



Environmental Assessment
For
Lower South Fork
Project

Responsible Agency:
U.S. Forest Service
Ouachita National Forest
Caddo-Womble Ranger District

Responsible Official:
Shalonda Guy, District Ranger
1523 Hwy 270 East
Mount Ida, AR 71957

For Further Information Contact:
Kim Miller
(870) 867-2101

This project is subject to subparts A and B of 36 *CFR Part 218 Project-Level Pre-decisional Administrative Review Process* (objection process); it is not authorized under the Healthy Forest Restoration Act (HFRA).

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs).

Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

June 2016

TABLE OF CONTENTS

CHAPTER 1 1
PURPOSE AND NEED FOR THE PROPOSED ACTION 1
Purpose of the Action..... 3
Need for the Action 3
Existing Versus Desired Conditions 4
Scope of This Environmental Analysis 6
 History of the Scoping and Planning Process 6
 Relevant Planning Documents..... 7
 Issues..... 7
Decisions to Be Made 7
CHAPTER 2 8
ALTERNATIVES INCLUDING THE PROPOSED ACTION 8
Alternatives Documented in Detail..... 8
 No Action..... 8
 Proposed Action..... 8
 No Herbicide Use..... 13
 Technical Requirements 14
 Monitoring 17
Other Alternatives Considered 18
Other Past, Present and Reasonably Foreseeable Future Actions 18
Summary Comparison of Alternatives 18
CHAPTER 3 20
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES.... 20
Air Quality 20
Cultural & Historical Resources 22
Soils..... 24
Water Resources & Quality 26
Management Indicator Species and Habitat (MIS)..... 34
Proposed, Threatened, Endangered and Sensitive Species (PETS) & Habitat..... 55
Local Economy & Financial Efficiency..... 72
Public Health & Safety 74
Recreation, Scenic Resource, Wild & Scenic Rivers 76
Climate Change..... 78
CHAPTER 4 81
PERSONS AND AGENCIES CONSULTED..... 81
CHAPTER 5 82
REFERENCES CITED 82
APPENDICES 85
Appendix A – Activities by Compartment and Stand (Proposed Action) 86
Appendix B - Project Maps..... 89

LISTING OF FIGURES & TABLES

FIGURE 1. VICINITY MAP 2
EXISTING CONDITIONS CONTRASTED TO DESIRED CONDITIONS (TABLE 1.1) 4
STANDS REQUIRING A LIMITED OPERATING SEASON SW001 (TABLE 2.1) 16
STANDS REQUIRING A LIMITED OPERATING SEASON SW002 (TABLE 2.2) 16
COMPARISON OF ACTIONS BY ALTERNATIVE (TABLE 2.3)..... 18
COMPARISON OF ENVIRONMENTAL EFFECTS BY ALTERNATIVE (TABLE 2.4) 19
COMPARISON OF OBJECTIVES MET BY ALTERNATIVE (TABLE 2.5)..... 19
MAXIMUM ALLOWABLE SOIL LOSS (TABLE 3.1)..... 25
SEDIMENT DELIVERY BY ALTERNATIVE (TABLE 3.2)..... 29
OPEN ROAD DENSITY BY MA (TABLE 3.3) 30
POTENTIALLY AFFECTED MANAGEMENT INDICATOR SPECIES (TABLE 3.4) 34
TERRESTRIAL MIS AND ASSOCIATED PURPOSES (TABLE 3.5) 35
TERRESTRIAL MIS RESPONSE BY ALTERNATIVE (TABLE 3.6) 36
SUMMARY OF LD₅₀ VALUES FOR BIRD SPECIES (TABLE 3.7)..... 38
AQUATIC MIS AND ASSOCIATED PURPOSES (TABLE 3.8) 51
SUMMARY OF LD₅₀ VALUES FOR BLUEGILL (TABLE 3.9)..... 54
PETS SPECIES EVALUATED (TABLE 3.10) 56
SUMMARY OF LD₅₀ VALUES FOR BEE (TABLE 3.11) 65
COMPARISON BY FINANCIAL EFFICIENCY (TABLE 3.12) 73
FIGURE 2. MANAGEMENT AREA MAP 90
FIGURE 3. PROPOSED TIMBER HARVEST MAP..... 91
FIGURE 4. PROPOSED SILVICULTURAL ACTIVITIES MAP 92
FIGURE 5. PROPOSED WILDLIFE ACTIVITIES MAP 93
FIGURE 6. PROPOSED PRESCRIBED BURNING MAP 94
FIGURE 7. PROPOSED TRANSPORTATION ACTIVITIES MAP..... 95
FIGURE 8. SOIL CONCERNS MAP 96
FIGURE 9. WATER RESOURCES MAP 97
FIGURE 10. SCENIC INTEGRITY OBJECTIVES MAP 98

Chapter 1

Purpose and Need for the Proposed Action

Proposed Action

The Caddo-Womble Ranger District proposes to implement the following management activities*:

- Clearcut regeneration harvest – 194 acres
- Seed tree regeneration harvest – 484 acres
- Commercial thinning with hardwood component – 2,075 acres
- 1st plantation thinning (commercial thinning) – 1,826 acres
- Site preparation prescribed burning – 678 acres
- Chemical/mechanical site preparation for natural regeneration – 678 acres
- Timber stand improvement or release (seedling/sapling) – 973 acres
- Pre-commercial thinning – 1,305 acres
- Hand plant shortleaf pine seedlings – 678 acres
- Woodland development or restoration (commercial thinning) – 474 acres
- Pond improvement – 43 each
- Wildlife opening improvements – 14 acres
- Wildlife opening – 8 acres
- Gate maintenance – 7 gates
- Nest box installation – 38 boxes
- Ecosystem prescribed burning (National Forest) – 15,670 acres
- Fire line construction – 39 miles
- Fire line maintenance – 41 miles
- Road construction – 1 mile
- Road reconstruction – 34 miles
- Temporary road construction – 26 miles
- Pre-haul road maintenance – 2 miles
- Non-native invasive species treatment throughout project area

*All figures are approximate and are for total acres in a stand. Treatment acres would be less due to avoided slopes and/or riparian areas.

The Lower South Fork Project area is located in Montgomery County in all or part of: T1S, R24W, S31 – 35; T2S, R23W, S7, 18, 30-32; T2S, R24W, S1-9, 10-17, 20-29; T2S, R25W, S1; T3S, R23W, S5-7; T3S, R24W, S1-5, 8-12, 15. It includes management in Compartments 38, 1626, 1628-1630, 1632-1635, and 1641-1642. It contains approximately 15,670 acres of National Forest System lands; this includes approximately 12,714 acres suitable for timber production. There are 8,639 acres of non-FS ownership.

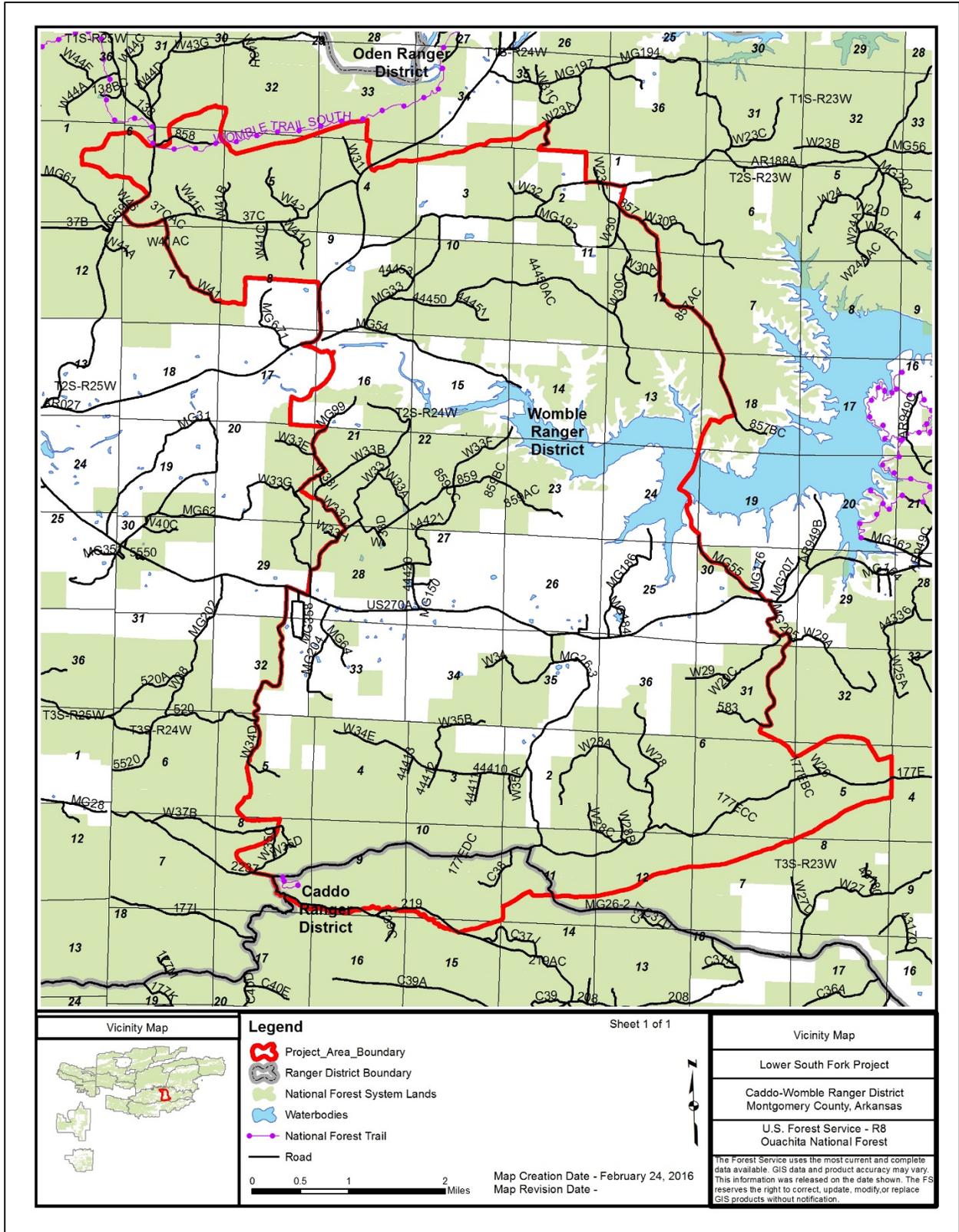


FIGURE 1. VICINITY MAP

Purpose of the Action

The purpose of this action is to restore the health and vigor of the Lower South Fork Project area by providing for a diversity of plant and animal communities, early seral habitat in a well-distributed grass/forb or shrub/seedling stage, a reduction in fuel accumulation and a production of a sustainable yield of wood products.

Need for the Action

- Current conditions in the project area do not meet the desired conditions for the forest Management Areas (MAs) and the ecological systems that occur within.
- Past fire suppression activities have removed the natural role of fire from the landscape. This absence of fire has resulted in excessive fuel accumulations, increasing the risk of damage to resources in the event of wildfire.
- The absence of fire has also resulted in reduced open understories necessary for the growth of wildlife foods and the natural regeneration of pine and oak. The absence of fire has also caused loss of habitat conditions for plants adapted to fire.
- Pine stands contain damaged, poorly formed and diseased trees. The trees are overcrowded or densely stocked, reducing growth and crown development. These conditions result in stress and reduced vigor and health, thus increasing susceptibility to insects and disease.
- There is limited access to those stands in need of silvicultural treatment, resulting in the need for temporary and system road construction. Some existing roads are not useable by log trucks for hauling creating the need for road re-construction.
- There is a lack of high quality forage and a lack of nesting habitat for species requiring early successional habitat in the form of wildlife openings within the project area. Trees and shrubs are encroaching on the existing wildlife openings that occur within the area.
- There is a lack of suitable natural cavities for nesting within the project area.
- There are known populations of exotic and invasive plant species throughout the project area.
- There are loblolly pine plantations near the Ouachita Seed Orchard, managed for the production of improved seed from shortleaf pine. The close proximity of the loblolly stands poses a hybridization risk to the shortleaf pine seed source.

Existing Versus Desired Conditions

Contrasts between existing and desired conditions, as well as management activities designed to meet project objectives, are shown in Table 1.1. These management activities were determined to be within the scope of this analysis. Project activities would move the existing conditions toward the desired conditions as referenced in the Ouachita National Forest’s Revised Forest Plan (Revised Forest Plan). Within the Proposed Management Activities column, the acres outlined for specific treatments are often given in total acres within a stand. **Sensitive areas such as riparian or steep slopes would be avoided, resulting in fewer actual acres disturbed.**

EXISTING CONDITIONS CONTRASTED TO DESIRED CONDITIONS (TABLE 1.1)

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
Improve forest health by reducing the likelihood of insect infestations, disease outbreaks, and establishment of non-native, invasive species on National Forest System lands (Revised Forest Plan, p. 58).	61% of pine, pine-hardwood, hardwood and hardwood pine stands are above 70 years of age. This combined with overstocked conditions reduces the health and vigor of the stands and increases their susceptibility to damage from insects and disease.	Reduce basal area levels in stands that are overstocked. Reduce the percentage of older age classes in the project area. Provide healthy, young, vigorous stands.	<ul style="list-style-type: none"> • Regeneration harvests on 678 acres • Intermediate harvests on 4,375 acres • Precommercial thinning on 1,305 acres. • 678 acres of site preparation • 678 acres hand planting shortleaf pine seedlings
Contribute to the economic base of local communities by providing a sustained yield of wood products at a level consistent with sound economic principles and appropriate multiple use objectives. (Revised Forest Plan, p. 68)	Pine plantations and other overstocked stands contain damaged and poorly formed trees. These areas are also over-crowded and densely stocked, which results in reduced growth and crown development. These conditions result in poor quality wood products.	Reduce basal area levels in pine plantations and other overstocked stands.	<ul style="list-style-type: none"> • Regeneration harvests on 678 acres • Intermediate harvests on 4,375 acres
Within MA 14, grass-forb and seedling-sapling conditions are well represented, particularly in the portions suitable for timber management, where they make up at least 6% of the landscape (Revised Forest Plan, p.35).	There are 12,714 acres of suitable land within the project area; there are no acres (0%), in early seral (0-10 age year) habitat.	Provide at least 763 acres but not more than 1,780 acres of early seral (grass-forb or seedling-sapling) conditions.	<ul style="list-style-type: none"> • Regeneration harvests on 678 acres • Woodland development/restoration on 474 acres • Improve 14 acres of existing wildlife openings

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
<p>Limit even-aged regeneration cutting to no more than 14% of suitable acres managed under even-aged prescriptions, per 10-year entry. (Revised Forest Plan, WF002 p. 78)</p>			<ul style="list-style-type: none"> • Construct 8 acres of wildlife openings
<p>Provide for a diversity of plant and animal communities throughout the planning area.</p> <ul style="list-style-type: none"> • Improve habitat for game and non-game species. (Revised Forest Plan, P.20) • Manage for identified natural plant communities. (Revised Forest Plan pp. 6-19) • Increase prescribed burning on the forest to help achieve and maintain desired future conditions. (Revised Forest Plan, OBJ011 p. 59) 	<p>Due to past fire suppression activities, the natural role of fire has been removed from the landscape. This has limited the amount of open understories necessary for wildlife foods, the lack of natural regeneration of pine and oak species, and the loss of habitat conditions for fire adapted plant species.</p>	<p>Increase fire frequency to meet desired intervals for various ecosystems present in project area. (Revised Forest Plan, Part I)</p> <p>Ouachita Shortleaf Pine-Oak Forest Prescribed fire applied to at least 50% of the community every 5-7 years, with an occasional growing season fire. (Revised Forest Plan, p.7)</p> <p>Dry – Mesic Oak Forest Prescribed fire applied to at least 50% of the community every 4-5 years, with an occasional growing season fire. (Revised Forest Plan, p.8)</p>	<ul style="list-style-type: none"> • Landscape prescribed burning on up to 15,670 acres.
<p>Reduce fuel loads of National Forest System lands that have the greatest potential for catastrophic wildland fire (Revised Forest Plan, p. 68).</p>	<p>Fire suppression has resulted in excessive fuel accumulations, increasing the risk of damage to resources in the event of wildfire.</p>	<p>Minimize the risk of resource damage by reducing fuel loadings.</p>	<ul style="list-style-type: none"> • Landscape prescribe burning on up to 15,670 acres. • 39 miles of fireline construction. • 41 miles of fireline maintenance
<p>Where open habitats are not provided by other conditions, develop one permanent wildlife opening, one to five acres per 160 acres of habitat. (Revised Forest Plan, WF008 P. 78)</p>	<p>There is a lack of high quality forage and a lack of nesting habitat for species requiring early seral habitat.</p>	<p>Provide permanent open habitat for foraging and nesting within the project area.</p>	<ul style="list-style-type: none"> • Wildlife opening construction 8 acres • Wildlife opening improvements on 14 acres

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
Develop and operate the road system, maintained to the minimum standard needed to meet the requirements of the proposed actions, protect the environment, and provide for reasonable and safe access. (Revised Forest Plan p. 67)	There is no access to some of the stands proposed for harvest and silvicultural activities. Some of the roads would not support timber hauling in their current condition.	Provide access to stands in need of silvicultural treatment. Improve road conditions on travel ways proposed for timber hauling.	<ul style="list-style-type: none"> • Road construction of 1 mile • Road Reconstruction on approx. 34 miles • Temporary road construction on approx. 26 miles • Pre-haul road maintenance on approx. 2 miles
Treat forest to eliminate non-native, invasive species. (Revised Forest Plan, OBJ03, p. 59)	Non-native, invasive species present within the project area include <i>Sericea lespedeza</i> and <i>Albizia julibrissin</i>	Treat approximately 50 acres of NFS lands across the project area towards meeting the forest target of 300 acres per year.	<ul style="list-style-type: none"> • Mechanical removal • Removal with herbicide treatment
Maintain or improve watershed health. Conduct watershed improvement on at least 40 acres per year. (Revised Forest Plan, OBJ14, OBJ15, p. 62)	Roads, unclassified trails, and other areas have been identified as having active erosion.	Replace eroded culverts and restore fish passage. Clean up illegal dump sites and restrict access where applicable. Prevent/repair resource damage along roads, trails, gravel pits, and other areas identified with appropriate erosion control measures.	<ul style="list-style-type: none"> • Watershed restoration treatment throughout project area
The Ouachita Seed Orchard is an important federal source of improved shortleaf pine seed. (Revised Forest Plan, p. 33)	Three loblolly pine plantations are within one mile of the orchard.	Convert the loblolly pine plantations to shortleaf pine.	<ul style="list-style-type: none"> • Clearcut 194 acres loblolly plantation • Site prep and plant shortleaf pine seedlings

Scope of This Environmental Analysis

History of the Scoping and Planning Process

A project announcement letter requesting comments on the proposal was mailed to interested agencies, groups and individuals on January 7, 2016. The project was also published in the Ouachita National Forest Schedule of Proposed Actions. One response was received:

- One individual expressed concern over adverse effects of logging and road construction on forest resources, and opposed glyphosate (herbicide) use for vegetation management.

Relevant Planning Documents

The following documents directly influence the scope of this environmental analysis:

- Revised Land and Resource Management Plan for the Ouachita National Forest (Revised Forest Plan, USDA Forest Service, 2005a), and the accompanying Final Environmental Impact Statement (FEIS, USDA Forest Service, 2005b)
- Travel Analysis Report for the Lower South Fork Project

The Revised Forest Plan guides all natural resource management activities for the Ouachita National Forest. The forest management direction, communicated in terms of Desired Conditions (pp. 6-26); Strategies (pp. 27-72); and Design Criteria (pp. 73-123) that apply to the forest lands identified in this proposal are incorporated by reference.

The treatments described in the Lower South Fork Project Environmental Assessment are consistent with the management direction of the Revised Forest Plan and are typical of those for which environmental effects are disclosed in the FEIS.

Issues

Based on the site-specific concerns raised during scoping, the following issues will be analyzed in depth:

- **Issue 1:** Herbicide use may create a safety hazard to workers and forest visitors.
Method of measurement: Hazard quotient values of herbicides
- **Issue 2:** Logging and road construction may harm natural resources.
Method of measurement: Universal Soil Loss Equation (USLE) values, Aquatic Cumulative Effects (ACE) model values

Decisions to Be Made

The District Ranger must decide which alternative to select. The District Ranger must also determine if the selected alternative would or would not be a major Federal action, significantly affecting the quality of the human environment.

Chapter 2

Alternatives Including the Proposed Action

Alternatives Documented in Detail

No Action

In this alternative, no management activities other than those previously permitted and approved activities would continue in the project area:

- Road maintenance – normal and emergency road maintenance would continue on all existing roads.
- Power line right of way (ROW) maintenance would continue on existing ROW's.
- Fire suppression – natural caused fires may be suppressed unless appropriate conditions allow for it to be used as a management tool to accomplish resource needs. Human caused fires by accident or intention (arson) would be suppressed.
- Off road vehicle use – ORV use of the area would continue under the Travel Management Project for the Ouachita National Forest.
- Camping would continue under the current rules of the Ouachita National Forest. Special restrictions would apply during times of wildfire threat.
- Hunting and Fishing would continue under the rules of the Arkansas Game and Fish Commission.
- Firewood cutting would continue under the permitting rules of the Ouachita National Forest, the public would continue to harvest firewood.
- Rock gathering would continue under the permitting rules of the Ouachita National Forest, the public would continue to collect rock for personal use.
- Maintenance of previously established wildlife openings would occur.
- Existing quartz, shale and gravel mining would continue in approved locations.

Proposed Action

This proposed action has been modified from the proposal provided in the January 2016 project announcement letter. Proposed even-aged regeneration harvest units were redesigned to comply with Revised Forest Plan management direction for lands surrounding Lake Ouachita (Management Area 16).

Description of Treatments (See Appendix A for list of activities by compartment and stand. See Appendix B for maps displaying activity locations).

Clearcut Regeneration Harvest (CC) - A clearcut regeneration harvest is proposed on acquired loblolly pine plantations and is optimal treatment for the primary purpose of restoring native forest in the project area. The Revised Forest Plan (FR010, p. 82) specifies that clearcutting may be utilized in certain instances, including restoration of native forests on lands that currently support non-native tree species. These loblolly pine plantations are located near (within one

mile) of the Ouachita Seed Orchard, an important federal source of improved shortleaf pine seed. To reduce hybridization, priority should be given to converting these loblolly pine plantations back to shortleaf pine (Stewart et. al. 2013). Cutting or harvest in streamside management areas (SMAs) could occur for the purpose of reducing vulnerability to southern pine and/or ips beetle and/or restore native vegetation (9.02/Table 3.10, p. 104). A hardwood component of 10% to 30% would be developed with the regeneration of the native shortleaf pine.

Revised Forest Plan design criteria FR005, FR0009/Table 3.2, and Table 3.15 identify parameters associated with even-aged management. The management practice of clearcut harvest has been selected to accomplish replacement of this forest type that is outside its natural range (OBJ11, p. 60). The Revised Forest Plan provides that maximum size of regeneration areas may be exceeded with approval of the Forest Supervisor up to a maximum of 80 acres for pine and pine-hardwood forest types (FR009/Table 3.2, page 80; Table 3.15, page 111). The Revised Forest Plan also authorizes utilization of clearcutting for the purpose of restoring native forests on lands that currently support non-native tree species (FR010, page 82). The proposed clearcut is based on reasonable and prudent silvicultural practices of Ouachita National Forest lands. Utilization of clearcutting as a harvest method and applying treatment to no more than 80 contiguous acres, are consistent with the objective of the Revised Forest Plan to replace off-site loblolly pine with shortleaf pine and native hardwoods.

Even Age Regeneration Harvest (Modified Seed Tree Regeneration - ST) – A timber harvest cut designed to obtain natural regeneration from seed trees left for that purpose. Approximately 10-15 sq. ft. of pine, 5-10 sq. ft. of hardwood basal area per acre is retained in the overstory. Seed trees are retained indefinitely. This cut would establish a two-aged stand. This treatment differs from a traditional seed tree by retaining a mix of hardwoods and pines in the overstory after regeneration. Trees harvested in these areas may be utilized for public firewood or commercial sale.

To facilitate natural pine regeneration, adequate site preparation is needed to disturb the soil surface in the newly created openings. Competing vegetation may be removed manually with chainsaws, heavy equipment, scarifying, ripping, prescribed fire, herbicide application and/or the use of a large steel drum pulled behind a bulldozer to chop. If warranted, the herbicide triclopyr, imazapyr, imazapic and/or glyphosate may be applied using either hack-and-squirt or foliar spray by hand method. Prescribed fire will be employed in late summer/early fall months for best results. However, prescribed burning may be conducted during the winter or early spring months to combine activities with other wildlife habitat/fuel reduction prescribed burning. When burning is not possible, a mechanical treatment such as scarification or ripping of the area may be used. When possible, site preparation activities will coincide with adequate cone crops. If after five years there are fewer than 150 pine seedlings per acre, the area will be hand planted with genetically improved shortleaf pine seedlings. Where established regeneration is present, seedlings may regenerate too densely causing overcrowded conditions, requiring pre-commercial thinning and/or release.

Chemical Site Preparation - After pine regeneration harvest, hardwoods would be reduced to 20% of the residual basal area of pine using herbicide application in the form of foliar spray, stem injection, and/or chainsaw fell and cut surface spray. A minimum of

5 square feet per acre of basal area of overstory hardwoods would be retained where available. In modified seed tree harvest areas one-half acre clumps of hardwoods per 20 acres of harvest area would be retained in order to create den trees. These areas may be made available for firewood or commercial sale.

Mechanical Site Preparation - Competing vegetation may be removed manually with chainsaws, heavy equipment and/or ripping. This will be used in lieu of or in addition to other site prep methods to ensure areas are properly prepared for future seed/seedlings. These areas may be made available for firewood or commercial sale.

Prescribed Burn Site Preparation - After chemical or mechanical site preparation activities have been conducted, prescribed burning may be employed in the even-aged regeneration harvest areas. This treatment would further reduce brush, downed-woody fuels, and duff and litter accumulations that may impede regeneration establishment. A detailed description of burning is provided later in this document under ecosystem prescribed burning.

Hand Plant Shortleaf Pine - Hand planting of shortleaf pine seedlings will be 8 X 10 spacing. If adequate amounts of pine regeneration (150 trees per acre) are not established, within 5 years in natural regenerated areas, these areas would be chopped, ripped and pine seedlings would be re-planted to meet target stocking levels.

Pre-commercial Thinning (PCT)/Release - Regenerated pine stands between 5 and 10 years of age would be thinned to a maximum of 700 trees per acre, averaging a 10 x 10 foot spacing, using hand tools or herbicide application as described on the previous page. Leave trees would be free of all competing vegetation such as vines and woody stems to ensure survival, reduced susceptibility to insects and disease, and increase growth of the residual stand. Poorly formed trees would also be removed. This may be accomplished manually with hand tools (e.g. chainsaws) or with the herbicides applied as a foliar spray or cut surface application to remove the overtopping and competing vegetation and brush. A foliar spray may be applied to areas with vegetation less than six feet tall and with pine regeneration that does not require thinning. A cut surface application is employed in areas with vegetation greater than six feet tall and/or with pine regeneration requiring thinning. During any activities, sufficient hardwood trees would be left scattered throughout the stand to ensure a 10 to 30 percent hardwood component in the stand. When selecting hardwood trees, preference would be given to mast producers. Final stocking after treatments would be 250-500 pine stems per acre. These areas may be made available for commercial sale.

Intermediate Harvest/Commercial Thinning (CT) - Stands are thinned to a total residual basal area of 60-70 square feet per acre based on the average stand diameter and community type as listed in Table 3.6 Thinning Guide by Community Group (Revised Forest Plan). Damaged, diseased, suppressed, and poorly formed trees would be targeted first for removal. These areas may be made available for commercial sale. Hardwood will be thinned and will be made available for commercial or firewood sale.

Intermediate Harvest/First Plantation Commercial Thinning (CT) - Densely stocked loblolly and shortleaf pine plantations would be thinned to a residual basal area of 50-60 ft² per acre. For mechanical harvesting equipment to operate within these stands and to reduce the amount of damage to the remaining stand, a minimum spacing between trees of 18 to 20 feet is required. These stands, with average diameters less than 10 inches will be thinned below the basal area guides listed in Table 3.6 Thinning Guide by Community Group (Revised Forest Plan). Pursuant to Revised Forest Plan Design Criteria FI005, deviations from these guides are allowable if site-specific conditions warrant, subject to approval by the project Responsible Official. Stands with an average diameter of six inches would be thinned to a basal area of 30 square feet. Damaged, diseased, suppressed, and poorly formed trees would be targeted first for removal. These stands are subject to severe Southern pine and Ips engraver beetle hazards. Should an outbreak of either pest occur, control would be extremely difficult with expectations of large outbreaks and severe damage to these and adjacent stands. Control of wildfires in dense stands such as these is extremely difficult. Firelines are difficult to construct and the dense stands present dense vertical as well as horizontal fuels. Few hardwoods have been able to compete with the dense and vigorously growing pine. The appearance of these stands is a very dense monoculture of pine timber. These areas may be made available for commercial sale. Hardwood, if present, will be thinned and made available for commercial or firewood sale.

Intermediate Harvest/Woodland Development or Restoration (CT)- Using a combination of fire, chainsaws, and/or herbicides; the overall basal area will be reduced as listed in Table 3.6 Thinning Guide by Community Group (Revised Forest Plan) to allow for the development of a grass/forb understory. These areas may be made available for firewood or commercial sale. Subsequent treatments will be required whenever there are more than 150 seedlings per acre over three feet tall covering more than half the area or whenever grass/forbs comprise less than half of the ground cover.

Pond Improvement - Activities would include repairing spillways, improving parking areas, installing signs, building fishing piers, clearing vegetation, and restocking of native fish species. Traditional methods of controlling nuisance vegetation within and surrounding ponds have proven unsuccessful or impracticable. With Forest Supervisor approval, the use of aquatic labeled herbicides would be used to control invasive or nuisance aquatic vegetation.

Wildlife Opening Improvement & Construction – Activities would include timber harvest, brush hogging, disking, fertilizing, and seeding existing wildlife openings with native warm and cool season grasses and forbs. These areas may be made available for firewood or commercial sale.

Invasive/Noxious Plant Species Control – Identified invasive species, but not limited to, fescue, Japanese honeysuckle, stiltweed, Chinese privet, multi-flora rose) would be eliminated from the road surface, ditches, and forest floor throughout the project area using various techniques. These techniques would include a combination of herbicide application, prescribed burning, light disking, and seeding with native warm season grasses.

Ecosystem Prescribed Burning - This activity would be implemented during the dormant and growing seasons (described below). Proposed burn areas would be burned as needed to reach a natural fire regime in this area. Areas are currently in a Condition Class 2 and 3 with the objective to reach and maintain Condition Class 1. The prescribed burn frequency is based on the current fuel loads, the priority of the unit and reasonable accessibility to achieve the desired condition. These are also considered when determining timing or season and intensity of the prescribed burn.

In order to minimize fireline construction, some of the burn blocks extend beyond the project area to utilize natural or existing man-made fuel breaks such as streams and roads.

Growing Season Prescribed Burning – These burns are implemented during the spring and summer months between leaf emergence in late March and April and leaf fall in late October and November. The burns involve application of controlled, low to moderate intensity fire to control competing vegetation (hardwoods), prepare sites for seeding, and perpetuate fire dependent species (shortleaf pine – bluestem). Vegetation three inches and less in diameter at the ground level is targeted for eradication; however, some larger diameter vegetation may be damaged. This will result in less competition for pine seedlings and other desirable fire-dependent species while creating an open understory to stimulate growth of native grasses and forbs and increased foraging opportunities for browsing animals.

Dormant Season Prescribed Burning – These burns are implemented after leaf fall and before leaf emergence during late fall and winter months. Moderate to high intensity fire is employed to reduce accumulated fuels, stimulate growth of native vegetation, and improve wildlife habitat. Approximately 80 percent of the area is burned with expected fuel reduction of approximately 30 percent. Some duff would be retained for soil protection. Some larger vegetation may be lost, however, two inches in dbh and less in diameter is targeted for reduction to create an open understory, stimulating growth of native grasses and forbs, and increased foraging opportunities for browsing animals.

Fireline Construction – A line up to 10-foot wide would be bladed to bare minimum soil using a bulldozer, removing ground vegetation and small trees. The fireline would meander around large trees, leaving them in place. After the burns are completed, these firelines would be waterbarred and seeded with native grasses and forbs where needed to restore vegetative cover to the exposed soil.

Fireline Reconstruction/Fireline Maintenance – Up to a 10-foot wide swath of brush and ground vegetation would be removed from existing firelines by blading using a bulldozer. After the burns are completed, these firelines would be waterbarred and seeded with native grasses and forbs where needed to restore vegetative cover to the exposed soil.

Road Construction – Roads would be constructed to accommodate access for management activities. These roads would be added to the system as classified roads, but would be closed to vehicular traffic after use with a gate or berm. They would be maintained as needed and retained for administrative use only.

Temporary Road Construction – Temporary road construction is necessary to access harvest areas. Per Revised Forest Plan design criteria, temporary roads would be decommissioned, revegetated, and re-contoured upon termination of management activity. After harvest, these roads would be closed with earthen berms or gates, fertilized, seeded and planted with native warm and cool season grasses and nonpersistent cultivars and utilized as temporary wildlife openings.

System Road Reconstruction – System road reconstruction would be required to support management activities, reduce erosion and sedimentation, and ensure safe travel on the existing road network. Activities could include any road improvements or realignment that results in an increase of an existing road's traffic service level, expands its capacity, changes its original design function, or relocates an existing road or portions of an existing road and treatment of the old roadway.

System Road Pre-haul Maintenance – Pre-haul maintenance would be required prior to timber hauling. Activities include brush removal, spot gravel, surface protection, blading, culvert replacement and drainage reconditioning as necessary to restore the road to its original design function.

Install Road Closure Devices – Metal gates or earthen berms would be installed to provide road closure. The closure devices would be installed on roads built as temporary access.

Rock Resources – Permits would be offered to the public for collection of rocks by private individuals within existing mine areas or road construction and reconstruction corridors. Rocks may be collected within areas of disturbance associated with existing mine areas or road construction and reconstruction.

No Herbicide Use

Herbicide application for invasive species control, site preparation and pre-commercial thinning/release would not occur. These activities would be accomplished manually with chainsaws and/or other mechanical means. All other activities are the same as those proposed under the Proposed Action.

Technical Requirements

The technical requirements described below apply to the Proposed Action and the No Herbicide Alternative.

Cultural Resources

The following measures only apply to cultural resource sites that are unevaluated, eligible for listing, or listed in the National Register of Historic Places.

HP1: Site Avoidance During Project Implementation

Avoidance of historic properties (HP) will require the protection from effects resulting from the undertaking. Effects will be avoided by (1) establishing clearly defined site boundaries and buffers around archeological sites where activities occur that might result in an adverse effect. Buffers will be of sufficient size to ensure that integrity of the characteristics and values which contribute to, or potentially contribute to, the properties' significance will not be affected, and (2) routing proposed new roads, temporary roads, log landings and skid trails away from historic properties;

HP2: Site Protection During Prescribed Burns

- (1) *Firelines.* Historic properties located along existing non-maintained woods roads used as fire lines will be protected by hand-clearing those sections that cross the sites. Although these roads are generally cleared of combustible debris using a small dozer, those sections crossing archeological sites will be cleared using leaf blowers and/or leaf rakes. There will be neither removal of soil, nor disturbance below the ground surface, during fireline preparation. Historic properties and features located along proposed routes of mechanically-constructed firelines, where firelines do not now exist, will be avoided by routing fireline construction around historic properties. Sites that lie along previously constructed dozer lines from past burns where the firelines will be used again as firelines, will be protected during future burns by hand clearing sections of line that cross the site, rather than re-clearing using heavy equipment. Where these activities will take place outside stands not already surveyed, cultural resources surveys and regulatory consultation will be completed prior to project implementation. Protection measures, HP1, HP3, and HP4, will be applied prior to project implementation to protect historic properties.
- (2) *Burn Unit Interior.* Combustible elements at historic properties in burn unit interiors will be protected from damage during burns by removing excessive fuels from the feature vicinity and, as necessary, by burning out around the feature prior to igniting the main burn, creating a fuel-free zone. Burn out is accomplished by constructing a set of two hand lines around the feature, approximately 30 to 50 feet apart, and then burning the area between the two lines while the burn is carefully monitored. Combustible features located in a burn unit will also be documented with digital photographs and/or field drawings prior to the burn. Historic properties containing above ground, non-combustible cultural features and exposed artifacts will be protected by removing fuel concentrations dense enough to significantly alter the characteristics of those cultural resources. No additional measures are proposed for any sites in the burn interior that have been previously burned or that do not contain combustible elements or other above ground features and exposed artifacts as proposed prescribed burns will not be sufficiently intense to cause adverse effects to these features.

- (3) *Post-Burn Monitoring.* Post-burn monitoring may be conducted at selected sites to assess actual and indirect effects of the burns on the sites against the expected effects. State Historic Preservation Office (SHPO) consultation will be carried out with respect to necessary mitigation for any sites that suffer unexpected damage during the burn or from indirect effects following the burn.

HP3: Other Protection Measures

If it is not feasible or desirable to avoid an historic property that may be harmed by a project activity (HP1), then the following steps will be taken: (1) In consultation with the Arkansas SHPO, the site(s) will be evaluated against National Registry Historic Places (NRHP) significance criteria (36 CFR 60.4) to determine eligibility for the NRHP. The evaluation may require subsurface site testing; (2) In consultation with the Arkansas SHPO, tribes and nations, and with the Advisory Council of Historic Preservation (ACHP) if required, mitigation measures will be developed to minimize the adverse effects on the site, so that a finding of No Adverse Effect results; (3) The agreed-upon mitigation measures will be implemented prior to initiation of activities having the potential to affect the site.

HP4: Discovery of Cultural Resources during Project Implementation

Although cultural resources surveys were designed to locate all NRHP eligible archeological sites and components, these may go undetected for a variety of reasons. Should unrecorded cultural resources be discovered, activities that may be affecting that resource will halt immediately; the resource will be evaluated by an archaeologist, and consultation will be initiated with the SHPO, tribes and nations, and the ACHP, to determine appropriate actions for protecting the resource and mitigating adverse effects. Project activities at that locale will not resume until the resource is adequately protected and until agreed-upon mitigation measures are implemented with SHPO approval.

Soils

Allow heavy equipment operations on hydric soils, soils with a severe compaction hazard rating, and floodplains with frequent or occasional flooding hazard only during the months of July through November. Operations during December through June are allowed with the use of methods or equipment that do not cause excessive soil compaction. This standard does not apply to areas dedicated to intensive use, including but not restricted to administrative sites, roads, primary skid trails, log decks, campgrounds, and special use areas. (Revised Forest Plan, SW001, p. 74)

Allow heavy equipment operations on soils that have a high compaction hazard rating only during the months of April through November. Operations during December through March are allowed with the use of methods or equipment that do not cause excessive soil compaction. This standard does not apply to areas dedicated to intensive use, including but not restricted to administrative sites, roads, primary skid trails, log decks, campgrounds, and special use areas. (Revised Forest Plan, SW002, p. 74)

These standards apply to operations in the stands displayed in the tables below.

STANDS REQUIRING A LIMITED OPERATING SEASON SW001 (TABLE 2.1)

Compartment	Stand	Compartment	Stand	Compartment	Stand
1626	6	1632	23	1641	1
1626	7	1632	24	1641	4
1626	8	1632	34	1641	5
1626	9	1632	36	1641	6
1628	8	1632	37	1641	11
1628	9	1632	39	1641	16
1628	13	1633	17	1641	19
1628	17	1633	39	1641	28
1628	18	1634	1	1642	3
1630	2	1634	8	1642	5
1630	9	1634	9	1642	6
1630	43	1634	10	1642	9
1632	2	1634	12	1642	12
1632	4	1634	29	1642	21
1632	14	1634	32	1642	22
1632	15	1634	35	1642	24
1632	17	1635	4	1642	25
1632	22	1635	23		

STANDS REQUIRING A LIMITED OPERATING SEASON SW002 (TABLE 2.2)

Compartment	Stand	Compartment	Stand	Compartment	Stand
1626	9	1633	37	1641	16
1632	4	1634	12	1641	19
1632	37	1634	29	1642	22
1633	17	1641	5		

Soil loss from management actions will not exceed the estimated Forested T-factor for each soil or soil map unit, based on the cumulative time period between soil disturbing management actions. (Revised Forest Plan, SW003 (3), p. 74)

Scenery

The following technical requirements are informed by the Southern Region’s Scenery Treatment Guide (April, 2008) and Revised Forest Plan design criteria specific to lands surrounding Lake Ouachita.

- Flowering and other visually attractive trees and understory shrubs are favored when leaving vegetation.
- For areas with a moderate to high Scenic Integrity Objective (SIO), leave tree marking or unit boundary is applied so as not to be visible within 100 feet of concern level 1 and 2 open roads.

Lower South Fork Project

- For areas with a moderate to high SIO, log landings, roads, and bladed skid trails should be located out of view, when possible, to avoid bare mineral soil being seen from concern level 1 and 2 open roads.
- The visual impact of roads and constructed firelines should be blended so they remain subordinate to the existing landscape character in size, form, line, color, and texture.
- Openings should be organically shaped. Edges should be shaped and/or feathered where appropriate to avoid a shadowing effect in the cut unit.
- Cut and fill slopes are re-vegetated to the extent possible.
- All harvest areas within a high SIO will be cut to an irregular shape and follow the landscape/contours.
- Slash should be treated to an average of four feet from the ground within 100' of the Womble Trail corridor.
- Except for property lines, tree marking paint will not be visible from Lake Ouachita.
- In first one-fourth mile and seen area from the lake surface, management actions will meet high SIO.
- Herbicides will not be used within one-fourth mile of Lake Ouachita.

Public Health and Safety

During prescribed burning activities, sign travel-ways as needed notifying the public there may be smoke along the road. Position flaggers or warning signs along the travel ways during active flaming. Inform the public of potential burn days, times, information contacts, and suggested alternatives for those concerned with smoke. Notify local, county and state law enforcement that burning will take place.

Monitoring

The Revised Forest Plan lists monitoring activities for the Ouachita National Forest. The Forest's monitoring program is designed to evaluate the environmental effects of actions similar to those proposed in this project and also serves to assess the effectiveness of treatments.

Trained contract administrators and inspectors will conduct routine on-site assessments throughout the implantation phases of the project, ensuring that the appropriate design criteria are followed to protect soil stability, water quality and other resources.

Activities that utilize herbicides will be monitored to ensure that all herbicides are used in accordance to label instructions. Form R8-FS-2100-1, Herbicide Treatment and Evaluation Record would be used to monitor all work involving herbicides. Stream samples would also be taken to monitor for offsite movement.

Other Alternatives Considered

An alternative was considered that would include no road construction, including temporary roads. Most areas proposed for even-aged regeneration harvest or woodland restoration/development would be inaccessible if temporary roads were not constructed; the Purpose and Need for early seral habitat would not be met. For these reasons, a no road construction alternative was not further analyzed.

Other Past, Present and Reasonably Foreseeable Future Actions

Private land ownership – Private owners can be expected to continue their current land use practices (i.e. residential, agriculture, crystal mining).

Other past activities within the Lower South Fork Project area are evident in descriptions of the present conditions for each resource section analyzed in Chapter 3. Other ongoing activities are listed above in the description of the No Action Alternative.

Summary Comparison of Alternatives

COMPARISON OF ACTIONS BY ALTERNATIVE (TABLE 2.3)

Action (measure)	No Action	Proposed Action	No Herbicide
Regeneration Harvest (acres)	0	678	678
Chemical Site Preparation (herbicides) (acres)	0	678	0
Mechanical Site Preparation (no herbicides) (acres)	0	0	678
Mechanical Site Preparation (acres)	0	678	678
Prescribed Burn Site Preparation (acres)	0	678	678
Hand Plant Shortleaf Pine Seedlings (acres)	0	678	678
Seedling Release (herbicides) (acres)	0	973	0
Seedling Release (manual) (acres)	0	0	973
Pre-Commercial Thinning (acres)	0	1,305	1,305
Intermediate Thinning (acres)	0	4,375	4,375
Wildlife Opening Improvement (acres)	0	14	14
Wildlife Opening (acres)	0	8	8
Pond Improvement (ponds)	0	43	43
Gate Maintenance	0	7	7
Invasive Plant Species Control (acres)	0	Throughout	Throughout
Prescribed Burning (acres)	0	15,670	15,670
Fireline Construction (miles)	0	39	39
Fireline Maintenance (miles)	0	41	41
Road Construction (miles)	0	1	1
Road Reconstruction (miles)	0	34	34
Temporary Road Construction (miles)	0	26	26
System Road Pre-haul Maintenance(miles)	0	2	2

COMPARISON OF ENVIRONMENTAL EFFECTS BY ALTERNATIVE (TABLE 2.4)

Environmental Effect (measure)	No Action	Proposed Action	No Herbicide
Additional Sediment Delivery by Watershed (tons/year)			
<i>Lower South Fork Ouachita River-Lake Ouachita 080401010403</i>	102	3,539	3,539
Air Quality Meets Air Quality Index	Yes	Yes	Yes
Early Seral Habitat Created (acres)	0	1,160	1,160
Open Road Density (mi/sq. mile)	1.45	1.48	1.48
Scenic Integrity Objectives Met	Yes	Yes	Yes
Below SW003 Allowable Soil Loss	Yes	Yes	Yes

COMPARISON OF OBJECTIVES MET BY ALTERNATIVE (TABLE 2.5)

Objective (measure)	No Action	Proposed Action	No Herbicide
Improve the health and vigor of forest stands and improve stand quality (acres of timber stands treated resulting in reduced basal areas)	0	5,053	5,053
Contribute to the economic base of local communities by providing a sustained yield of high-quality wood products. (volume harvested – 100 cubic feet (ccf))	0	31,000	31,000
Provide grass-forb and seedling-sapling habitat conditions. (percent of suitable acres in early seral habitat)	0	9	9
Provide for a diversity of plant and animal communities; reduce fuel loads. (acres of prescribed burning)	0	15,670	15,670
Maintain or Improve open habitats to provide high quality forage and nesting habitat for wildlife. (acres of wildlife openings maintained/created)	0	22	22
Eliminate non-native, invasive species. (acres treated for invasive species eradication)	0	50	50
Develop, operate, and maintain the road system to meet the requirements of the proposed actions, protect the environment, and provide reasonable and safe access. (road construction: temp road construction : road reconstruction: pre-haul maintenance)	0	1:26:34:2	1:26:34:2

Chapter 3

Affected Environment and Environmental Consequences

Air Quality

Present Conditions

The project area lies within lands designated as Class II with respect to the air resource. The Clean Air Act defines a Class II area as “a geographic area designated for a moderate degree of protection from future degradation of the air quality.” A Class I Area is a geographic area designated for the most stringent degree of protection from future degradation of air quality. The closest Class I Area is the Caney Creek Wilderness Area, approximately 25 miles west of the project area.

Existing emission sources occurring within the project area consist mainly of mobile sources. These would include, but are not limited to, combustion engines (such as those found in motor vehicles); dust from unpaved surfaces; smoke from local, county, agricultural, and forest burning; restaurants; and other activities. Arkansas state air regulators monitor ozone and fine particulate matter at several locations near the project area; none of these monitors have measured values greater than air quality standards set by the EPA. Of the six criteria air pollutants, one county in the state (includes the town of West Memphis) is designated a non-attainment area for ozone (US Environmental Protection Agency, 2016).

No Action

Direct and Indirect Effects

The prescribed fire proposed in this project would not occur, therefore there would be no additional smoke generated from the proposed prescribed burning, and no degradation of air quality.

Cumulative Effects

No cumulative effects would occur because no prescribe burning would be conducted under the No Action Alternative; there would be no additive effect.

Proposed Action and No Herbicide

Direct and Indirect Effects

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. Human health effects related to particulate matter in smoke include: increased premature deaths; aggravation of respiratory system or cardiovascular illnesses; and changes in lung function, structure, and natural defense. Smoke also becomes a safety issue when it affects visibility on roadways. Smoke can also have a nuisance odor.

Smoke can have negative short-and long-term health effects. Fire management personnel 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 because of limited exposure time.

Smoke is composed of hundreds of chemicals in gaseous, liquid and solid forms, some of which are toxins including carbon monoxide, particulate matter, acrolein and formaldehyde. Over 90 percent of the particulate emissions from prescribed fire are small enough to enter the human respiratory system. The repeated, lengthy exposure to relatively low smoke concentrations over many years can contribute to respiratory and cardiovascular problems.

Calculations of emissions from the proposed project were conducted to assess the increase in emissions loading in the project area. Consumption is assumed to be four tons per acre, with an average emission factor of 12 pounds of fine particulate matter per ton of fuel consumed. Calculations of emissions show that the resulting increase as a result of this project would be 54.3 tons from the largest prescribed burn unit.

All prescribed burning activities would be conducted in accordance with the Region 8 Smoke Management Guidelines in order to alleviate the smoke related impacts outlined above. Smoke management planning in accordance with the Guidelines has been successful in protecting health and safety during past activities. The Guidelines require that smoke dispersion modeling be conducted for most burn units to ensure that the smoke management objectives are met. If modeling shows potential impacts, adjustments or mitigations would be necessary in order to go forward with the burn. Each burn unit would be planned in accordance with the Guidelines such that specific parameters are met, including wind speeds and wind directions. While a few larger units would have the potential to transport smoke beyond the National Forest, potential impacts would be mitigated by burning with a wind direction away from the Forest boundary.

Based on existing air quality information, no long-term adverse impacts to air quality standards are expected from the proposed project. The proposed project is designed to ensure that the Guidelines are followed, and as such does not threaten to lead to a violation of any Federal, State or Local law or regulation related to air quality.

Cumulative Effects

The cumulative effects of prescribed burning on air quality consist of the downwind impact of multiple simultaneous prescribed burns, in addition to the other emissions in the area. These cumulative effects are rather short-lived. Once the burn is over and the smoke dissipates, the effect is over. Impacts to air quality would generally be confined to no more than a few hours or at most, 1-2 days. It is acknowledged that multiple simultaneous prescribed burns could cumulatively increase particulate levels. While it is difficult or nearly impossible to quantify such emissions in a planning analysis, voluntary compliance with the State of Arkansas Smoke Management Program insures compliance with applicable Federal and State regulations governing open burning.

Cultural & Historical Resources

Present Conditions

Archaeological investigations of the project area resulted in the survey of 2,258 acres. Including former investigations, 4,495 acres are archaeologically surveyed and 27 archaeological sites are documented. The Ouachita Cultural Resources Report No. 463 was prepared and submitted to the State Historic Preservation Office (SHPO), the Arkansas State Archeologist, and the federally recognized tribes interested in undertakings in Montgomery County: Caddo Tribe, Quapaw Nation, and Osage Nation.

Significant and undetermined sites will be protected from any proposed management activities. If any unknown heritage resources are discovered during stand treatments within the project areas, the District and Forest Archaeologists will be notified immediately. They will make an evaluation, in consultation with SHPO and the Tribal Historic Preservation Officers (THPOs), to determine appropriate action. Activity at that location will be suspended until that determination is complete.

Known Cultural Resources –Twenty-seven archeological sites have been identified in or near the Project Area as a result of cultural resources inventory surveys. Of the identified properties, five were determined significant and eligible for inclusion on the National Register of Historic Places (NHRP). Additionally, four archeological sites are of undetermined significance, but will be protected during project implementation.

Site Locations Not Yet Known - Cultural resource surveys may not be complete for certain activities because additional planning may be required prior to implementation. These activities include, but are not limited to:

- Burn boundary and fireline construction locations
- Temporary roads, skid trails, and log landings outside areas already surveyed
- Road construction, reconstruction, maintenance, conversion, or decommissioning activities involving ground disturbance occurring outside areas already surveyed
- New pond construction for wildlife water sources

These areas will be surveyed and regulatory and tribal consultation completed prior to implementation.

Effects Analysis

The scope of the analysis for potential effects to cultural resources includes the entire Lower South Fork Project area and considers the proposed activities within the treatment area (see Chapters 1 and 2), as well as access to these areas.

An effect to a cultural resource is the "...alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." (36 CFR 800.16(i)) Any project implementation activity that has potential to disturb the ground has potential to directly affect archeological sites, as does the use of fire as a management tool. Specific activities that

have potential to directly affect cultural resources include timber harvesting and associated log landings, skid trails, and temporary roads, prescribed burning and associated fireline construction and road maintenance, construction or reconstruction where ground disturbance takes place outside existing right-of-way area.

Proposed activities that do not have potential to affect cultural resources, and therefore, are not considered undertakings for purposes of this project include: Non-commercial thinning, timber stand improvements, on-going maintenance of existing Forest roads or reconstruction of previously surveyed roads where ground disturbance does not take place outside existing road prisms and existing drainage features, rehabilitation/closure of temporary roads, log landings, and skid trails using non-ground disturbing methods, road decommissioning using non-ground disturbing methods, and non-native invasive plant species control using non-ground disturbing methods.

In general, proposed activities have the potential to affect cultural resources by encouraging increased visitor use to those areas of the Forest in which cultural resources are located. Increased visitor use of an area in which archeological sites are located can render the sites vulnerable to both intentional and unintentional damage. Intentional damage can occur through unauthorized digging in archeological sites and unauthorized collecting of artifacts from sites. Unintentional damage can result from such activities as driving motorized vehicles across archeological sites, as well as from other activities, principally related to dispersed recreation, that lead to ground disturbance. Effects may also include increased or decreased vegetation on protected sites due to increased light with canopy layer reduction outside of the protected buffer.

No Action

Direct and Indirect Effects

There would be no change in effects from the current condition, and the potential threat to integrity of cultural resources would remain unchanged.

Cumulative Effects

There are no other past, present, or reasonably foreseeable future actions affecting cultural resources in the project area.

Proposed Action and No Herbicide

Direct and Indirect Effects

Proposed access changes, soil restoration work and opening of forested areas from timber harvest can impact cultural resources. Surface artifacts or features may be exposed, disturbed or removed due to increased access and visibility.

Project components that have potential to directly affect archeological sites are primarily timber, prescribed fire, road management, and some wildlife management activities. Adverse effects to cultural resources resulting from proposed activities could be avoided provided site avoidance and site protection measures are properly applied to the known historic properties (see Chapter 2, technical requirements/design criteria). In that instance, project activities would not be expected to adversely affect archeological sites.

Cumulative Effects

There are no other past, present, or reasonably foreseeable future actions affecting cultural resources in the project area.

Soils

Present Condition

There are 54 soil mapping units within the project area. The majority of the project area, almost 15,600 acres, is comprised of Littlefir-Bismarck complex soil mapping unit. The average slope range is 8 to 15%. This map unit consists of moderately deep to deep, and shallow, clayey and loamy soils on moderately sloping to moderately steep hillsides. Management concerns include shallow depth and very low water holding capacity of Bismarck soil and a moderate compaction hazard. See project file for the soil mapping unit legend and soil maps.

Prime Farmlands, Wetlands and Floodplains. Proposed management activities would not alter the soil's capacity to remain prime farmland. Soil mapping units identified as being in the 100-year flood plain or as being a hydric soil require special management considerations and evaluations so that proposed actions would not adversely alter the natural values of these areas. In this analysis area, there are no hydric soils or jurisdictional wetlands mapped. Soil map units 36, 54, 55, 60, 69, 101, 122, 128, 133, 146, and 152 depict floodplain landforms in this analysis area. These map units represent a total of 3,282 acres of the project area. These mapped areas help to give an approximate determination of the 100-year boundary where their width is determined to be more than 200 feet. No structures are proposed within 100-year floodplains or wetland locations. For detailed information, reference E.O. 11988, E.O. 11990, FSM 2526 and FSM 2527.

No Action

Only the undisturbed natural erosion would be expected to continue. Natural erosion from undisturbed forest soils is very low, generally in the neighborhood of 0.01 to 0.15 tons/acre/year. There would be no management activities conducted on forest soils; no compaction would occur.

Proposed Action and No Herbicide

Erosion – Erosion is the detachment and transport of individual soil particles by wind, water, or gravity. Soils are considered detrimentally eroded when soil loss exceeds soil loss tolerance (Forested T-factor) values. Ground disturbing management practices influence erosion principally because they remove vegetative ground cover and often concentrate and channel runoff water. Forested T-factors and the soils susceptibility to erosion vary by soil and mapping unit. Soils with higher K-factor values and those soil map units with severe erosion hazard ratings require more intensive management efforts to reduce the potential for accelerated erosion both during and after the soil disturbing activity. Erosion can best be managed to stay within the Forested T-factor values by leaving sufficient amounts of the forest floor, slash and other onsite

woody debris material which typically dominates an effective surface cover, not overly compacting soils which would reduce water infiltration rates and result in increased overland flow rates, and not allowing water to concentrate and channel on roads, skid trails and landings.

The Revised Forest Plan Forest-wide design criteria identify maximum allowable soil loss thresholds (pp. 74-75). In order to determine whether the proposed actions meet these criteria, the Universal Soil Loss Equation (USLE) was used to calculate soil loss resulting from proposed treatments. For this analysis, worst case-modeling scenarios were analyzed for proposed management actions on soil map units with a severe and moderate erosion hazard potential.

The total calculated soil loss for the proposed management activities and the maximum allowable soil loss for three-year recovery period are displayed in the table below. These values are based on adequate implementation of erosion control treatment of log decks, temporary roads and primary skid trails (deep tillage, waterbar and seed for Compartment 1632 Stand 23; scarify, waterbar and seed for Compartment 1641 Stand 4).

MAXIMUM ALLOWABLE SOIL LOSS (TABLE 3.1)

Soil Map Unit	Compartment/Stand	Treatment	Soil Loss (tons/acre)	
			Proposed Action & No Herbicide	Allowable
6	1632/23	Clearcut and Site Preparation	10.63	12.25
11	1641/4	Commercial Thin	5.01	6.30

These worst-case scenarios meet the Forest criteria of staying within the allowable soil loss Forested T-factor. These treatment units, along with other proposed treatment units of less intense soil disturbing management actions, would remain within acceptable limits over the entire project area when erosion control measures are adequately implemented. Any stands requiring additional erosion control measures (mulching) would be listed in Chapter 2, technical requirements.

Compaction – Compaction increases soil bulk density and decreases porosity as a result of the application of forces such as weight and vibration. Compaction can detrimentally impact both soil productivity and watershed condition by causing increased overland flow during storm events and reduced plant growth due to a combination of factors including reduced amounts of water entering the soil and its reduced availability to plant growth, a restricted root zone, and reduced soil aeration. It is generally acknowledged that all soils are susceptible to soil compaction or a decrease in soil porosity. The soils in this planning area are most susceptible to compaction when wet.

Soil map hazard ratings for compaction are primarily due to low proportions of rock content in the top 6-inches of soil. This situation, when combined with heavy equipment operation on wet soils, can result in unacceptable levels of compaction. To ensure that compaction effects are kept within acceptable levels, additional mitigation would be implemented. On soils with a moderate-high or high compaction hazard rating, logging would be limited to the drier periods of the year, namely April through November. On soils with a severe compaction hazard rating, logging would be limited to a July through November operating season. Stands requiring limited

operating seasons are listed in Chapter 2, technical requirements. Even during these drier periods, extra care would be taken to monitor soil conditions and suspend operations when soils become wet. Given this mitigation, soil compaction would be limited and is not expected to impair soil productivity.

Fire – Any long-term negative effects to the soil would be related to high severity burns or very short frequency of the burns. Typical burn severity would be limited by established burning parameters and mitigation measures designed to protect soils and overstory trees and to minimize risk of escape. These parameters result in retention of enough leaf litter to protect soil from the negative effects listed above in most cases. Under-burn frequencies would be determined to allow recovery of forest floors and soil biota, and to not deplete soil nutrients.

Cumulative Effects

Effects from past actions are no longer impacting the soil resource. There are no present actions impacting the soil resource. There is always the potential for a wind or insect/disease event that would result in salvage or sanitation harvests within the same areas proposed for harvest under this project. Because salvage or sanitation harvests in response to these natural events would also follow the Revised Forest Plan guidance designed to protect the soil resource, any additive effect would be minimal.

Water Resources & Quality

Present Condition

The project area boundary encompasses 23,695 acres of the 24,844-acre Lower South Fork Ouachita River-Lake Ouachita 12 digit hydrologic unit code (HUC) sixth-level subwatershed. It also includes small portions (14 acres to 232 acres) of Upper Mazarn Creek, Middle South Fork Ouachita River, Gap Creek-Lake Ouachita, Little Fir Cemetery-Lake Ouachita, and Ouachita River-Lake Ouachita sixth-level subwatersheds. Since watershed boundaries are not congruent with compartment or stand boundaries, some proposed actions such as prescribed burning and associated fireline construction or re-construction fall outside the boundaries of these subwatersheds.

The primary beneficial uses of waters within the project area are water sources for wildlife, amphibian spawning sites, native fisheries, and recreation. The project area is bisected by a portion of the South Fork of the Ouachita River; it flows into the western end of Lake Ouachita. The South Fork is designated an “Ecologically Sensitive Waterbody” and Lake Ouachita is categorized as an “Extraordinary Resource Water” (ERW) by the Arkansas Department of Environmental Quality (ADEQ, 2016). The South Fork designation is due to the locations of Arkansas fatmucket mussel and Caddo madtom. The ERW beneficial use is a combination of the chemical, physical and biological characteristics of a waterbody and its watershed which is characterized by scenic beauty, aesthetics, scientific values, broad scope recreation potential and intangible social values.

The northern portion of the subwatershed contains Hovel Creek, as well as several unnamed tributaries of the South Fork of the Ouachita River. The southern portion includes Shady Creek, Twin Creek, and East Fork Twin Creek. There are no impaired surface waters (303(d) listing) within or adjacent to the project area (ADEQ, 2016).

Effects Analysis

No Action

Direct and Indirect Effects

Although proposed soil disturbing activities resulting in stream sedimentation would not occur, watershed improvement activities would also not take place.

Proposed Action

Direct and Indirect Effects

Direct effects of management activities would result from logging equipment and vehicles traversing stream crossings, fireline and road construction through streams, etc. These activities could place pollutants directly into a watercourse. While it is impractical to eliminate all soil from entering a stream, it is possible to limit the amount that directly enters streams by designing and implementing BMPs found within the Revised Forest Plan and Arkansas Forester's BMPs. When herbicides are transported, mixed, and applied, there is a risk that the herbicide could be spilled. Herbicides may enter streams, ponds, and lakes during treatment by direct application or drift.

Indirect effects to water quality are those occurring at a later time or distance from the triggering management activity. Indirect effects are from management activities that do not have a direct connection to a stream course.

Timber harvest and fire can increase nutrients released to streams, with potentially positive or negative effects. Research studies in the Ouachita Mountains have shown increases in concentrations of some nutrients following timber harvest, but increases are generally small and short-lived, particularly where partial harvests are implemented (Oklahoma Cooperative Extension Service, 1994). Small increases in nutrient concentrations may have a beneficial effect on these typically nutrient-poor stream systems. Van Lear and others (1985) examined soil and nutrient export in ephemeral streamflow after three low-intensity prescribed fires prior to harvest in the Upper Piedmont of South Carolina. Minor increases in stormflow and sediment concentrations in the water were identified after low-intensity prescribed fires. It was suggested that erosion and sedimentation from plowed fire lines accounted for the majority of sediment from all watersheds.

Road maintenance and/or construction, fireline construction and reconstruction and timber management activities such as construction of skid trails, temporary roads and log landings could result in increases in erosion and sedimentation. Roads contribute more sediment to streams than any other land management practice (Lugo & Gucinski, 2000).

Increases in water yield are generally proportional to decreases in vegetative cover. Because vegetative cover would to some extent decrease, water yield increases are expected to be minor (Oklahoma Cooperative Extension Service, 1994). Stream channels in the area are capable of withstanding small increases in flow.

Forest monitoring has demonstrated that indirect effects from vegetation manipulation from harvest or stand improvement with buffers did not have a significant effect on water quality (Clingenpeel, 1989). Beasley et al. (1987) showed a statistically significant increase in nutrient concentrations of orthophosphorus, potassium and calcium for only the first year after clearcutting. There was no effect from selection harvesting. Because of the short period of increases (one year) and the dilution of untreated areas, there was no meaningful impact to water quality.

The Proposed Action includes the use of the herbicides triclopyr, imazapyr, imazapic, glyphosate and picloram for site preparation, release and for the control of non-native invasive species. The control of non-native invasive terrestrial vegetation using herbicides within MA-9 would only be with an appropriately labeled formulation for both aquatic and terrestrial site use. When herbicides are applied, there is a risk that the chemical could move offsite, possibly entering streams, ponds, lakes, or infiltrate ground water by vertical seepage into aquifers. The Forest Service has specific regulations for the use and application of herbicides, and the Ouachita NF adheres to additional design criteria for herbicide application in the Revised Forest Plan. When all BMPs or regulations are implemented, there should be little movement of herbicide offsite. The introduction of herbicides into the water is treated as an indirect effect since standards and guidelines (BMPs) do not permit direct application for silvicultural purposes. Herbicide monitoring across the Forest has found that only trace amounts of herbicide have ever been detected in streams (Clingenpeel, 1993).

Herbicide applications were monitored for effectiveness in protecting water quality over a five-year period on the Ouachita NF (Clingenpeel, 1993). The objective was to determine if herbicides are present in water in high enough quantities to pose a threat to human health or aquatic organisms. From 1989 through 1993, 168 sites and 348 water samples were analyzed for the presence of herbicides. The application of triclopyr for site preparation and release was included in the analysis. Of those samples, 69 had detectable levels of herbicide. No concentrations were detected that would pose a meaningful threat to beneficial uses. Based on this evaluation, the BMPs used in the transportation, mixing, application and disposal are effective at protecting beneficial uses. Based on the results of these research and monitoring efforts and the mandatory implementation of BMP's an adverse direct or indirect effect resulting from these proposed management actions is unlikely.

No Herbicide Use

Direct and Indirect Effects

The effects of management activities would be the same as those described above except the listed effects from herbicide would not occur.

Cumulative Effects All Alternatives

The Aquatic Cumulative Effects (ACE) model was used to identify the watershed condition of the primary 12-digit Hydrological Unit Code (HUC) sixth-level subwatershed, as well as assess proposed project impacts. Watershed Condition Ranking (WCR) is a risk ranking integrated in the model that returns a High, Moderate, or Low ranking based on predicted sediment delivery to streams, and effects on fish community diversity and abundance. The primary variables driving ACE, and subsequently the WCR, are road density, urban areas, pasture lands and project treatments.

Local research has shown that the effects of increased sediment as a result of timber harvests are identifiable for up to 3 years (Beasley, Miller, & Lawson, 1987). The timeframe of this model is bound by three years prior and one year following implementation. This captures the effects of other management activities that may still affect the project area. This is consistent with most project level environmental analyses that have an operability of five years. Proposed actions are constrained to a single year. This expresses the maximum possible effect that could occur. Past activities that have a lasting effect (such as roads and changes in land use) are captured by modeling the sediment increase from an undisturbed condition. The predicted sediment delivery and risk level for the subwatershed is displayed in the table below.

SEDIMENT DELIVERY BY ALTERNATIVE (TABLE 3.2)

Subwatershed <i>12-digit HUC ID</i>	Alternative	Sediment Delivery		Risk Level
		Additional Tons Per Year	% Increase*	
Lower South Fork Ouachita River – Lake Ouachita 80401010403	<i>Current Condition</i>		869	Low
	No Action	102	890	Low
	Proposed Action & No Herbicide	3,539	1,592	High

*Percent increase over sediment delivery from undisturbed watershed condition

The predicted sediment delivery from the Proposed Action and the No Herbicide Alternative would change the current risk level from low to high. Environmental effects would persist and could change the hydrologic system with observable changes for as long as the causing actions persist. Effects can threaten exceedance of environmental thresholds for periods of time (years). If causative actions persist over time, permanent adjustments can occur to the hydrologic system (USDA Forest Service, 2015).

To reduce predicted sediment, the Aquatic Cumulative Effects (ACE) Output Analysis Protocol offers dispersing project impacts by spreading implementation over multiple years, rather than model all treatments to occur in one year. Apportioning implementation over three years resulted in a moderate risk level to beneficial uses. Environmental effects are measurable and observable for short periods of time following storm events. These effects are short term (less than a few weeks) and do not affect large portions of the watershed. Recovery is complete and beneficial uses are disrupted only for short periods in localized areas. In addition to the application of forest standards and BMPs, monitoring may be necessary (USDA Forest Service, 2015).

Transportation & Infrastructure

Present Conditions

Roads within the Lower South Fork Project area are used for a variety of purposes, including access to Lake Ouachita, vehicle touring, and hunting access. US Hwy 270 bisects the project area, accommodating travel east and west; FS Road 177 parallels the southern border. State Hwy 27 clips the northwest corner of the project area.

There are approximately 49 miles of National Forest System roads (NFSR) in the project area; about 15 miles are closed (administrative use). There are also 24 miles of highway and county roads. The current Motor Vehicle Use Map (MVUM) designates NFSRs as follows: 6.4 miles open to highway legal vehicles only, yearlong; 15.9 miles open to all vehicles, yearlong; 8.9 miles open to highway legal vehicles yearlong/OHVs seasonally; and 3.5 miles open seasonally to all vehicles.

Motorized mixed use occurs when a NFSR is designated for use by both highway-legal and non-highway-legal motor vehicles (FSM 7705). Motorized mixed use is allowed on 28.3 miles of roads within the project area. There are no designated motorized (OHV) trails.

The open road density (ORD) of the project area is 1.45 miles/square mile. For wildlife purposes, the Revised Forest Plan provides ORD objectives by MA (OBJ05, p. 59). The following table displays calculated ORDs for the project and the objective for each MA.

OPEN ROAD DENSITY BY MA (TABLE 3.3)

Management Area	Open Road Density (mi/mi ²)	
	Objective	Project
7	1.0	0.31
14	1.0	1.62
16	0.75	1.84
17	0.75	2.10
21	0.75	0.96

Effects Analysis

No Action

Direct, Indirect and Cumulative Effects

No activities are proposed, therefore there would be no direct, indirect or cumulative effects to access or to ORD.

Proposed Action and No Herbicide

Direct and Indirect Effects

Roads would be constructed to accommodate access for management activities. Although newly constructed road (1 mile) would be added to the system as classified road, it would be closed to vehicular traffic after use with a gate or berm; there would be no change in ORD. It would be maintained as needed and retained for administrative use only.

Temporary roads would be obliterated after management activities are completed. System road reconstruction and pre-haul maintenance would improve conditions sufficient to support management activities and restore routes to their original design function.

There would be no changes to motor vehicle use route designations published on the MVUM.

Cumulative Effects

There are no other past, present or reasonably foreseeable changes to the transportation system that would result in additional effects.

Vegetation

Present Conditions

The project area contains approximately 15,670 acres, of which, 15,670 acres are federally owned; 12,714 acres are considered suitable (for timber production) lands; 8,639 acres are non-Forest Service ownership. It includes Compartments 38, 1626, 1628-1630, 1632-1635, and 1641-1642. Pine stands dominate the project area:

- Pine forest = **10,075** acres.
- Pine hardwood forest = **1,865** acres.
- Hardwood pine forest = **79** acres.
- Hardwood forest = **695** acres.

Age classes range from 11 years old to 120 years of age with the majority, 59%, falling into 81-90 years. 61% of the area is over 70 years of age, and there are currently no silviculturally-managed acres of 10 years or less. There are 6,852 acres of mature pine and pine/hardwood forest types (80+ years), while the mature hardwood and hardwood/pine types account for 151 acres (100+ years). The following table illustrates age class distributions on suitable lands only.

FOREST TYPE BY AGE CLASS SUITABLE LAND (TABLE 3.3)

Age Class			Forest Type											
			Pine			Pine-Hardwood			Hardwood-Pine			Hardwood		
Years (2015)	Acres	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total
0-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-20	326	3	303	3	2.4	23	1	0.2	0	0	0	0	0	0
21-30	1,058	8	776	8	6.1	282	15	2.2	0	0	0	0	0	0
31-40	2,375	19	2,345	23	18.4	0	0	0	30	38	0.2	0	0	0
41-50	1,121	9	1,121	11	8.8	0	0	0	0	0	0	0	0	0
51-60	98	0.7	98	1	0.8	0	0	0	0	0	0	0	0	0
61-70	19	0.3	0	0	0	0	0	0	0	0	0	19	3	0.1
71-80	140	1	17	0.5	0.1	123	7	1.0	0	0	0	0	0	0
81-90	2,313	18	1,961	19	15.4	131	7	1.0	49	62	0.4	172	25	1.4
91-100	3,873	30	2,647	26	20.8	873	47	6.9	0	0	0	353	51	2.8
101-110	1,204	9	797	8	6.3	322	17	2.5	0	0	0	85	12	0.7
111+	187	2	10	0.5	0.1	111	6	0.9	0	0	0	66	9	0.5
Total	12,714	100	10,075	100	79.2	1,865	100	14.7	79	100	0.6	695	100	5.5

1 – Pine: At least 70% of the dominant and co-dominant crowns are softwoods.
 Pine/Hardwood: 51-69% of the dominant and co-dominant crowns are softwoods.
 Hardwood/Pine: 51-69% of the dominant and co-dominant crowns are hardwoods.
 Hardwood: At least 70% of the dominant and co-dominant crowns are hardwoods.

Most stands have an average basal area of up to 190 square feet per acre, while trees per acre range from 2,000 to 3,000. The stand conditions are predominately immature pole timber, immature sawtimber, and mature sawtimber.

Non-Native Invasive Species (NNIS) - An invasive species is identified as “[a] species that can move into an area and become dominant either numerically or in terms of cover, resource use, or other ecological impacts. An invasive species may be native or non-native” (USDA-Forest Service 2005a p. 132; USDA-Forest Service 2005b p. 172). Several non-native invasive plant species have been identified throughout the Project Area. These species include, but are not limited to, Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), mimosa (*Albizia julibrissin*), autumn olive (*Elaeagnus umbellata*) and multiflora rose (*Rosa multiflora*).

No Action

Direct, Indirect and Cumulative Effects

There would be no direct effects on forest health and stand vigor. Proposed actions resulting in early seral habitat creation would not occur. In the absence of fire or other vegetation management activity, trees would grow in and grow up and shade out shrubs, forbs and grasses

and reduce their quantities. In the absence of management activities such as thinning and regeneration harvests, forest health would be at risk due to increased potential for pest infestations such as the southern pine beetle. Over time, with no implementation of vegetation management, the amount of trees would increase, and forest health and stand vigor would continue to decline.

In the absence of natural disturbance, through time the current age classes would retain the same distribution in relation to one another, but the distribution would be increasingly skewed to the older age classes. The forest would continue to age, moving more pine and hardwood acreage into mature growth.

The lack of active NNIS control would allow plants to continue to produce seed and opportunistically spread throughout the area.

Proposed Action

Direct and Indirect Effects

The amount of early seral habitat within suitable acres would increase from zero to approximately 1,160 acres (9%) through clearcut, seedtree, and woodland development harvests, and wildlife opening construction. Dormant season, low intensity prescribed burning top-kills woody stems of three inches and less. This would hinder the in-growth of trees and maintain existing early seral habitat.

Diseased, damaged and suppressed trees would be removed through intermediate harvest activities on approximately 4,375 acres of pine stands. By reducing stand densities through thinning, stand vigor would improve.

Existing mature growth pine habitat (80 years old or greater) would be reduced through even-aged regeneration harvests from 43% to 37% of the acreage in pine and pine-hardwood stands. The percentage of mature growth hardwood habitat (100 years old or greater) would not change.

During the regeneration of pine stands, the hardwood sprout/seedling component objective is 10 to 30 percent of stems in hardwoods, primarily oaks and hickories (Revised Forest Plan, FR003, p. 80). Hardwoods would be removed in pine regeneration harvest areas through subsequent seedling release treatments, however a minimum of 10 percent hardwood would be retained or maintained through the life of the stand where possible. Recruitment of hardwoods within these stands could also be impeded by these activities.

NNIS would be reduced by treating identified populations across the project area with a combination of herbicide application and prescribed burning. Conversely, ground-disturbing activities such as timber harvest, road construction, road maintenance, fireline construction, fireline maintenance, and wildlife opening construction could increase the population and spread of non-native invasive species by destroying individual stems which would result in prolific

sprouting. They would also provide seedbeds for NNIS germination. Mechanical equipment could also dislodge seeds and transport them to unaffected areas. Implementation of Best Management Practices would reduce the possibility of introducing or spreading non-native invasive plants during project implementation.

Cumulative Effects

There are no other effects on vegetation from other projects that would be additive to this proposal; there would be no cumulative effects.

No Herbicide Use

The effects of this alternative would be the same as those listed under the Proposed Action except only manual or mechanical methods would be used in vegetation management activities. NNIS control would be more difficult, increasing the likelihood of continued spread. Site preparation and release activities would be less successful, making stand establishment more difficult.

Management Indicator Species and Habitat (MIS)

As part of the overall effort to ensure that habitat requirements of all native vertebrates, invertebrates, and plants are considered in the planning, implementation, and monitoring of Forest management practices, the Revised Forest Plan lists 24 species that should adequately address the effects of Forest management practices on fish and wildlife populations and their habitat needs, as well as demand species and species of special interest. These 24 species, termed “Management Indicator Species” (MIS), represent a broad array of habitats covering diverse geographic areas within the ONF, as well as inhabiting areas with diverse management objectives.

Management Indicator Species (MIS) Selected for This Project: The entire list of 24 MIS was reviewed and a subset was selected as MIS for the actions proposed in this EA. The MIS selected include 6 terrestrial species and 8 fish species. Species not known to occur within the action area, lacking suitable habitat, or not tied to an appropriate evaluation objective were not selected, as indicated in the far right column of the following table.

POTENTIALLY AFFECTED MANAGEMENT INDICATOR SPECIES (TABLE 3.4)

Life Form	Common Name	Scientific Name	Selected?
Mammal	White-tailed deer	<i>Odocoileus virginianus</i>	Yes
Bird	Northern Bobwhite	<i>Colinus virginianus</i>	Yes
Bird	Eastern Wild Turkey	<i>Meleagris gallapavo</i>	Yes
Bird	Red-cockaded Woodpecker	<i>Picoides borealis</i>	No
Bird	Pileated woodpecker	<i>Dryocopus pileatus</i>	Yes
Bird	Scarlet Tanager	<i>Piranga olivacea</i>	Yes
Bird	Prairie Warbler	<i>Dendroica discolor</i>	Yes
Fish	Largemouth bass	<i>Micropterus salmoides</i>	No

Life Form	Common Name	Scientific Name	Selected?
Fish	Smallmouth bass	<i>Micropterus dolomieu</i>	Yes
Fish	Bluegill sunfish	<i>Lepomis macrochirus</i>	No
Fish	Redear sunfish	<i>Lepomis microlophus</i>	No
Fish	Yellow bullhead	<i>Ameiurus natalis</i>	No
Fish	Highland stoneroller	<i>Campostoma spadiceum</i>	Yes
Fish	Redfin darter	<i>Etheostoma whipplei</i>	No
Fish	Green sunfish	<i>Lepomis cyanellus</i>	Yes
Fish	Longear sunfish	<i>Lepomis megalotis</i>	Yes
Fish	Johnny darter	<i>Etheostoma nigrum</i>	No
Fish	Orangebelly darter	<i>Etheostoma radiosum</i>	Yes
Fish	Channel darter	<i>Percina copelandi</i>	No
Fish	Pirate perch	<i>Aphredoderus sayanus</i>	No
Fish	Creek chubsucker	<i>Erimyzon oblongus</i>	No
Fish	Northern Studfish	<i>Fundulus catenatus</i>	Yes
Fish	Northern hog sucker	<i>Hypentilium nigricans</i>	Yes
Fish	Striped shiner	<i>Luxilus chrysocephalus</i>	Yes

Terrestrial MIS

TERRESTRIAL MIS AND ASSOCIATED PURPOSES (TABLE 3.5)

Life Form	Scientific Name	Common Name	Primary Reason for Selection
Bird	<i>Colinus virginianus</i>	Northern Bobwhite	To help indicate effects of management on meeting public hunting demand, and to help indicate effects of management on the pine-oak woodland community
Bird	<i>Dendroica discolor</i>	Prairie Warbler	To help indicate effects of management on the early successional component of forest communities
Bird	<i>Meleagris gallopavo</i>	Eastern Wild Turkey	To help indicate effects of management on meeting public hunting demand
Mammal	<i>Odocoileus virginianus</i>	White-tailed deer	To help indicate effects of management on meeting public hunting demand
Bird	<i>Dryocopus pileatus</i>	Pileated Woodpecker	To help indicate effects of management on snags and snag-dependent species
Bird	<i>Piranga olivacea</i>	Scarlet Tanager	To help indicate effects of management on mature forest communities

Terrestrial MIS Forest-wide Trends

The 6 selected terrestrial MIS were modeled using the CompPATS wildlife model to compare predicted future habitat capabilities over the next decade (2016-2026) for each of the 3 alternatives evaluated in the project area. Projected numbers of terrestrial MIS per square mile were compared against the current “pre-existing habitat condition” which serves as the baseline for the proposed activities.

TERRESTRIAL MIS RESPONSE BY ALTERNATIVE (TABLE 3.6)

Alternative Year*	Management Indicator Species					
	White-tailed Deer	Pileated Woodpecker	Eastern Wild Turkey	Northern Bobwhite	Scarlet Tanager	Prairie Warbler
	Individuals Per Square Mile					
<i>Baseline</i>	12	28	5	12	28	3
No Action						
<i>Project 1st year</i>	12	28	5	12	28	3
<i>Project at 10 years</i>	13	30	5	12	29	0
<i>Forest-wide trend</i>	+	+	No Change	No Change	+	-
Proposed Action & Alternative C – No Herbicide						
<i>Project 1st year</i>	22	26	7	44	28	41
<i>Project at 10 years</i>	17	29	5	29	29	15
<i>Forest-wide trend</i>	+	-	+	+	No Change	+

Northern Bobwhite (*Colinus virginianus*)

Northern Bobwhites require a diverse, habitat that includes open areas of herbaceous vegetation for foraging, grassy areas for nesting, heavy brush or woody cover, and bare ground with little litter cover (Rosene, 1984) (Roseberry & Sudkamp, 1998) (Brennan, 1999). They also readily use early pine and pine-hardwood forest conditions for foraging, hiding, nesting, and rearing young (Brennan, 1999). Bobwhites are usually associated with early successional plant communities, and their abundant herbaceous plants, seed crops, fruits, and insect prey items are vital to their life history (Dimmick, Gudlin, McKenzie, & Wells, 2004).

This species has experienced population declines across Arkansas due to decreases in early seral stage habitat, loss of agricultural lands, and changes in agricultural practices. The 2005 Revised Forest Plan FEIS population objective for the Northern Bobwhite is an average of 36.6 birds per square mile. Bobwhite call counts, Breeding Bird Survey data indicate a slight increase for the Ouachita National Forest.

The Northern Bobwhite population viability on the Ouachita National Forest is not expected to be threatened and populations are expected to improve through Revised Forest Plan implementation. The Ouachita National Forest has pursued aggressive prescribed fire and thinning programs that are providing habitat improvements, especially associated with some 200,000 acres of shortleaf pine-bluestem grass ecosystem restoration. It is expected that these management actions will soon positively act to overcome the downward trends.

Direct and Indirect Effects

No Action

This alternative would have an overall negative effect on the forest-wide population trend for this species by lack of creation of foraging opportunities. No action would mean that no new open area would be created for these species resulting in no creation of early-seral habitats as

overstory vegetation becomes established and shades out sub-canopy competition. Natural recruitment of early seral communities would also be limited in that suppression of wildfires and timber insect infestation would still occur.

Proposed Action

This alternative would have an overall positive effect on the Forest-wide trend for this species due to the creation and maintenance of early successional habitat needed by quail. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinnings would all promote and help maintain a mosaic of open forest stands with patches of early successional habitat. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species. With sustained habitat improvements, the quail population may slow its current decreasing trend and possibly increase in this ecosystem.

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

All proposed timber management activities will create several areas of early seral stage habitat and would open up the canopy, allowing sunlight to penetrate the forest floor, thus increasing the early seral vegetation which is essential to bobwhites. Overall the proposed actions would create a variety of habitats (foraging, nesting, brooding, escape cover, etc.) within the ranges of this species. Habitat benefits derived from the various harvest treatments would depend directly on the size and type of harvest. Many treatments like seed tree and clearcut restoration would provide more long term habitat benefits due to their size and varying landscape attributes. No direct effects should occur to adults since they are highly mobile. However, existing nest with eggs could be damaged and/or destroyed if timber activities occur during the nesting season. Re-nesting would also likely occur in most situations of disturbance thus offsetting overall losses in brood production.

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could potentially harm quail, glyphosate, imazapic, imazapyr, picloram and triclopyr are considered relatively non-toxic to birds when applied according to registered label directions. Based on these toxicity ratings, these herbicides should not have any substantial direct effects on quail. Potential exposure to herbicides from proposed treatments would likely fall below risk factors (LD₅₀ and LC₅₀ values) established in the risk assessments for birds. Given that adults are highly mobile and application most likely would occur outside the nesting season, it is improbable that there would be any direct effects to quails. Herbicide applications could help create and maintain additional patches of early successional habitat. The following table lists the toxicity ratings to bird species for each herbicide proposed for use.

SUMMARY OF LD₅₀ VALUES FOR BIRD SPECIES (TABLE 3.7)

Active Ingredient	LD ₅₀ *	Toxicity Risk to Bobwhite and or Mallard	Risk Assessment
Glyphosate	>5000mg/kg bw	Relatively non toxic	Syracuse Environmental Research Associates, Inc. 2011a
Imazapic	>5000 mg/kg bw	Relatively non toxic	Syracuse Environmental Research Associates, Inc. 2004
Imazapyr	>5000 mg/kg bw	Relatively non toxic	Syracuse Environmental Research Associates, Inc. 2011b
Picloram	>4012 mg a.e./kg	Relatively non toxic	Syracuse Environmental Research Associates, Inc. 2011c
Triclopyr	>1000 mg/kg bw	Relatively non toxic	Syracuse Environmental Research Associates, Inc. 2011d

LD₅₀*: lethal dose for 50% of population tested

Prescribed Burning (fire restoration treatments and fuel reduction)

Prescribed burns would occur over the majority of the project area sometime during the 10 years following implementation of the proposed actions and would occur in both growing and dormant seasons. Direct effects to bobwhites are unlikely since these species are highly mobile and would be able to avoid burns. There is the potential for nest to be lost if burns occur during nesting season. Indirect effects of prescribed burning would be to consume woody debris which would encourage growth of shrubs and herbaceous plants essential for foraging and nesting.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Eggs and nest may be destroyed or abandon by adults when roads or firelines are constructed during nesting season. Bobwhites may be displaced during construction and periods of high activity, such as timber removal. After the use of roads and firelines, would provide additional early seral habitat, resulting in an increase in nesting and foraging habitat.

Pond Improvements

No direct effects are anticipated for pond improvements. Indirectly pond improvements would serve as important water sources and foraging area.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement would increase and enhance the amount of available early seral habitat for these species within the watershed and provide areas of high nutrient forage as well as nesting habitat.

Nest Boxes Installation/Gate Maintenance

Nest box installation and gate maintenance should have no direct or indirect effects on this ground-nesting terrestrial species.

No Herbicide Use

The No Herbicide Alternative would have an overall positive effect on the forest-wide population trend for this species. The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Prairie Warbler (*Dendroica discolor*)

As a Neotropical migrant, Prairie Warbler uses early successional habitats such as regeneration old fields, pastures, and young forest stands. The vegetation selected may be deciduous, conifer, or mixed types. Habitats with scattered saplings, scrubby thickets, cutover or burned over woods, woodland margins, open brushy lands, mixed pine and hardwood, and scrub oak woodlands are most often selected.

Breeding Bird Survey data indicates a 3.0% decline from 1966-2012 (Sauer, et al., 2014). Further, warbler populations have been declining on the Ouachita National Forest over the past ten years (USDA Forest Service, 2011). The 2011 Monitoring Report states, "Throughout the Prairie Warbler range, a downward trend is indicated." this decline is considered directly related to the reduction in acres of early forest stage cover habitat in pine forest types.

Direct and Indirect Effects

No Action

This alternative would perpetuate conditions that could keep prairie warbler populations on a downward trend, possibly even jeopardizing the viability of this species within this ecosystem. This loss in numbers of prairie warblers is being observed Forest-wide. This alternative would likely have a negative impact on the Forest population trend for this species.

Proposed Action

This alternative should have a positive effect on the Forest population trend for this species due to the creation and maintenance of early successional habitat needed by this warbler, which is presently very low in this ecosystem. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinnings would all promote and help maintain a mosaic of open forest stands with patches of early successional habitat. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species. With sustained habitat improvements, the prairie warbler population should increase.

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

All proposed timber management activities will create several areas of early seral stage habitat and would open up the canopy, allowing sunlight to penetrate the forest floor, thus increasing the early seral vegetation which is essential to warblers. Overall the proposed actions would create a variety of habitats (foraging, nesting, etc.) within the ranges of this species. Habitat benefits derived from the various harvest treatments would depend directly on the size and type of harvest. Many treatments like seed tree and clearcut restoration would provide more long term habitat benefits due to their size and varying landscape attributes.

No direct effects should occur to adults since they are highly mobile. However, existing nest with eggs could be damaged and/or destroyed if timber activities occur during the nesting season. Re-nesting would also likely occur in most situations of disturbance thus offsetting overall losses in brood production.

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could potentially harm warblers, glyphosate, imazapic, imazapyr, picloram and triclopyr are considered relatively non-toxic to birds when applied according to registered label directions. Based on these toxicity ratings, these herbicides should not have any substantial direct effects on warblers. Potential exposure to herbicides from proposed treatments would likely fall below risk factors (LD₅₀ and LC₅₀ values) established in the risk assessments for birds. Given that adults are highly mobile and application most likely would occur outside the nesting season, it is improbable that there would be any direct effects to warblers. Herbicide applications could help create and maintain additional patches of early successional habitat. See Table 3.7 (above) for a list of toxicity ratings to bird species for each herbicide proposed for use.

Prescribed Burning (fire restoration treatments and fuel reduction)

Prescribed burns would occur over the majority of the project area sometime during the 10 years following implementation of the proposed actions and would occur in both growing and dormant seasons. Direct effects to warblers are unlikely since these species are highly mobile and would be able to avoid burns. There is the potential for nest to be lost if burns occur during nesting season. Indirect effects of prescribed burning would be to consume woody debris which would encourage growth of shrubs and herbaceous plants essential for foraging and nesting.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Eggs and nest may be destroyed or abandon by adults when roads or firelines are constructed during nesting season. Warblers may be displaced during construction and periods of high activity, such as timber removal. After the use of roads and firelines, would provide additional early seral habitat, resulting in an increase in nesting and foraging habitat.

Pond Improvements

No direct effects are anticipated for pond improvements. Indirectly pond improvements would serve as important water sources and foraging area.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement would increase and enhance the amount of available early seral habitat for this species within the watershed and provide areas of high nutrient forage habitat.

Nest Boxes Installation/Gate Maintenance

No direct or indirect impacts are anticipated as a result of placing nest boxes and maintaining gates in project area. Placement would require minimal ground disturbance and would not result in a significant loss of habitat.

No Herbicide Use

This alternative would have an overall positive effect on the forest-wide population trend for this species. The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide applications would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Eastern Wild Turkey (*Meleagris gallapavo*)

This species is a highly prized game animal that uses a wide range of habitat types with habitat diversity needs that include grass and forb openings (seeds, fruits, berries and insects) interspersed with older timber stands capable of producing hard and soft mast.

Turkey harvest, poult production and Landbird point surveys data indicates a downward trend. These data would appear to indicate a reduction in the number of turkey while habitat capability modeling indicates a positive trend and remains above the level projected in the Revised Forest Plan. The sustained high levels for habitat capability would indicate that the drop in harvest levels, reductions in poult per hen, and birds detected on the Landbird points are due to factors other than habitat. Research across the South has shown that prescribed fire treatment including growing season burn, improve turkey habitat by opening up dense forest, reducing shrub and brush, and improving nesting and brood rearing habitat (Cox & Widener, 2008). In addition, areas that were not burned for more than two years were almost devoid of turkey hens.

Direct and Indirect Effects

No Action

Under this alternative, the current habitat capability for turkeys would remain at levels just above the minimum projected levels in the Revised Forest Plan. However, the turkey population is not currently facing any viability issues, and this alternative should have no effect on the Forest-wide population trend for this species.

Proposed Action

This alternative should have a positive effect on the Forest population trend for this species due to the creation and maintenance of early successional areas needed as a critical habitat component by turkeys. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinnings would all promote and help maintain a mosaic of open forest stands with blocks of early successional habitat. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species, specifically, a mixture of early successional habitat needed for nesting and poult rearing, as well as the mature forests needed for roosting and hard mast forage production. With sustained forest health and habitat diversity, the turkey population should remain stable or increase with this alternative.

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

All proposed timber management activities will create several areas of early seral stage habitat and would open up the canopy, allowing sunlight to penetrate the forest floor, thus increasing the early seral vegetation. Overall the proposed actions would create a variety of habitats (foraging, nesting, brooding, escape cover, etc.) within the ranges of this species. Habitat benefits derived from the various harvest treatments would depend directly on the size and type of harvest. Many treatments like seed tree and clearcut would provide more long term habitat benefits due to their size and varying landscape attributes.

No direct effects are anticipated since adult birds are highly mobile. However, existing nest, eggs and young poults could be damaged or destroyed. Turkeys may be temporarily displaced during timber management activities and nest may be abandon. Re-nesting would also likely occur in most situations of disturbance thus offsetting overall losses in brood production.

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could potentially harm turkeys, glyphosate, imazapic, imazapyr, picloram and triclopyr are considered relatively non-toxic to birds when applied according to registered label directions. Based on these toxicity ratings, these herbicides should not have any substantial direct

effects on turkey. Potential exposure to herbicides from proposed treatments would likely fall below risk factors (LD₅₀ and LC₅₀ values) established in the risk assessments for birds. Given that adults are highly mobile and application most likely would occur outside the nesting season, it is improbable that there would be any direct effects to quails. Herbicide applications could help create and maintain additional patches of early successional habitat. Overall, any negative direct effects would be far outweighed by the beneficial indirect effects of this alternative. Table 3.7 (above) lists the toxicity ratings to bird species for each herbicide proposed for use.

Prescribed Burning (fire restoration treatments and fuel reduction)

Direct effects of dormant and growing season burns on this bird are likely minimal because adults are highly mobile and poults are precocial and able to follow the hen within one to two days of hatching. Nesting, eggs, and non-mobile hatchlings may be destroyed by growing season burns, but the benefits of improved habitat outweigh the nests lost, and in many cases females would likely re-nest.

Indirect effect of prescribed burning would be to consume woody debris allowing early forest stage and demand species easier access to browse. Burning would also encourage growth of herbaceous browse which is essential for growth and development of this species.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Eggs and nest may be destroyed or abandon by adults when roads or firelines are constructed during nesting season. Turkeys may be displaced during construction and periods of high activity, such as timber removal. After the use of roads and firelines, would provide additional early seral habitat, resulting in an increase in nesting and foraging habitat.

Pond Improvements

No direct effects are anticipated for pond improvements. Indirectly pond improvements would serve as important water sources and foraging area.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement would increase and enhance the amount of available early seral habitat for these species within the watershed and provide areas of high nutrient forage habitat.

Nest Boxes Installation/Gate Maintenance

Nest box installation and maintenance of gates should have no direct or indirect effects on this ground-nesting terrestrial species.

No Herbicide Use

The No Herbicide Alternative would have an overall positive effect on the forest-wide population trend for this species. The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

White-tailed Deer (*Odocoileus virginianus*)

White-tailed deer has a diet that includes annual and perennial forbs, fruits, hard mast, grasses, flowers and fungi. Food utilization studies of deer in the southern U.S. show that use of woody twigs, even in winter, is insignificant (Miller, 2001). The quality and quantity of forage have the greatest impacts on deer populations.

The estimated habitat capability for deer for fiscal years 2006-2011 show a downward trend; yet it still exceeds the desired habitat capability of 48,250 acres for FY 2016. Habitat carrying capacity is calculated using acres within the Ouachita National Forest and is influenced by the amount of prescribed fire and early seral habitat created, including regeneration, thinning, timber stand improvement, mid-story removal, wildlife openings, and site preparation (USDA Forest Service, 2011).

For deer, the habitat capability model places a greater value on early seral stage habitat and gives lesser value to habitat created by thinning and prescribed fire. In contrast to the declines in even-age regeneration cutting, the acres of thinning and prescribed fire have increased.

Direct and Indirect Effects

No Action

The amount of early successional habitat needed by deer in this area would remain absent unless created through random natural disasters. However, the deer population is not currently facing any viability issues, and this alternative should have minimal impacts on the forest population trend for this species.

Proposed Action

This alternative would be beneficial due to the creation and maintenance of early successional areas needed as a critical habitat component by deer. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinning would all promote and help maintain a mosaic of open forest stands with patches of early successional habitat. Sedimentation and creation of wildlife nesting habitat would not have any substantial cumulative effects on deer. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species, specifically, a mixture of early successional habitat needed for cover and browsing, as well as the mature mast producing

hardwoods needed for fall and winter foraging. With sustained forest health and habitat diversity, the deer population should remain stable or increase with this alternative. This alternative should have a positive effect on the Forest population trend for this species.

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

After timber management activities are completed and it is followed up by fire and silvicultural treatments, the persistence of the early seral habitat conditions would be extended. The reduction in the density of trees and associated shade would result in improved habitat conditions for forest floor food and cover plants benefitting deer. The response of herbaceous forage species to harvest, in declining order by method, would be clearcut, permanent openings, seed tree and then thinnings. A good mix of these harvest methods would provide excellent deer habitat (Yarrow & Yarrow, 2005).

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Direct contact with herbicides (or feeding on vegetation that has been exposed to herbicides) could potentially harm deer. This species may be displaced during application of herbicide, but his will be for a relatively short period of time in any treatment area. The application of herbicides will lengthen the duration of early seral habitat where applied, thus maintaining appropriate habitat patches for deer.

Prescribed Burning (*fire restoration treatments and fuel reduction*)

Prescribed fire would increase browse, forbs, grass and legume production and overall nutrition. Fire also plays an important role in the development and maintenance of oak forests that provide important winter deer foods.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Closed roads and fireline corridors provide additional edge habitat, travel ways, escapes routes and potential foraging areas and bedding sites. Typical forest open roads have very low traffic levels except during deer season and generally would have little to no effect on deer activity.

Pond Improvements

No direct effects are anticipated for pond improvements. Indirectly pond improvements would serve as important water sources and foraging area.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement would increase and enhance the amount of available early seral habitat for these species within the watershed and provide areas of high nutrient forage habitat.

Nest Boxes Installation/Gate Maintenance

No direct or indirect impacts are anticipated as a result of placing nest boxes and maintaining gates in the project area. Placement would require minimal ground disturbance and would not result in a loss of habitat.

No Herbicide Use

This alternative should have a positive effect on the Forest population trend for this species. The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Pileated Woodpecker (*Dryocopus pileatus*)

Pileated Woodpecker is a member of the cavity nesting, tree trunk probing, insectivore guild, prefers dense, mature to over mature hardwood, hardwood-pine and mature pine forest types. The most important characteristics of forest used by pileated woodpeckers are forest contiguity, mature trees and snags, openness of forest floor, amount of decaying wood litter, and a relative humidity that promotes fungal decay and the ant, termite, and beetle populations upon which these birds feed (Bull & Jackson, 2011) Pileated woodpeckers are a primary excavator of cavities important to obligate secondary cavity nesters, and are a key indicator for the retention of a complete community of cavity nesting species. Nest cavities are constructed by both sexes usually in dead limbs and trunks in areas that are shaded most of the day.

Population trend and habitat capability data for this bird are mixed (USDA Forest Service, 2011). The Breeding surveys data indicates a downward trend of 1.18% for Arkansas from 1966-2012 with a less intense decrease of 0.99% in most recent years, from 2002-2012 (Sauer, et al., 2014). The CompPATS wildlife model takes into account the condition in all forest types, and it factors in management practices including prescribed fire and thinning. These data show a downward trend for the last 5 years, but a long-term upward trend. The overall situation should continue to improve as the unmanaged hardwood and hardwood-pine and the managed pine snag age. The current habitat capability that is estimated to support 11,580 birds exceeds the 2005 Revised Forest Plan FEIS bird population objectives of 11,265 for FY 2015 but is trending towards the FY 2016 desired capability.

Direct and Indirect Effects

No Action

This alternative would have a positive effect on the forest-wide trend for this species. Management activities would be deferred; preferred habitat, including a snag component, would continue to be available for this species.

Proposed Action

This alternative would have a negative effect on the forest-wide trend for this species. However, the current population density and habitat capability exceed the Revised Forest Plan population objectives, and its habitat appears to be secure within the Forest.

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

This species could lose active nests if harvest is conducted during the nesting season, but adults would be expected to move to undisturbed habitat and perhaps re-nest. These treatments would also have both negative and positive indirect effects on woodpeckers due to the removal of trees from the landscape reducing the upper tree canopy. Since this species prefer closed canopy forest they would be expected to abandon those portions of the harvest area with little or no closed tree canopy. However, standards established in the Revised Forest Plan for the retention of hardwoods and snags in harvest areas would mitigate impacts to woodpeckers' foraging and nesting habitats. Fallen trees and snags created as a result of timber management activities would also enhance foraging and nesting habitat opportunities for woodpeckers.

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Direct contact with herbicides (or feeding on insects that have been exposed to herbicides) could potentially harm woodpeckers. Vegetation impacted by herbicide treatment is not typically used as foraging substrate by woodpeckers because it decomposes rapidly and does not host preferred insect prey species. Overall, there should be no substantial direct effects on this woodpecker under this alternative.

Prescribed Burning (*fire restoration treatments and fuel reduction*)

Adult birds are highly mobile and would experience no direct effects. Growing season burns could directly affect nests with eggs and nestlings if the cavity tree in which they occur is damaged or felled due to burn-through, or perhaps abandoned if exposed to prolonged periods of smoke.

Indirect effect may include the loss of large snags (and potential nest sites) felled as a result of burning activities, but snags are rarely consumed and if felled by burn-through would contribute to foraging substrate as logs. Prescribed fire would also enhance and encourage growth of herbaceous and woody ground cover responsible for berry and seed production and resulting enhanced insect populations.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Nest with eggs may be destroyed or abandon if road or fireline construction results in the removal of snags containing nests. Mobile adults would not be impacted. Woodpeckers may be displaced from nest sites if road construction and prolonged use occur adjacent to occupied snags

Lower South Fork Project

during nesting season. Disturbance from fireline construction would be brief as equipment quickly passes through any particular area. Firelines receive minimal and infrequent use and have less disturbance impact than roads. Closed roads and fireline would provide flight corridors through dense timber.

Pond Improvements

Pond improvements do not provide suitable foraging or nesting habitat for woodpeckers thus no impacts to woodpeckers are anticipated.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement does not provide suitable foraging or nesting habitat for woodpecker and thus no impacts to woodpeckers are anticipated.

Nest Boxes Installation/Gate Maintenance

No direct or indirect impacts are anticipated as a result of placing nest boxes in project area. Placement would require minimal ground disturbance and would not result in a significant loss of habitat.

No Herbicide Use

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Scarlet Tanager (*Piranga olivacea*)

The preferred habitats for this Neotropical migrant are composed of various types of deciduous forest, pine-oak woodlands, parks, orchards, and large shade trees in suburban areas (Senesac, 1993) (Bushman & Therres, 1988) (Isler & Isler, 1987). Scarlet tanagers are most common in areas with closed canopy, a dense understory with high shrub diversity, and little ground cover (Bushman & Therres, 1988). Tanagers are insectivorous during the breeding season feeding on prey items such as aphids, weevils, woodborers, leaf beetles, cicadas, scale insects, dragonflies, ants, termites, caterpillars, moths, parasitic wasps, and bees. Foraging often occur mid-canopy with frequent sallies into the air to catch flying insects.

Forest Service trends are showing slight population increases overall (USDA Forest Service, 2011). Breeding Surveys results from 1966-2012 in Arkansas indicate a slightly declining population, with a 0.33% reduction in population levels (Sauer, et al., 2014). However, in the most recent time period, from 2002-2012, populations in Arkansas have seen a 0.10% increase (Sauer, et al., 2014).

Direct and Indirect Effects

No Action

This alternative would have a positive effect on the forest-wide trend for this species. Management activities would be deferred; mature forest habitat preferred by this species would remain unchanged.

Proposed Action

This alternative would have no effect on the forest-wide trend for this species, given the stability of the mature hardwood forests it inhabits and the stable population trend it holds across its overall range.

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

This species could lose active nests if harvest is conducted during the nesting season, but adults would be expected to move to undisturbed habitat and perhaps re-nest. These treatments would also have both negative and positive indirect effects on tanagers due to the removal of trees from the landscape reducing the upper tree canopy. Since this species prefer closed canopy forest they would be expected to abandon those portions of the harvest area with little or no closed tree canopy. The proposed timber activities would improve future nesting and foraging habitat for tanagers by helping to improve health and vigor of oak/hickory forest communities as a result of decreased competition.

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Direct contact with herbicides (or feeding on insects that have been exposed to herbicides) could potentially harm tanagers. Since tanagers are primarily mid-to-upper canopy foragers it is unlikely that effects of herbicide application would be encountered. However, tanagers feed on a wide variety of insect prey, many of which spend time in or traveling through understory vegetation where herbicide application would occur. Although tanagers may consume some insect prey that has been exposed to herbicide treatments the realistic dose estimates for such exposures would be insignificant.

Prescribed Burning (*fire restoration treatments and fuel reduction*)

Prescribed fire during the nesting season could temporarily displace adults or cause nest abandonment by adults. Beneficial impacts to fruit and seed production would result from prescribed fire, especially in pine forest types. Prescribed fire would have little effect on hardwood stands because of higher moisture levels in the soil, increased shading, reduced fire intensity, and reduced levels of fine fuels, other than leaves needed to carry fire.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

The felling and removal of timber during road building and fireline construction activities could result in loss of eggs or nestlings, if present, but would have no effect on mobile adult birds. Birds may be displaced from nest sites, especially if road construction and prolonged use occurs adjacent to occupied nest. Fireline construction would occur quickly, receive little use, and would have less impact than open roads. Closed roads and firelines would provide flight corridors through dense timber and possibly areas to forage for fruits and insects.

Pond Improvements

Pond improvements do not provide suitable foraging or nesting habitat for tanagers thus no impacts to tanagers are anticipated.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement does not provide suitable foraging or nesting habitat and thus no impacts are anticipated.

Nest Boxes Installation/Gate Maintenance

No direct or indirect impacts are anticipated as a result of placing nest boxes in project area. Placement would require minimal ground disturbance and would not result in a significant loss of habitat.

No Herbicide Use

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Aquatic MIS

This project is within the Ouachita Mountain Streams Ecoregion. Three of the MIS fish species of the Ouachita Mountain Ecoregion have no known occurrences in the drainages involved in the proposed analysis area, either at the project site, or downstream. As a result, Channel Darter (*Percina copelandi*), Redfin Darter (*Etheostoma whipplei*) and Johnny Darter (*Etheostoma nigum*) were not selected as MIS (Caddo-Womble stream survey records 1991-2013) (Robison & Buchanan, 1988).

AQUATIC MIS AND ASSOCIATED PURPOSES (TABLE 3.8)

Life Form	Scientific Name	Common Name	Primary Reason for Selection
Fish	<i>Campostoma spadiceum</i>	Highland Stoneroller	To help indicate effects of management activities on aquatic habitat and water quality in streams within the Ouachita Mountain Ecoregion.
Fish	<i>Etheostoma radiosum</i>	Orangebelly Darter	
Fish	<i>Fundulus catenatus</i>	Northern Studfish	
Fish	<i>Hypentilium nigricans</i>	Northern Hog Sucker	
Fish	<i>Lepomis cyanellus</i>	Green Sunfish	
Fish	<i>Lepomis megalotis</i>	Longear Sunfish	
Fish	<i>Luxilus chrysocephalus</i>	Striped Shiner	
Fish	<i>Micropterus dolomieu</i>	Smallmouth Bass	To help indicate effects of management activities on meeting public fishing demand in streams

Previous Forest-wide trends for the 8 aquatic MIS species selected will be discussed individually, based on the Revised Forest Plan FEIS, as well as the ONF Monitoring and Evaluation Report for the Revised Forest Plan (USDA Forest Service, 2011). These documents summarize monitoring information for MIS species over the past decade, while providing an assessment of each MIS species’ current status and conservation needs.

Highland Stoneroller

Highland Stonerollers generally inhabit small to medium streams with cool, clear water and gravel, cobble or exposed bedrock substrates. They are sometimes found in upland impoundments and slow-moving, turbid water (Robison & Buchanan, 1988). Highland Stonerollers are common across the Forest, with populations fluctuating from year to year. Many factors, biotic and abiotic and natural and man-caused contribute to these fluctuations. Over time, these populations appear to be stable. The conservation of this species across the forest is not in question. Based on Basin Area Stream Surveys (BASS) and other Forest stream surveys, there appear to be no adverse effect on highland stoneroller populations as a result of forest management activities.

Orangebelly Darter

Orangebelly Darters occur in a variety of habitats from small, gravelly, high-gradient streams, to larger, more sluggish lowland rivers. This darter is most common in clear, gravel cobble-bottomed streams with moderate to high gradient (Robison & Buchanan, 1988). Orangebelly Darters are relatively abundant in the ONF, particularly in the Lower Ouachita Mountain Ecoregion. Population densities appear to fluctuate but remain relatively stable over time. The conservation of this species across this ecoregion is not in question. Based on BASS and other Forest stream surveys, there appears to be no adverse effect on Orangebelly Darter populations from forest management activities.

Northern Studfish

Northern Studfish occur in the Ouachita Mountains in clear streams and rivers of moderate to high gradient and permanent flow. It is usually found in quiet, shallow waters along the margins of pools having rock and gravel substrate. The conservation of this species is not thought to be in question because of its common occurrence across a wide area (Robison & Buchanan, 1988). Based on BASS and other Forest stream surveys, there appears to be no adverse implications for Northern Studfish populations as a result of Forest management activities.

Northern Hog Sucker

The Northern Hog Sucker occurs in clear, permanent streams with gravel or rocky substrate and generally prefers deep riffles, runs, or pools having a current. It is intolerant of pollution, silt, and stream channel modification (Robison & Buchanan, 1988). Based on stream monitoring data, it appears that Northern Hog Sucker populations on the ONF remain stable. There is no information to suggest that the Northern Hog Sucker has conservation concerns on ONF. There are also no indications to suggest that management activities are having a direct or indirect effect on populations of the Northern hog sucker.

Green Sunfish

The Green Sunfish is an adaptable species that occurs in a variety of aquatic habitats, and is tolerant of a wide range of ecological conditions, particularly to extremes of turbidity, dissolved oxygen, temperature, and flow (Robison & Buchanan, 1988). Based on BASS inventory data, it appears that populations of Green Sunfish fluctuate from year to year. Many factors, biotic and abiotic, natural and man-caused, contribute to these fluctuations. Percent site occurrence and population densities indicate that managed streams and reference streams are similar for Green Sunfish. There are no indications that Green Sunfish are increasing as a result of management activities. The conservation of this species is not in question.

Longear Sunfish

Longear Sunfish occur in a variety of habitats but is most abundant in small, clear, upland streams with rocky bottoms and permanent or semi-permanent flow. It avoids strong current, turbid water, and silt substrate (Robison & Buchanan, 1988). Based on BASS inventory data, populations of Longear Sunfish fluctuate from year to year, but appear to be stable over time. Percent site occurrence and population densities indicate that managed streams and reference streams are similar for this species. Longear Sunfish are commonly distributed throughout much of the Upper and Lower Ouachita Mountain Ecoregions. There appears to be no adverse effect on Longear Sunfish from Forest management activities. The conservation of this species across these ecoregions is stable and is not in question.

Striped Shiner

The Striped Shiner is abundant in the Ouachita mountains and seems to prefer small to moderate-sized perennial streams with permanent flow, clear water, and rocky or gravel substrate. It occurs in some current, but avoids strong current preferring the pool habitats within the streams (Robison & Buchanan, 1988). Based on stream surveys and BASS inventory data, there appears

to be wide fluctuations in populations of Striped Shiners on the Forest, with no apparent upward or downward trends. Striped Shiners are common throughout the Lower Ouachita Mountain Ecoregion. The conservation of this species in the ONF is not in question. Based on BASS inventory data and other Forest stream surveys, Forest management activities appear to have no adverse effect on Striped Shiner populations.

Smallmouth Bass

The Smallmouth Bass is mainly found in cool, clear mountain streams with permanent flow and rocky bottoms. This species is common only on the southern part of the ONF. The Smallmouth Bass does not tolerate habitat alteration in comparison to the other two black basses (Spotted and Largemouth Basses), and it is especially intolerant of high turbidity and siltation (Robison & Buchanan, 1988). The BASS data on the ONF indicate that both site occurrence percentages and population densities of Smallmouth Bass are similar between reference and managed watersheds. This implies that Forest Service management activities are having no adverse effects on Smallmouth Bass populations.

Direct and Indirect Effects

No Action

This alternative would have no effect on the forest-wide trends for MIS fish species. Stream sedimentation from proposed management actions would not occur; however, some existing sediment sources would not be remedied (areas of eroded soils, road repairs).

Proposed Action

The Proposed Action would have no effect on the forest-wide trends for MIS fish species.

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

None of the proposed timber management activities are expected to have any effects on MIS fish species. These species and its habitats are currently protected by streamside management areas, as defined in the Revised Forest Plan.

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Glyphosate, imazapic, imazapyr, picloram, and triclopyr for site preparation, seedling release, and control of non-native invasive species (NNIS). Neither the published literature nor the U.S. EPA files (US Environmental Protection Agency, 1993) (US Environmental Protection Agency, 1998) include data regarding the toxicity of these chemicals or their formulations on these MIS fish species. Most all bioassay studies use various fish species, mainly bluegill, which has been used as the closest representative in the table below.

SUMMARY OF LD₅₀ VALUES FOR BLUEGILL (TABLE 3.9)

Active Ingredient	LD50*	Toxicity Risk to Bluegill	Risk Assessment
Glyphosate	70-170mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2011a
Imazapic	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004
Imazapyr	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2011b
Picloram	Varies greatly with formulation	Appears to be somewhat toxic with great variation	Syracuse Environmental Research Associates, Inc. 2011c
Triclopyr	Varies greatly with formulation	Appears to be somewhat toxic with great variation	Syracuse Environmental Research Associates, Inc. 2011d

LD50* - lethal concentration for 50% of population tested

Herbicide application in site preparation and timber stand improvement areas is not likely to have any impacts on MIS fish. All streams would be protected by 30 and 100-foot herbicide application buffers; all source waters would be protected by 300-foot buffers. Buffers are to be clearly marked (design criteria HU006) before treatment so applicators can easily see and avoid them (USDA Forest Service, 2005a).

Effects to these MIS fish could occur as a result of contact with herbicide, with personnel applying herbicide, or an accidental chemical spill, but are not likely due to approximately 99% of NNIS treatments would occur outside streamside management areas (aquatic habitats).

Prescribed Burning (fire restoration treatments and fuel reduction)

Effects from prescribed fire would vary due to fire intensity, aspect, and slope; it would be expected that some degree of forest floor cover would be removed. Prescribed burns would occur over the majority of the analysis area sometime during the 10 years following project implementation. Revised Forest Plan design criteria for streamside management areas would limit the potential for impacts from prescribed burning.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

As drainage structures are installed, and road/firelines are reconstructed/constructed and shaped, removal of vegetative cover and soil disturbance would temporarily increase sedimentation, concentrate runoff, and potentially impact water quality for these MIS fish. Conversely, existing sedimentation would be reduced by proposed reconstruction and road maintenance treatments. The potential for sedimentation would be reduced by implementing Revised Forest Plan design criteria: firelines crossing streamside management areas would be constructed using hand tools; firelines would be water barred and seeded after construction.

Pond Improvements

Wildlife ponds within the project area are meant to provide a source of water and habitat for non-fish species such as amphibians, reptiles, insects and other non-fish species. No direct or indirect impacts to these MIS fish are anticipated.

Wildlife Opening Construction/Improvement

Sites do not contain suitable habitat capable of supporting these MIS fish species. No direct or indirect impacts to these MIS fish species are anticipated.

Nest Boxes Installation/Gate Maintenance

Proposed treatments would have no direct or indirect impacts on MIS fish species because all proposed treatment sites are located outside of suitable habitats.

No Herbicide Use

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Proposed, Threatened, Endangered and Sensitive Species (PETS) & Habitat

Eighty PETS species were reviewed for occurring or potentially occurring in the analysis area (Regional Forester's Sensitive Species list, Forest Service's Sensitive Species List, Arkansas natural Heritage Commission inventories of PETS species locations). The table below lists PETS species that occur or potentially occur in the analysis area, and would be affected by proposed project activities.

PETS SPECIES EVALUATED (TABLE 3.10)

Group	Scientific Name	Common Name	Status
Mammal	<i>Myotis septentrionalis</i>	Northern Long-eared bat	Threatened
Mollusks	<i>Lampsilis powellii</i>	Arkansas fatmucket	Threatened
Mollusks	<i>Lampsilis hydiana</i>	Louisiana fatmucket	Sensitive
Mollusks	<i>Obovaria jacksoniana/ Villosa arkansasensis</i>	Southern Hickory Nut	Sensitive
Mollusks	<i>Lampsilis satura</i>	Sandbank pocketbook	Sensitive
Mollusks	<i>Toxolasma lividus</i>	Purple Lilliput	Sensitive
Fish	<i>Noturus lachneri</i>	Caddo madtom	Sensitive
Mammal	<i>Myotis leibii</i>	Eastern small-footed bat	Sensitive
Bird	<i>Aimophila aestivalis</i>	Bachman's sparrow	Sensitive
Bird	<i>Haliaeetus leucocephalus</i>	Bald eagle	Sensitive
Insect	<i>Speyeria diana</i>	Diana fritillary	Sensitive
Vascular Plant	<i>Carex latebracteata</i>	Waterfall's sedge	Sensitive
Vascular Plant	<i>Castanea pumila var. ozarkensis</i>	Ozark chinquapin	Sensitive
Vascular Plant	<i>Helianthus occidentalis</i>	Shinner's fewleaf sunflower	Sensitive
Vascular Plant	<i>Cypripedium kentuckiense</i>	Southern lady's-slipper	Sensitive
Vascular Plant	<i>Calamovilfa arcuata</i>	Cumberland sandreed	Sensitive
Vascular Plant	<i>Amorpha ouachitensis</i>	Ouachita false indigo	Sensitive
Vascular Plant	<i>Draba aprica</i>	Open-ground draba	Sensitive
Vascular Plant	<i>Valerianella nuttallii</i>	Nuttall's cornsalad	Sensitive

Bats: Northern long-eared (*Myotis septentrionalis*); Eastern small-footed (*Myotis leibii*)

Direct and Indirect Effects

No Action

This alternative would have no direct effects on the Northern long-eared and Eastern small-footed bats. Indirect effects would include the natural succession of early seral habitats into mature forest. This process could result in an overall decline of foraging habitat and open mid-story for ease of movement.

Proposed Action

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

Timber management treatments all have the potential to both positively and negatively affect both bat species within the project area. For instance, falling trees could directly affect roosting bats and/or maternity sites. Roosting and/or maternity sites could potentially be felled or damaged by cutting that would occur in a densely stocked offsite loblolly pine stands. These loblolly stands would be restored to shortleaf pine. However, direct effects are expected to be minimal because there are no known roost trees or maternity trees in the project area.

Lower South Fork Project

Direct impacts to small-footed bats would be highly unlikely since these bat species tends to prefer mesic old growth hardwood forest and rocky ridges and rock outcrops for roosting and maternity sites. Although the mentioned habitats are present within the proposed project area these habitats do not fall within areas suitable for timber production and thus would be protected from any potential direct effect/impact related to timber management.

Disturbance within treatment areas may also cause bat species to temporarily abandon sites but actions would not likely exclude bats from foraging in areas. Thinning of forest stands could indirectly alter foraging areas and temporarily change insect populations and densities within treatment areas. Insect populations would likely increase with increased plant diversity due to more open conditions. No direct or indirect effects would occur to wintering bats because there are no known hibernacula in the project area. The closest known northern long-eared bat hibernaculum is 4.9 miles from the projects area and no suitable mine habitat is within the project area.

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Direct effects to Northern long-eared and Eastern small-footed bats are unlikely due to herbicide applications for chemical site preparation, timber stand improvement and non-native invasive control treatments occurring during the day when bats are not active. Positive indirect effects could occur from potentially reducing hardwood vegetation during chemical site prep and increasing early seral vegetation and consequently the insect population numbers and/or diversity in treatment areas. Reduction of non-native invasive species would also improve the native plant populations and which could increase insect populations in the area.

Prescribed Burning (fire restoration treatments and fuel reduction)

Prescribed burning would not directly affect northern long-eared and Eastern small-footed bats in the winter because there are no hibernacula's in the project area. Fire from prescribed burning could directly affect this bat species by burning up roost or maternity trees if occurring during the active bat seasons, but would be unlikely because the majority of burns occur in the dormant growing season and there are no known roost trees or maternity trees in the project area. Indirect effects of prescribed burns would be to possibly reduce the amount of understory vegetation that inhibits free bat movement and foraging activity by maintaining uncluttered foraging pathways and easier access to roost trees and disturbance from smoke may also cause bats to temporarily abandon treatment sites but actions would not likely exclude bats from foraging. Proposed burns would occur over the majority of the project area and would be burned in sections during the next 10-year period and beyond. The variety of fire intensities that would occur due to environmental conditions would provide a habitat mosaic with varying degrees of mid-story vegetation removal and occasional over-story tree mortality. Prescribed fire would help maintain and create habitat for this bat species.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Road/Fireline construction, reconstruction and maintenance treatments can have the potential to both positively and negatively affect these bat species within the project area. Road and fireline clearing, could directly affect roosting bat and /or maternity sites, resulting in damaged or

removal of trees. If a maternity tree is felled, young non-volant pups could be killed. Disturbance within road/fireline construction, reconstruction and maintenance areas may also cause bats to temporarily abandon sites but, actions would not likely exclude bats from foraging in road corridor areas. No direct or indirect effects would occur to wintering northern long-eared bats because there are no known hibernacula in the road corridor. The closest hibernaculum is 4.9 miles from the project area and no suitable mine habitat is within the project area. However, direct effects are expected to be minimal because there are no known roost trees or maternity trees in the project area. Indirect benefits would be likely since proposed actions would provide linear flight corridors and linear foraging habitats for bats.

Pond Improvements

Wildlife ponds often support hydrophytic (water dependent plant species) vegetation not found in riparian systems which in turns supports a whole host of aquatic insect species also not found in streams and river systems. This diversity of vegetation and associated insect populations would provide foraging habitats for bats.

The direct and indirect effects of pond improvements the existing ponds would be similar to those for timber management and chemical treatments and to provide reliable water sources for the bats throughout the watershed.

Wildlife Opening Construction/Improvement

Wildlife openings play an important role in the foraging ecology of woodland bat species. Many bat species take advantage of wildlife openings since they support a high concentration of insects and a rich diversity of insect populations. The uncluttered flying space provided by openings allows bats to freely maneuver, find and catch insect prey and expend less energy than they normally would in a more heavily forested habitat dodging trees.

The direct and indirect effects of wildlife opening construction/improvement to the existing openings and new openings would be similar to those for timber harvest and non-native invasive treatments and to provide open foraging areas throughout the watershed.

Nest Boxes Installation/Gate Maintenance

Boxes would be placed along ridges, flood plains and mid-slopes to provide summer roosting habitat and possible maternity roosting sites for tree roosting bat species. No direct impacts are anticipated for northern long-eared and Eastern small-footed bats from the placement of bat boxes. Currently there are nine North American bat species known to use bat houses seven of which occur in Arkansas. Northern long-eared bats along with other bat species (little brown bat, free-tailed bat, big brown bat, evening bat) that occur in the area would likely benefit from their placement.

Gate are placed at various road accesses to wildlife habitat areas and roads in order to protect potential sensitive species habitats, for public safety concerns and to decrease open road density in the project area. No direct or indirect impact to these bat species is anticipated.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

Effects from the proposed activities in the Lower South Fork project area, along with continuing effects from past and planned future activities (prescribed burning, native grass management and harvest treatments) in an adjacent project area within the range of these species are expected to increase the amount of suitable foraging and roosting areas and provide reliable water sources throughout the project area.

Mussels and Fish: Arkansas Fatmucket (*Lampsilis powellii*); Louisiana Fatmucket (*Lampsilis hydiana*); Southern Hickorynut (*Obovaria jacksoniana*); Sandbank pocketbook (*Lampsilis satura*); Purple Lilliput (*Toxolasma lividus*); Caddo Madtom (*Moturus taylori*)

Direct and Indirect Effects

No Action

The No Action alternative would have no direct effects on PETS fish and mussels species. Stream sedimentation from proposed management actions would not occur; however, some existing sediment sources would not be remedied (areas of eroded soils, road repairs).

Proposed Action

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

None of the proposed timber management activities are expected to have any direct or indirect effects on these mussel and fish species. These species and its habitats are currently protected by streamside management areas, as defined in the Revised Forest Plan (USDA Forest Service, 2005a).

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Herbicide application and manual control methods for NNIS species would be allowed throughout the proposed activity area as needed for elimination/control of non-native invasive weeds. The Womble district is proposing the use of the following herbicide active ingredients for site preparation, seedling release and control of non-native invasive species: glyphosate, imazapic, imazapyr, picloram and triclopyr.

Direct and indirect effects to these mussels and fish species could occur as a result of contact with herbicide or with personnel conducting mechanical and chemical control activities but are not likely due to approximately 99% of NNIS treatments occurring outside streamside management area protection buffers (aquatic habitats) and following Revised Forest Plan design criteria.

Prescribed Burning (fire restoration treatments and fuel reduction)

Effects from prescribed fire would vary due to fire intensity, aspect, and slope and it would be expected that some degree of forest floor cover would be removed. Prescribed burns would occur over the majority of the analysis area sometime during the 10 years following implementation of the proposed project. Strict guidelines outlined in the Revised Forest Plan for protection of perennial streams would limit the potential for any direct or indirect impacts to these PETS species or their aquatic habitats.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Direct and indirect effects from proposed treatments would occur only at and adjacent to stream crossing and would be the same as those for fish passage restoration. Removal of vegetative cover and soil disturbance as roads/firelines are established shaped and drainage structures installed would temporarily increase sedimentation, concentrate runoff, and potentially impact water quality, but failure to reconstruct some of these roads and to maintain other roads would have detrimental impacts. Also fireline construction and layout would take advantage of natural and manmade barriers (stream and roads) thus limiting the need to manually construct new lines. Fireline crossing intermittent and perennial stream corridors would be constructed using hand tools. Firelines would be water barred and seeded after construction to limit the potential for sediment runoff. The potential for sedimentation would be reduced by implementing Revised Forest Plan standards and guideline.

Pond Improvements

Wildlife ponds within the project area are meant to provide a source of water and habitat for non-fish species such as amphibians, reptiles, insects and other non-fish species. No direct or indirect impacts to these PETS mussels and fish are anticipated.

Wildlife Opening Construction/Improvement

Sites do not contain suitable habitat capable of supporting these PETS mussel and fish species. No direct or indirect impacts to these PETS mussels and fish species are anticipated.

Nest Boxes Installation/Gate Maintenance

Proposed treatments would have no direct or indirect impacts on mussels and fish species because all proposed treatment sites are located outside of suitable habitats.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Bachman's sparrow (*Aimophila aestivalis*)

Direct and Indirect Effects

No Action

With this alternative there would be no direct effects. Indirect effects would include the natural succession of early seral habitats into mature forest. This process could result in an overall decline of open areas containing grasses and herbaceous plants in which this species forages and nests. Without the continued presence of early seral stage habitats this species population would be expected to decline.

Alternative B: Proposed Action

The proposed management activities under this alternative would ensure more quality long-term habitat for this species, specifically, a mixture of early successional habitat needed for nesting, as well as the mature forests needed for roosting and hard mast forage production.

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

Currently there is no suitable habitat for this species. All proposed timber management activities would create several areas of early seral stage habitat and would open up the canopy, allowing sunlight to penetrate the forest floor, thus increasing the early seral vegetation. Overall the proposed actions would create a variety of habitats within the range of this species. Habitat benefits derived from the various harvest treatments would depend directly on the size and type of harvest.

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Direct contact with herbicides (or feeding on vegetation that have been exposed to herbicides) could potentially harm this species, glyphosate, imazapic, imazapyr, picloram and triclopyr are considered relatively non-toxic to birds when applied according to registered label directions. Based on these toxicity ratings, these herbicides should not have any substantial direct effects on Bachman's sparrows. Potential exposure to herbicides from proposed treatments would likely fall below risk factors (LD₅₀ and LC₅₀ values) established in the risk assessments for birds. Given that adults are highly mobile and application most likely would occur outside the nesting season, it is improbable that there would be any direct effects to sparrows. Herbicide applications could help create and maintain additional patches of early successional habitat.

Prescribed Burning (fire restoration treatments and fuel reduction)

Direct effects of dormant and growing season burns on this bird are likely minimal because adults are highly mobile. Nesting, eggs, and non-mobile hatchlings may be destroyed by growing season burns, but the benefits of improved habitat outweigh the nests lost, and in many cases females would likely re-nest.

Lower South Fork Project

Indirect effect of prescribed burning would be to consume woody debris allowing early forest stage and demand species easier access to browse. Burning would also encourage growth of herbaceous browse which is essential for growth and development of this species. The application of prescribed fire will create and maintain the early successional habitat required by Bachman's Sparrows (Cox & Jones, 2007) (Jones, Cox, Toriani-Moura, & Cooper, 2013). In fact, it has been found that Bachman's Sparrows are dependent on frequent fire regimes and prefer to nest in areas that have burned within the past year (Jones, Cox, Toriani-Moura, & Cooper, 2013).

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Eggs and nest may be destroyed or abandon by adults when roads or firelines are constructed during nesting season. Bachman's sparrow may be displaced during construction and periods of high activity, such as timber removal. After the use of roads and firelines, would provide additional early seral habitat, resulting in an increase in nesting and foraging habitat.

Pond Improvements

No direct effects are anticipated for pond improvements. Indirectly pond improvements would serve as important water sources and foraging area.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvement would increase and enhance the amount of available early seral habitat for these species within the watershed and provide areas of high nutrient forage habitat.

Nest Boxes Installation/Gate Maintenance

Nest box installation and maintenance of gates should have no direct or indirect effects on this species.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Bald Eagle (*Haliaeetus leucocephalus*)

Direct and Indirect Effects

No Action

Under this alternative there would be no effects on this species or its habitat.

Proposed Action

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

There would be no direct and indirect effects from any timber activities, due to this species being highly mobile and their nesting sites are within the riparian community, which is protected by MA9 as defined in the Revised Forest Plan (USDA Forest Service, 2005a).

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Direct contact with herbicides (or feeding on animals that have been exposed to herbicides) could potentially harm this species, glyphosate, imazapic, imazapyr, picloram and triclopyr are considered relatively non-toxic to birds when applied according to registered label directions. Given that adults are highly mobile and application most likely would occur outside the nesting season, it is improbable that there would be any direct effects to eagles. Herbicide applications could help create and maintain additional patches of early successional habitat.

Prescribed Burning (*fire restoration treatments and fuel reduction*)

Adult birds are highly mobile and would experience no direct effects. Prescribed burns could directly affect nests with eggs and nestlings if the nesting tree in which they occur is damaged or felled due to burn-through, or perhaps abandoned if exposed to prolonged periods of smoke. Indirect effects may include growth enhancement of herbaceous and woody ground cover responsible for berry and seed production and resulting enhanced animal populations.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

No effects are anticipated from road/fireline construction, reconstruction and maintenance.

Pond Improvements

No direct effects are anticipated from pond improvements. Indirectly pond improvements would serve as important water sources and foraging area.

Wildlife Opening Construction/Improvement

No effects are anticipated for wildlife opening construction/improvement.

Nest Boxes Installation/Gate Maintenance

Nest box installation and maintenance of gates should have no direct or indirect effects on this species.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Diana fritillary (*Speyeria diana*)

Direct and Indirect Effects

No Action

This alternative would have no direct effect on Diana fritillary. Indirect effects would include the natural succession of early seral habitats into mature forest. This process could result in an overall decline of some woody shrubs, and annual and perennial broadleaf herbaceous plant species, that provide shelter and food sources for this species. Without the continued presence of early seral stage habitats this species population would be expected to decline.

Proposed Action

All proposed activities would create some disturbance to the understory vegetation and could result in temporary loss of some woody shrubs, annual and perennial broadleaf herbaceous plant species that provide shelter and food sources for this butterfly species. While some butterfly habitats may be impacted by the treatment activities, maintaining or expanding suitable habitat would be beneficial for the species in the long-term.

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

Adult butterflies are highly mobile and it is unlikely that they would be directly affected by timber management actions. However, there is the possibility of harm to eggs and larvae if trees are felled or equipment impacts eggs and larva in the leaf litter. Although timber management activities may directly affect eggs and larvae of butterflies these same actions would also allow for increases in new herbaceous plant growth which may contain high quality nectar producers and violets for egg deposition beneficial for this butterfly species.

All actions would create some disturbance to the understory vegetation and could result in the temporary loss of some woody shrubs, and annual, and perennial broadleaf herbaceous plant species that provide shelter and food sources for this butterfly species. While some butterfly habitats may be impacted by the treatment activities, maintaining or expanding suitable habitat would be beneficial for this species in the long-term.

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Given the great diversity of species of terrestrial invertebrates, the use of data from a single species (*Bee-Apis mellifera*) for the risk characterization leads to uncertainty in the risk assessment. However, given the preponderance of scientific studies available this information is applicable and represents the best science resource to date.

Bioassay studies of the listed chemicals proposed for use in the project area all exhibit very low toxicity to invertebrate species (bees). These determinations were based on concentrations of herbicides applied to bees that would far exceed concentrations applied in field treatment applications. Given the low risk of toxicity exhibited in invertebrate testing, no direct impact to Diana fritillary is anticipated. Indirect effects of herbicide application would most likely come in the temporary loss of some woody shrubs, annual and perennial broadleaf herbaceous plant species that provide shelter and food sources for this butterfly species. While some butterfly habitats may be impacted by the treatment activities, maintaining or expanding suitable habitat would be beneficial for the species in the long-term. The table below lists the toxicity ratings of proposed herbicide active ingredients on terrestrial invertebrate species (bee).

SUMMARY OF LD₅₀ VALUES FOR BEE (TABLE 3.11)

Active Ingredient	LD ₅₀ *	Toxicity Risk to Bee	Risk Assessment
Glyphosate	>100 µg/bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2011a
Imazapic	No LD50 stated		Syracuse Environmental Research Associates, Inc. 2004
Imazapyr	>100 µg/bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2011b
Picloram	>100 µg a.i./bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2011c
Triclopyr	>72 µg/bee	Nontoxic	Syracuse Environmental Research Associates, Inc. 2011d

LD₅₀*- lethal dose for 50% of population tested

Prescribed Burning (fire restoration treatments and fuel reduction)

Adult Diana fritillary butterflies are naturally adept at avoiding natural and prescribed fires, therefore no direct impacts are anticipated. There is the possibility that prescribed burning may directly kill eggs and larvae over-wintering in the leaf litter. However, prescribed burning benefits should far outweigh the onetime loss of eggs and larvae by enhancing and expanding the acres of suitable foraging and egg laying habitat throughout the watershed. Indirect effects of proposed burning would enhance and increase in acres of suitable foraging and egg laying habitat.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Since adult butterflies are highly mobile it is extremely unlikely that they would be directly affected by road/fireline construction, reconstruction and maintenance treatments. However, there is the possibility of crushing eggs and larvae with heavy equipment. Although proposed activities may have direct negative effects on eggs and larvae of butterflies, these same actions would also allow for increases in new herbaceous plant growth which may contain high quality nectar producers and violets for egg deposition beneficial for this butterfly species.

All proposed actions would create some disturbance to the understory vegetation and could result in the temporary loss of some woody shrubs, annual and perennial broadleaf herbaceous plants species that provide shelter and food sources for this butterfly species. While some butterfly habitats may be negatively impacted by the treatment activities, maintaining or expanding suitable habitat would be “beneficial” for the species in the long-term.

Pond Improvements

No direct are anticipated as a result of improving ponds in the project area. Indirect effects may include herbaceous vegetation around the pond being disturbed during restoration which could cause a small temporary interruption in the butterflies' habitat.

Wildlife Opening Construction/Improvement

Wildlife opening construction/improvements would not impact the Diana fritillary directly, since they are highly mobile. However, the possibility of construction/improvements may directly impact eggs and larvae if in leaf litter. Indirect effects would provide habitat for plant species that is used by this butterfly and should outweigh the loss of eggs and larvae by enhancing suitable foraging and egg laying habitat.

Nest Boxes Installation/Gate Maintenance

No direct or indirect impacts are anticipated as a result of placing roosting or nest boxes or maintaining gates within that project area. Placement would require minimal ground disturbance if any and would not result in the loss of vegetation upon which Diana fritillary is dependent.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Plants Preferring Moderate Disturbance: Waterfall's sedge (*Carex latebracteata*); Ozark chinquapin (*Castanea pumila var. ozarkensis*); Shinner's fewleaf sunflower (*Helianthus occidentalis plantagineus*)

No Action

Waterfall's sedge grows in a wide variety of habitats and Shinner's fewleaf sunflower forms dense colonies, preferring full sunlight with some areas of disturbance and low competition; populations would be expected to remain viable and stable under this alternative. Ozark chinquapin occur entirely as stump sprouts due to chestnut blight a condition in which it has persisted for decades. Individual plants within the project area would be expected to remain stable as long as stumps continue to persist. No direct or indirect effects are anticipated from this alternative.

Proposed Action

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

Waterfall's sedge and Shinner's fewleaf sunflower have responded well to moderate levels of disturbance. Although it is likely that vegetative portions of individual plants might be directly impacted by felling timber and timber removal, this disturbance should not pose a risk to local populations. Regeneration cuts would directly impact these species by being out-competed in an open canopy. Thinning of timber stands often indirectly improves habitat conditions by allowing more sunlight to reach the forest floor (increasing growth potential and seed production) and by providing areas of disturbed soil for dispersal of seeds and development of new growth. Individual plants may be damaged or even uprooted during timber harvest and planting but overall habitat conditions should improve as a result of the proposed actions.

Timber management actions are proposed for upland shortleaf pine, pine/hardwood and hardwood stands that may support habitat conditions conducive to Ozark chinquapin. These activities may damage or uproot trees. Field surveys found no new locations of Ozark chinquapin; known and any newly-found locations would be flagged and protected from proposed timber management activities in that area.

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Target areas for most herbicide application would occur in areas that are suffocated with invasive plants and along roadsides; it is possible that these treatments could occur in MA 6 – Rare Upland Communities. Individual plants could be impacted if prescribed burning and or heavy equipment was used as a control treatment during growing season. Herbicide application methods, including direct application to target foliage or to freshly cut stumps/surfaces, would minimize the possibility of direct contamination to non-target species. Effects to sensitive plants would be further minimized because 1) the use of herbicides is prohibited when weather conditions exceed the threshold for use that could cause drift (Revised Forest Plan, HU015, Table 3.8, pp. 88-89) and 2) locations of these sensitive plants within the project area are documented. The greatest threat to glade species, like waterfall's sedge, is habitat loss due to the encroachment of woody and non-native invasive herbaceous species into open glade areas. The herbicide application to invasive vegetative species and the removal of woody species would improve habitat quality by increasing light to the forest floor, decreasing competition.

Direct effects to Ozark chinquapin are unlikely due to no new locations or occurrence in areas where most applications of herbicide would occur. This tree's physical form is easily recognized allowing avoidance in know location planned for invasive species control by mechanical and herbicide application. The Revised Forest Plan (TE008, p. 77) states, "Herbicides will not be applied to Ozark chinquapin, and stems of this species will be individually flagged or otherwise marked in the field by qualified personnel prior to herbicide application within the stand. Use of soil active, mobile herbicides should not be applied where they might move to the root system of

Lower South Fork Project

this species” (USDA Forest Service, 2005a). If foliar application is used, a buffer of 30 feet would be required if trees are found and flagged in an application area. When Chinquapins respond well to an increased level of light and a reduction in competition for water, space, and nutrients when competing vegetation is reduced by herbicide.

Prescribed Burning (fire restoration treatments and fuel reduction)

Vegetative portion of plants and some seed loss would likely occur depending on intensity and duration of burn events. Some individual Ozark chinquapins may be set back by being burned but they would be expected to re-sprout from their stumps. It is likely that Waterfall’s sedge and Shinner’s fewleaf sunflower would benefit indirectly from burning due to reduced competition and their ability to tolerate moderate soil disturbance. Loss of the natural fire regime has led to successional change that has negatively affected regeneration and growth in chinquapin (NatureServe, 2016). Prescribed burning would help reduce understory competition, providing long-term opportunities for individual plants to grow, and would attempt to restore the fire regime.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Road/fireline construction/ reconstruction and maintenance may be detrimental to these species by uprooting individual plants. Uprooting of Ozark chinquapin, Waterfall’s sedge, and Shinner’s fewleaf sunflower would result in the permanent loss of that individual plant. Waterfall’s sedge could recolonize areas of temporary roads and firelines in disturbed areas; therefore any direct effects should not be permanent. Habitat on open roads would be eliminated into the future for each species. Any soil disturbance from construction/ reconstruction should be temporary.

Pond Improvements

The proposed activities would occur outside of habitats preferred by these plants species, no direct or indirect impact are anticipated.

Wildlife Opening Construction/Improvement

At the proposed sites for new wildlife openings, no occurrence of these species were found; no direct or indirect impacts are anticipated for these plant species.

Nest Boxes Installation/Gate Maintenance

The proposed activities would occur outside of habitats preferred by these plants species; no direct or indirect impacts are anticipated.

Alternative C: No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Sensitive Plant Species of Streamside Management Areas

Plants of Streamside Management Areas: Southern lady's slipper (*Cypripedium kentuckiense*); Cumberland sandreed (*Calamovilfa arcuate*); Ouachita false indigo (*Amorpha ouachitensis*)

Direct and Indirect Effects

No Action

This alternative would allow natural processes to occur without human intervention. Only natural disturbances would cause changes to these species and their associated habitats, which are at the edges of streams, in seeps, wetlands and riparian areas. These changes would be expected to be within the normal range of habitat fluctuation that occurs naturally, and to which these species are adapted. No direct or indirect effects on these sensitive plant species would occur as a result of deferred management.

Proposed Action

Under the proposed activities, management actions would protect overall forest health and provide long-term, mesic, closed-canopy habitat in streamside management areas and seeps/springs preferred by these plants. Soil disturbance, heavy equipment operation, prescribed fire, creation/maintenance of early successional habitat, and sedimentation within the project area would largely occur outside of this species; preferred habitat; therefore, any negative effects would be minimal.

Timber Management (regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement)

Timber management treatments are proposed for upland shortleaf pine, pine/hardwood and hardwood stands. These treatment areas only support habitat conditions for these sensitive species within streamside management areas and wetland communities such as seeps and springs, which are protected by Revised Forest Plan design criteria. The proposed timber management actions would have no impact on these sensitive plant species.

Chemical Treatments (chemical site preparation, chemical timber stand improvement and non-native invasive plant species control)

Target areas for most herbicide application would occur in areas that are suffocated with invasive plants and along roadsides; it is possible that these treatments could occur in MA 9 – Water and Riparian Communities. Individual plants could be impacted if prescribed burning and or heavy equipment was used as a control treatment during growing season. Herbicide application methods, including direct application to target foliage or to freshly cut stumps/surfaces, would

minimize the possibility of direct contamination to non-target species. Effects to sensitive plants would be further minimized because 1) the use of herbicides is prohibited when weather conditions exceed the threshold for use that could cause drift (Revised Forest Plan, HU015, Table 3.8, pp. 88-89) and 2) locations of these sensitive plants within the project area are documented.

The riparian areas are being affected by invasive plants encroachment that could affect Southern lady's slipper, Cumberland sandreed and Ouachita false indigo. The herbicide application to invasive species and the removal of woody species would improve habitat quality by decreasing competition, though some individual Southern lady's slipper, Cumberland sandreed and Ouachita false indigo plants could be damaged or killed during the herbicide treatment.

Prescribed Burning (fire restoration treatments and fuel reduction)

Prescribed burns would occur over the majority of the project area. Effects would vary due to fire intensity, aspect, and slope; it would be expected that some degree of the forest floor cover would be removed. Overall, prescribed fire is not likely to directly impact these species due to the wet habitat conditions in which they normally occur, and prescribed burning occurring during the plants' dormancy. Indirectly, plants may benefit post-burn due to reduced competition.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Fire lines used for prescribed burning would take advantage of existing natural barriers, such as existing roadways and streams, and hand lines would be utilized within streamside management areas, both limiting the amount of disturbance in preferred habitats. Reconstruction of system roads would occur in previously disturbed areas generally unsuitable to these sensitive plant species due to soil compaction. Direct or indirect effects are not anticipated because of the limited amount of disturbance to preferred habitats. If roads or firelines are constructed in riparian areas, seeps and/or spring heads, the habitat could be altered and become unsuitable for these species.

Pond Improvements

No direct or indirect impacts are anticipated for these sensitive plant species.

Wildlife Opening Construction/Improvement

Examination of proposed sites for wildlife opening construction found no occurrence of these sensitive plant species; no direct or indirect impacts are anticipated for these plant species.

Nest Boxes Installation/Gate Maintenance

The proposed activities would occur outside of habitats preferred by these plants species, no direct or indirect impact are anticipated.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Plant Species of Glades and Similar Habitats: Nuttall's cornsalad (*Valerianella nuttallii*); Open-ground draba (*Draba aprica*)

Direct and Indirect Effects

No Action

Under this alternative, natural processes would occur without human intervention. Only natural disturbances would cause changes to these sensitive plant species and their associated glade and similar habitats. These changes would be expected to be within normal range of habitat fluctuation that occur naturally, and to which these species are adapted. No direct or indirect effects are anticipated on these plant species as a result of deferred management.

Proposed Action

Timber Management (*regeneration harvest (seed-tree, clearcut for shortleaf restoration) thinnings (pre-commercial, commercial, woodland), mechanical site preparation, chop/rip/hand plant shortleaf pine seedlings, and mechanical timber stand improvement*)

The Revised Forest Plan, specifically the standards for MA 6, provides protection for rare upland communities where these plant species may occur. These standards would protect nearly all of the habitats associated with these sensitive plant species. Timber harvest may occur on the outside of these sensitive species habitat and they may directly affect individuals, though when possible, trees would be removed and carried to the landing without skidding along the ground. However, sites appropriate for these plant species are generally on slopes too steep and rocky for timber production.

Chemical Treatments (*chemical site preparation, chemical timber stand improvement and non-native invasive plant species control*)

Botanical field surveys of the proposed treatment areas found no occurrence of these plant species. No direct or indirect impacts are anticipated. If they were to occur within suitable habitat in NNIS treatment areas, it is possible that vegetative portions of individual plants might be directly impacted by herbicide application or manual treatment methods for NNIS control, but effects are expected to be limited. All herbicide application for NNIS control would be applied directly to individual stems and at the lowest application levels necessary. It is more likely that these sensitive plant species would indirectly benefit from proposed treatments in that competing vegetation would be eliminated or suppressed, allowing opportunities for seeding and new growth. As part of implementation, each site proposed for treatment would be evaluated for the presence of populations or of habitat for PETS species, and for determining the best treatment method and timing.

Prescribed Burning (fire restoration treatments and fuel reduction)

There would be a direct effect on existing plants if burning was performed during a growing season and individual plants were top-killed. Since glade species occur in shallow soils and on generally bare ground where there is very little competition, the prescribed fire might burn around plant clusters. Indirectly, prescribed fire would open the canopy and reduce vegetative competition, thus improving habitat for these species.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Fire lines used for prescribed burning would take advantage of existing natural barriers such as existing roadways and streams and would utilize hand lines within streamside management areas, limiting the amount of disturbance in preferred habitats. Reconstruction of system roads would occur in previously disturbed areas generally unsuitable to these sensitive plant species due to soil compaction. Direct or indirect effects are not anticipated because of the limited amount of disturbance to preferred habitats.

Pond Improvements

No direct or indirect impacts are anticipated for these sensitive plant species.

Wildlife Opening Construction/Improvement

Examination of proposed sites for wildlife opening construction found no occurrence of these species. Therefore no direct or indirect impacts are anticipated for these plant species.

Nest Boxes Installation/Gate Maintenance

The proposed activities would occur outside of habitats preferred by these plants species, no direct or indirect impact are anticipated.

No Herbicide

The effects of this alternative would be the same as the proposed action except the effects attributed to herbicide application would not occur.

Cumulative Effects

There are no past, present, or reasonably foreseeable future actions that would be additive to the effects of this project.

Local Economy & Financial Efficiency

Present Conditions

The Lower South Fork Project is located in Montgomery County. As of 2014, the population of Montgomery County was 9,082. National Forest System lands occupy 63% of the county land base. Employment in commodity sectors of the economy that have the potential to use federal

public lands consists of 2% of total jobs in timber; 3% in mining (unrelated to fossil fuels); and 12% in agriculture. Employment in travel and tourism sectors that provides goods and services to visitors equals 25% of total jobs (Headwaters Economics, 2016).

No Action

Direct, Indirect and Cumulative Effects

There would be no effects on the local economy from not implementing the proposed actions. Ongoing Forest Service contracts located within Montgomery County would continue to provide jobs and revenue to local communities and businesses.

Proposed Action and No Herbicide

Direct, Indirect and Cumulative Effects

Many management actions are performed by contractors (site preparation, stand improvement, timber sale layout etc.). These activities would provide jobs to the local community and create a stream of revenue to local businesses. These effects would be additive to ongoing Forest Service contracts located within Montgomery County.

Project Financial Efficiency

Under the Proposed Action and the No Herbicide Alternative there would be both costs and revenues associated with the sale of timber. Costs include activities that are directly associated with timber management (site preparation, timber sale administration, road maintenance, etc.). Revenues are generated from the sale of timber. A computer program called Quick Silver version 7.0 was used to evaluate the financial efficiency of each alternative; these results are displayed in the table below.

COMPARISON BY FINANCIAL EFFICIENCY (TABLE 3.12)

Financial Indicator	No Action \$	Proposed Action \$	No Herbicide \$
Present Value of Revenues ¹	0	1,542,057.69	1,542,057.69
Present Value of Costs ²	0	(1,453,475.36)	(1,493,690.64)
Present Net Value ³	0	88,582.33	48,367.05
Revenue/Cost Ratio ⁴	N/A	1.06	1.03

1- Present Value of Revenues – The sum of all revenues discounted at some interest rate.

2- Present Value of Costs – The sum of all costs discounted at some interest rate.

3- Net Present Value – The sum of the present value of the revenues minus the sum of the present value of the costs.

4- Revenue/Cost Ratio – Present value of revenues divided by the present value of costs.

The Revenue/Cost Ratio is highest for the Proposed Action. Two seedling release treatments would be expected under the No Herbicide Alternative.

Public Health & Safety

Present Conditions

Refer to the present conditions described in the Air Quality section and the Water Resources & Quality section of this chapter.

No Action

Direct and Indirect Effects

The prescribed burning and the application of herbicides would not take place under this alternative; there would be no effect to public health and safety specific to these activities.

Cumulative effects

There are no actions proposed under this alternative, so there would be no cumulative effects on this resource.

Proposed Action

Direct and Indirect Effects

Refer to the Air Quality section of this chapter for disclosure of effects on public health and safety from prescribed burning.

Accidents or other unforeseen events might occur during herbicide transportation, mixing, and application. Public safety in and around areas of herbicide use is a high priority concern. Measures are taken to help ensure that the general public does not come in contact with herbicides, which would eliminate the risk entirely. These include posting warning signs on areas that have been treated; selectively targeting vegetation that needs to be controlled rather than using broadcast application; establishing buffer zones of non-treatment around private property, streams, roads, and hiking trails; carefully transporting only enough herbicide for one day's use; mixing it on site away from private land, open water, or other sensitive areas; properly maintaining and operating equipment (e.g. no leaks); and having good accident pre-planning and emergency spill plans in place. Enforcement and administration will be effective in reducing the risk of accidental contamination to humans or the environment. In the event of an accidental spill, the Emergency Spill Plan (Forest Service Manual 2109 Chapter 30) would be followed. The Plan contains procedures for spill containment and cordoning-off of the spill area. These measures along with others given in the Revised Forest Plan are incorporated into contracts and through good enforcement and administration would be effective in reducing the risk of accidental contamination of humans or the environment.

Herbicide applications were monitored for effectiveness in protecting water quality over a five-year period on the Ouachita NF (Clingenpeel, 1993). The objective was to determine if herbicides are present in water in high enough quantities to pose a threat to human health or

aquatic organisms. From 1989 through 1993, 168 sites and 348 water samples were analyzed for the presence of herbicides. Of those samples, 69 had detectable levels of herbicide. No concentrations were detected that would pose a significant threat to human health or aquatic organisms.

Syracuse Environmental Research Associates Incorporated (SERA) Human Health and Ecological Risk Assessments were used to analyze the risks associated with the herbicides proposed for treatment. Site-specific risk assessments developed by SERA have been conducted for this project as required by the Revised Forest Plan (p. 87, HU002) and are located in the project file.

Estimates of risk are presented in terms of a hazard quotient (HQ). An HQ is the quotient of an estimate of exposure divided by the appropriate toxicity value. Concern for the development of adverse effects increases as the value of the HQ increases.

Glyphosate may be used at an application rate of 2 lbs/acre. It would generally be applied as a foliar application to weeds and woody brush. Hazard quotients are at acceptable levels (less than 1) for all exposure scenarios except for the following: water consumption by a child after an accidental spill, and consumption of contaminated vegetation by an adult female.

Imazapic may be used at an application rate of 0.188 lb/acre. It would generally be applied as a foliar application to weeds. Hazard quotients are at acceptable levels (less than 1) for all exposure scenarios except for water consumption by a child after an accidental spill.

Imazapyr may be used at an application rate of 1.5 lb/acre. It would generally be applied as a foliar application to weeds and brush species. At this rate, the risk assessments indicate the use of imazapyr does not pose any identifiable hazard to workers or the general public in Forest Service applications. Hazard quotients are at acceptable levels (less than 1) for all exposure scenarios.

Picloram may be used at an application rate of 1.0 lb/acre as a foliar spray; it may only be used to control kudzu. For workers, hazard quotients are below a level of concern (less than 1) for all exposure scenarios. For members of the general public, hazard quotients are at acceptable levels (less than 1) for all exposure scenarios except for the following: water consumption by a child after an accidental spill, and consumption of contaminated vegetation by an adult female.

Triclopyr triethylamine (salt) may be applied at a rate of 4 lbs/acre for cut-surface treatments; triclopyr butoxyethyl (ester) may be applied at a rate of 2 lbs/acre for foliar spray. Triclopyr is used to control herbaceous and woody broadleaf weeds.

At the central and upper bounds of the estimated exposures for workers using a backpack sprayer application method, the hazard quotients for both triclopyr amine and triclopyr ester formulations exceed the level of concern, ranging from 1 to 12. The level of concern is also exceeded for accidental exposure to contaminated gloves for one hour at the central and upper bounds of exposure to triclopyr ester.

For the general public, several exposure scenarios exceed the level of concern. Hazard quotients for direct spray of a child's whole body and direct spray to the feet and lower legs of an adult female range from 1.4 to 3. For an adult female consuming contaminated vegetation, the upper bound HQ is 108 for acute exposures and 26 for longer-term exposures. In addition, some of the central estimates of exposure to triclopyr involving a young woman consuming contaminated vegetation or fruit also exceed the level of concern. Because triclopyr has been shown to cause adverse developmental effects in mammals, high HQs associated with terrestrial applications are of particular concern in terms of the potential for adverse reproductive outcomes in humans. Adverse developmental effects in experimental mammals have been observed, however, only at doses that cause frank signs of maternal toxicity. The available toxicity studies suggest that overt and severe toxicity would not be associated with any of the HQs and this diminishes concern for reproductive effects in humans (SERA, 2011d).

Cumulative Effects

There are no other past, present or reasonably foreseeable future applications of herbicide within the project vicinity that would be additive to the effects of this project.

No Herbicide Use

Refer to the Air Quality section of this chapter for disclosure of direct, indirect, and cumulative effects on public health and safety from prescribed burning.

Since no herbicides would be utilized under this alternative, there would be no direct, indirect, or cumulative effects on public health and safety resulting from herbicide use.

Recreation, Scenic Resource, Wild & Scenic Rivers

Present Conditions

Lake fishing, camping, hunting, hiking and scenic automobile touring are dispersed throughout the project area. The Womble Trail traverses the northwest corner of the project area. Crystal Mountain Scenic Area is located in the southwest corner. The project area also includes Corps of Engineers land surrounding Lake Ouachita, including Twin Creek Campground. Portions of the Crystal Vista Auto Tour, including part of FS Road 177, are located in the southern half of the project area. The closest wilderness area, Caney Creek, is located 25 miles west of the project area. Bear Mountain, the closest inventoried roadless area, is located 10 miles east. Ouachita River segment IV, an eligible river for consideration as a component of the National System of Wild and Scenic Rivers, is located 0.5 miles north of the project area.

Scenic Integrity Objective (SIO) levels, referring to the degree of acceptable alternations to landscape character, include high (40%), medium (58%), and low (2%). The areas surrounding the Womble Trail, Crystal Vista Auto Tour, and Lake Ouachita have high SIOs.

No Action

Direct and Indirect Effects

No management actions are proposed; this alternative would not alter scenic integrity. Changes in the landscape would continue to appear natural to the observer. There would be no effects on recreational users.

Cumulative effects

There would be no cumulative effects; no management actions are proposed; no additive effect would occur.

Proposed Action

Direct and Indirect Effects

Immediate effects to the recreation resource would include a disturbance in the recreation experience by the sights, sounds, and smells of management activities such as logging operations and prescribed burning. Noise from logging and road construction, as well as increased dust, would be a temporary disturbance while management activities are being performed.

Regeneration harvests and thinning operations could result in increased wildlife viewing and hunting opportunities.

Proposed modified seed tree regeneration harvests and clearcut would reduce the stand basal area and create a visible linear edge along the surrounding forest. The number of trees removed from a typical thinning usually creates a minimal change in the forest form. Few, if any, linear edges occur. Pine needles in slash turn a distinctive red-orange color and the wood becomes gray. Hardwood slash does not change color, but tends to be noticeable in early spring and in late fall. Understory vegetation helps screen slash from view.

Proposed site preparation would result in a loss of midstory and understory vegetative screening, and produce slash on the forest floor. Because these activities target hardwoods, a loss of spring and fall colors would be evident. Although the application of herbicides may coincide with the seasonal browning of leaves in autumn, standing dead vegetation may be evident for two or three years after application.

Changes in color and texture would result from exposed soil in roads, skid trails, and firelines. Prescribed fires that burn along the ground tends to create short-term color changes. Prescribed burning would temporarily reduce the amount of understory vegetation, allowing for greater viewing depth into the forest. Burning would create a charred appearance on tree trunks and the forest floor. These effects would diminish in three to six months due to regrowth of vegetation on the forest floor, as well as natural leaf shedding. The landscape would regenerate within 1 to 2 years following the disturbance, allowing greening-up and limiting far distant views into the landscape.

Commercial plantation thinning is proposed in two stands adjacent to, but not abutting, the Womble Trail (see Figure 10). Techniques designed to achieve scenic integrity objectives and landscape character would be applied to reduce impacts to the trail corridor (see Chapter 2, Technical Requirements). Proposed even-aged regeneration harvest units were redesigned to comply with Revised Forest Plan management direction for lands surrounding Lake Ouachita (Management Area 16) to reduce visual impacts on the landscape.

There would be no effects on roadless areas, wild and scenic rivers, or wilderness due to their distant location from management actions.

Cumulative effects

There are no other past, present or reasonably foreseeable future actions within the project vicinity that would be additive to the effects of this project.

No Herbicide Use

The effects of this alternative would be the same as those attributed to the Proposed Action above, except the listed effects from herbicide would not occur.

Climate Change

Effects of proposed actions on climate change

Forests play a major role in the global carbon cycle by storing carbon in live plant biomass (approximately 50% of dry plant biomass is carbon), in dead plant material and in soils. Forests contain three-fourths of all plant biomass on earth, and nearly half of all soil carbon. The amount stored represents the balance between absorbing CO₂ from the atmosphere in the process of photosynthesis and releasing carbon into the atmosphere through live plant respiration, decomposition of dead organic matter, and burning of biomass (Krankina & Harmon, 2006).

Through the process of photosynthesis, carbon is removed from the atmospheric pool. About half the carbon absorbed through photosynthesis is later released by plants through respiration as they use their own energy to grow. The rest is either stored in the plant, transferred to the soil where it may persist for a very long time in the form of organic matter, or transported through the food chain to support other forms of terrestrial life. When plants die and decompose, or when biomass or its ancient remains in the form of fossil fuels are burned, the original captured and stored carbon is released back to the atmosphere as CO₂ and other carbon-based gases. In addition, when forests or other terrestrial ecosystems are disturbed through harvesting, conversion, or natural events such as fires, some of the carbon stored in the soils and organic matter, such as stumps, snags, and slash, is oxidized and released back to the atmospheric pool as CO₂. The amount released varies, depending on subsequent land use and probably rarely is more than 50% of the original soil store (Salwasser, 2006). As forests become older, the amount of carbon released through respiration and decay can exceed that taken up in photosynthesis, and the total accumulated carbon levels off. This situation becomes more likely as stands grow overly dense

and lose vigor. Wildfires are the greatest cause of carbon release from forests. At the global scale, if more carbon is released than is captured and stored through photosynthesis or oceanic processes, the concentration of carbon dioxide (CO₂) builds in the atmospheric pool. However, the greatest changes in forest sequestration and storage over time have been due to changes in land use and land use cover, particularly from forest to agriculture and more recently changes are due to conversions from forest to urban development, dams, highways, and other infrastructure (Malmsheimer, Heffernan, & Brink, 2008).

No Action

Direct and Indirect Effects

No management activities would occur under Alternative A, therefore no direct effects on greenhouse gases (GHG) emissions and carbon cycling would occur. Because no management activities would take place, carbon would continue to be sequestered and stored in forest plants, trees, (biomass) and soil. Unmanaged, older forests can become net carbon sources, especially if probable loss due to wildfires are included (Malmsheimer, Heffernan, & Brink, 2008).

Cumulative Effects

As GHG emissions and carbon cycling are integrated across the global atmosphere, it is not possible to determine the cumulative impact on global climate from emissions associated with this project or any number of projects. It is not expected that the effects of this project or multiple projects can be specifically attributed to the cumulative effects on global climate change.

Proposed Action and No Herbicide

Direct and Indirect Effects

The proposed harvest operations would result in a release of carbon and reduce carbon storage in the forest both by removing organic matter (trees) and by increasing heterotrophic soil respiration. However, much of the carbon that is removed is offset by storage in forest products. Forest management that includes harvesting provides increased climate change mitigation benefits over time because wood-decay CO₂ emissions from wood products are delayed (Malmsheimer, Heffernan, & Brink, 2008). Prescribed burning activities, although a carbon neutral process, would release CO₂, other greenhouse gases, and particulates into the atmosphere.

Indirectly, implementation of the proposed actions would increase the overall health, vitality and growth within the project area, and reduce the susceptibility to insects and disease. This would serve as a way to increase carbon storage within the project area and mitigate carbon accumulation in the atmosphere.

Cumulative Effects

As GHG emissions and carbon cycling are integrated across the global atmosphere, it is not possible to determine the cumulative impact on global climate from emissions associated with this project or any number of projects. It is not expected that the effects of this project or multiple projects can be specifically attributed the cumulative effects on global climate change.

Effects of Climate Change on the Proposed Project

For some management proposals, climate change may affect the project. For example: the effects of decreased snowfall on a ski area expansion proposal at a marginal geographic location, such as a southern aspect or low elevation. However, for this project, no direct, indirect, or cumulative effects from climate change on the proposal are anticipated.

Chapter 4 ***Persons and Agencies Consulted***

Coordination

Daniel Crump	Timber Sale Administrator
Horace Lawrence	Timber Sale Administrator
Kim Miller	District Silviculturist
Brian Pounds	Wildlife Technician
Mary Rodgers	District Biologist
Derrick Rollins	Wildlife Technician
Ben Rowland	Fire Management Officer
Chip Stokes	Geographic Information System Specialist
Clay Van Horn	Timber Management Assistant
Seanna Whisenhunt	Prescription Forester
David Whitmire	Heritage Resource Technician

Consultation

Arkansas Natural Heritage Commission
Caddo Nation
Lisa Cline Forest NEPA Coordinator
Roger Coleman Forest Archeologist
Susan Hooks Forest Botanist
Rich Standage Forest Fisheries Biologist
Osage Nation
Quapaw Tribe of Oklahoma
State Historic Preservation Office
US Fish and Wildlife Service

Chapter 5

References Cited

- ADEQ. (2016). *Maps*. Retrieved March 15, 2016, from Arkansas Department of Environmental Quality: <https://www.adeq.state.ar.us/>
- Beasley, R., Miller, E., & Lawson, E. (1987). *Chemical Properties of Soils and Streams in Natural and Disturbed Forest Ecosystems in the Ouachita Mountains*. Arkansas Water Resources Research Center. Publication No. 132.
- Brennan, L. A. (1999). Northern Bobwhite. In *The Birds of North America* (Vol. No. 397, pp. 1-28).
- Bull, E., & Jackson, J. (2011). *Pileated Woodpecker (Dryocopus pileatus)*. Retrieved from The Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/148>
- Bushman, E. S., & Therres, G. D. (1988). *Habitat management guidelines for forest interior breeding birds of coastal Maryland*. *Wildlife Technical Pub. 88-1*. Maryland Department of Natural Resources.
- Clingenpeel, J. A. (1989). *Above and Below Storm Sampling BMP Effectiveness FY 1989 Monitoring Results*. Ouachita National Forest. Hot Springs AR: Ouachita National Forest.
- Clingenpeel, J. A. (1993). *Herbicide Effectiveness Monitoring on the Ouachita National Forest for Water Quality in the Fiscal Years of 1989 through 1993*. Hot Springs AR: Ouachita National Forest.
- Cox, J., & Jones, C. (2007). Home range and survival characteristics of male Bachman's Sparrows in an old-growth forest managed with breeding season burns. *Journal of Field Ornithology*, 78, 263-269.
- Cox, J., & Widener, B. (2008). *Lightning-Season Burning: Friend or Foe of Breeding Birds?* Tall Timber Research Station and Land Conservancy.
- Dimmick, R. W., Gudlin, M., McKenzie, D., & Wells, R. (2004). *The northern bobwhite conservation initiative; a plan for quail population recovery*. Columbia SC: Northern Bobwhite Conservation Initiative.
- Headwaters Economics. (2016). Economic Profile System. Bozeman, MT. Retrieved 2014, from www.headwaterseconomics.org
- Isler, M. L., & Isler, P. R. (1987). *The tanagers: natural history, distribution and identification*. Washington, DC: Smithsonian Institution Press.
- Jones, C., Cox, J., Toriani-Moura, E., & Cooper, R. (2013). Nest-site characteristics of Bachman's Sparrows and their relationship to plant succession following prescribed burns. *Wilson Journal of Ornithology*, 125(2), 293-300.
- Krankina, O. N., & Harmon, M. E. (2006). Forest, carbon, and climate change: a synthesis of science findings. 79-85. Oregon Forest Resources Institute, Oregon State University College of Forestry, Oregon Department of Forestry.
- Lugo, A., & Gucinski, H. (2000). Function, Effects, and Management of Forest Roads. *Forest Ecology and Management*, 133, pp. 249-262.
- Malmsheimer, R. W., Heffernan, P., & Brink, S. (2008, April/May). Forest management solutions for mitigating climate change in the United States. *Journal of Forestry*, 141-156.

- Miller, K. (2001). White-tailed deer. In *Wildlife of southern forests: habitat and management* (pp. 95-107). Blaine: Hancock House Publishers.
- NatureServe. (2016). Retrieved from NatureServe Explorer: An Online Encyclopedia of Life: <http://www.natureserve.org/explorer>
- Oklahoma Cooperative Extension Service. (1994). *Forestry and Water Quality: A Review of Watershed Research in the Ouachita Mountains*. Circular, Oklahoma State University, Division of Agricultural Sciences and Natural Resources.
- Robison, H. W., & Buchanan, T. M. (1988). *The Fishes of Arkansas*. Fayetteville: The University of Arkansas Press.
- Roseberry, J. L., & Sudkamp, S. D. (1998). Assessing the suitability of landscapes for northern bobwhite. *Journal of Wildlife Management*(62), 895-902.
- Rosene, W. (1984). *The bobwhite quail: Its life and management*. Hartwell GA: The Sun Press.
- Salwasser, H. (2006). Forest, carbon, and climate change: a synthesis of science findings. Oregon Forest Resources Institute, Oregon State University College of Forestry, Oregon Department of Forestry.
- Sauer, J., Hines, J., Fallon, J., Pardieck, K., Ziolkowski JR, D., & Link, W. (2014). The North American Breeding Bird Survey, Results and Analysis 1966-2012. *Version 02.19.2014*. Laurel, MD, USA: USGS Patuxent Wildlife Research Center.
- Senesac, P. (1993). Project tanager: reference booklet. Ithaca, NY: Cornell Laboratory of Ornithology.
- SERA. (2004). Imazapic-Human Health and Ecological Risk Assessment-Final Report. Syracuse, NY, USA: Syracuse Environmental Research Associates, Inc. Retrieved from http://www.fs.fed.us/foresthealth/pesticide/pdfs/122304_Imazapic.pdf
- SERA. (2011a). Glyphosate-Human Health and Ecological Risk Assessment - Final Report. Syracuse, NY, USA: Syracuse Environmental Research Associates, Inc. Retrieved from http://www.fs.fed.us/foresthealth/pesticide/pdfs/Glyphosate_SERA_TR-052-22-03b.pdf
- SERA. (2011b). Imazapyr - Human health and Ecological Risk Assessment - Final Report. Syracuse, NY, USA: Syracuse Environmental Research Associates, Inc. Retrieved from http://www.fs.fed.us/foresthealth/pesticide/pdfs/Imazapyr_TR-052-29-03a.pdf
- SERA. (2011c). Picloram-Human Health and Ecological Risk Assessment-Final Report. Syracuse, NY, USA: Syracuse Environmental Research Associates, Inc. Retrieved from http://www.fs.fed.us/foresthealth/pesticide/pdfs/Picloram_SERA_TR-052-27-03a
- SERA. (2011d). Triclopyr-Revised Human health and Ecological Risk Assessment -Final Report. Syracuse, NY, USA: Syracuse Environmental Research Associates, Inc. Retrieved from <http://www.fs.fed.us/foresthealth/pesticide/pdfs/052-25-03aTriclopyr.pdf>
- US Environmental Protection Agency. (1993). R.E.D. FACTS-Glyphosate. Retrieved from <http://www.epa.gov/oppsrrd1/REDs/factsheets/0178fact.pdf>
- US Environmental Protection Agency. (1998). R.E.D. FACTS-Triclopyr. Retrieved from <http://www.epa.gov/oppsrrd1/REDs/factsheets/2710fact.pdf>
- US Environmental Protection Agency. (2016). *Criteria Pollutant Maps*. Retrieved from <http://www.epa.gov/airquality/greenbk>
- USDA Forest Service. (2005a). Revised Land and Resource Management Plan, Ouachita National Forest, Arkansas and Oklahoma. Forest Service, Southern Region.
- USDA Forest Service. (2011). *Five-Year Review of the 2005 Forest Plan*. Hot Springs AR: Ouachita National Forest.
- USDA Forest Service. (2015). *A Guide for the Aquatic Cumulative Effects Model - DRAFT*. Hot

Lower South Fork Project

Springs: Ouachita National Forest.

Yarrow, G. K., & Yarrow, D. T. (2005). *Managing wildlife: managing wildlife on private lands in Alabama and the southeast*. Alabama Wildlife Federation.

Appendices

(A) Activities List by Compartment and Stand

(B) Project Maps

- 1. Management Areas**
- 2. Proposed Timber Harvest**
- 3. Proposed Silvicultural Activities**
- 4. Proposed Wildlife Activities**
- 5. Proposed Prescribed Burning**
- 6. Proposed Transportation Activities**
- 7. Soil Concerns**
- 8. Water Resources**
- 9. Scenic Integrity Objectives**

Appendix A – Activities by Compartment and Stand (Proposed Action)

The following tables list the specific actions proposed for each Forest compartment and stand. All treatments, except nest structures, are given in acres. Acreage values are estimates based on best available data; actual treated area may be revised to reflect more accurate field information and stand analysis.

The No Herbicide Alternative would consist of the same treatments as the Proposed Action, except that hand tool or mechanical methods would be employed to accomplish site preparation, release, midstory removal, overstory mast development, and non-native invasive plant control.

Location		Proposed Harvest/Silvicultural Activity								
Compartment	Stand	Clearcut	Seedtree	Commercial Thinning	1 st Plantation Thinning	Woodland Restoration	Site Preparation	Hand Plant	Release	Pre-commercial Thinning
1626	5								159	
1626	6				59					
1626	7			59						
1626	8		45				45	45	45	45
1626	9		71				71	71	71	71
1626	18								39	
1626	19								31	
1626	26				30					
1628	3				83					
1628	5			130						
1628	8				96					
1628	13				57					
1628	15				42					
1628	16		72				72	72	72	72
1628	17		29				29	29	29	29
1628	18				102					
1628	19			29						
1628	25								41	
1628	30			22						
1628	32			35						
1629	8								24	
1630	2				90					
1630	6				73					
1630	5									67
1630	9			66						
1630	11									32
1630	15		28				28	28	28	28
1630	17			78						
1630	38		22				22	22	22	22
1630	39		26				26	26	26	26
1630	40		25				25	25	25	25
1630	43				56					

Lower South Fork Project

Location		Proposed Harvest/Silvicultural Activity								
Compartment	Stand	Clearcut	Seedtree	Commercial Thinning	1 st Plantation Thinning	Woodland Restoration	Site Preparation	Hand Plant	Release	Pre-commercial Thinning
1630	99									51
1632	2			98						
1632	4				59					
1632	9				79					
1632	14			24						
1632	15			16						
1632	17				52					
1632	19									82
1632	22			67						
1632	23			340						
1632	24			56						
1632	34			12						
1632	35									104
1632	36				49					
1632	37			80						
1632	39			145						
1632	55	38					38	38	38	38
1633	2			89						
1633	17			28						
1633	21		17				17	17	17	17
1633	22			19						
1633	24		21				21	21	21	21
1633	37	77					77	77	77	77
1633	38				40					
1633	39	80					80	80	80	80
1634	1			20						
1634	8		50				50	50	50	50
1634	9				58					
1634	10				87					
1634	12		43				43	43	43	43
1634	17									31
1634	23									16
1634	24									12
1634	26			25						
1634	29				36					
1634	32				186					
1634	35		35				35	35	35	35
1635	1									44
1635	3									60
1635	4				56					
1635	8				75					
1635	23			342						
1641	1				44					
1641	4				88					
1641	5					73				

Lower South Fork Project

Location		Proposed Harvest/Silvicultural Activity								
Compartment	Stand	Clearcut	Seedtree	Commercial Thinning	1 st Plantation Thinning	Woodland Restoration	Site Preparation	Hand Plant	Release	Pre-commercial Thinning
1641	6			58						
1641	11				103					
1641	12									36
1641	15									42
1641	16					116				
1641	19					81				
1641	28					57				
1641	46									51
1642	3					33				
1642	5					93				
1642	6			104						
1642	9			19						
1642	12			31						
1642	21				34					
1642	22				92					
1642	24					19				
1642	25			83						

Appendix B - Project Maps

- Figure 2. Management Areas**
- Figure 3. Proposed Timber Harvest**
- Figure 4. Proposed Silvicultural Activities**
- Figure 5. Proposed Wildlife Activities**
- Figure 6. Proposed Prescribed Burning**
- Figure 7. Proposed Transportation Activities**
- Figure 8. Soil Concerns**
- Figure 9. Water Resources**
- Figure 10. Scenic Integrity Objectives**

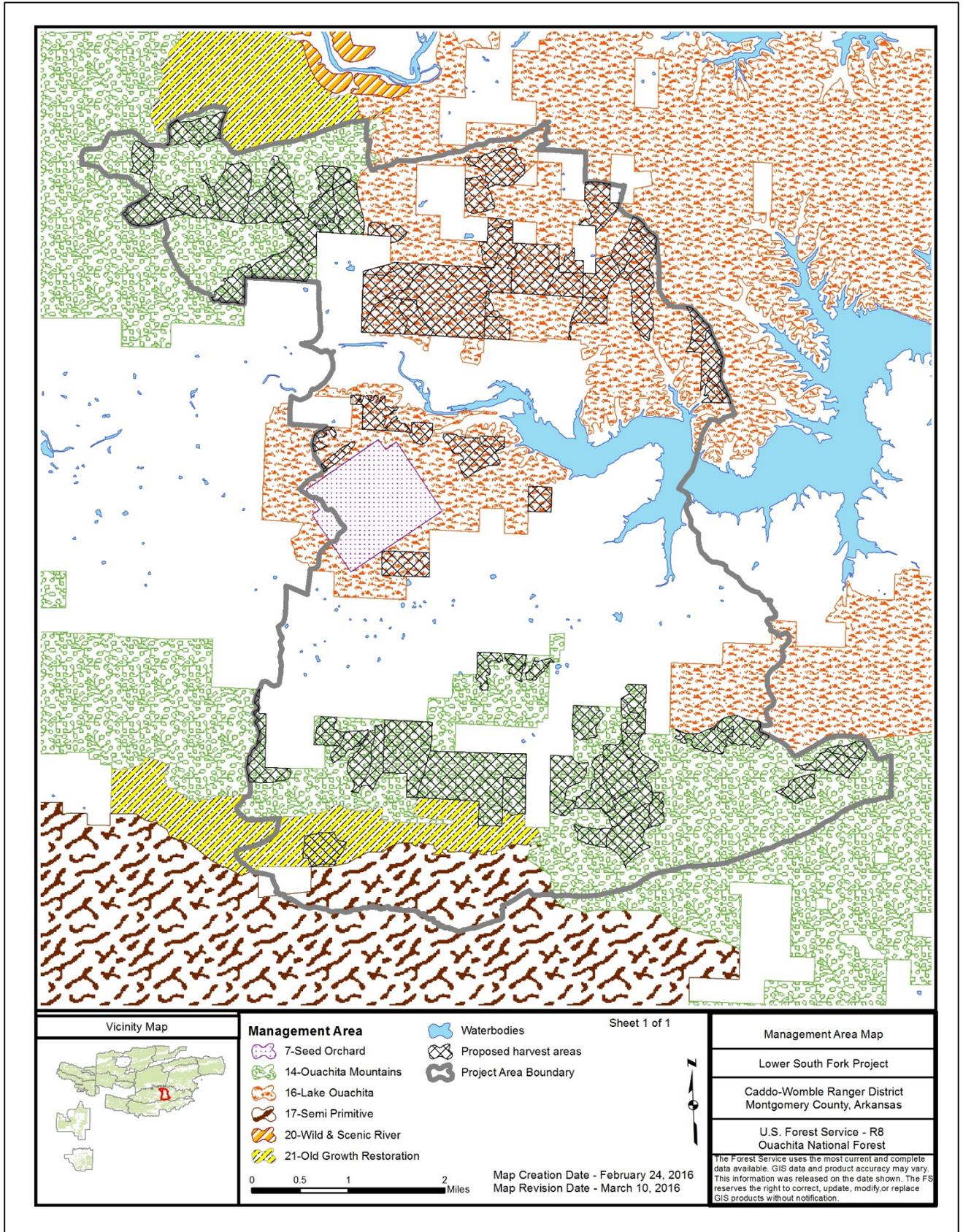


FIGURE 2. MANAGEMENT AREA MAP

Ouachita National Forest
Arkansas and Oklahoma

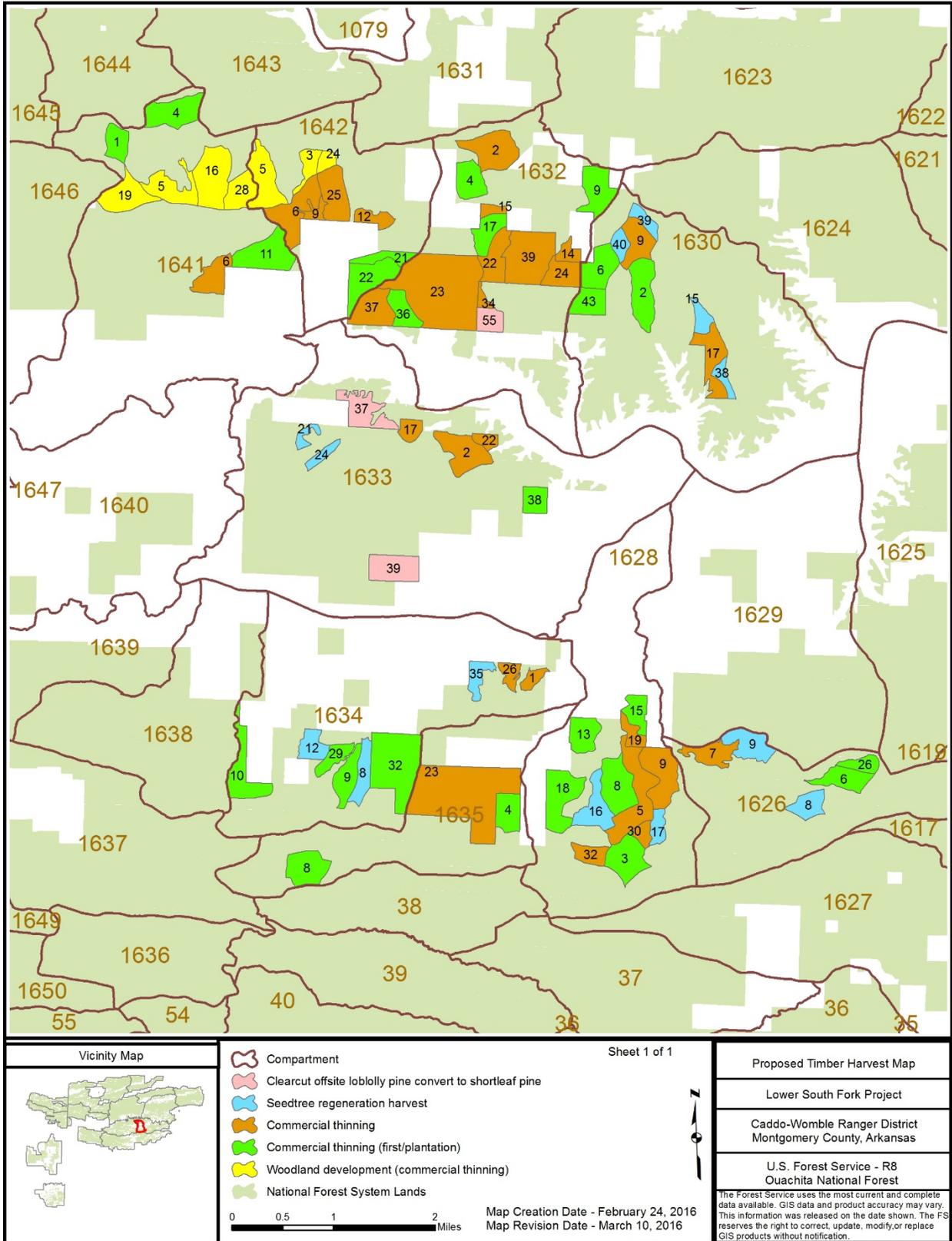


FIGURE 3. PROPOSED TIMBER HARVEST MAP

Ouachita National Forest
Arkansas and Oklahoma

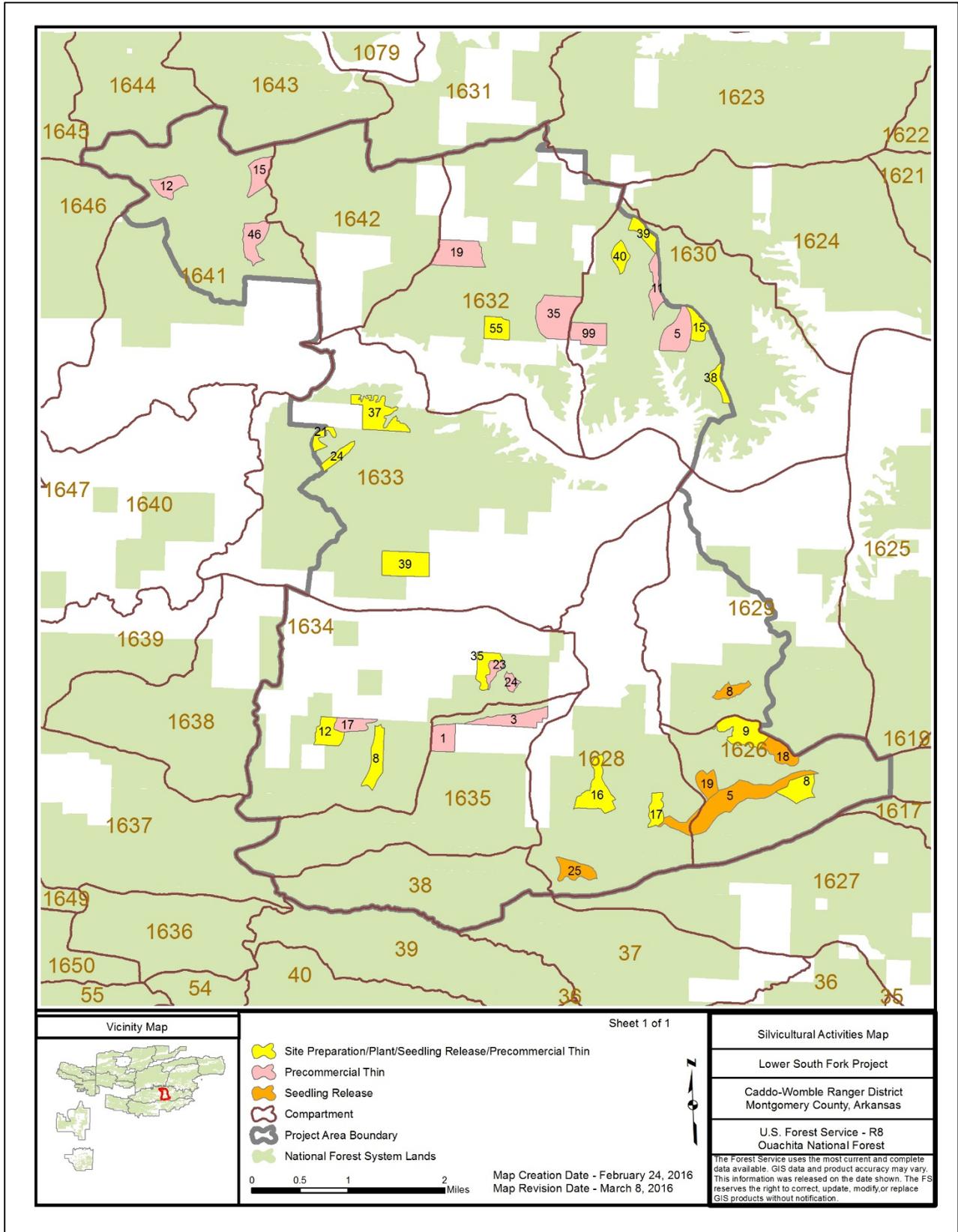


FIGURE 4. PROPOSED SILVICULTURAL ACTIVITIES MAP

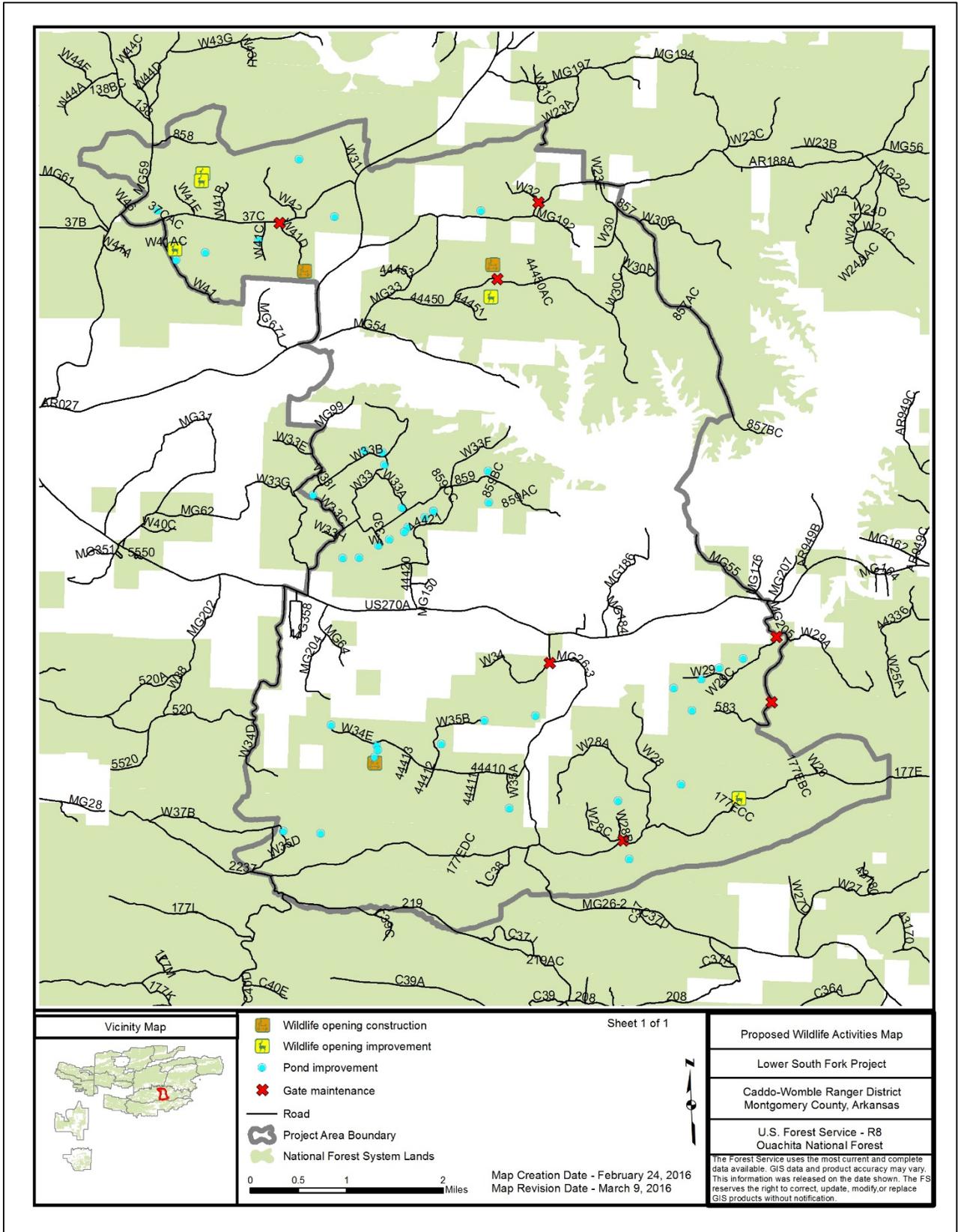


FIGURE 5. PROPOSED WILDLIFE ACTIVITIES MAP

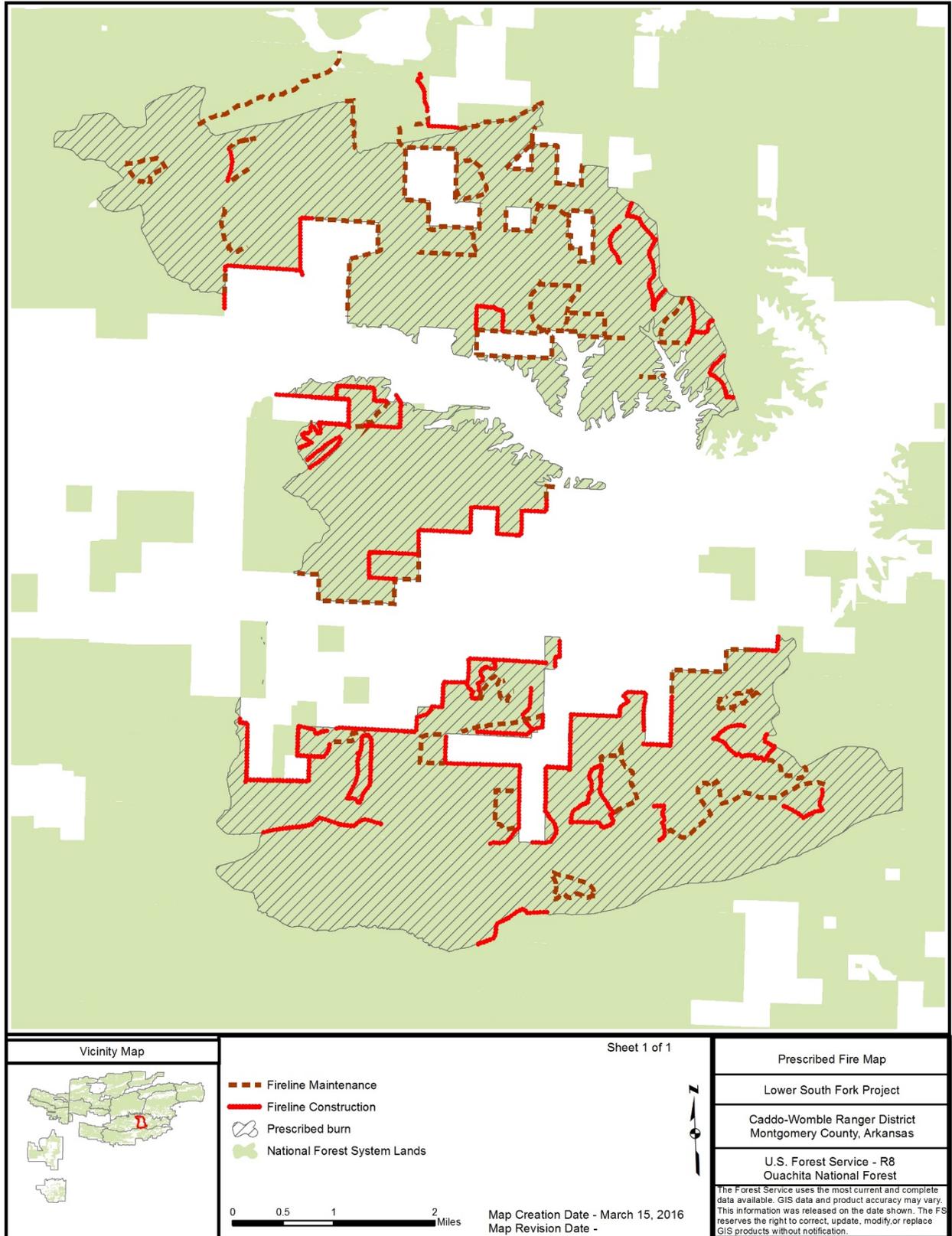


FIGURE 6. PROPOSED PRESCRIBED BURNING MAP

Ouachita National Forest
Arkansas and Oklahoma

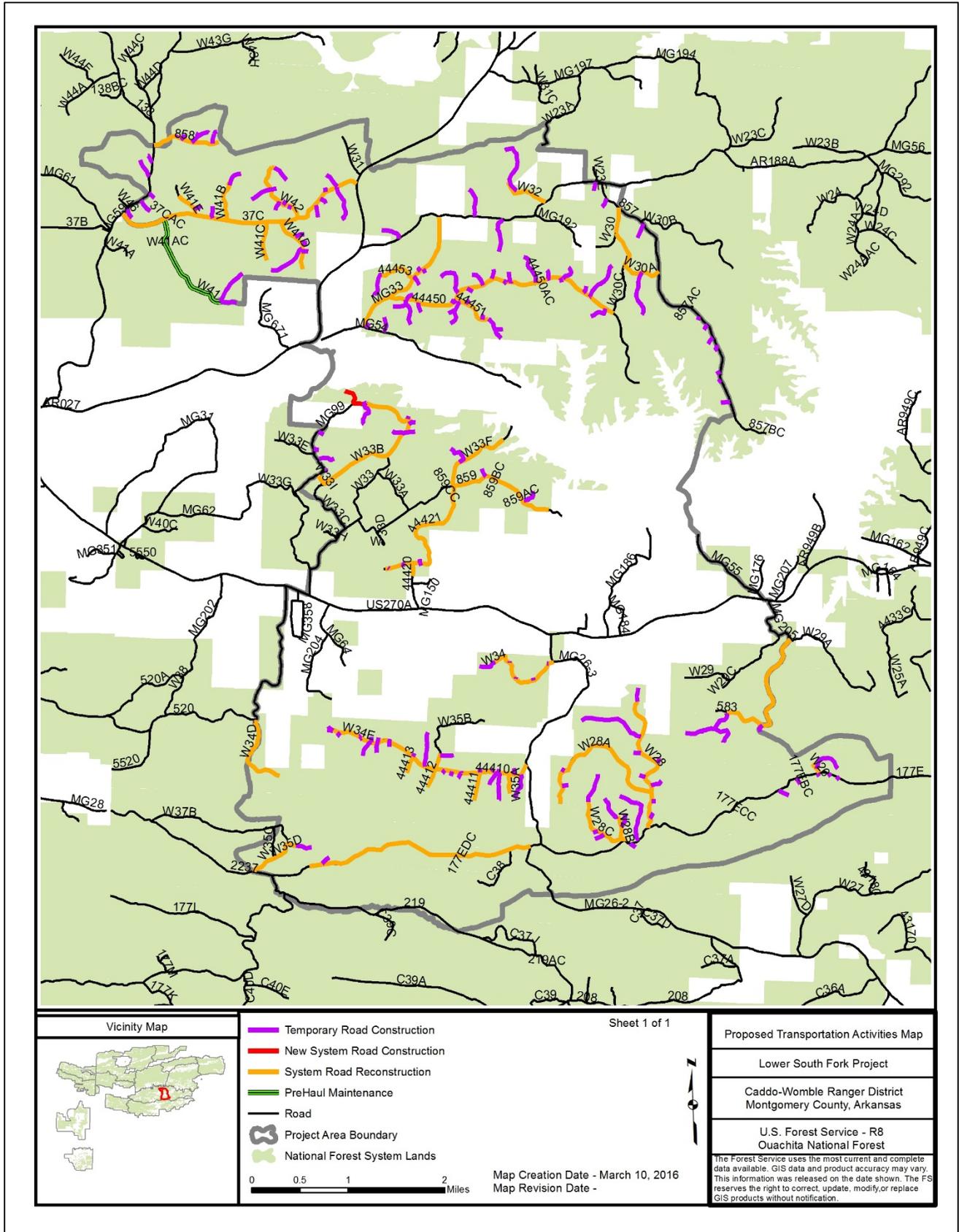


FIGURE 7. PROPOSED TRANSPORTATION ACTIVITIES MAP

Ouachita National Forest
Arkansas and Oklahoma

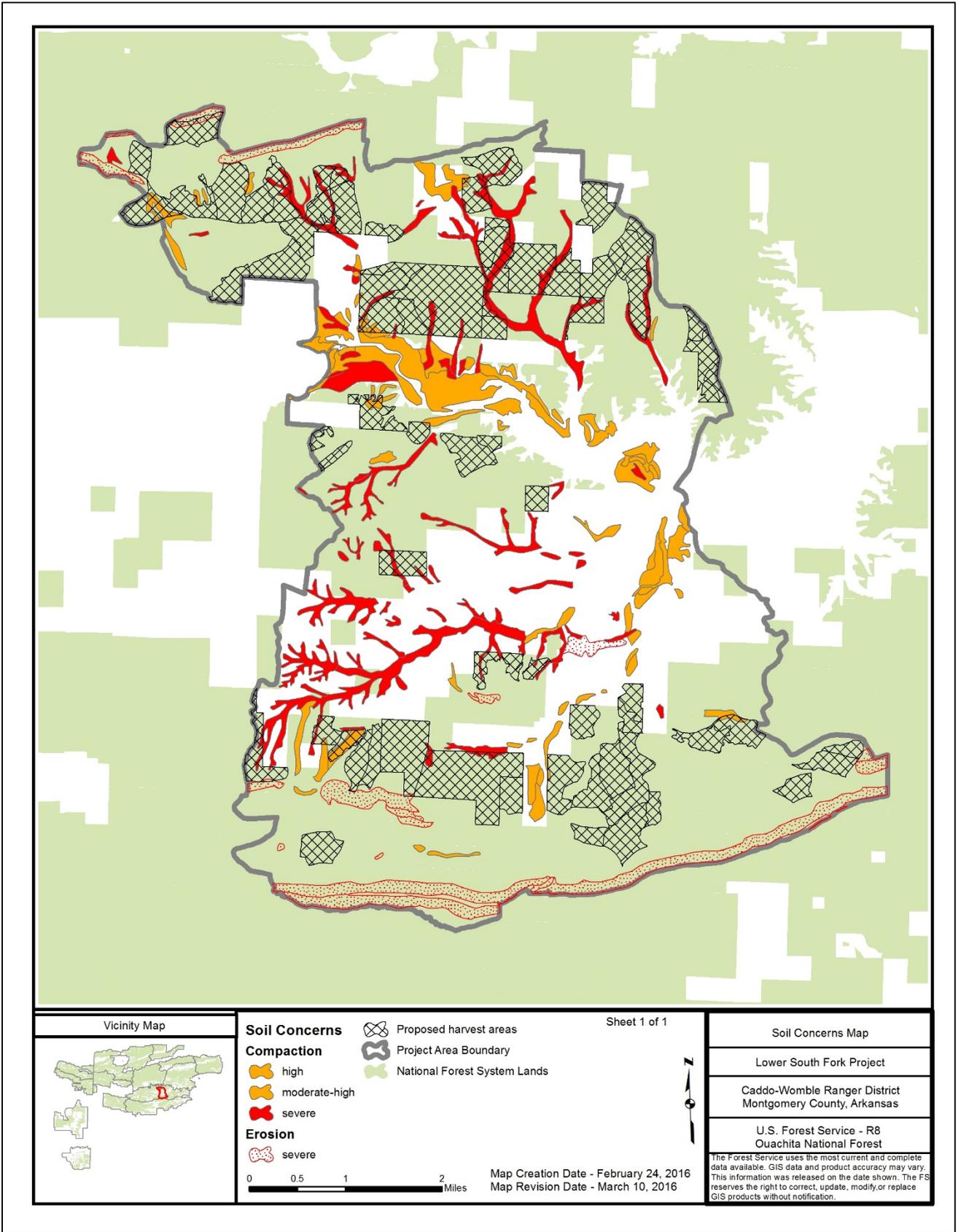


FIGURE 8. SOIL CONCERNS MAP

Ouachita National Forest
 Arkansas and Oklahoma

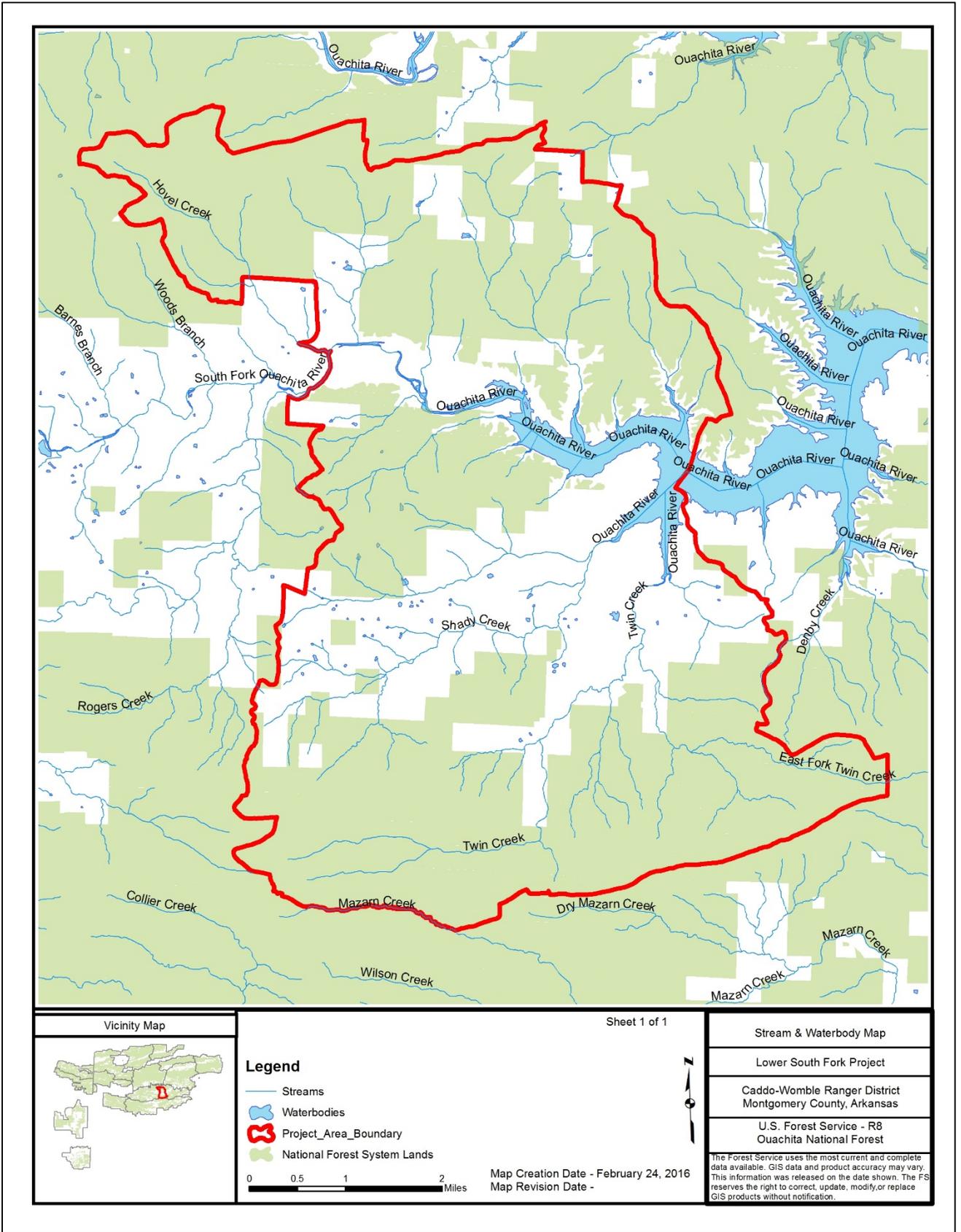


FIGURE 9. WATER RESOURCES MAP

Ouachita National Forest
Arkansas and Oklahoma

