildfire within the Wildland Urban Interface in this area. Occasional brief exposure of the general public to low concentrations of drift smoke is more a temporary inconvenience than a health problem. High smoke concentrations can, however, be a very serious matter, particularly near homes of people with respiratory illnesses or near health-care facilities. Prescribed burning proposed for this project would meet the standards established for the National Ambient Air Quality Standards as discussed in the Air Quality section of this EA.

Smoke can have negative short-and long-term health effects (Wade and Lunsford, 1988). Fire management personnel who are exposed to high smoke concentrations often suffer eye and respiratory system irritation. Under some circumstances, continued exposure to high concentrations of carbon monoxide at the combustion zone can result in impaired alertness and judgment. The probability of this happening on a prescribed fire is, however, virtually nonexistent.

Over 90 percent of the particulate emissions from prescribed fire are small enough to enter the human respiratory system. These particulates can contain hundreds of chemical compounds, some of which are toxic. The repeated, lengthy exposure to relatively low smoke concentrations over many years can contribute to respiratory problems and cancer. But, the risk of developing cancer from exposure to prescribed fire has been estimated to be less than 1 in a million.

In general, the public, with the exception of the very ill, very young, and the elderly, have a low risk of long-term chronic health impacts, such as asthma, pulmonary disease or other respiratory diseases from prescribed burns (Sandberg and Dost 1990). This is due in part to the short exposure times, typically 15 hours or less, at concentrations that are below the NAAQS.

Herbicides proposed in this alternative break down rapidly in the soil. Both theoretical calculations and field studies suggest that prescribed fires are hot enough to destroy any chemical residues. Minute quantities that may end up in smoke are well within currently-accepted air quality standards. Threshold limit values (TLVs) are often used to measure the safety of herbicide residues in smoke. Expected exposure rates of workers to various brown-and-burn combinations have been compared with TLVs. They showed virtually no potential for harm to workers or the general public.

There is at least one group of compounds carried in smoke that can have an immediate acute impact on individuals. When noxious plants such as poison ivy burn, the smoke can cause skin rashes. These rashes can be much more widespread on the body than those caused by direct contact with the plants. If this smoke is inhaled, respiratory systems can also be affected.

Alternative 2

There would be no change from the existing condition regarding risks to human health from the use of herbicides, prescribed burning, or cutting tools. Risks to human health and safety from falling limbs and trees would remain stable or increase. Accumulations of forest litter in the analysis area would continue to create a potential for wildfires.

O. ECONOMICS AND SOCIAL ENVIRONMENT

Existing Condition

The project area lies within Logan County. Logan County was used as the analysis area for economic and social effects.

The economy of Logan County is summarized in the table below.

The 2000 total population of Logan County was 22,486 people (U.S. Census Bureau, 2011c). In 2000, the population 16 years and over in the labor force for Logan County was 17,404. Of these numbers of people, seventeen in Logan County were in the Armed Forces and the remainder was in the civilian labor force. Approximately 9,722 people were employed in the civilian labor force with 517 being unemployed.

Table 16 shows the occupation of the employed civilian labor force (U.S. Census Bureau, 2011c).

Table 16. Logan County Civilian Labor Force Occupations.

Description	Logan County	
	Number of Employees	Percent of Total Employees
Management, Professional, and Related Occupations	2,109	22.9
Service Occupations	1,242	13.5
Sales and Office Occupations	1,801	19.6
Farming, Fishing, and Forestry Occupations	143	1.6
Construction, Extraction, and Maintenance Occupations	1,302	14.1
Production, Transportation, and Material Moving Occupations	2,608	28.3

Table 17 shows the income for Logan County (U.S. Census Bureau, 2011c).

Table 17. Logan County Household Income.

Income in Dollars	Logan County	
	Number of Households	Percent of Households
Less than $10,000	1,273	14.6
$10,000 to $14,999	907	10.4
$15,000 to $24, 999	1,673	19.2
$25,000 to $34,999	1,432	16.4
$35,000 to $49,999	1,618	18.5

Table 17. Logan County Household Income, continued.

Income in Dollars	Logan County	
$50,000 to $74,999	1,185	13.6
$75,000 to $99,999	329	3.8
$100,000 to $149,999	184	2.1
$150,000 to $199,999	55	0.6
$200,000 or more	77	0.9
Median household income (dollars)	28,344	

The total land area of Logan County is estimated at 454,317 acres (U.S. Census Bureau, 2011a). Ozark and Ouachita National Forest lands comprise 86,306 acres of land in Logan County. This means that 19% of the taxable land base of Logan County is in National Forest and not subject to property taxes.

In addition to the percentage of jobs and income generated by forest industries, a portion of county roads and school budgets is funded from generated income on National Forest lands within the counties. These two sources are Payments in Lieu of Taxes (PILT) and Title I of the Secure Rural Schools and Self-Determination Act (SRS). Logan County received $193,271 from the PILT program in Fiscal Year 2011 (U.S. Department of Interior, 2011) and $208,247 from the SRS (U.S. Department of Agriculture - Forest Service, 2011).

The Ozark-St. Francis FEIS for the LRMP estimated benefits, costs, net benefits, and cumulative present net value (FEIS pgs. 3-454 – 3-456). The benefits included market values and non-market estimated values. Market values included those values for which the Forest Service receives money such as minerals, timber, range, and special uses. Non-market values are estimated values for amenities such as wildlife and recreation. Over a 50-year analysis period, the Benefit/Cost ratio for all resource activities (in the selected LRMP alterative) was 1.59. The Benefit/Cost ratio for the timber management program alone was 1.35 (Ozark-St. Francis FEIS - Table 3-228, p. 3-455). A B/C ratio of more than 1.0 represents a positive net benefit. Therefore, timber management on the Ozark NF was shown to be cost effective. When combined with the benefits of non-commodity resources that accompany timber harvesting, the overall benefits to the public are even greater.

Traditional uses of this area are discussed under Recreation beginning on page 50.

Effects

Alternative 1

An economic analysis of proposed activities for each alternative was prepared. Calculations are part of the process documentation.

Table 18 is a comparison of the economic analysis for all alternatives. Present Net Value (PNV) is calculated and is used as an indicator of the efficiency of the project.

Table 18. Comparison of Economic Analysis for all Alternatives.*

Action	Alternative 1	Alternative 2
Present Value Revenues	$ 3,344,561	$ 690,781
Present Value Costs	$ 2,683,385	----
Net Present Value	$ 661,175	$ 690,781
B/C Ratio	1.25	----

*All measures are approximations.

The following assumptions were made for this analysis:

(1) The time frame for this economic analysis begins with project decision and continues through the project planning cycle (10 years).

(2) Calculations, which considered the time value of costs and revenues for each alternative, were used to determine net present value. Quick-Silver, a project analysis tool developed by the U.S. Forest Service, was used to determine the economic performance of long-term investments for this project. A 4% discount rate was used for this analysis. Results are shown in Table 18, page 90.

(3) Revenues generated by dispersed recreation activities influence local and regional economies. Increases and decreases for revenue generated by dispersed recreation, such as hunting, are based on existing wildlife habitat (current condition) and manipulation of this habitat by activities proposed in the alternatives. Since habitat change is influenced primarily by vegetative manipulation, the dollars generated from hunting were used in this analysis.

Values were assigned to four species that comprise the bulk of the sport hunting in the area. These species are deer, turkey, quail, and squirrel. Average number of user days for each species and a dollar figure per user day was used to compute the total revenue. The dollar figures used were: $47/user day for deer and turkey and $25/user day for squirrel and quail (Maharaj and Carpenter, 1999). The number of user days per hunter assigned to each species was: deer - 5 user days; turkey - 8 user days; quail - 0.5 user days; and squirrel - 0.5 user days. These values were derived from the following source:

-Appendix F, FEIS, 1985-2030 RPA Program Development of Benefit Values and Cost (U.S. Department of Agriculture, 1985)
-Table 5, p. F-10, Values for Recreation, Wilderness, and Wildlife and Fish Activities by NFS Region (U.S. Department of Agriculture 1986)
-Table 6, p.F-11, Outing Values for Recreation, Wilderness, and Wildlife and Fish by NFS Region (U.S. Department of Agriculture 1986)

(4) The B/C ratio for each alternative in Table 18 reflects revenues generated from timber harvesting and hunting generated by wildlife management. The action alternative had a B/C ratio greater than 1.0 resulting in a positive net benefit. The dollars generated by dispersed recreation and tourism would not be affected by activities in the alternative. This does not include use based on hunting opportunity that is explained in Item 3 above.

The revenues derived from the selling price of timber would contribute to school and road funds in Logan

County.

Social effects on public health, recreation, and visual quality are discussed under these headings in the EA.

Alternative 2

No money would be spent by, or returned to, the Federal Government. No additional employment in the timber industry would occur, nor would potentially available intermediate age and maturing trees contribute to maintaining jobs that already exist. Some employment may actually be lost. No firewood from these areas would be available to local people for home heating purposes. Some standing timber, and the corresponding expected potential economic returns, would be lost with the mortality of some trees. Wildlife habitat condition would remain essentially static, deteriorating for some game and non-game species, while improving slightly for others.

Logan County would still receive a payment under the PILT and the SRS programs. However, under the SRS program, the potential amount that would be returned to all counties in Arkansas containing Ozark-St. Francis National Forest lands would be reduced because no revenues from timber sales in these compartments would be contributed toward the Forest's total amount of timber sale revenue generated.

Social effects on public health, recreation, and visual quality are discussed under these headings in the EA.

P. ENVIRONMENTAL JUSTICE AND CIVIL RIGHTS

Logan County was used as the analysis area for environmental justice and civil rights effects.

The population of Logan County in 2010 was 22,353 (U.S. Census Bureau, 2011e). Table 19 shows the breakdown in demographics for the county and for Arkansas as a whole in 2010 (U.S. Census Bureau 2011d).

Table 19. Year 2010 Population Demographics for Logan County and Arkansas.

Race	Logan County	Arkansas
White	93.2%	76.9%
Black or African American	1.3%	15.5%
American Indian and Alaska Native	1.1%	0.8%
Asian	1.6%	1.2%
Native Hawaiian and Other Pacific Islander	*	0.2%
Persons reporting some other race	0.9%	3.4%
Person reporting two or more races	1.8%	2.0%

*Value greater than zero but less than half unit of measure shown

The percent of persons below the poverty level in 2000 in Logan County was 15.4% (U.S. Census Bureau,

2011c). The state's level as a whole was 15.8% (U.S. Census Bureau, 2011b) making Logan County poverty average comparable with the state as a whole.

Using these figures as a basis for analysis, there would be no disproportionate effects to these minority groups resulting from the alternatives.

Civil rights implications were considered related to each alternative. This included the effects of the alternatives on minority groups, women, and consumers. Civil rights imply the fair and equal treatment under law, both within the agency and in relations with the public. No potentially major civil rights impacts were found related to any alternative. Therefore, a civil rights impact analysis and statement of findings are not required for this project.

IV. CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, Tribal, State, and local agencies during the development of this environmental assessment:

ID Team Members:

Mary Brennan; Zone Archeologist; Boston Mountain/Pleasant Hill/Mt. Magazine Ranger Districts; Ozark National Forest; Clarksville, Arkansas

Mark Burge; Timber Management Assistant; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Ron Burrow; Law Enforcement Officer; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Richard Carpenter; Wildlife Technician; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Jason Davis; Engineering Technician; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Coyle Ellingberg; Timber Sales Administrator; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Robert Flowers; Landscape Architect; Ozark-St. Francis National Forest; Russellville, Arkansas

Todd Hoopes; Fire Management Officer; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas.

Brent Hummel; Forester Trainee; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Richard Monk; Forest Hydrologist; Ozark-St. Francis National Forest; Russellville, AR

David Moore; Lead Timber Marker; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Joy Serrano; Outdoor Recreation Planner; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Chip Stokes; GIS Technician; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Gina Tatum; Silvicultural Technician; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Greg Taylor; Wildlife Biologist; Pleasant Hill Ranger District; Ozark National Forest; Clarksville, Arkansas.

John Thias; Forester; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Len Weeks; Forest Soil Scientist; Ozark-St. Francis National Forest; Russellville, Arkansas

Vicki Weindel; NEPA Coordinator and ID Team Leader; Mt. Magazine Ranger District; Ozark National Forest; Paris, Arkansas

Keith Whalen; Fisheries Biologist; Ozark-St. Francis National Forest; Russellville, Arkansas

Federal, Tribal, State, and Local Agencies:

Arkansas State Historic Preservation Office

Colby Wells; Wildlife Technician; Mt. Magazine Wildlife Management Area; Arkansas Game and Fish Commission; Paris, Arkansas

Kevin Lynch; Biologist; Arkansas Game and Fish Commission; Fort Smith, Arkansas

Henrietta Ellis; Absentee Shawnee Tribe of Oklahoma; Shawnee, Oklahoma

Robert Cast; Caddo Nation of Oklahoma; Binger, Oklahoma

Richard Allen; Cherokee Nation of Oklahoma; Tahlequah, Oklahoma

Terry Cole; Choctaw Nation of Oklahoma; Durant, Oklahoma

Tamara Francis; Delaware Nation; Anadarko, Oklahoma

Robin Dushane; Eastern Shawnee Tribe; Seneca, Missouri

Jean Ann Lambert; Quapaw Tribe; Fayetteville, Arkansas

Dr. Andrea Hunter; Osage Nation; Pawhuska, Oklahoma

Lisa LaRue Stopp; United Keetoowah Band of Cherokee Indians; Tahlequah, Oklahoma

APPENDIX A. RESOURCE MAPS.

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Scenic Integrity Objective Map

Recreation Opportunity Spectrum Map

Forest Type Map

Age Class Distribution Map

Stand Map

Existing Improvements Map

APPENDIX B. SOILS.

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Soil Type Map

APPENDIX C. TRANSPORTATION SYSTEM.

Alternative 1

Road No.	Current Status	Miles	Future Status	Miles
Barber Ridge Road	Open	0.1*	Decommissioned	0.1*
Spring Lake Road	Open	3.1	Open	3.1
1604	Open Open Open	2.1 2.0 1.5	Open Closed Decommissioned	2.1 2.0 1.5
1604A	Closed Open Closed	1.2 0.2 0.2	Decommissioned Decommissioned Closed	1.2 0.2 0.2
1607	Open	0.4	Open	0.4
1612A	Open	0.2	Open	0.2
1613	Open	2.6	Open	2.6
1624	Closed Open	0.9 1.4	Closed Open	0.9 1.4
1624A	Closed	0.7	Closed	0.7
1657	Closed Open	0.9 0.8	Closed Open	0.9 0.8
1687	Open	0.9	Open	0.9
1687E	Open Open	0.5 1.2	Closed Open	0.5 1.2
1690	Open	3.4	Open	3.4
1690A	Open	1.1	Open	1.1
96023A	Closed Open	0.9 0.5	Closed Closed	0.9 0.5
96023B	Closed Open	0.5 0.1	Closed Closed	0.5 0.1

APPENDIX C. TRANSPORTATION SYSTEM, continued.

Road No.	Current Status	Miles	Future Status	Miles
96023C	Open	0.7	Closed	0.7
96023D	Closed	1.1	Closed	1.1
96023E	Closed	0.1	Closed	0.1
96027A	Closed Open Open	0.3 2.4 0.2	Closed Closed Open	0.3 2.4 0.2
96027B	Open	0.3	Closed	0.3
96027C	Closed	0.5	Closed	0.5
96027D	Closed	0.7	Closed	0.7
96027E	Open	0.2	Open	0.2
96027F	Closed	0.04	Closed	0.04
96027G	Closed	1.2	Closed	1.2
96028A	Closed	1.2	Closed	1.2
96028B	Closed	0.5	Closed	0.5
96028C	Closed	0.1	Closed	0.1
96028D	Closed	0.1	Closed	0.1
96028E	Closed	0.1	Closed	0.1
96028F	Open	0.1	Open	0.1
96031A	Closed	0.6	Closed	0.6
96036A	Open	0.02*	Decommissioned	0.02*
96062A	Closed	0.6	Closed	0.6
96062B	Closed	0.2	Closed	0.2
96062C	Closed	0.7	Closed	0.7

APPENDIX C. TRANSPORTATION SYSTEM, continued.

Road No.	Current Status	Miles	Future Status	Miles
96062D	Open	0.1	Open	0.1
96062E	Closed	0.9	Closed	0.9
96061C	(New Construction)	0.2*	Closed	0.2*
96062F	Closed	0.2	Closed	0.2
96063G	Closed	0.4	Closed	0.4
	TOTAL	**40.0**		**40.0**

* Miles are outside compartment boundaries, not Included in compartment totals

Alternative 2

The status of roads for this alternative would be the same as the current status listed in Alternative 1.

APPENDIX D. HERITAGE RESOURCE SITE ELIGIBILITY.

Site No.	Site Type	Site Description	NR Eligibility
3LO270	Prehistoric	Rock shelter	Eligible
3LO272	Prehistoric	Rock shelter	Eligible
3LO274	Prehistoric	Isolate	Not eligible
3LO538	Historic	Houseplace	Not eligible
3LO539	Historic	Houseplace	Not eligible
3LO541	Historic	Houseplace	Not eligible
3LO566	Historic	Houseplace	Not eligible
3LO567	Historic	Houseplace	Not eligible
3LO568	Historic	Houseplace	Not eligible
3LO595	Historic	Houseplace	Not eligible
3LO599	Historic/Prehistoric	Store	Eligible
3LO601	Prehistoric	Lithic scatter	Not eligible
3LO874	Historic	Houseplace	Not eligible
3LO883	Historic	Houseplace	Not eligible
3LO884	Historic	Houseplace	Not eligible
3LO910	Historic	Houseplace	Not eligible
3LO912	Historic	Houseplace	Not eligible
3LO916	Historic	Houseplace	Not eligible

APPENDIX E. PROPOSED ACTION COMMENT PERIOD COMMENTS AND RESPONSES.

Scoping for this project began with the mailing of the proposed action to adjacent landowners and interested citizens on April 5, 2011. This list included letters to nine Native American Tribes and the Arkansas Game and Fish Commission. The scoping package contained a description of the proposed action, a map depicting the proposed action, and a comment form. A total of 75 letters were mailed.

A copy of the proposed action letter was posted that same week on the Ozark-St. Francis National Forests website at http://www.fs.fed.us/oonf/ozark/projects/planning/magproject.html.

This project was also listed in the Schedule of Proposed Actions and posted on the Ozark-St. Francis National Forests website at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5291930.pdf

Issues serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. Issues are best identified during scoping early in the process to help set the scope of the actions, alternatives, and effects to consider.

Two public responses were received from this scoping effort. Both of the public responses received were in favor of the proposed actions. Therefore, no issues were identified for this project.

These comments are shown below followed by a Forest Service response.

Comments by James Dickey, Adjacent Landowner

Comment:
Mr. Dickey had no objections to the proposed actions as long as FDR 1602, FDR 1613, and Spring Lake Road were maintained in a proper manner.

Response:
FDR 1602 is outside of the Shoal Project boundaries. Yell County and the Forest Service maintain this road jointly. Reconstruction from the intersection of Spring Lake Road south to the Forest Boundary on the west side of Spring Lake Road was approved in the Chickalah Project. Road reconstruction of FDR 1602 on the east side of Spring Lake Road to the Forest Boundary to the east is also planned for this road in the upcoming Prairie Project.

FDR 1613 receives maintenance twice a year and is in very good shape. Maintenance will be performed on this road during the timber sale if needed.

Spring Lake Road is proposed for reconstruction in the Shoal Project and will be maintained by the timber purchaser during the timber sale. Logan County is responsible for regular maintenance of this road.

Comments by Bruce Parker, Landowner

Comment:
Mr. Parker was glad to see that Barber Ridge Road is going to be straightened. He has a cabin on the road and felt the road was very unsafe.

Response:
Mr. Parker's comment was noted.

APPENDIX F. TIERED DOCUMENTS AND REFERENCES.

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