Environmental Assessment

For

Southern Creek Ouachita River Project

Responsible Agency:
US Forest Service, Ouachita National Forest
Mena-Oden Ranger District

Responsible Official:
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Chapter 1
Purpose of and Need for the Proposed Action

Proposed Action

The Mena-Oden Ranger District proposes to implement the following management activities*:

- Commercial thinning – 736 acres
- Seed tree with reserves – 225 acres
- Site preparation by prescribed burn/herbicide or mechanical – 225 acres
- Hand plant shortleaf pine seedlings (if necessary) – 225 acres
- Stand improvement-midstory removal chainsaw/herbicide – 225 acres
- Stand improvement-regeneration release chainsaw/herbicide – 225 acres
- Stand improvement-regeneration precommercial thinning (PCT) chainsaw – 225 acres
- Fuel reduction prescribed burning – 5,460 acres
- Fire line construction – 3.4 miles
- Fire line maintenance – 5.3 miles
- Non-native invasive, exotic and nusance plant species treatment – 5,460 acres
- Wildlife habitat improvement-midstory reduction – 160 acres
- Wildlife pond rehabilitation – 12 ponds
- Wildlife opening rehabilitation – 1 opening
- Nest box installation – 6 units
- Fish passage restoration – 4 crossings
- Stream restoration- ½ mile
- Woodland (Shortleaf Pine Oak and Oak) Restoration by Commercial Thinning, Midstory Reduction and/or Prescribed Burning – 877 acres
- Temporary road construction – 5 miles
- Seasonal OHV user designation change Rd 799 – 4.6 miles
- Road maintenance – 9 miles

*All figures are approximate.

The Southern Creek Ouachita River Project (SCOR) is located in. Township (T) 1 South (S), Range (R) 28 West (W), Sections 19-21 and 28-33; T1S, R29W, Sections 25-27 and 34-36; T2S, R28W, Sections 4-9, 16-20, and 29-32; T2S, R29W, Sections 1-3, 10-15, 22-27, and 34-36; T3S, R28W, Section 6; and T3S, R29W, Sections 1-3 and 10-12 in Polk County, Arkansas. Of the 6,636 acre project area, 5,460 acres are located on National Forest system lands. The SCOR is comprised of Compartments 852, 855, 856, 857, 859 and small portions of Compartments 860 and is approximately 10 miles east of Mena AR. The proposed action will occur in Management Areas (MA) 9, 14 and 17.

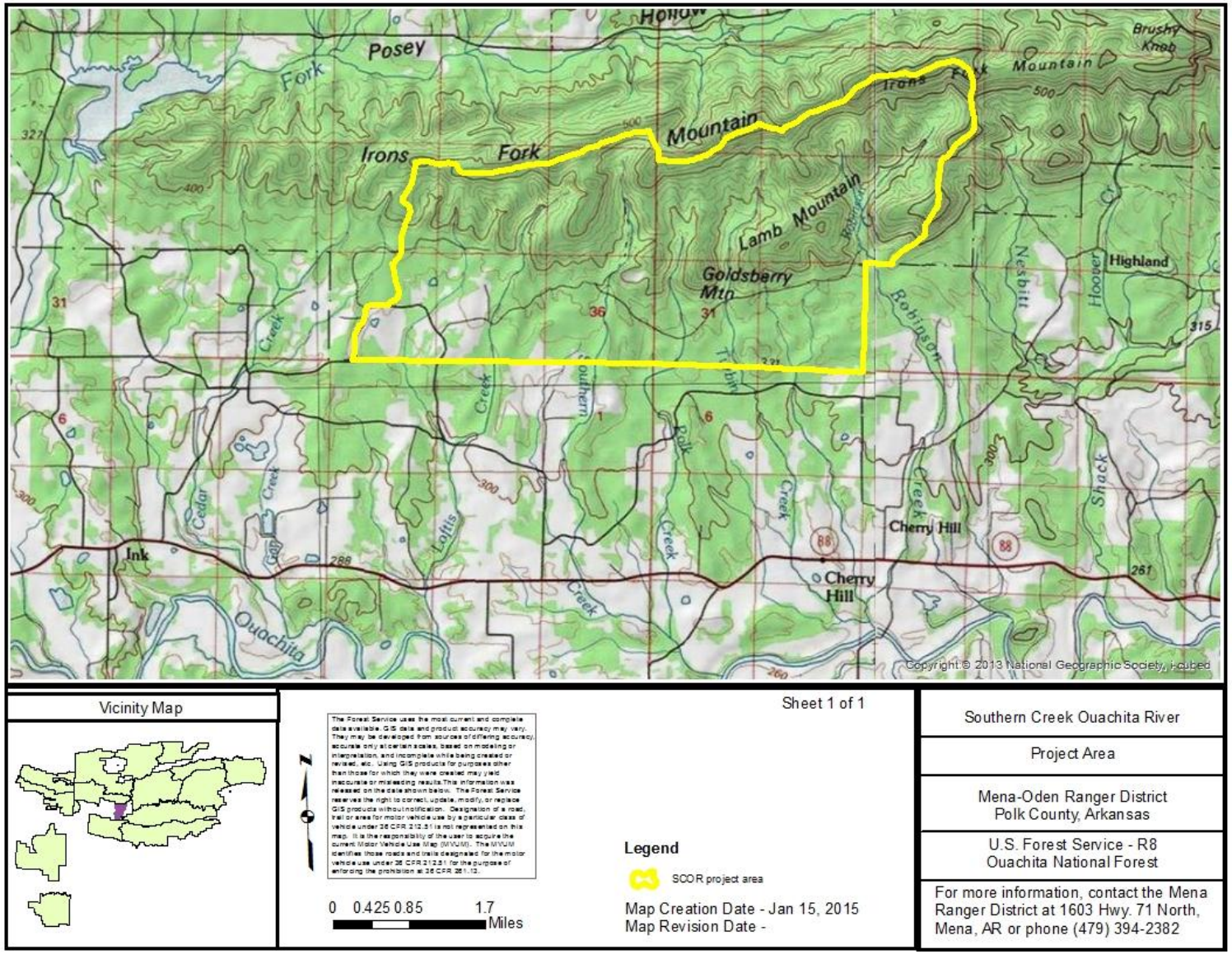

Figure 1.1 SCOR Vicinity Map

Purpose of and Need for the Action

The **purpose** of this action is to restore the health and vigor of the SCOR area. Implementing these activities would provide for a diversity of plant and animal communities throughout the SCOR area, provide early seral habitat in a well-distributed grass/forb or shrub/seedling stage, reduce fuel accumulation, and produce a sustainable yield of wood products.

Need for the Action

- Current conditions in the SCOR area do not meet the desired conditions for the forest Management Areas (MA's) 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 many native plant communities, wildlife foods, and the natural regeneration of pine and oak.
- Pine stands contain damaged, poorly formed and diseased trees. The trees are overcrowded or densely stocked, which reduces 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 permanent 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 within the project area.
- Standing water is not readily available throughout the SCOR area year-round and is needed for consumption by wildlife and as reproductive sites for native amphibian species.
- There is a lack of suitable natural cavities for nesting within the project area.
- Glades are being encroached by cedar trees and non-native plant species that have reduced light reaching the ground and led to an impoverished cover of herbaceous plants.
- There are known populations of exotic and invasive plant species throughout the project area.

Table 1.1. Existing Conditions Contrasted to the Desired Conditions

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed 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 Land and Resource Management Plan, RLRMP, p. 58).	88% of the pine stands and 85% of the pine-hardwood stands within the project area are older than 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.	• Commercial thinning on 736 acres
Grass-forb and seedling-sapling conditions are well represented, particularly in the portions suitable for timber management, where they make up at least 6 percent of the landscape (RLRMP, p.6).	Early seral (0-10 age year) habitat makes up less than 2% of suitable acres.	Provide at least 96 acres (6% of the suitable acres) of early seral (grass-forb or shrub-seedling) conditions.	• 225 acres of regeneration treatments
Where open habitats are not provided by other conditions, develop one permanent wildlife opening, one to five acres per 160 acres of habitat. (RLRMP, WF008 P. 78)	There is a lack of high quality forage and a lack of nesting habitat for species requiring early seral habitat. There is one permanent wildlife opening within the project area.	Provide permanent open habitat for foraging and nesting in the project area.	• Maintain 2 acres of permanent wildlife opening and create and maintain habitat within woodland (877 acres).
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. (RLRMP p. 68)	Pine plantations contain damaged and poorly formed trees. These plantations 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.	• Commercial thinning on 736 acres
Provide for a diversity of plant and	Due to past fire suppression activities,	Increase fire frequency to	• Prescribed burning on

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Activities
animal communities throughout the planning area. • Improve habitat for game and non-game species. (RLRMP, p.20) • Manage for identified natural plant communities. (RLRMP pp. 6-19) • Increase prescribed burning on the forest to help achieve and maintain desired future conditions. (RLRMP, OBJ011 p. 59)	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.	meet desired intervals for various ecosystems present in project area. (RLRMP, Part I) Ouachita Shortleaf Pine-Oak Forest: >= 50% of the community every 5-7 years, with an occasional growing season fire. Ouachita Shorltleaf Pine-Oak Woodland: >= 50% of the community every 4-5 years, with an occasional growing season fire.	5,460 acres • Midstory removal on 160 acres
Reduce fuel loads of National Forest System lands that have the greatest potential for catastrophic wildland fire (RLRMP, p. 68).	Fire suppression has resulted in excessive fuel accumulations, increasing the risk of damage to resources in the event of wildfire.	Minimize the risk of resource damage by reducing fuel loadings.	• Prescribe burn 5,460 acres
Provide nesting structures where suitable natural cavities do not occur and when needed. (RLRMP, WF009, p.79)	There is a lack of suitable natural nesting cavities for wildlife within the project area.	Provide nesting structures throughout the project area.	• Install 6 nesting structures
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. (RLRMP 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.	• 5 miles temporary road construction • 9 miles system road maintenance
Treat forest to eliminate non-native, invasive species. (RLRMP, OBJ03, p. 59)	Non-native, invasive species present within the project area include *Sericea lespedeza* and *Albizia julibrissin.*	Eradicate or control the spread of non-native invasive species across the project area.	• Mechanical removal • Removal with herbicide treatment

Scope of This Environmental Analysis

Relevant Planning Documents

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

- Revised Land and Resource Management Plan (RLRMP or Revised Forest Plan) for the Ouachita National Forest (USDA Forest Service, 2005a)
- Final Environmental Impact Statement (FEIS), Revised Land and Resource Management Plan, Ouachita National Forest (USDA Forest Service, 2005b)
- Travel Analysis Report for the SCOR

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.

Table 1.2. Reference for Revised Forest Plan Standards by Management Area

Management Area Number	Management Area Description	Project Area National Forest System Acres	Revised Forest Plan Reference Management Area Design Criteria*
6	Rare Upland Communities	10	Part 2, p.32; Part 3, p. 102
9	Water and Riparian Area	714	Part 2, p.34; Part 3, pp. 103-108
14	Ouachita Mountains, Habitat Diversity Emphasis	1,759	Part 2, p. 35; Part 3, p. 108
17	Semi-Primitive Area	2,977	Part 2, p. 37; Part 3, p. 111

* Part 3–Design Criteria of the Revised Forest Plan (pp. 73-97) present standards applicable Forest-wide.

History of the Planning and Scoping Process

The SCOR was first listed in the Schedule of Proposed Actions (SOPA) on January 1, 2015. A Project Announcement Letter (PAL) or "scoping letter" was mailed to interested publics on October 20, 2014, requesting input on the proposed actions regarding management of the SCOR area. The PAL was also published to the Forest's website at that time. Comments were received from one individual.

Issues

No site-specific concerns regarding the use of herbicides were raised during scoping; however Forest policy requires analysis of alternatives to herbicide use. For this reason, the following issue 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

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

Alternative Design

Alternatives to be Documented in Detail

Three (3) alternatives were identified by the ID Team and approved by the Responsible Official to be evaluated and documented in detail:

- Proposed Action
- No Herbicide
- No Action

Proposed Action

See Appendix A for list of activities by compartment and stand; see Appendix B for maps displaying activity locations.

Commercial Thinning

Current composition is mostly shortleaf pine with some thicker hardwood patches. These stands would be commercially thinned to a target basal area (BA) of approximately 60 to 70 square feet per acre. Stands less than 30 years of age and those dominated by loblolly pine would generally be thinned to the lower limit of 60 BA per acre. This thinning would improve the existing stand and regulate growth by adjusting stand density through cutting and removal of pine and hardwood trees, while striving to retain healthy, well-formed leave trees. The post-thinning stocking levels would allow for a more advantageous distribution of site resources; thereby, creating vigorous timber stands that are less susceptible to insect and disease infestations. Thinning hardwood species also increases their health and vigor. Hardwood and soft mast species will be released where possible during thinning operations. Post-harvest stocking levels of hardwood species would be maintained at an approximate rate of 10 to 30 percent in pine-dominated stands and approximately 30 to 50 percent in mixed pine and hardwood stands in accordance with Forest Wide Design Criteria FI005 and TH001(Revised Forest Plan).

Seed Tree with Reserves

Seed tree with reserves regeneration methods are designed to obtain natural regeneration from retained seed trees. A seed tree with reserves harvest is the start of a two-aged regeneration method involving cutting of all pine and hardwood trees except for 5 to 15 BA per acre that are widely and uniformly dispersed for seed production. Residual tree composition left within the harvest unit is based on the pre-harvest stand composition and will consist of both overstory pine and hardwood. The quantity of remaining overstory or midstory

hardwoods should be equal to or greater than 5 BA per acre. Leave trees would be retained throughout the life of each stand to ensure a mixed stand composition and supply of wildlife habitat (Forest Wide Design Criteria WF001-WF005, WF007, VM003, VM004, FI005, FR001-FR009, FR011, FR014, TH001)

Site Preparation (Herbicide, Manual or Mechanical, and Prescribed Burning)

Site preparation improves access for planting, reduces competing hardwoods, and prepares a seedbed suitable for desired natural regeneration of shortleaf pine. In stands receiving a seed-tree with reserves regeneration method, preparation of the site for shortleaf pine regeneration would occur in accordance with Forest Wide Design Criteria FR013 (Revised Forest Plan).

Various methods of site preparation involving herbicide, manual or mechanical, and prescribed burning would be used either separately or in combination with one another.

Herbicide

To achieve desired goals for site preparation and release treatments, herbicide application may be necessary. A mixture of herbicides with the active ingredients imazapyr, metsulfuron methyl, glyphosate, and/or triclopyr would best achieve desired condition goals based on past practices. This mixture provides improved control over imazapyr alone, while reducing costs. Triclopyr, metsulfuron methyl, glyphosate, and imazapyr would be applied at the lowest rate necessary to control targeted vegetation and not exceed the label rate. Site-specific risk assessments were conducted using the procedure developed by Syracuse Environmental Research Associates (SERA).

Application methods would include: 1) foliar spray, which involves application of herbicide to foliage of trees and shrubs less than six feet in height; 2) frill treatment, which involves application of herbicide by spray bottle into cuts that expose the tree's sapwood; and 3) cut-stump treatment, which involves application of herbicide by spray bottle to the surface of cut stumps. Application of foliar-spray methods would be made during the spring and summer seasons when vegetation is green and growing. Cut-surface treatments, which include frill and cut-stump treatments, however, are not dependent upon time of year (Revised Forest Plan - Forest Wide Design Criteria HU001-HU016, HU018).

Manual
Manual treatments consist of hand-operated tools (e.g., chainsaws) to cut or girdle overstory and midstory vegetation and herbicides in combination with manual ground tools as a means to aid delivery of herbicide into the cambium (see "***Herbicide***") (Revised Forest Plan - Forest Wide Design Criteria FR013).

Mechanical
Mechanical methods include mechanical scarification (where prescribed burning is not feasible) raking, piling, and mechanical ripping (if natural regeneration were deemed unsuccessful) (Forest Wide Design Criteria FR013).

Prescribed Burning
The regeneration harvest and shortleaf pine forest restoration areas would receive a site preparation burn separately or within fuel reduction burn units depending on location. This burning involves application of controlled, moderate to high intensity fire to control competing vegetation (hardwoods), reduce accumulated leaf litter and preparation of sites for seeding and/or hand planting. Site-preparation burns are implemented during the time between leaf emergence and leaf fall. Vegetation three inches and less in diameter at the ground level would be targeted for higher rootstock eradication. This will result in less competition for pine seedlings and other desirable fire dependent species, while creating an open understory.

Prescribed burning would aim to maintain 10-20 percent of hard mast producers. The pretreatments, if any, would retain all soft mast producing species present in order to sustain their presence subsequent to prescribed burning.

Hand Planting with Shortleaf Pine
Planting may be used on a case-by-case basis to accomplish desired stocking levels. Shortleaf pine seedlings would be planted in loosened soil created by a mechanical ripper mounted on a bulldozer in order to take advantage of microsites and increase seedling survival. Tree spacing would be adjusted based on past regeneration survival percentages (Forest Wide Design Criteria FR007).

Timber Stand Improvement by Release
Release operations are treatments conducted to regulate species composition and improve quality of young stands. Release of shortleaf pine seedlings from undesirable vegetation would occur in those stands scheduled for regeneration cuttings. Those stands would receive this treatment within three to five years of stand establishment.

Manual treatments (e.g. chainsaws or machetes) would be used when boles of desired trees are not shaded. Herbicide methods—specifically foliar applications and/or cut-surface treatments (see "***Herbicide***")—would be used when competing vegetation is more than half the height of desired regeneration and, therefore, shading the boles. The hardwood patches would receive thinning in order to provide areas for mast production at the approximate rate of 20 percent in each stand (Revised Forest Plan - Forest Wide Design Criteria FI001-FI004).

Timber Stand Improvement by PCT

Precommercial thinning (PCT) is the removal of trees not for immediate financial return but to reduce stocking to concentrate growth on…more desirable [shortleaf pine] trees (Helms 1998). This treatment would be performed manually using chainsaws or machetes in order to release shortleaf pine trees from other shortleaf pine trees in favor of better spacing [e.g. 250-500 trees per acre (Revised Forest Plan – Table 3.5)].

Firewood Areas

Firewood cutting would be available in those stands culturally treated with the objective of reducing the amount of existing hardwood for regeneration or wildlife stand improvement (Revised Forest Plan - Forest Wide Design Criteria FW001, FW002).

Wildlife Stand Improvement by Midstory Reduction

The goal of midstory removal is to thin out mid-canopy vegetation to increase growth of understory forbs, grasses, and shrubs, to enhance wildlife forage, and increase growth and vigor of overstory mast producers. Stands would be thinned from below to approximately a seven-inch diameter at breast height (DBH); however, determining which trees would be removed would be based more upon individual tree crown location and how the crown is shading the understory rather than on a DBH limit. Therefore, trees larger than seven inches DBH would occasionally be removed. Although the purpose is mainly to reduce a hardwood midstory layer, hardwoods would be retained following Revised Forest Plan standards.

Non-native Invasive, Exotic and Nusance Plant Species Treatments

Manual treatments and herbicide treatments would be applied to all areas within the project area as needed to control and or eliminate the spread of non-native invasive, exotic and/or nusance plant species (e.g., tall fescue, sericea lespedeza, autumn olive, honey suckle, privet). These treatments would include use of approved USDA herbicides and manual treatments such as prescribed fire, mid-story reduction, mowing/weed-eating, girdling and manual uprooting, mechanical or similar treatments.

A mixture of herbicides containing one or more of the active ingredients clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr and an adjuvant for increased control would be used to eradicate noxious

weeds. This application provides for control of undesired non-native invasive and noxious plant species and aids in the release and establishment of native plant species.

Fish Passage Restoration

Proposed fish passage restoration would include activities such as addition of drainage structures, culvert replacement, and/or addition of riprap along with possible road reconstruction and/or crossing reconstruction.

Wildlife Opening Rehabilitation

Existing wildlife openings and right of ways would be treated with a mixture of herbicides or manual methods in order to control non-native invasive plants and woody encroachment (see non-native invasive treatment above). Once herbicide treatments are complete existing openings would be disked, fertilized, limed and seeded with native grasses/plants to provide enhanced foraging opportunities for wildlife.

Pond Rehabilitation

Existing wildlife ponds would be restored. Ponds would be reshaped and cleared of trees and brush, and failing dams would be repaired. Disturbed soils would be seeded and or planted with native species fertilized, limed and mulched to provide enhanced foraging opportunities for wildlife.

Fuel Reduction Prescribed Burning

The project area has been divided into 3 burn units ranging in size from 1,675 to 2,807 acres, for a total of approximately 5,460 acres. Each burn unit will be treated with controlled broadcast fire approximately every 1 to 5 years during either the growing or dormant season. This recurring schedule will be on a continuous basis and extend indefinitely beyond the 10-year period during which other proposed management activities will occur. Prescribed burning is a key management tool to achieve improved Fire Regimes and Condition Classes for National Forest lands (Revised Forest Plan - Forest Wide Design Criteria PF001-PF006)

Growing Season

Growing Season burning involves application of controlled, moderate to high intensity fire to control competing vegetation (hardwoods), prepare sites for seeding, and perpetuate fire dependent species (e.g., shortleaf pine). Other added benefits would include reducing accumulated fuels, stimulating growth of native vegetation, and improving wildlife habitat. These burns are implemented during the time between leaf emergence and leaf fall. Vegetation three inches and less in diameter at the ground level would be targeted for higher rootstock eradication. This will result in less competition for pine seedlings and other desirable fire dependent species, while creating an open understory, stimulating growth of native grasses and forbs, and increasing foraging for browsing animals.

Dormant Season

Dormant Season burning involves application of controlled, low intensity fire to reduce accumulated fuels, stimulate growth of native vegetation, and improve wildlife habitat. There would be approximately 80 percent coverage in areas to be burned, with expected fuel reduction of approximately 30 percent. Some duff would be retained for soil protection. Vegetation 1¼ inches in DBH and less in diameter would be targeted for reduction to create an open understory, stimulating growth of native grasses and forbs, and increasing foraging for browsing animals.

Prescribed burning, and treatments preceding the burns, would aim to maintain 10-20 percent of hard mast producers. The pretreatments, if any, would retain all soft mast producing species present in order to sustain their presence subsequent to prescribed burning (Revised Forest Plan - Forest Wide Design Criteria PF001-PF006).

Fireline Construction

Firelines would be constructed to contain the prescribed burns. Firelines would be waterbarred and seeded after use to control erosion and provide temporary linear openings for wildlife (Revised Forest Plan - Forest Wide Design Criteria PF005).

Fireline Reconstruction

Existing firelines or temporary road construction prisms would be reconstructed to contain the prescribed burns. Fireline would be waterbarred and seeded after use to control erosion and provide temporary linear openings for wildlife (Revised Forest Plan - Forest Wide Design Criteria PF005).

Stream Restoration

Eroding areas of stream banks would be restored using various stabilization and sedimentation control methods such as; rip-rap, root wads, log cribbing, seeding, plantings and mulching etc. Unauthorized Road access to the stream will be closed.

Dispersed Campsite Closure

Dispersed campsites within this watershed may be closed due to soil compaction, active erosion, sedimentation, and aquatic or heritage resource concerns and unauthorized road and trail use. (Forest Wide Design Criteria SW008)

Unauthorized Road – Close and Decommission

Unauthorized roads and trails (user created all-terrain vehicle (ATV), off-highway vehicle (OHV)) would be closed and decommissioned. Methods of decommissioning range from blocking the road entrance (earthen mound) to full obliteration, which includes closing, re-seeding, mulching and re-contouring slopes to natural condition, and using water diversion methods to prevent additional soil erosion and watershed resource damage. (Forest Wide Design Criteria TR005 and TR007)

Resource Protection – Gate or Berm Installation
Access roads or entrances to; wildlife openings, abandoned mines, and unauthorized roads added to system, system roads permanently closed and system roads closed and decommissioned would have gates or berms installed to protect soil, water, wildlife resources and reduce existing open road density.

Temporary Road Construction
Approximately 5 miles of temporary road would be constructed to access and haul timber from stands proposed for commercial harvest. After use, these temporary roads would be closed with earthen berms and seeded (Revised Forest Plan - Forest Wide Design Criteria TR001, TR004, TR007-TR009, TR013, and TR015-TR018).

Road Maintenance
There are approximately 9 miles of existing classified road that would require general road maintenance. This maintenance includes slide and slump repair, surface blading, spot surfacing with gravel, maintenance of drainage structures, ditch cleaning and clearing the roadside of vegetation (Revised Forest Plan - Forest Wide Design Criteria TR011).

No Herbicide
This alternative addresses Forest direction requiring analysis of an alternative to herbicide use when feasible and practical to accomplish management purposes. The No Herbicide Alternative is the same as the Proposed Action except that mechanical methods or chainsaws and other hand tools, instead of herbicide application, would be utilized for site preparation, release, midstory removal, overstory development, and control of non-native invasive plants.

No Action
No-Action does not mean that activities in the project area would not occur. Road maintenance for public safety would continue. The area would continue to be accessible for outdoor recreation purposes. The Forest Service would respond to wildfires. Salvage operations and/or suppression of insect or disease outbreaks could take place. It is also possible that management activities qualifying as categorical exclusions (36 CFR Part 220) could take place in the project area.

Technical Requirements

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

Cultural Resources

HP1: Site Avoidance During Project Implementation

Cultural sites 3PL1575 (Comp. 852), 3PL664, 3PL666, 3PL736, 3PL1017, 3PL1020(Comp. 855), 3PL525, 3PL647, 3PL649, 3PL735(Comp. 856) 3PL1573, 3PL1574, and 3PL265(Comp. 859) within the Southern Creek Ouachita project area are

potentially eliglible for inclusion in the National Registar of Historic Places (NRHP) and will therefore be protected. Cutural site 3PL265 within the Southern Creek Ouachita project area has an undetermined NRHP eligibility and therefore will be protected. For cultural resource sites that are eligible for NRHP inclusion and for sites that the NRHP eligibility is undetermined: avoidance of historic properties would require the protection from effects resulting from the undertaking. Effects would be avoided by establishing clearly defined site boundaries and buffers around archeological sites where activities might result in an adverse effect. Buffers would be of sufficient size to ensure that integrity of the characteristics and values which contribute to the properties' significance would not be affected.

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 greatly 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)
This standard applies to operations in the following stands: **Compartment 855 Stand 82 and Compartment 859 Stand 66** which are currently under private ownership**.**

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)
This standard applies to operations in the stands displayed in the table below.

Table 2.1. Stands With a Limited Operating Season

Compartment	Stand
855	6
855	9
855	10
855	8
856	7
857	12
857	2

Compartment	Stand
857	1
857	15
859	21
859	8
859	15
859	2
859	14

Compartment	Stand
859	18
859	13
859	9
859	12
859	1
859	22

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.

Alternatives Considered But Eliminated from Detailed Study

Proposed Action without Harvest Activity

An alternative similar to the Proposed Action but without harvest applications was considered by the ID Team but eliminated from detailed analysis because the ID Team concluded that a No Action Alternative adequately addressed the overall effects of a no harvest alternative.

Proposed Action without Prescribed Burning

An alternative similar to the Proposed Action, but without the application of prescribed burning (other than existing authorized burn decisions), was considered by the ID Team but eliminated from detailed analysis. The ID Team concluded that a No Action Alternative adequately addressed the overall effects of a no prescribed burning alternative.

Other Past, Present, and Reasonably Foreseeable Future Actions

A 2007 decision for the Upper Irons Fork Project, situated adjacent to the northern boundary of the project area, authorized ecosystem management activities, including 900 acres of timber harvest and 11,570 acres of prescribed burning. A 2013 decision for the Big Fork Project, on the Womble Ranger District located just to the southeast of the Project, authorized ecosystem management activities, including 1,041 acres of timber harvest and 10,158 acres of prescribed burning. These decisions are currently being implemented.

Salvage operations and/or suppression of insect or disease outbreaks would be authorized under the following decisions: Environmental Assessment for Salvage of Dead, Down,and or Damaged Timber (2007); Implementation of Suppression for Control of Southern Pine Beetle and Other Bark Beetles (2013)

Summary Comparison All Alternatives

The following tables provide a comparison of alternatives utilizing both quantitative and qualitative measures.

Table 2.2. Summary Comparison of Management Activities by Alternative

Activity and Measure	Proposed Action	No Herbicide	No Action
Commercial Thinning (acres)	736	736	0
Seed Tree with Reserves (acres)	225	225	0
Site Preparation by Herbicide, Manual or Mechanical (acres)	225	225	0
Hand plant shortleaf pine seedlings (acres)	225	225	0
Stand Improvement Regeneration Release (Chainsaw and Herbicide) and PCT (Chainsaw only) (acres)	225	225	0
Firewood Areas	As needed	As needed	As needed
Prescribed Burning Fuel Reduction (acres)	5,460	5,460	0
Fireline Construction (miles)	3.4	3.4	0
Fireline Reconstruction (miles)	5.3	5.3	0
Woodland (Shortleaf Pine Oak and Oak) Restoration by Commercial Thinning, Midstory Reduction and/or Prescribed Burning (acres)	877	877	0
Central Interior Highlands Dry Acidic Glade and Barrens Restoration by Prescribed Fire (acres)	2	2	0
Central Interior Acidic Cliff and Talus Restoration by Prescribed Fire (acres)	8	8	0
Fish Passage Restoration (crossings)	4	4	0
Wildlife Pond Rehabilitation (ponds)	12	12	0
Wildlife Opening Rehabilitation (acres)	2	2	0
Nest Box Installation (boxes)	6	6	0
Wildlife Habitat Improvement Midstory Reduction (acres)	160	160	0
Non-native Invasive, Exotic, and/or Nusance Plant Species Treatment (acres)	5,460	5,460	0
Stream Restoration (miles)	½ mile	½ mile	0
Dispersed Campsite Closure (sites)	As needed	As needed	0

Unauthorized road –Close and Decommision (miles)	As needed	As needed	As needed
Road Closure Gates or Berms	As needed	As needed	As needed
Seasonal OHV user designation change Rd 799 (miles)	4.7	4.7	0
Temporary Road Construction (miles)	5	5	0
Road Maintenance (miles)	9	9	0

Table 2.3. Summary Comparison of Effects on Environment by Alternative

Effect	Proposed Action	No Herbicide	No Action
Revenue/Cost Ratio	7.2	6.5	N/A
Open Road Density	1.3	1.3	1.3
Soil Loss Below Threshold	Yes	Yes	Yes
Potential Risk to Beneficial Uses Southern Creek- Ouachita River *80401010201*	High	High	High
Acres of Early Seral Habitat Created	225	225	0

Chapter 3
Affected Environment and Environmental Consequences

Analysis Methods

Air Quality – Calculations of emissions from the proposed project were conducted to assess the increase in emissions loading in the project area and throughout the state. The emissions were calculated using a range of consumption values (in tons per acre) for each unit based on best available information and professional judgment (Region 8 Air Quality Specialist Melanie Pitrolo).

Soils – The Ouachita National Forest Universal Soil Loss Equation (USLE) model was used to predict whether soil loss from proposed management actions would be below maximum allowable thresholds. The model was developed by ONF personnel, and modified by Forest Soil Scientists.

Water Quality – The Aquatic Cumulative Effects (ACE) model was used to determine the possible cumulative impacts of management activities on water quality. This model addresses the effects of timber harvesting, roads and wildlife management activities on water quality and fisheries. The model calculates sediment loadings resulting from proposed management activities. The model also assigns a risk rating of low, medium or high for adverse effects to aquatic beneficial uses. The model was developed for the Ouachita National Forest in Arkansas and Oklahoma and is specific to the physiographic zones within the Ouachita National Forest.

Financial Efficiency – Quick-Silver (version 7.0) was used to determine the financial efficiency of each Alternative. This program is a project analysis tool that utilizes a Microsoft Access database for use by forest managers to determine the economic performance of long-term investments.

Public Health and Safety – SERA (Syracuse Environmental Research Associates, Inc.) Pesticide Human Health and Ecological Risk Assessments were used to analyze the risks associated with the herbicides proposed for use in this project. Project specific SERA worksheets were completed for herbicides clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr to determine HQs (Hazard Quotients) for the proposed application rates of these herbicides. An HQ is the ratio of a projected level of human exposure divided by some index of acceptable exposure or an exposure associated with a defined risk. HQs of 1.0 or less indicate scenarios with acceptably low risk.

Management Indicater Species –Selected terrestrial management indicator species were modeled using the CompPATS wildlife habitat capability model (HCM) to compare habitat capabilities for each alternative.

Air Quality

Current Conditions

Air pollution is the presence in the atmosphere of one or more contaminants of a nature, concentration, and duration to be hazardous to human health or welfare (Sandberg and others 1999). Air quality is a measure of the presence of air pollution. Ambient air quality is defined by the Clean Air Act as the air quality anywhere people have access, outside of industrial site boundaries. National ambient air quality standards (NAAQS) are standards of air quality designed to protect human health or welfare and are applied to six criteria pollutants. Although the proposed project includes several different activities, not all proposed activities result in air emissions. Thus, this air analysis will only focus on the one proposed activity, prescribed burning, that results in an increase in air emissions.

Emissions from wildland fire include carbon dioxide, water, carbon monoxide, particulate matter, hydrocarbons or volatile organic compounds, and nitrogen oxides. Carbon monoxide is the most abundant pollutant emitted from wildland fire. It is of concern to human health, because it binds to hemoglobin in place of oxygen and leads to oxygen deprivation and all of the associated symptoms, from diminished work capacity to nausea, headaches, and loss of mental acuity. Carbon monoxide concentrations can be quite high adjacent to the burn unit, but they decrease rapidly away from the burn unit toward cleaner air. Carbon monoxide exposure can be significant for those working the line on a prescribed fire, but due to rapid dilution, carbon monoxide is not a concern to urban and rural areas even a short distance downwind. Nitrogen oxide (NOx) emissions from wildland fires are very small, and hydrocarbon emissions are moderate. Alone they are not very important to human health, but they are precursors to the criteria pollutant, ozone. Ozone is formed in the atmosphere when nitrogen oxides and hydrocarbons combine in the presence of sunlight. Fire-related NOx and hydrocarbon emissions become more important to ozone levels only when other persistent and much larger pollution sources already present a substantial base load of precursors. The most important pollutant from wildland fire emissions is fine particulate matter ($PM_{2.5}$) due to the amount emitted and the effects on human health and visibility (Hardy et al. 2001). The term fine particulate refers to particulate matter 2.5 microns or less in diameter.

Under the Clean Air Act, the Environmental Protection Agency (EPA) establishes air quality standards to protect public health, including the health of "sensitive" populations such as people with asthma, children, and older adults. EPA also sets limits to protect public welfare. This includes protecting ecosystems, including plants and animals, from harm, as well as protecting against decreased visibility and damage to crops, vegetation, and buildings. EPA has set national air quality standards for six common air pollutants (also called the criteria pollutants):

- ozone (O^3)
- particulate matter (PM)
- carbon monoxide (CO)
- nitrogen dioxide (NO^2)
- sulfur dioxide (SO^2)
- lead (Pb)

If the air quality in a geographic area meets or is cleaner than the national standard, it is called an attainment area; areas that don't meet the national standard are called nonattainment areas. If an area is designated as nonattainment, it signifies that the air in the area is unhealthy to breathe.

The criteria pollutants of most concern on the Ouachita National Forest are particulate matter and ozone. Fine particulate matter is the leading cause of regional haze (also known as visibility impairment), while ozone can harm sensitive vegetation within the forest. Additionally, at elevated concentrations these two pollutants can impair the health of both employees of and visitors to the National Forest. Arkansas and Oklahoma state air regulators monitor ozone and fine particulate matter at several locations near the proposed project. Specifically, ozone monitoring is conducted in Polk County in Arkansas, and in McCurtain County, Oklahoma. Fine particulate matter monitoring is conducted in Polk County, Arkansas. None of these monitors have measured values greater than the air quality standards (NAAQS) set by EPA. Additionally, it should be noted that none of the counties where this project is proposed are designated nonattainment for any criteria pollutants, including ozone and particulate matter.

OZONE

Meeting ozone standards provides important public and environmental health benefits. EPA has worked closely with states and tribes to identify areas in the country that meet the standards and those that need to take steps to reduce ozone pollution. EPAs final designations are based on air quality monitoring data, recommendations submitted by the states and tribes, and other technical information. Most of Arkansas is listed as **Unclassifiable /Attainment**. Polk County, Arkansas, falls within this category. See the adjacent map. (Environmental Protection Agency / 2008 Ground-level Ozone Standards as required by the Clean Air Act Region 6 Final Designations, April 2012)

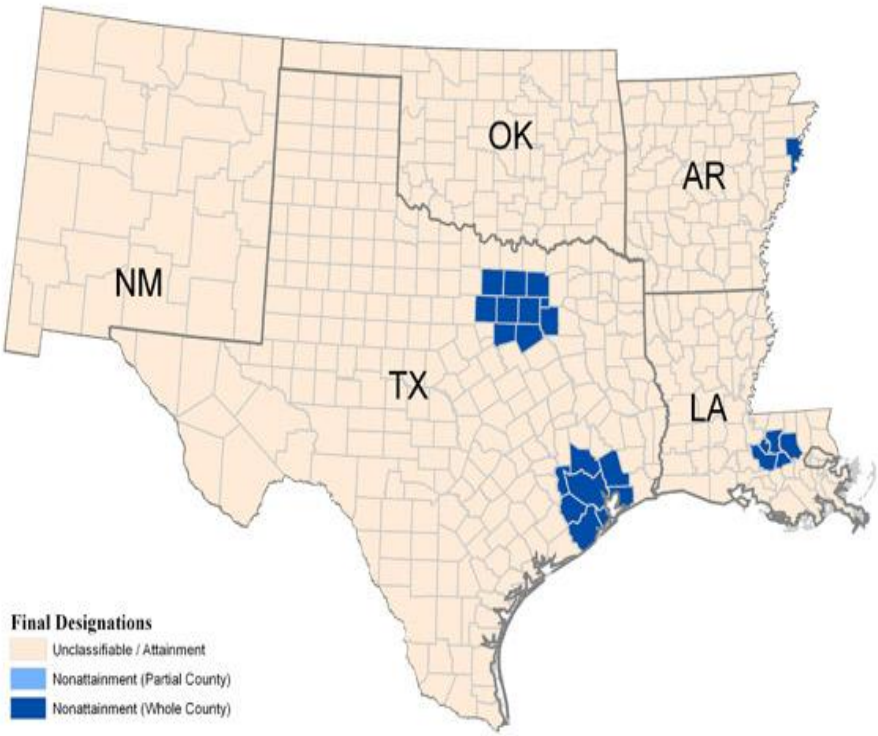

Figure 2.1. Map of final designations - EPA region 6

http://www.epa.gov/ozonedesignations/2008standards/final/region6f.htm

While air quality monitoring describes ambient pollution levels, emissions inventories provide information on the contribution of various pollution sources to total emissions for specific geographic areas. Emissions from prescribed fires are unlikely to be a significant contributor to ozone. In much of the rural South, ozone formation tends to be NOx-limited and prescribed fires are usually not a major NOx source when compared to others, such as vehicles. Also, the amount of NOx and Volatile Organic Compounds (VOC) coming from forestry activities is small compared to other sources. And most importantly, weather and climate conditions in this area tend to preclude prescribed burning from becoming a significant contributor to ozone formation. Most ozone events occur in mid-spring through late summer when hot temperatures and high-pressure air masses may stagnate over an area, and pollution is not dispersed. Prescribed burning is not typically conducted under these types of weather conditions because of the smoke dispersion issues.

Direct & Indirect Effects

Proposed Action

Fine particulate matter is emitted from prescribed fires and is a contributor to ambient levels of this pollutant. Within the county where burning is proposed, prescribed fire emissions currently account for nearly 77% percent of all fine particulate emissions (1,257 tons/year from fires compared to 1,642 tons/year total emissions). In the state of Arkansas, prescribed fire emissions account for 50.6% of all fine particulate matter emissions (72,256 tons/year from fires compared to 142,824 tons/year total emissions). Other sources of fine particulate emissions include fuel combustion and operations at industrial facilities, waste disposal and recycling operations, construction, and agricultural activities. The source for the above data is EPA's National Emissions Inventory for 2011, available online at http://www.epa.gov/air/emissions/index.htm

Calculations of emissions from the proposed project were also conducted to assess the increase in emissions loading in the project area and throughout the state. The emissions were calculated using a range of consumption values (in tons per acre) for each unit based on best available information and professional judgment (Region 8 Air Quality Specialist Melanie Pitrolo). Consumption is assumed to be between two and four tons per acre, with an average emission factor of 12 pounds of fine particulate matter per ton of fuel consumed. Calculations of emissions from the proposed units show that the resulting emissions increase as a result of this project range from 65.5 tons per year to 131 tons per year. This is a resulting increase of between 4% – 8% in the county where the project is proposed, and less than 0.1% increase in state-wide emissions.

All prescribed burning activities on the Ouachita National Forest, including those proposed in this action, are conducted in accordance with the State Smoke Management Guidelines in order to alleviate the smoke related impacts outlined above. Smoke management planning in accordance with the State 8 Smoke Management 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 will be necessary in order to go forward with the burn. Each burn unit will be planned in accordance with the Guidelines such that specific parameters are met, including wind speeds and directions. While a few larger units have the potential to transport smoke beyond the National Forest, potential impacts will be mitigated by burning with a wind direction away from the Forest boundary.

Mitigation measures in the form of 'priorities and objectives' and 'design criteria' (Revised Forest Plan, pgs. 62-69 and 73-97) are included under all action alternatives to minimize potential for these effects. Key is the development of a burning plan prior to implementation that considers wind direction and other smoke dispersal factors. A burning plan would be prepared for each burn to ensure that the combustion products (smoke) do not intrude into smoke-sensitive areas. Burning would only occur when conditions are right for adequate smoke dispersal away from smoke sensitive areas (burn plan would address prescription parameters). Proposed burn areas under the Proposed Action are large enough for efficient burning and small enough to allow burning to be completed by mid-afternoon (1500–1630 hrs), so that most smoke is dispersed by nightfall when smoke tends to sink down slope into valleys. Prescribed burning would be spread over time and space to minimize local cumulative smoke effects. With these measures, effects from smoke under the Proposed Action are expected to be small and within federal and state acceptable levels.

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 State Smoke Management 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.

No Herbicide

The effects on air quality would be the same as the Proposed Action. The only difference between the Proposed Action and this alternative is that herbicide use is not proposed in this alternative.

No Action

There would be no direct effects to air quality with this alternative. Indirectly, large wildfires could occur with the natural accumulation of fuels. This alternative does not include prescribed burning and therefore would have negligible potential for affecting air quality other than that which may occur under a wildfire situation. Smoke hazards from a reduced visibility and nuisance perspective have the potential to be increased due to the accumulation build-up of unburned fuels.

Cultural and Historical Resources

Current Conditions

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 proposed 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 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.

Direct & Indirect Effects

Proposed Action and No Herbicide

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.

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). In that instance, project activities would not be expected to adversely affect archeological sites.

No Action

Currently, archeological surface and subsurface site integrity in the project area is subject to adverse effects from the buildup of hazardous fuels and the potential decline of unmanaged forest. These conditions pose the potential for increased tree mortality and wildfire occurrence and intensity. Fires occurring in areas with dense concentrations of combustible material have the potential to burn with greater than normal intensity and duration, thereby altering the physical integrity and/or research value of archeological sites or site components. Resulting soil exposure can lead to an increase in erosion, thus disturbing or leading to a loss of archeological soil matrices and/or site components. Sites in currently accessible areas, such as along roads, are vulnerable to disturbance or vandalism due to accessibility. 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

Proposed Action and No Herbicide

There would be no additive effect from this project because there are no past, present or reasonably foreseeable future actions affecting cultural resources.

No Action

There would be no change in effects from the current condition; there would be no cumulative effects.

Recreation, Scenery, Wilderness, Roadless Areas

Current Conditions

There are no developed recreation areas or trails within the project area. For the most part, hunting, camping, and scenic automobile touring are dispersed throughout the project area. Hunting and associated hunter camps are the predominant recreational activity. Scenic Integrity Objective (SIO) levels include high (0%), medium (85%), and low (15%). The closest wilderness area, Caney Creek Wilderness , is located approximately 15 miles south of the project area. The closest inventoried roadless area, is located approximately 5 miles north of the project area.

Direct & Indirect Effects

Proposed Action and No Herbicide

Forest visitors may experience disturbance by the sights and sounds of logging trucks and harvest operations. They may be temporarily displaced during prescribed fire activities.

Increases in wildlife food sources due to prescribed burning and wildlife habitat improvement may result in enhanced hunting and wildlife viewing opportunities. In the short term, vegetation removal through harvest, wildlife habitat improvement, stand improvement, and prescribed burning would negatively impact the scenic quality of the area. These management activities would result in dead and dying vegetation, slash and root wads. In the long term, these same activities would provide a more open view of the forest, enhancing the viewing depth. The Scenery Treatment Guide – Southern Regional National Forests (April 2008) would be followed to reduce impacts to scenic quality. There would be no effects on roadless or wilderness areas because of their distance from management activities.

No Action

Without vegetation management activities, there is a greater chance of large-scale, unmanaged impacts to recreation and scenery resources from wildfire, and insect and disease outbreaks.

Cumulative Effects

There would be no cumulative effects resulting from any of the alternatives, because there are no other past, present, or reasonably foreseeable future actions that would result in additional effects on this resource.

Local Economy and Financial Efficiency

Current Conditions

The manufacturing industry is the largest employer in Polk County (14% of total jobs) followed by health care (12%), and retail trade (11%). Government comprises 13% of total jobs. Jobs associated with timber (growing and harvesting, sawmills and paper mills, and wood products manufacturing) make up 1.8% of total jobs in the county. Forest Service land comprises 37% of the county's land base (Headwaters Economics, 2014).

Direct & Indirect Effects

Proposed Action and No Herbicide

Many management actions are performed by contractors (site preparation, stand improvement, etc.). These activities would provide jobs to the local community and create a stream of revenue to local businesses.

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 involved with timber management (site preparation, timber sale administration, road maintenance, etc.) Revenues are generated from the sale of timber. QuickSilver7 was used to evaluate the financial efficiency of each alternative; these results are displayed in the table below.

Table 3.1. Comparison by Financial Efficiency

Financial Measure	**Proposed Action**	**No Herbicide**
Present Value of Revenues ($)	$1,748,240.68	$1,748,676.40
Present Value of Costs ($)	-$242,818.61	-$267,108.80
Present Net Value ($)	$1,505,422.07	$1,481,567.60
Revenue/Cost Ratio	7.2	6.5

The Revenue/Cost Ratio is highest for the Proposed Action. Past practice has shown that manual release usually requires re-treatment; therefore a follow-up release (no herbicide) treatment was included in the analysis for those acres proposed for manual release.

No Action

No additional jobs or revenue would be generated for the local community.

Cumulative Effects

Proposed Action and No Herbicide

In 2017, ecosystem management activities, including timber harvests, will be implemented on 736 acres in Polk County by the Ouachita National Forest. The economic effects of the Proposed Action and No Herbicide Alternative would be additive to the jobs and revenue provided by these ongoing and future activities.

No Action

Future Forest Service contracts located within Polk County would occur, but there would be no additive effects on the local economy from not implementing the proposed actions.

Transportation and Infrastructure

Current Conditions

The project area encompasses approximately 6,636 acres (1,176 acres of privately owned and 5,460 acres of Forest Service lands). There are approximately 10 miles of road in the project area; 8 miles are designated as National Forest system roads. Project area roads also include 2 miles of Polk County roads. Approximately 4.6 miles of NF system roads in the project area are open to highway legal vehicles only, 2.3 miles of NF system roads are closed (administrative use only). There are no designated trails within the project area.

Open Road Density (ORD) is calculated by converting the acres within the project area into square miles (total acres/640 acres) and then dividing that figure into the linear measure of open roads within the project area. Any open road, regardless of jurisdiction, contributes to a project area's open road density. Many of the open roads within the project area are under county jurisdiction and cannot be closed because they serve as important travel ways for people and goods. The ORD for the project area is 0.76 miles per square mile for NFS lands (1.3 miles per square mile on all lands).

Direct & Indirect Effects

Proposed Action and No Herbicide

There would be no change in ORD from these actions. Public motor vehicle use designations would change on Rd 799 to allow for seasonl OHV use. Temporary roads would be closed and obliterated after management activities are completed. Unauthorized user-created trail may be gated, bermed, and or decommissioned as per the Revised Land and Resource Management Plan. Four road crossings within the project area would be rehabilitated.

No Action

Other than routine road maintenance, no other transportation-related activities would occur.

Cumulative Effects

There are no other past, present or reasonably foreseeable future actions within the project area that would contribute effects to the transportation system.

Soil Resource

Current Conditions

The Southern Creek, Ouachita River Project Area lies within the Central Mountain Subdivision of the Ouachita Mountains Physiographic Region. The topography and soils of this project area are derived primarily from geology and subsequent geomorphological and pedological processes. Topographic features of the area consist of gently sloping (3 to 8%) to moderately sloping (8 to 15%) hills and steep (15 to 35%) to very steep (>60%) mountains with undulating (3 to 15%) ridge tops, and nearly level (0 to 3%) floodplains to gently

sloping (1 to 8%) stream terraces. Elevations range from just over 1,000 feet to more than 2,000 feet above mean sea level. Two major geologic formations underly the project area. The Jackfork Sandstone Formation is of the Early Pennsylvanian age and underlies about the northern three-fourths of the project area. It consists of thin to massive, light brown to gray, fine grained, quartzitic sandstone; blue-black to brown siltstone; and interbedded gray-black shale. The massive sandstone is fairly resistant to weathering and typically forms high ridges with many rock exposures. Clebit and Pirum soils formed in material weathered from the sandstone. Bengal and Carnasaw soils formed in material weathered from the shale. Caston and Octavia soils formed in colluvial material from both the sandstone and shale. The Stanley Shale Formation is of Late Mississippian age, and is composed mostly of black and brownish to olive-gray shale and has lesser quantities of thin to massive, silty, fine grained, gray to brown sandstone. It also has some grayish black chert. Minor amounts of conglomerate, quartzose sandstone, and tuft are present in the lower part of the formation. The sandstones decompose upon weathering and form low ridges. Thus, the formation typically forms valleys with a series of hills and or mountains. Bismarck and Littlefir soils formed in material weathered from the shale. Nashoba and Sherless soils formed in material weathered from the sandstone. Temperature and humidity vary from one locale to another due to aspect. North slopes are relatively cooler and damper, while south slopes tend to be warmer and drier.

The desired conditions for this watershed area and the soil resource are to restore/maintain the watersheds natural hydrologic function (ie: the functional integrity of the natural drainage system and the watersheds inherent capacity to absorb and retain water), and to restore/maintain the inherent productivity of the soil resource. This can be accomplished through proper planning and implementation of all soil disturbing activities that will meet our Revised Forest Plan standards, Final EIS to the Revised Land and Resource Management Plan Ouachita National Forest and the Regions soil quality standards.

The Southern Creek Ouachita River watershed is classified as “Functioning at Risk” within the Watershed Condition Class (WCC) framework. This essentially means that the physical attributes of the watershed are not functioning at sufficient levels to maintain or improve biological integrity. Physical, hydrological, or biological threshold have not necessarily been exceeded, but if pre-emptive attention to the factors that are contributing to the watershed condition is not provided, the current trend or trajectory of decline could place the watershed in a state of “Impaired Function.” WCC ratings should not be confused with the assessment of silvicultural activities on watersheds through the Aquatic Cumulative Effects (ACE) model addressed in the Water Quality section of this document. (See watershed condition indicator ratings in WCC file).

Wetlands and Floodplains

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 will not adversely alter the natural values of these areas.. In this analysis area, there are no hydric soils or jurisdictional wetlands mapped, although soil map units 60 and 68 may have small areas (inclusions) of hydric soils. Soil map units 36, 54, 55, 60 and 68 depict floodplain

landforms in this analysis area. These map units represent a total of 718 acres (10.7%) of the project area..

Direct & Indirect Effects

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 soil map units with a severe erosion hazard potential, which would be impacted by the most intensive soil disturbing management actions.

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 (scarify, waterbar and seed).

Table 3.2. Comparison of Proposed Action and Allowable Soil Loss

Soil Map Unit	Compartment/ Stand	Treatment	Soil Loss (tons/acre)	
			Proposed Action	Allowable
33	856/5	Heavy Thinning	1.88	8.55
130	859/6	Heavy Thinning	6.86	8.10
79	852/6	Heavy Thinning	7.88	8.25

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.

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 decrease soil porosity. The soils in this planning area are most susceptible to compaction when wet.

The soil resource inventory identified three soil map units with a moderate-high compaction hazard rating, two with a high rating, and three soil map units with a compaction hazard rating of severe. These hazard ratings 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 proposed for 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 (less than three-years) 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. Underburn frequencies would be three-years or greater, which would allow recovery of forest floors and soil biota and would not deplete soil nutrients.

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 (Soil Resource Report). There would be no management activities conducted on forest soils; no compaction would occur.

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 Quality

Current Conditions

The project area contains portions of one 6th level subwatershed HUC 0804010201 (Southern Creek Ouachita River). Creeks of the project area drain south to the Ouachita River. There are no impaired waterbodies (ADEQ 303(d) listing), or designated ground sources (wells) for public drinking water.

Direct & Indirect Effects

Proposed Action

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 RLRMP 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 clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr for site preparation, release and for the control of non-native invasive species. 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 RLRMP. 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

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

No Action

Although proposed soil disturbing activities resulting in stream sedimentation would not occur, watershed improvement activities, such as road decommissioning and fish passage restoration improvements would also not take place.

Cumulative Effects

Proposed Action, No Herbicide and No Action

The Aquatic Cumulative Effects (ACE) model was used to determine the watershed condition of the 6th level HUC 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 each subwatershed is displayed in the table below.

Table 3.3. Sediment Delivery By Alternative

Subwatershed *6th level HUC ID#*	**Alternative**	**Sediment Delivery**		**Risk Level**
		Tons Per Year	**% Increase***	
Southern Creek Ouachita River *80401010201*	*Current Condition*	142	0	High
	No Action	181	1	High
	Proposed Action & No Herbicide	309	1	High

*Percent increase over sediment delivery from current condition

The predicted sediment delivery from the Proposed Action and the No Herbicide Alternative would not change the current risk level from 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 exceedence of environmental thresholds for periods of time (years). If causative actions persist over time, permanent adjustments can occur to the hydrologic system.

To reduce predicted sediment, the Ace 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. The Protocol states that if predicted sediment does not exceed 2% increase over the current condition, then it is not considered to be a measurable change (Moser, 2014). In the Southern Creek Ouachita River subwatershed, prescribed burning and harvest activities were modeled to occur in years two through five. This dispersal of treatments resulted in a predicted sediment increase that does not exceed 2% over the current condition for each year.

Vegetation

Current Conditions

Based on recent forest inventories, the current acreage of the various age classes and the percentage of the Project Area they comprise are tabulated by forest type in the table below. This distribution is only forested land.

Table 3.4. Current Age Class Distribution by Forest Type

Age Class (years)		**Forest Type** (acres)				**Total**	
		Pine	**Pine-Hardwood**	**Hardwood -Pine**	**Hardwood**	Suitable Acres	Percent
0-10		0	0	0	0	0	0
11−20		93	0	0	0	85	5
21−30		230	39	0	0	269	16
31−40		102	0	0	27	102	6
41−50		45	93	0	0	45	3
51−60		0	0	0	0	0	0
61−70		96	0	0	0	73	4
71−80		767	60	0	0	140	8
81-90		1114	549	249	0	546	33
91-100		880	348	142	0	349	21
101+		188	92	0	383	62	4
Total	Acres	3515	1181	391	410	1671	100
	%	63	22	7	8		

Early Seral Conditions (Revised Forest Plan, WF001)**.** There are approximately 0 acres of early seral stage habitat (0-10 year age class) in the pine forest type. There are 9 acres of closed roads; there are currently 2 acres of permanent wildlife openings, no utility right-of-ways occur within the project area . This total area of 11 acres of existing early seral condition comprises approximately 0.07% of the total suitable acres (suitable for timber production).

Mature Growth (Revised Forest Plan, WF006)**.** There are approximately 3,171 acres of pine and pine hardwood mature-growth (80 plus years of age), totaling nearly 68% of the total pine/pine-hardwood forest type. There are 383 acres of hardwood and hardwood-pine mature-growth (100 plus years of age), totaling 48% of the forest type.

Retention and Recruitment of Hardwoods. There are approximately 801 acres of hardwood and hardwood-pine forest type representing 15 % of the timber resource within the Project Area. These forest types would be managed for retention (leave) and recruitment (addition) of hardwoods.

Hardwood Mast Production (Revised Forest Plan, WF003)**.** There are approximately 774 acres of 50+ year old hardwood and hardwood-pine stands totaling 14% of the timber resource within the Project Area, or 88% of the total hardwood and hardwood-pine forest type.

Stand Vigor and Health. Trees in most of the pine stands are crowded or densely stocked. This condition results in stress, reduced vigor and health, and increased susceptibility to insects and diseases. Hardwood stands, especially those near ridgelines, are stressed from periodic drought and are also overstocked resulting in reduced vigor and health with increasing susceptibility to infestations by insects such as the Red oak borer *Enaphalodes rufulus*.

Non-Native Invasive Species. Several non-native invasive plant species have been detected throughout the Project Area. The most prevalent are found along roadways and other openings and are sericea lespedeza (*Lespedeza cuneata*), mimosa/silktree (*Albizia julibrissin*) and fescue grass species (*Lolium* spp.), widely used for erosion control and as a local forage grass. Japanese honeysuckle (*Lonicera japonica*) is found along roadways, openings, under dense canopies and within streamside management areas.

Direct & Indirect Effects

Proposed Action

The table below details the age class distribution of the project area after implementation of harvest activities. Age class distributions are shown for pine types and for all forested land (total of all forest types). There would be no change to hardwood forest type age class distributions.

Table 3.5. Post-Harvest Age Class Distribution Pine Types

Age Class (years)	**Forest Type** (acres)				**Forested Land**	
	Pine	**Pine-Hardwood**	**Hardwood-Pine**	**Hardwood**	**Suitable Acres**	**Percent**
0-10	224	0	0	0	224	15
11−20	93	0	0	0	85	5
21−30	230	39	0	0	269	17
31−40	102	0	0	27	102	7
41−50	45	93	0	0	45	3
51−60	0	0	0	0	0	0
61−70	47	0	0	0	24	1
71−80	708	60	0	0	101	7
81-90	1114	549	249	0	546	36
91-100	744	348	142	0	77	5
101+	188	92	0	383	62	4

Total	Acres	3495	1181	391	410	1535	100
	%	63	22	7	8		

Early seral habitat would increase to comprise 15% of sutiable acres in the project area. Mature growth pine would decrease to approximately 55% of the pine types. Diseased, damaged and suppressed trees would be removed through commercial thinning activities on approximately 736 acres of pine stands. By reducing stand densities through thinning, stand vigor would improve. 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 (RLRMP, 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. Within the stands proposed for midstory reduction, selected suppressed and intermediate trees would be released from competition, thus increasing mast production on released trees.

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.

No Herbicide

The effects of this alternative would be the same as those listed for 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.

No Action

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. 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 thinning and regeneration harvests, forest health would be at risk due to increased potential for pest infestations such as the southern pine beetle. Forest health and stand vigor would continue to decline.

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

Cumulative Effects

Potential wind events or insect/disease outbreaks could trigger management actions that would affect many vegetative characteristics, including age class distribution (early seral, mature growth), and stand health and vigor. These effects would be additive to those resulting from implementation of this proposal.

Biological

Effects on Biological Diversity

The following discussion provides a review and determination for Management Indicator Species (MIS) within and near the analysis area and federally Proposed, Endangered, Threatened and Forest Sensitive (PETS) species and their associated habitats possibly or potentially affected by the proposed alternatives.

Management Indicator Species

Following passage of the National Forest Management Act (NFMA) in 1976, the Secretary of Agriculture, on the advice of the Committee of Scientists, promulgated regulations to guide the development of plans for the National Forest System (36 CFR 219). For fish and wildlife resources, among other things, these regulations at CFR 219.19 (a) (1) state:

"In order to estimate the effects of each alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities. In selection of management indicator species, the following categories shall be represented where appropriate:

Endangered and threatened plant and animal species identified on State and Federal lists for the planning area; Species with special habitat needs that may be influenced significantly by planned management programs; Species commonly hunted, fished or trapped; Non-game species of special interest; and Additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality."

The MIS Revised Forest Plan selection process reviewed the Ouachita National Forest list of MIS, and concluded that the 24 species listed in Table 14 were adequate to address the effects of management on fish and wildlife populations, their habitat needs as well as demand species and species of special interest.

Management Indicator Species Selected for this Project

The entire list of 24 MIS was reviewed and a subset of 15 was selected as MIS for this project. MIS selected include both terrestrial and aquatic species.

Table 3.6. Management Indicator Species and primary reason for selection.
The far right column indicates which Forest MIS species are selected for this project.

Common Name	Scientific Name	Primary reason(s) for selection	Selected as MIS for Project (Yes/No)
Terrestrial MIS			
Northern Bobwhite	*Colinus virginianus*	To help indicate effects of management on public hunting demand and to help indicate effects of management on the pine-oak woodland community	Yes (because of lack of suitable habitat)
Eastern wild turkey	*Meleagris gallopavo*	To help indicate effects of management on public hunting demand	Yes
White-tailed deer	*Odocoileus virginianus*	To help indicate effects of management on public hunting demand	Yes
Red-cockaded woodpecker	*Picoides borealis*	To help indicate effects of management on recovery of this endangered species and to help indicate effects on management of shortleaf pine-bluestem woodland community	No (outside MA 22)
Prairie warbler	*Dendroica discolor*	To help indicate effects of management on early successional component of forest communities	Yes (because of lack of suitable habitat)
Scarlet tanager	*Piranga olivacea*	To help indicate effects of management on mature forest communities	Yes
Pileated woodpecker	*Dryocopus pileatus*	To help indicate effects of management on snags and snag-dependent species	Yes
Ponds and Lakes (Forester Pond exists within the project areas)			
Bluegill	*Lepomis macrochirus*	To help indicate management effects on health of ponds and lakes and demand for recreational fishing.	No
Redear sunfish	*Lepomis microlophus*		No
Largemouth bass	*Micropterus salmoides*		No
Arkansas River Valley Streams (Analysis area occurs outside of the Arkansas River Valley Ecoregion)			
Yellow bullhead	Ameiurus natalis	To help indicate effects of management on aquatic habitat and water quality in streams within the Arkansas River Valley Ecoregion.	No
Highland stoneroller	Campostoma spadiceum		
Redfin darter	Etheostoma whipplei		
Green sunfish	Lepomis cyanellus		
Longear sunfish	Lepomis megalotis		
Gulf Coastal Plain Ecoregion Streams (Analysis area occurs outside of the Gulf Coastal Plain Ecoregion)			
Pirate perch	*Aphredoderus sayanus*	To help indicate effects of management on aquatic habitat and water quality in streams within the Gulf Coast Plain Ecoregion.	No
Highland stoneroller	*Campostoma spadiceum*		
Creek chubsucker	*Erimyzon*		

Common Name	Scientific Name	Primary reason(s) for selection	Selected as MIS for Project (Yes/No)
	oblongus		
Green sunfish	*Lepomis cyanellus*		
Longear sunfish	*Lepomis megalotis*		
Ouachita Mountain Ecoregion Streams			
Highland stoneroller	*Campostoma spadiceum*	To help indicate effects of management on aquatic habitat and water quality in streams within the Ouachita Mountain Ecoregion.	Yes
Johnny darter	*Etheostoma nigrum*		No (does not occur in analysis area)
Orangebelly darter	*Etheostoma radiosum*		Yes
Redfin darter	*Etheostoma whipplei*		No
Northern studfish	*Fundulus catenatus*		Yes
Northern hog sucker	*Hypentelium nigricans*		Yes
Green sunfish	*Lepomis cyanellus*		Yes
Longear sunfish	*Lepomis megalotis*		Yes
Striped shiner	*Luxilus chrysocephalus*		Yes
Smallmouth bass	*Micropterus dolomieu*		Yes
Channel darter	*Percina copelandi*		No (does not occur in analysis area)
Forest-wide			
Smallmouth bass	*Micropterus dolomieu*	To help indicate the effects of management on meeting public fishing demand in streams	Yes

Effects Analysis: Management Indicator Species
The analysis of effects discussion below is separated and organized as follows. 1) Terrestrial species are discussed before aquatic species are discussed. 2) Some species are lumped into species groups when the effects are similar to the effects on others. 3) Each species, or group of species, is discussed by alternative. 4) Each alternative, direct, indirect, and cumulative effects on each species or group of species is discussed.

Terrestrial MIS

Methodology Used Modeling MIS Forest Trends

The selected terrestrial MIS were modeled using the CompPATS wildlife habitat capability model (HCM) to compare habitat capabilities over the next decade (2015-2025) for each alternative. Projected numbers of terrestrial MIS per square mile are listed in Table 15 by alternative.

In order to show future Forest-wide trends for modeled terrestrial MIS, a comparison of habitat capability numbers projected for this project was made to the pre-existing habitat condition (baseline). First year projections are based on habitat conditions after initial project implementation and ten year projections are estimated ten years after initial project implementation.

Table 3.7. Response of selected Management Indicator Species to alternative by decade of implementation.

	Management Indicator Species					
Alternative	**White-tailed Deer**	**Pileated wood-pecker**	**Eastern Wild Turkey**	**Northern Bobwhite**	**Scarlet Tanager**	**Prairie Warbler**
	Individuals per square mile					
Alternative 1 – No Action						
Baseline	14	34	6	12	29	3
Project 1st year	14	34	6	12	29	3
Project at 10 years	13	35	6	12	30	0
Alternative 2 – Proposed Action						
Baseline	14	34	6	12	29	3
Project 1st year	31	15	10	97	25	114
Project at 10 years	17	30	6	26	30	12
Alternative 3 - Proposed Action without Herbicides						
Baseline	14	34	6	15	41	3
Project 1st year	31	15	10	97	25	114
Project at 10 years	17	30	6	26	30	12

Current Conditions

Demand and Pine-Oak Woodland Species

- **Northern Bobwhite** *(Colinus virginianus)*

Northern Bobwhite was selected as a *Demand Species* indicator and also to indicate 'Early Forest Stage Cover.' It was selected because of its small game status, economic importance; preference for forest openings interspersed with timber for cover and associated ecotones as an indicator of effects of management on the pine-oak woodland and pine bluestem communities.

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. In the 2005 Forest Plan, the population objective for the Northern Bobwhite is an average of 36.6 birds per square mile (USDA Forest Service 2005b). Bobwhite call counts, Breeding Bird Survey data indicate declining bobwhite populations and habitat capability measures indicate a slight increase for the Ouachita National Forest.

Since FY 1997, the Ouachita NF has been conducting bird surveys on over 300 Landbird monitoring points. Northern Bobwhite data indicate a slight downward trend in birds detected over a 13-year period. During the past 5 years, this trend has continued. Estimated habitat capability for the Northern Bobwhite shows a modest increase in the last 5 years; however, it is still far from reaching the projected FY 2015 desired forest-wide habitat capability of 101,748 based on 2005 Forest Plan. One major factor is that early seral habitat creation has never attained the 2005 Forest Plan objective of 5,500 acres per year (USDA Forest Service 2011).

The Northern Bobwhite population viability on the Ouachita NF is not expected to be threatened and populations are expected to improve through 2005 Forest Plan implementation. The Ouachita NF 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.

- **Prairie Warbler** (*Dendroica discolor*)

The Prairie Warbler is a MIS on the Ouachita National Forest, selected to help indicate the effects of management on the early successional component of forest communities. As a neo-tropical migrant, the Prairie Warbler is an international species of concern. This species uses early successional habitats such as regenerating 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 significant declining trend of 4.6 percent for the time period of 1966-2006 for the Ozark-Ouachita Plateau and a decline throughout prairie warbler range nationwide. Phase II research on the Ouachita National Forest also documents a downward trend. Data are supporting a conclusion of a declining population trend for prairie warbler in pine and pine-hardwood habitat types.

Although declining, the population viability on the Ouachita NF should not be threatened. The population decline has been exacerbated by the fact that the quantity of early seral habitat expected to be produced annually (5,500 acres), largely by seed tree and shelterwood cutting, has not yet been realized. There will be a lag time between implementation of the 2005 Forest Plan, the increase in early seral habitat, and an associated Prairie Warbler response. Meanwhile, increases in thinning and prescribed fire in the pine and pine-hardwood types especially that associated with approximately 200,000 acres of shortleaf-bluestem ecosystem restoration, will benefit Prairie Warbler populations (USDA Forest Service, 2011).

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management (thinning's (pre-commercial, commercial, woodland), regeneration harvest (seed-tree, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction):

Initially, no direct impacts are likely since there is limited habitat available but after implementation direct impacts from the various proposed vegetation treatments could come in the form of trees being felled on nests or increased logging disturbance causing abandonment of nests. Re-nesting would also likely occur in most situations of disturbance thus offsetting overall losses in brood production.

The Proposed Action calls for the creation of several areas of early seral stage habitat. All proposed timber treatments would open up the canopy, allowing sunlight penetration to the forest floor, and an increase of early seral vegetation essential to bobwhite and prairie warbler. Overall the proposed actions would create a variety of habitats (foraging, nesting, brooding, fawning, escape cover etc.) within the home ranges of these species. Habitat benefits derived from the various harvest treatments would depend directly on the size and type of harvest. Treatments like shelterwood and seed tree thinning, and especially woodland/old growth restoration treatments would provide more long term habitat benefits due to their size and varying landscape attributes (soil types, moisture gradients, slope aspects).

Given the proposed treatments it is likely that the proposed action would provide long term indirect benefit's to bobwhite and prairie warbler. Populations of these birds within the analysis area could expect improved early seral habitat conditions for at least the next 5-10 years in timber harvest areas and indefinitely in woodland/old growth restoration areas.

Herbicide Treatments *(timber stand improvement and non-native invasive control)*
Manual Treatments for Non-Native Invasive Control:

The Mena RD is proposing the use of the following herbicide active ingredients for site preparation, seedling release, and control of non-native invasive species: clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr. Since no risk assessment studies have been conducted specific to prairie warbler, northern bobwhite and or Mallard studies will be used to support a discussion of potential risks for these MIS species.

Table 3.8. Summary of LD_{50} Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	***LD_{50}****	***Toxicity Risk to Bobwhite and or Mallard***	***Risk Assessment***
Fluroxypyr	>2000mg/kg of body weight	U.S. EPA/OPP (1998a) classifies fluroxypyr acid and fluroxypyr-MHE as *Practically Nontoxic* to birds	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	>2000mg/kg of body weight	U.S. EPA/OPP (1993) classifies glyphosate as no more than *slightly toxic* to birds	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	>2150mg/kg of body weight	*Practically Nontoxic*	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	>2150mg/kg of body weight	All acute exposure studies in birds show that metsulfuron methyl has *very low toxicity*	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>2250 mg/kg of body weight	All acute exposure studies in birds show that metsulfuron methyl has *very low toxicity*	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	849mg/kg to 2055 mg/kg of body weight	U.S. EPA/OPP (1998b) has classified triclopyr as being *slightly toxic to birds*	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	LC_{50}** 4640ppm LD_{50} 5620mg/kb of body weight	*No signs of toxicity* reported in mallard duck or bobwhite	Syracuse Environmental Research Associates, Inc. 2004d

LD_{50}*- lethal dose for 50% of population tested
LC_{50} -** lethal concentration for 50% of population tested

Acute oral and dietary studies of the listed chemicals proposed for use in the project area exhibit a range in analysis toxicity from practically nontoxic to slight toxicity to birds. These determinations were based on concentrations of herbicides in quail diets (For Clopyralid both

quail and mallard results were used) that would in all cases far exceed concentrations applied in field applications.

Prairie warblers generally forage for insects on leaves and twigs of hardwoods or conifers. Most foraging typically occurs within 1 – 10 feet of the ground. Since prairie warblers forage primarily in the understory and lower canopy there is the potential for exposure in herbicide application areas. This is also true for northern bobwhite since it is a ground nest and terrestrial gleaning omnivore-granivore.

Although it is possible for northern bobwhite and prairies warbler to consume some insect prey that has been exposed to herbicide treatments the realistic dose estimates for such exposures would be insignificant (Also see herbicide effects discussion/tables for wild turkey and Diana fritillary). Potential exposure to herbicides from proposed treatments would likely fall below risk factors (LD_{50} and LC_{50} values) established in the risk assessments for birds. Given; that adults are highly mobile and application most likely would occur outside the nesting season and the restrictions for field application rates established by herbicide specimens labeling, it is improbable that there would be any direct, indirect or cumulative effects on bobwhite or prairie warbler.

Direct, indirect and cumulative effects for manual control methods would be the same as those determined for timber management treatments.

Prescribed Burning (fuel reduction and fire restoration treatments):

Prescribed burns would occur over the majority of the analysis area sometime during the 10 years following implementation of the proposed project and would occur in both growing and non-growing seasons. Direct effects to bobwhites and prairie warblers are unlikely since these species are highly mobile and would be able to avoid burns. There is the potential for nests to be lost if burns occur during nesting periods. 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. Cumulative effects of a prescribed burning regime would provide enhanced foraging, nesting, and cover habitats.

Fish Passage Restoration:

None of the proposed actions listed above would have any direct, indirect or cumulative effects on bobwhite or prairie warbler since these proposed actions occur outside of suitable habitats or in areas already disturbed by other actions.

Pond and Wildlife Opening Rehabilitation:

Wildlife opening rehabilitation 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 fawning and nesting habitat. Ponds would also serve as important water sources and foraging areas. Overall, these proposed wildlife treatments would have direct, indirect and cumulative impacts similar to proposed vegetation treatments.

Soil Stabilization and Restoration (stream restoration, dispersed campsite closure, unauthorized road close and decommission):

Proposed soil stabilization and restoration treatments (see section IV for descriptions) would be used to protect wildlife, soil and water resources. No direct impacts to quail and prairie warbler are anticipated since actions would be to close currently open roads, reassign designation of existing roads and rehabilitate impacted areas. Indirect benefits would be likely since proposed actions would provide linear flight and travel corridors and allow these areas to re-vegetate thus providing potential foraging habitat. Cumulatively the proposed action would increase the amount of suitable foraging areas in the analysis area for the next 5-10 years as restoration areas are reclaimed by surrounding habitats.

***Road/Fireline Construction, Reconstruction and Maintenance Treatments*:**

Direct, indirect and cumulative impacts would be the same as those determined for timber management treatments.

Nest/Roost Box Installation & Resource Protection-Gate Installation:

No direct, indirect or cumulative impacts are anticipated as a result of placing roosting or nest boxes within the analysis area. Placement would require minimal ground disturbance and would not result in the significant loss of available habitat.

Effect on Forest-wide Population Trends:

The Habitat Capability Model demonstrates that selection of this alternative would increase populations of bobwhite and prairie warbler. Indirect effects of the Proposed Action would in part be "beneficial" to these species by providing treatment areas with vegetative structural diversity and plant species diversity. Many of the browse items and associated insects would also persist in treatment areas for a long period of time.

No Herbicide

The No Herbicide alternative would have no direct, indirect or cumulative effects on bobwhite and prairie warbler as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Proposed Action alternative.

Effect on Forest-wide Population Trends:

HCM indicates effects on forest-wide trends for the No Herbicide alternative would be the same as the Proposed Action alternative.

No Action

The No Action alternative would have no direct effects on prairie warbler or northern bobwhite. Selection of this alternative would have negative indirect effects on these species.

The Habitat Capability Model (HCM) demonstrates this in forecasting that populations of these species would be expected to decrease as early seral communities transition to more mature forested conditions.

Both the bobwhite and prairie warbler prefer open and/or cutover areas, as noted above. No action would mean that no new open areas would be created for these species. Natural recruitment of early seral communities would also be limited in that suppression of wildfires and timber insect infestations would still occur under the No Action alternative. This alternative would result in the gradual loss of early-seral habitats as overstory vegetation becomes established and shades out sub-canopy competition.

Effect on Forest-wide Population Trends:

The Habitat Capability Model demonstrates that selection of this alternative would maintain or decrease populations of northern bobwhite and decrease to no suitable habitat in the case of the prairie warbler by limiting development of early seral habitat.

Demand Species

Current Conditions

- **Eastern Wild Turkey** (*Meleagris gallopavo*)

The Eastern Wild Turkey is a demand species selected because it is a game species with economic importance, and it uses a wide range of habitat types with habitat diversity including grass and forb openings interspersed with mast producing hardwoods.

The Forest Plan minimum population objective is 3.3 turkeys per square mile (9,177 turkeys) after 10 years and 3.9 per square mile at 50 years (USDA Forest Service. 2005b). Turkey harvest, poult production, Landbird point survey data indicate 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 2005 Plan. The sustained high levels for habitat capability would indicate that the drop in harvest levels, reductions in poults per hen, and birds detected on the Landbird points are due to factors other than habitat.

Insufficient data exist to suggest that Eastern Wild Turkey may be in danger of losing population viability or falling below the desired population levels. Due to conflicting indicators, additional data should be collected to determine if additional management changes are warranted. Research across the South has shown that prescribed fire treatments, including the growing season burns, improve turkey habitat by opening up dense forest, reducing shrub and brush, and improving nesting and brood rearing habitat (Cox, 2008). In addition, areas that were not burned for more than two years were almost devoid of turkey hens. No management changes are warranted at this time. In addition, research is currently ongoing on the Forest to look at habitat preferences of the Eastern Wild Turkey (USDA Forest Service, 2011).

- **White-tailed Deer** (*Odocoileus virginianus*)

White-tailed Deer was selected as a demand species for its big game status, economic importance, and its association with early successional seral stages, brushy stages, interspersed hardwoods and associated edges.

The estimated habitat capability for deer for fiscal years 2006-2010 shows a downward trend; yet, it still exceeds the desired habitat capability of 48,250 acres for FY 2015. Habitat carrying capacity is calculated using acres within the Ouachita NF and is influenced by the amount of prescribed fire and early seral habitat created, including regeneration, thinning, timber stand improvement, mid-story removal, wildlife stand improvement, wildlife openings, and site preparation (USDA Forest Service, 2011).

For deer, the CompPATS 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.

The Final Environmental Impact Statement for the 2005 Forest Plan (USDA Forest Service 2005b) indicates in Table 3.59 (p. 166), a desired terrestrial habitat capability to support an average of 13.7 deer per square mile within the Ouachita NF after 10 years. This is calculated on a land base of 1,780,101 acres (2,780 square miles) for a habitat capability that would support 38,105 deer. The habitat capability as estimated by the CompPATS wildlife model exceeds the 2005 Forest Plan projections for every year in the period 2006 -2010 but is showing a decreasing trend. The deer harvest data indicate increasing deer density. The 2005 Forest Plan objective is to create 5,500 acres of early seral stage (grass/forb) habitat per year, and 2,676 acres were created by regeneration harvests and wildlife habitat improvement in FY 2010 (USDA Forest Service, 2011).

The decreasing habitat capability for the past few years as estimated by the CompPATS wildlife model is related to fewer acres than anticipated in grass/forb habitat (forest types ages 0-10 years) preferred by deer. Although acres of created early successional habitat have not matched the desired levels, deer densities (based on spotlight surveys) for FY 2008 are the highest in the last 9 years and double the FY 2000 deer density. While FY 2010 results are the lowest since FY 2003, overall deer harvest is showing an upward trend. Deer are widespread, abundant, and the habitat capability still remains above the Forest Plan projection. There are no indications of a need for adjustment in current management practices (USDA Forest Service, 2011).

Direct, Indirect and Cumulative Effects of each Alternative

Effect on Forest-wide Population Trends:

The HCM indicates that deer and turkey habitat capability would remain at or above that recommended by the RFP remaining stable over the next decade. No cumulative effects are anticipated that would affect forest-wide trends.

Proposed Action

Timber Management (thinning's (pre-commercial, commercial, woodland), regeneration harvest (seed-tree, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)*:*

Direct, indirect, and cumulative impacts would be the same as those determined for northern bobwhite and prairie warbler.

Herbicide Treatments (timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control:

Since no risk assessment studies have been conducted specific to wild turkey, see effects of herbicide application, direct indirect and cumulative effects discussion for northern bobwhite and prairie warbler. Determinations for these bird species will also apply here.

Table 3.9: Summary of No Observed Adverse Effect Level (NOAEL) Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	***NOAEL****	***Toxicity Risk to Mammals***	***Risk Assessment***
Fluroxypyr	100mg/kg/day	*very low toxicity at applied rates*	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	175 mg/kg/day	*very low toxicity at applied rates* U.S.	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	45 mg/kg/day	*very low toxicity at applied rates*	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	250 mg/kg/day	*very low toxicity at applied rates*	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	25 mg/kg/day	*very low toxicity at applied rates*	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	100 mg/kg/day	*very low toxicity at applied rates*	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	75 mg/kg/day	*very low toxicity at applied rates*	Syracuse Environmental Research Associates, Inc. 2004d

NOAEL = is the highest tested dose or concentration of a chemical or agent, at which no such adverse effect is found in exposed test organisms where higher doses or concentrations resulted in an adverse effect.

Wild turkeys are omnivores foraging on the ground for a wide variety of food items such as; insects, seeds, nuts, fruits and other plant food. Since foraging occurs primarily on the ground there is the potential for exposure in herbicide application areas. However, in all situations of field application of these chemicals specimen label rates for each chemical would be followed and applied rates would be at or below the recommended application rate. In all bioassay test for each chemical the concentration tested and NOAEL observed far

exceeds concentration rates that would be applied in field applications and thus no direct, indirect or cumulative effects to eastern wild turkey (using quail analog) or white-tailed deer are anticipated.

Direct, indirect and cumulative effects/impacts for manual control methods would be the same as those determined for timber management treatments.

Prescribed Burning (fuel reduction and fire restoration treatments):

Prescribed burning would occur in both growing and non-growing seasons. Direct impacts to deer and turkey are unlikely since these species are highly mobile and would be able to avoid burns. There is the potential for turkey nest to be lost if burns occur during nesting periods. This potential impact however would be limited in scope considering only a small portion of the available nesting habitat within the analysis area would be burned at any one time. Indirect effects 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 these MIS species. Deer especially are dependent on crude protein found in herbaceous browse for growth and antler development. Cumulative effects of prescribed burning would provide foraging, fawning and cover habitats.

All other proposed management activities **(**see descriptions in section IV.**):**

Direct, indirect, and cumulative impacts would be the same as those determined for northern bobwhite and prairie warbler.

Effect on Forest-wide Population Trends:

The HCM indicates that selection of this alternative would increase then return to baseline levels for local turkey and increase then remain above baseline levels for deer habitat carrying capacities over the first decade. The Proposed Action alternative would have no long term effects on Forest-wide population trends for these species.

No Herbicide

The No Herbicide alternative would have no direct, indirect or cumulative effects on deer and turkey and their preferred habitats as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Proposed Action alternative.

Effect on Forest-wide Population Trends:

HCM indicates effects on forest-wide trends for the No Herbicide alternative would be the same as the Proposed Action alternative.

No Action

The No Action alternative would allow forested lands to change without the interference of landscape scale land management. This alternative would have no direct effects on eastern wild turkey and white-tailed deer over the next decade and only events unrelated to human activities would create forestland openings used by these species. Habitat conditions would remain viable for these species.

Snag Dependent Species

Current Conditions

- **Pileated Woodpecker** *(Dryocopus pileatus)*

The pileated woodpecker is a MIS selected to indicate the effects of management on snags and snag-dependent species. It is a member of the cavity nesting, tree trunk probing, insectivore guild, prefers dense, mature to overmature hardwood, hardwood-pine and mature pine forest types. The most important characteristics of forests 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 and Jackson, 1995). 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. Nest tree species and size vary but most are in trees larger than 15 inches (38 cm) diameter at breast high (dbh) with entrances ranging from 16-69ft (5-21m) above the forest floor (Bushman and Therres, 1988). The diet of pileated woodpeckers consists mainly of insects (70%), especially carpenter ants, insect larvae, and wood-boring beetles. Additional food items include other insects, fruits and berries, hard mast (acorns) and seeds of sumac (Hamel, 1992; DeGraaf et al., 1991).

Landbird monitoring data on the Ouachita NF indicate the long term trend to be stable to slightly decreasing for Pileated Woodpecker. The CompPATS wildlife model estimates for the habitat capability indicate a more defined decreasing trend for the last 5 years than Landbird data. These CompPATS wildlife model data are for pine, pine-hardwood, hardwood, and hardwood-pine stands with the greatest value being for stands greater than or equal to 41 years old.

The CompPATS wildlife model takes into account the conditions 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 stands age. The current habitat capability that is estimated to support 11,580 birds exceeds the 2005 Forest Plan bird population objectives of 11,265 for FY 2015 (USDA Forest Service 2005b) but is trending towards the FY 2015 desired capability. The Pileated Woodpecker and its habitat appear to be secure within the Ouachita NF. There are no indications of a need to alter management direction.

Mature Forest Community Species

- **Scarlet Tanager** (*Piranga olivacea*)

The Scarlet tanager is a Management Indicator Species, selected to help indicate the effects of management on mature forest communities. The scarlet tanager migrates into Arkansas from the south in spring, becoming a "common summer resident in extensive upland woods" in the Ouachita Mountain region; higher elevations result in higher populations of scarlet tanager (James and Neal, 1986). Males arrive in breeding areas in April and May, and establish territories several days before females arrive. Once females arrive and mate selections are made, they choose a nesting site and construct the nest alone (Isler and Isler, 1987). Nests are typically placed in a leaf cluster, on a horizontal limb, where there is a clear unobstructed view of the ground, and with clear open flyways from adjacent trees to the nest (Senesac, 1993; Hamel, 1992; DeGraff et al., 1991).

Habitats include deciduous forest of various types, pine-oak woodlands, parks, orchards, and large shade trees in suburban areas (Senesac, 1993; Bushman and Therres, 1988; Isler and Isler, 1987). Scarlet tanagers are most common in areas with closed canopy, a dense understory with high shrub diversity, and little ground cover (Bushman and 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 occurs mid-canopy with frequent sallies into the air to catch flying insects. From late summer through winter tanagers consume fruits and berries, perhaps to buildup fat reserves for fall migration (Prescott, 1965).

The Landbird point data collected from 2006-2010 indicate an overall stable to increasing trend for the Scarlet Tanager as opposed to Landbird point data, Ouachita NF habitat capability data do not support a stable trend for the Scarlet Tanager. Data support a stable trend on the Ouachita NF and the Ozark-Ouachita Plateau where mature hardwood and mixed types are represented. On the Ouachita NF, there are over 200,000 acres of hardwood and hardwood/pine forest types greater than 41 years old. The Scarlet Tanager and its habitat are secure within the Ouachita NF, and the continued long-term viability of this species is not in question (USDA Forest Service 2010).

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management (thinning's (pre-commercial, commercial, woodland), regeneration harvest (seed-tree, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction):

Proposed treatments would result in direct effects to pileated woodpecker and scarlet tanager. These 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 pileated woodpecker and scarlet tanager due to removal of trees from the landscape reducing the

upper tree canopy. Since both of these 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 and guidelines established in the Revised Forest Plan (USDA Forest Service, 2005a) for the retention of hardwoods and snags in harvest areas would mitigate impacts to pileated woodpecker and scarlet tanager foraging and nesting habitats. Fallen trees and snags created as a result of proposed actions would also enhance foraging and nesting habitat opportunities for pileated woodpecker. The Proposed Action would also improve future nesting and foraging habitat for scarlet tanager by helping to improve health and vigor of oak/hickory forest communities as a result of decreased competition. The HCM indicates that viable populations of pileated woodpecker and scarlet tanager would be maintained locally under this alternative.

Herbicide Treatments (timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control:

The direct, indirect and cumulative effects of herbicide application or use of manual control methods for non-native invasive treatments areas would have little or no impacts on pileated woodpecker or scarlet tanager. The only direct, indirect and cumulative impacts to pileated woodpecker and scarlet tanager would concern the temporary loss of fruits and berries that make up their annual diet. Vegetation impacted by herbicide treatment is not typically used as foraging substrate by pileated woodpeckers because it decomposes rapidly and does not host preferred insect prey species. Since scarlet 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 scarlet tanagers may consume some insect prey that has been exposed to herbicide treatments the realistic dose estimates for such exposures would be insignificant (Also see herbicide effects discussion/tables for wild turkey and Diana fritillary).

Prescribed Burning (fuel reduction and fire restoration treatments):

Direct, indirect and cumulative effects to pileated woodpecker and scarlet tanager would be same as those for timber management treatments.

Pond and Wildlife Opening Rehabilitation:

Existing wildlife opening and pond rehabilitation sites do not provide suitable foraging or nesting habitat for pileated woodpecker or scarlet tanager and thus no direct, indirect or cumulative impacts to pileated woodpecker or scarlet tanager are anticipated.

All other proposed management activities (see descriptions in section IV.):

Direct, indirect, and cumulative impacts would be the same as those determined for northern bobwhite and prairie warbler.

Effect on Forest-wide Population Trends:

The HCM predicts that the Proposed Action alternative would decrease then increase to maintain local habitat capability for pileated woodpecker and scarlet tanager over the next decade and would have no measurable effects on Forest-wide trends of these MIS species. Viable populations of pileated woodpecker and scarlet tanager would be maintained locally under this alternative.

No Herbicide

The No Herbicide alternative would have no direct, indirect or cumulative effects on pileated woodpecker or scarlet tanager as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Proposed Action alternative.

Effect on Forest-wide Population Trends:

HCM indicates effects on forest-wide trends for the No Herbicide alternative would be the same as the Proposed Action alternative.

No Action

No direct effects on pileated woodpecker or scarlet tanager would occur under the No Action alternative. Selection of this alternative for the most part would have positive indirect effects on populations of pileated woodpecker and scarlet tanager as these two species prefer mature forest habitats. Selection of the No Action alternative would prevent timber harvest, allowing the forest to continue to age. As a result, the older forests preferred by these species would continue to grow and mature.

Effect on Forest-wide Population Trends:

The HCM indicates that local habitat capabilities for pileated woodpecker and scarlet tanager would slightly increase and remain stable under this alternative. Forest-wide population trends for these species would be positive.

Aquatic MIS

Current Conditions

All but one of the five aquatic MIS categories as listed in Table 3.32 of the Revised Forest Plan Environmental Impact Statement (USDA FS 2005b) do not occur within the proposed treatment areas and thus were not selected for further analysis. The aquatic communities found within this analysis area are: *Ouachita Mountain Ecoregion Streams and Forest Wide*.

Two Management Indicator 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, Johnny darter and channel darters were not selected as MIS (Mena stream survey data 2013, 2014; Robison and Buchanan, 1988).

- The 8 fish species selected for this project [Highland stoneroller (*Campostoma spadiceum*), Green sunfish (*Lepomis cyanellus*), Longear sunfish (*Lepomis megalotis*), Orangebelly darter (*Etheostoma radiosum*), Northern hogsucker (*Hypentelium nigricans*), Northern studfish (Fundulus catenatus), Smallmouth bass (*Micropterus dolomieu*) Striped shiner (*Luxilus chrysocephalus*)] represent a variety of niches filled by fish species in the Ouachita Mountain Ecoregion.

Robison and Buchanan (1988) provide habitat descriptions below for the ten fish MIS selected for this project. The highland stoneroller inhabits small, generally clear streams with gravel, rubble, or exposed bedrock substrates . . . . [and] is often the most abundant species in small, clear upland streams. The green sunfish is a highly adaptable species and can be found in almost every type of aquatic habitat in Arkansas. The longear sunfish also occurs in many aquatic habitats, but is most abundant in small, clear, upland streams with rocky bottoms and permanent or semi-permanent flows. The orangebelly darter occurs in a variety of habitats from small, gravelly, high-gradient streams to larger more sluggish lowland rivers. The northern hog sucker prefers clear, permanent streams with gravel or rock substrate and generally prefers deep riffles, runs, or pools having a current. The northern studfish is found in clear flowing streams and rivers of moderate to high gradient and permanent flow. It preferred stream habitats are quiet, shallow waters along the margins of pools having rock and gravel substrates. The smallmouth bass is mainly an inhabitant of cool, clear mountain streams with permanent flow and rocky bottoms and is more intolerant to habitat alteration than any of the other black basses, and it is especially intolerant of high turbidity and siltation. The striped shiner tends to prefer small to moderate-sized streams with permanent flow, clear water and rocky or gravel substrates. It prefers some current but tends to avoid strong currents.

Direct, Indirect and Cumulative Effects of each Alternative on Aquatic MIS

The effects of each alternative to aquatic MIS fish species will be addressed as a group.

Proposed Action

Timber Management (thinning's (pre-commercial, commercial, woodland), regeneration harvest (seed-tree, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction):

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

Herbicide Treatments (timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control:

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

Neither the published literature nor the U.S. EPA files (U.S. EPA/OPP 1993, 1998a) include data regarding the toxicity of any of these chemicals or their formulations specific to these sensitive fish species. Most all bioassay studies use various fish species, mainly bluegill which will be used as the closest representative to MIS fish species.

Table 3.10. Summary of LD50 Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Fluroxypyr	14.3-100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	70-170mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>150mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	Varies greatly with formulation	Appears to be somewhat toxic with great variation	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004d

LC50** - lethal concentration for 50% of population tested

Herbicide application in timber stand improvement areas is not likely to have any direct, indirect or cumulative impacts on these sensitive fish species. All streams perennial and intermittent would be protected, by 100 and 30-foot herbicide application buffers and; all source waters would be protected by 300-foot buffers. Buffers are to be clearly marked (herbicide standard HU006) before treatment so applicators can easily see and avoid them (USDA Forest Service, 2005a).

Direct and indirect effects to these MIS 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 98% of NNIS treatments occurring outside streamside

management area protection buffers (aquatic habitats) and following RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13). Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010).

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. No cumulative effects are anticipated.

Prescribed Burning (fuel reduction and fire restoration treatments):

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 guide lines outlined in the Revised Forest Plan for protection of perennial streams would limit the potential for any direct, indirect, or cumulative impacts to these MIS fish species or their aquatic habitats.

Fish Passage Restoration:

Direct and indirect impacts could occur during demolition and construction by individuals being crushed or impacted and localized water quality degradation due to sedimentation/leachate but this would be a onetime short-term occurrence and the area of disturbance would be limited. In an effort to avoid impacts any work within the stream channel would take place during low flow periods and employ erosion/sediment control techniques such as; sediment screens, filters, seeding and mulching (etc.) to control sediment loss thus limiting potential for any impacts to downstream populations. Replacement or modification of structures will have the long-term benefit of improving/easing fish passage at the site and restoring barrier free migration upstream from increased stream flow capacity and lower water velocities for longer periods of time facilitating aquatic organism passage over a greater range of stream flows. No cumulative impacts are anticipated due to the limited scope and short duration of work involved.

Pond and Wildlife Opening Rehabilitation:

Sites do not contain suitable habitats capable of supporting these MIS fish species and wildlife ponds within the analysis area 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, indirect, or cumulative impacts to these MIS fish species are anticipated.

Soil Stabilization and Restoration (stream restoration, dispersed campsite closure, unauthorized road close and decommission):

Proposed soil stabilization and restoration treatments (see section IV for descriptions) would be used to protect wildlife, soil and water resources. Proposed stream restoration treatments could have a direct effect on MIS fish species by individuals being crushed during restoration treatments but is unlikely due to the limited area of impact. All other proposed soil restoration actions will have no direct effect. Indirect effects could occur from increased siltation during restoration activities, but would be a temporary disturbance and short in duration and not expected to pose an increased risk to these MIS fish species. In an effort to avoid impacts all work within SMA would take place during low flow periods. Cumulatively, these restoration treatments are anticipated to benefit these sensitive fish species by decreasing stream siltation and sedimentation and improving water quality.

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/fire-lines 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 more detrimental impacts than the proposed roadwork. Also fire-line construction and layout would take advantage of natural and manmade barriers (streams and roads) thus limiting the need to manually construct new lines. Fire-lines crossing intermittent and perennial stream corridors would be constructed using hand tools. Fire-lines would be water barred and seeded after construction to limit the potential for sediment runoff. The potential for sedimentation would be reduced by implementing RFP standards and guidelines. Cumulatively, these proposed treatments are anticipated to benefit these MIS fish species by decreasing stream siltation and sedimentation.

Resource Protection-Gate Installation, Nest/Roost Box Installation & Dispersed Campsite Closure:

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

Effect on Forest-wide Population Trends:

Implementation of the Proposed Action alternative would have positive Forest-wide trends for these species.

No Herbicide

The No Herbicide alternative would have no direct, indirect or cumulative effects on these MIS fish species as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in the Proposed Action alternative.

Effect on Forest-wide Population Trends:

Implementation of the No Herbicide alternative would have positive Forest-wide trends for these species.

No Action

The No Action alternative would have no directs effects on MIS fish species. Although, aquatic habitats are protected under all alternatives by management standards in the Revised Forest Plan indirect effects to MIS fish species under this alternative would continue to persist contributing sediments to streams from sites with eroded soils not being stabilized, roads needing repairs/closures and stream crossings with barriers to aquatic organism passage not being restored.

Effect on Forest-wide Population Trends:

Implementation of the No Action alternative would have negative effects on future Forest-wide trends for these species.

Proposed, Endangered, Threatened and Sensitive Species (PETS)

A review of each species listed on the Regional Forester's Sensitive Species list for the Ouachita National Forest was given special consideration during project planning for the Southern Creek Ouachita River project. The Forest Service's Sensitive Species list for the Mena and Oden Ranger Districts, the Arkansas Natural Heritage Commission inventories of PETS species, the USDI -FWS list of Endangered and Threatened Wildlife and Plants, Vernon Bate's sensitive plant survey of the Mena and Oden RDs (Bates, 1990; Bates, 1991), and Forest and District records were all examined for potential PETS species locations.

Consultation History for PETS species included in the Revised Forest Plan can be found in the Biological Evaluation for the Southern Creek Ouachita River project which is included in this EA as Appendix C. The Biological Evaluation for the Southern Creek Ouachita River Watershed (SCORW-BE) reviewed all PETS species identified to occur or potentially occur on the Ouachita National Forest. In all, 80 species were reviewed including 16 PET species and 64 Sensitive species. Of those, the SCORW-BE reviewed 28 species in detail. Detailed descriptions of these PETS species, their habitats, and a discussion of the effects of the proposed actions on each are included in the SCORW-BE. The information below addresses direct, indirect, and cumulative effects of all alternatives on the selected PETS species as those species occurring or potentially occurring in the analysis area. The other PETS species listed in the SCORW-BE are excluded from further discussion here as no direct, indirect, or cumulative effects are expected.

Effects Analysis on Proposed, Endangered, Threatened and Sensitive Species

The analysis of effects discussion below is separated and organized as follows. 1) Species will be discussed in the order shown in the table below. 2) Some species are lumped into

species groups when the effects on each are similar. 3) Each species, or group of species, is discussed by alternative. 4) For each alternative, direct, indirect, and cumulative effects on each species or group of species is discussed.

Table 3.11. PETS Species evaluated for the proposed Southern Creek Ouachita River Project Area.

Group	Scientific Name	Common Name	Status
Mammal	*Myotis sodalis*	Indiana bat	Endangered
Mammal	*Myotis septentrionalis*	Northern Long-eared bat	Proposed Endangered
Bird	*Picoides borealis*	Red-cockaded Woodpecker	Endangered
Vascular Plant	*Ptilimnium nodosum*	Harperella	Endangered
Mollusks	*Cumberlandia monodonta*	Spectaclecase	Endangered
Mollusks	*Lampsilis powellii*	Arkansas fatmucket	Threatened
Mollusks	*Quadrula cylindrica cylindrica*	Rabbitsfoot	Threatened
Mollusks	*Lampsilis hydiana*	Louisiana fatmucket	Sensitive
Mollusks	*Villosa arkansasensis*	Ouachita creekshell	Sensitive
Mollusks	*Cyprogenia aberti*	Western fanshell mussel	Sensitive
Mollusks	*Lampsilis satura*	Sandbank pocketbook	Sensitive
Mollusks	*Toxolasma lividus*	Purple Lilliput	Sensitive
Crustaceans	*Procambarus reimeri*	A crayfish	Sensitive
Crustaceans	*Orconectes menae*	A crayfish	Sensitive
Fish	*Etheostoma pallididorsum*	Paleback Darter	Sensitive
Fish	*Notropis ortenburgeri*	Kiamichi shiner	Sensitive
Fish	*Noturus lachneri*	Caddo madtom	Sensitive
Fish	*Percina brucethompsoni*	Ouachita darter	Sensitive
Insect	*Speyeria diana*	Diana fritillary	Sensitive
Amphibians	*Plethodon fourchensis*	Fourche Mountain salamander	Sensitive
Mammal	*Myotis leibii*	Eastern small-footed bat	Sensitive
Bird	*Aimophila aestivalis*	Bachman's Sparrow	Sensitive
Vascular Plant	*Amorpha ouachitensis*	Ouachita leadplant	Sensitive
Vascular Plant	*Castanea pumila* var. *ozarkensis*	Ozark chinquapin	Sensitive
Vascular Plant	*Cypripedium kentuckiense*	Southern Lady's slipper	Sensitive
Vascular Plant	*Vernonia lettermannii*	Narrowleaf ironweed	Sensitive
Vascular Plant	*Streptanthus squamiformis*	Pineoak jewelflower	Sensitive
Vascular Plant	*Solidago ouachitensis*	Ouachita Mountain goldenrod	Sensitive

- **Indiana bat (*Myotis sodalis*) Endangered**
- **Northern Long-eared bat (*Myotis septentrionalis)* Proposed Endangered**
- **Eastern small-footed bat (*Myotis leibii*) Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management (commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

Timber management treatments all have the potential to both positively and negatively affect bat species within the analysis 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 falling trees. If a maternity tree is felled, young non-volant pups could be killed. Disturbance within treatment areas may also cause bats to temporarily abandon treatment sites but actions would not likely exclude bats from foraging in treatment areas. Thinning of forest stands could indirectly alter foraging areas and temporarily change insect populations and densities within treatment areas. Insects populations would likely increase with increased plant diversity due to more open conditions and increased openness of the forest mid-story would also benefit foraging bats by easing movement through the forest. No direct or indirect effects would occur to wintering Indiana, northern long-eared bats or Eastern small-footed bats as no winter hibernacula exists in the analysis area.

Southern Creek of Ouachita River watershed has had commercial harvest, wildlife improvement projects, and prescribed burning in the past. The use of fire and timber harvest activities would at first decrease the amount of roosting habitat but over time the amount of habitat would be increased due to the snags created by fire and harvest damage. Cumulative effects would and has increase the amount of suitable foraging areas in the analysis area for the next 5-10 years as permanently closed and decommissioned areas are reclaimed by surrounding habitats. The cumulative effects of maintained water sources would be to provide reliable water sources and open foraging areas throughout the watershed.

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

The Mena RD is proposing the use of the following herbicide active ingredients for site preparation, seedling release, and control of non-native invasive species: clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr. Direct effects/impacts to Indiana and Northern long-eared bat are unlikely due to herbicide use for timber stand improvement only affecting 225 acres of area in pine/pine hardwood stands, and non-native invasive species treatments mainly along road right of ways occurring in unsuitable habitat. Both positive and negative indirect effects could occur from potentially reducing/increasing vegetation and consequently the insect population numbers of diversity in treatment areas. No cumulative effects/impacts are anticipated from the proposed herbicide treatments.

Direct, indirect and cumulative effects/impacts for manual control methods would be the same as those determined for timber management treatments.

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

There will be no direct effects/impacts on Indiana, Northern long-eared, or Eastern small-footed bats from prescribed burning treatments. The only known Indiana bat, Northern long-eared bat, or Eastern small-footed bat hibernaculum on Forest is Bear Den Cave located in southeastern Oklahoma. The 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. The cumulative effects of prescribed fire would be minimal because proposed burns would only affect a small percentage of the project area and would be burned in sections during the 10-year period covered by this document. The variety of fire intensities that would occur due to environmental conditions would provide a habitat mosaic with varying degrees of midstory vegetation removal and occasional overstory tree mortality that would help create new possible roost trees.

Fish Passage Restoration

Sites do not contain suitable habitats capable of supporting these species. No direct, indirect, or cumulative impacts to Indiana bat or small footed bat are anticipated.

Pond and Wildlife Opening Rehabilitation

Wildlife ponds and openings play and important role in the foraging ecology of woodland bat species. Many bat species take advantage of wildlife ponds for drinking and foraging since openings often 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.

The proposal to rehabilitate wildlife ponds is not necessarily meant or intended to increase the availability of open water. There is a rich diversity of large and small, permanent streams and thus water is not a limiting factor for wildlife. However non-flowing limnetic (pond like) habitats are limited within the analysis area. Ponds provide important ecological niche habitats essential to certain species of amphibians, birds, reptiles and insects as well as mammals like bats. 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 excellent foraging habitats for bats.

The direct and indirect effects of rehabilitating the existing ponds and openings would be similar to those for timber harvest and non-native invasive treatments. The cumulative effects would be to provide reliable water sources and open foraging areas throughout the watershed.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. No direct effects/impacts to Indiana bat, Northern long-eared bat, and small-footed bats are anticipated since actions would be to close currently open and closed roads/trails and rehabilitate impacted areas. Indirect benefits would be likely since proposed actions would provide linear flight corridors and linear foraging areas for bats. Cumulatively effects would increase the amount of suitable foraging areas in the analysis area for the next 5-10 years as permanently closed and decommissioned areas are reclaimed by surrounding habitats.

Resource Protection - Gate Installation

Gates would be 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 analysis area. Therefore no direct, indirect, or cumulative impact to these bat species is anticipated.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Direct, indirect, and cumulative effects/impacts would be the same as those determined for timber management and soil stabilization and restoration treatments.

No Herbicide

The No Herbicide alternative would have no direct, indirect or cumulative effects on Indiana bat, Northern long-eared bat, and Eastern small-footed bat as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Proposed Action alternative.

No Action

The No Action alternative would have no direct effects Indiana bat, Eastern small-footed bat, or Northern long-eared bat. 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 midstory for ease of movement. Without the continued presence of a diversity of seral habitats Indiana bat, Northern long-eared bat, or Eastern small-footed bat populations could be affected. No cumulative effects would be expected in the absence of proposed activities.

- **Paleback darter (***Etheostoma pallididorsum)* **Sensitive**
- **Ouachita darter (***Percina brucethompsoni***) Sensitive**
- **Kiamichi shiner (***Notropis ortenburgeri)* **Sensitive**
- **Caddo madtom (***Noturus lachneri)* **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management
(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

None of the proposed timber management actions are expected to have any direct, indirect, or cumulative effects on to Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom. This species and its habitats are, currently protected by streamside management areas, as defined in the Revised Forest Plan (USDA Forest Service, 2005a).

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

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

Neither the published literature nor the U.S. EPA files (U.S. EPA/OPP 1993, 1998a) include data regarding the toxicity of any of these chemicals or their formulations specific to to Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom. Most all bioassay studies use various fish species, mainly bluegill which will be used as the closest representative to this sensitive fish species.

Table 3.12. Summary of LD50 Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Fluroxypyr	14.3-100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	70-170mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>150mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	Varies greatly with formulation	Appears to be somewhat toxic with	Syracuse Environmental Research Associates, Inc. 2003b

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Clopyralid	>100mg/L	great variation Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004d

LC50** - lethal concentration for 50% of population tested

Herbicide application in timber stand improvement areas is not likely to have any direct, indirect or cumulative impacts on to Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom. Only 225 acres of reforestation is proposed and is outside streamside protection areas. All streams perennial and intermittent would be protected, by 100 and 30-foot herbicide application buffers and; all source waters would be protected by 300-foot buffers. Buffers are to be clearly marked (herbicide standard HU006) before treatment so applicators can easily see and avoid them (USDA Forest Service, 2005a).

Direct and indirect effects to Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom 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 98% of NNIS treatments occurring outside streamside management area protection buffers (aquatic habitats) and following RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13). Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010). 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. No cumulative effects are anticipated.

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

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 approximately 12 to 16 percent of the analysis area sometime during the 10 years following implementation of the proposed project. This along with strict guide lines outlined in the Revised Forest Plan for protection of perennial streams would limit the potential for any direct, indirect, or cumulative impacts to Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom or their habitats.

Fish Passage Restoration

Proposed fish passage restoration would occur at various stream crossings within the analysis area. Drainage structures would be replaced and/or modified on the downstream/upstream sides with large rock or cobble to allow for fish passage.

Direct and indirect impacts could occur during demolition and construction by individuals being crushed or impacted and localized water quality degradation due to sedimentation/leachate but this would be a onetime short-term occurrence and the area of disturbance would be limited. In an effort to avoid impacts any work within the stream channel would take place during low flow periods and employ erosion/sediment control techniques such as; sediment screens, filters, seeding and mulching (etc.) to control sediment loss thus limiting potential for any impacts to downstream populations. Replacement or modification of structures will have the long-term benefit of improving/easing fish passage at the site and restoring barrier free migration upstream from increased stream flow capacity and lower water velocities for longer periods of time facilitating aquatic organism passage over a greater range of stream flows. No cumulative impacts are anticipated due to the limited scope and short duration of work involved.

Pond and Wildlife Opening Rehabilitation

Sites do not contain suitable habitats capable of supporting this sensitive species. No direct, indirect, or cumulative impacts to Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom are anticipated.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. Proposed stream restoration treatments could have a direct effect on Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom by individuals being crushed during restoration treatments but is unlikely due to the limited area of impact. All other proposed soil restoration actions will have no direct effect. Indirect effects could occur from increased siltation during restoration activities, but would be a temporary disturbance and short in duration and not expected to pose an increased risk to the Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom. In an effort to avoid impacts all work within SMA would take place during low flow periods. Cumulatively, these restoration treatments are anticipated to benefit to the Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom by decreasing stream siltation and sedimentation and improving water quality.

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 more detrimental impacts than the proposed roadwork. Also fire-line construction and layout would take advantage of natural and manmade barriers

(streams and roads) thus limiting the need to manually construct new lines. Firelines 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 RFP standards and guidelines. Cumulatively, these proposed treatments are anticipated to benefit to the Paleback darters, Ouachita darter, Kiamich shiner, and Caddo madtom by decreasing stream siltation and sedimentation.

Resource Protection-Gate Installation

Proposed treatments would have no direct, indirect, or cumulative impacts on the Paleback darters, Ouachita darter, Kiamichi shiner, and Caddo madtom. All proposed treatment sites are located outside of suitable habitats for this sensitive fish species.

No Herbicide

Direct, indirect and cumulative effects would be the same as those determined for MIS fish species.

No Action

Direct, indirect and cumulative effects would be the same as those determined for MIS fish species.

- **A crayfish** *(Orconectes menae)* **Sensitive**
- **A crayfish** *(Orconectes reimeri)* **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management
(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

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

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

Herbicide application and manual control methods for NNIS species would be allowed throughout the proposed planning area as needed for elimination/control of non-native

invasive weeds. The Mena RD is proposing the use of the following herbicide active ingredients for site preparation, seedling release, and control of non-native invasive species: clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr.

Neither the published literature nor the U.S. EPA files (U.S. EPA/OPP 1993, 1998a) include data regarding the toxicity of any of these chemicals or their formulations specific on these crayfish species. Most all bioassay studies use various fish species, mainly bluegill which will be used as the closest representative to this sensitive fish species.

Table 3.13. Summary of LD50 Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Fluroxypyr	14.3-100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	70-170mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>150mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	Varies greatly with formulation	Appears to be somewhat toxic with great variation	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004d

LC50** - lethal concentration for 50% of population tested

Herbicide application in timber stand improvement areas is not likely to have any direct, indirect or cumulative impacts on these crayfish species. Only 225 acres of reforestation is proposed and is outside streamside protection areas. All streams perennial and intermittent would be protected, by 100 and 30-foot herbicide application buffers and; all source waters would be protected by 300-foot buffers. Buffers are to be clearly marked (herbicide standard HU006) before treatment so applicators can easily see and avoid them (USDA Forest Service, 2005a).

Direct and indirect effects to on these crayfish 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 RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13). Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010). 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. No cumulative effects are anticipated.

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

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 analysis area sometime during the 10 years following implementation of the proposed project. This along with strict guide lines outlined in the Revised Forest Plan for protection of perennial streams would limit the potential for any direct, indirect, or cumulative impacts to on these crayfish species or their habitats.

Fish Passage Restoration

Proposed fish passage restoration would occur at various stream crossings within the analysis area. Drainage structures would be replaced and/or modified on the downstream/upstream sides with large rock or cobble to allow for fish passage.

Direct and indirect impacts could occur during demolition and construction by individuals being crushed or impacted and localized water quality degradation due to sedimentation/leachate but this would be a onetime short-term occurrence and the area of disturbance would be limited. In an effort to avoid impacts any work within the stream channel would take place during low flow periods and employ erosion/sediment control techniques such as; sediment screens, filters, seeding and mulching (etc.) to control sediment loss thus limiting potential for any impacts to downstream populations. Replacement or modification of structures will have the long-term benefit of improving/easing fish passage at the site and restoring barrier free migration upstream from increased stream flow capacity and lower water velocities for longer periods of time facilitating aquatic organism passage over a greater range of stream flows. No cumulative impacts are anticipated due to the limited scope and short duration of work involved.

Pond and Wildlife Opening Rehabilitation

Sites do not contain suitable habitats capable of supporting this sensitive species. No direct, indirect, or cumulative impacts to on these crayfish species are anticipated.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. Proposed stream restoration treatments could have a direct effect on these crayfish species by individuals being crushed during restoration treatments but is unlikely due to the limited area of impact. All other proposed soil restoration actions will have no direct effect. Indirect effects could occur from increased siltation during restoration activities, but would be a temporary disturbance and short in duration and not expected to pose an increased risk to these crayfish species. In an effort to avoid impacts all work within SMA would take place during low flow periods. Cumulatively, these restoration treatments are anticipated to benefit to these crayfish species by decreasing stream siltation and sedimentation and improving water quality.

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 more detrimental impacts than the proposed roadwork. Also fire-line construction and layout would take advantage of natural and manmade barriers (streams and roads) thus limiting the need to manually construct new lines. Firelines 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 RFP standards and guidelines. Cumulatively, these proposed treatments are anticipated to benefit to these crayfish species by decreasing stream siltation and sedimentation.

Resource Protection-Gate Installation

Proposed treatments would have no direct, indirect, or cumulative impacts on these crayfish species. All proposed treatment sites are located outside of suitable habitats for this sensitive fish species.

No Herbicide

Direct, indirect and cumulative effects would be the same as those determined for the proposed action.

No Action

No action would have no direct, indirect or cumulative effect on these crayfish species.

- **Arkansas fatmucket (***Lampsillis powellii)* **Threatened**
- **Spectaclecase (***Cumberlandia monodonta***) Endangered**

- **Rabbitsfoot (***Quadrula cylindrical cylindrica)* **Threatened**
- **Louisiana fatmucket (***Lampsilis hydiana)* **Sensitive**
- **Ouachita creekshell (***Villosa arkansasensis)* **Sensitive**
- **Western fanshell mussel (***Cyprogenia aberti***) Sensitive**
- **Sandbank pocketbook (***Lampsilis satura)* **Sensitive**
- **Purple Lilliput (***Toxolasma lividus)* **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management
(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

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

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

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

Neither the published literature nor the U.S. EPA files (U.S. EPA/OPP 1993, 1998a) include data regarding the toxicity of any of these chemicals or their formulations specific to mollusk species. Most all bioassay studies use various fish species, mainly bluegill which will be used as the closest representative to this sensitive fish species.

Table 3.14. Summary of LD50 Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Fluroxypyr	14.3-100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	70-170mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004a

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Imazapyr	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>150mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	Varies greatly with formulation	Appears to be somewhat toxic with great variation	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004d

LC50** - lethal concentration for 50% of population tested

Herbicide application in timber stand improvement areas is not likely to have any direct, indirect or cumulative impacts on any mollusks species. Only 225 acres of reforestation is proposed and is outside streamside protection areas. All streams perennial and intermittent would be protected, by 100 and 30-foot herbicide application buffers and; all source waters would be protected by 300-foot buffers. Buffers are to be clearly marked (herbicide standard HU006) before treatment so applicators can easily see and avoid them (USDA Forest Service, 2005a).

Direct and indirect effects to mollusk 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 RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13).Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010). 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. No cumulative effects are anticipated.

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

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 approximately 12 to 16 percent of the analysis area sometime during the 10

years following implementation of the proposed project. This along with strict guide lines outlined in the Revised Forest Plan for protection of perennial streams would limit the potential for any direct, indirect, or cumulative impacts to mollusks species or their habitats.

Fish Passage Restoration

Proposed fish passage restoration would occur at various stream crossings within the analysis area. Drainage structures would be replaced and/or modified on the downstream/upstream sides with large rock or cobble to allow for fish passage.

Direct and indirect impacts could occur during demolition and construction by individuals being crushed or impacted and localized water quality degradation due to sedimentation/leachate but this would be a onetime short-term occurrence and the area of disturbance would be limited. In an effort to avoid impacts any work within the stream channel would take place during low flow periods and employ erosion/sediment control techniques such as; sediment screens, filters, seeding and mulching (etc.) to control sediment loss thus limiting potential for any impacts to downstream populations. Replacement or modification of structures will have the long-term benefit of improving/easing fish passage at the site and restoring barrier free migration upstream from increased stream flow capacity and lower water velocities for longer periods of time facilitating aquatic organism passage over a greater range of stream flows. No cumulative impacts are anticipated due to the limited scope and short duration of work involved.

Pond and Wildlife Opening Rehabilitation

Sites do not contain suitable habitats capable of supporting this sensitive species. No direct, indirect, or cumulative impacts to the mollusks species are anticipated.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. Proposed stream restoration treatments could have a direct effect on mollusks species by individuals being crushed during restoration treatments but is unlikely due to the limited area of impact. All other proposed soil restoration actions will have no direct effect. Indirect effects could occur from increased siltation during restoration activities, but would be a temporary disturbance and short in duration and not expected to pose an increased risk to mollusks species. In an effort to avoid impacts all work within SMA would take place during low flow periods. Cumulatively, these restoration treatments are anticipated to benefit to the mollusks species by decreasing stream siltation and sedimentation and improving water quality.

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 more detrimental impacts than the proposed roadwork. Also fire-line construction and layout would take advantage of natural and manmade barriers (streams and roads) thus limiting the need to manually construct new lines. Firelines 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 RFP standards and guidelines. Cumulatively, these proposed treatments are anticipated to benefit to the mollusks species by decreasing stream siltation and sedimentation.

Resource Protection-Gate Installation

Proposed treatments would have no direct, indirect, or cumulative impacts on the mollusks species. All proposed treatment sites are located outside of suitable habitats for this sensitive fish species.

No Herbicide

Direct, indirect and cumulative effects would be the same as those determined for MIS fish species.

No Action

Direct, indirect and cumulative effects would be the same as those determined for MIS fish species.

- **Fourche Mountain salamander** *(Plethodon fourchensis)*

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management
(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

Fourche Mountain salamander habitats are generally confined to steep, rocky, north facing slopes, of mixed deciduous hardwoods adjacent to riparian habitats. Since Fourche Mountain salamander habitats are somewhat restrictive no direct or indirect impacts are anticipated from the proposed timber management actions. All proposed actions would occur outside of streamside buffer areas and slopes over 35%. No cumulative impacts are anticipated.

Herbicide Treatments (Timber stand improvement and non-native invasive control)

Manual Treatments for Non-Native Invasive Control

The Mena RD is proposing the use of the following herbicide active ingredients for site preparation, seedling release, and control of non-native invasive species: clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr. Neither the published literature nor the U.S. EPA files (U.S. EPA/OPP 1993, 1998a) include data regarding the toxicity of any of these chemicals or their formulations to amphibian species except for triclopyr. Most all bioassay studies use various fish species as the closest potential analogs to amphibians. Given the great disparity of risk assessment information for terrestrial amphibians the risk characterizations obviously lead to uncertainty in the risk assessment. Therefore all measures would be taken to limit the potential of exposure to terrestrial amphibian communities within the planning area.

Table 3.15. Summary of LD50 Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	LC50*	Toxicity Risk to Bluegill	Risk Assessment
Fluroxypyr	14.3-100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	70-170mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2003a
Imazapic	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>150mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	Varies greatly with formulation	Appears to be somewhat toxic with great variation	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	>100mg/L	Practically Nontoxic	Syracuse Environmental Research Associates, Inc. 2004d

LC50** - lethal concentration for 50% of population tested

Herbicide application in timber stand improvement areas is not likely to have any direct, indirect or cumulative impacts on Fourche Mountain salamander. Only 225 acres of reforestation is proposed and is outside optimal habitat and streamside areas. Surveys conducted within timber stand improvement areas did not find any Fourche Mountain salamanders.

Herbicide application and manual control methods for NNIS species would be allowed throughout the proposed planning area as needed for elimination/control of non-native invasive weeds. Direct and indirect effects to Fourche Mountain salamander 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 98% of NNIS treatments occurring along maintained road right of ways that are disturbed compacted areas not conducive to salamanders and following RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. . Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13). Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010). As part of implementation, each site proposed for treatment would be evaluated for the presence of PETS species and PETS habitat for determining the best treatment method and timing. No cumulative effects are anticipated.

Prescribed Burning (Fuel reduction and fire restoration treatments)

Fourche Mountain salamanders have a high rate of dehydration and depend on habitats with high soil moisture content. Rocky slopes, rotten logs and extensive tunnel systems are constructed and used to escape heat and dry conditions (Trauth et al., 2004). Given the preferred habitats of this salamander it is unlikely that prescribed burning would have any direct, indirect or cumulative impact.

Fish Passage Restoration

Direct, indirect, and cumulative impacts would be the same as those determined for sensitive crayfish species.

Pond and Wildlife Opening Rehabilitation

All proposed pond and wildlife openings rehabilitation sites were surveyed for Fourche salamanders and suitable habitat in 2014 by district biologists. None of the proposed sites were found to contain sensitive salamanders. No direct, indirect or cumulative impacts on Fourche Mountain salamander are anticipated.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. These restoration areas do not contain habitat suitable for Fourche Mountain salamander or is unsuitable due to over use. No direct or indirect impacts to Fourche Mountain salamander are anticipated. Decommissioning of roads may benefit Fourche Mountain salamander by decreasing stream siltation and sedimentation and by reconnecting habitats separated by road systems.

Resource Protection - Gate Installation

No direct, indirect or cumulative impacts from installation of access gates are anticipated due to the limited area of disturbance and proposed mine closure actions would occur directly in mine openings and therefore would not directly, indirectly, or cumulatively impact Fourche Mountain salamander.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

It is possible that individual salamanders could be impacted by the proposed actions. If Fourche Mountain salamanders were to occur they would generally be found in habitats such as; steep, rocky, north facing slopes, of mixed deciduous hardwoods adjacent to riparian habitats and certain mine locations within the analysis area. Any direct impacts are anticapated to be limited due to these habitat preferences and surveys found no new occurrence of Fourche Mountain salamander in proposed treaments areas. In addition, firelines used for prescribed burning would take advantage of existing natural barriers rather than cut a line through possible salamander habitats. Indirect or cumulative effects are not anticipated because of the limited amount of disturbance to preferred habitats. Reconstruction and maintenance of system roads would have no direct, indirect or cumulative impacts to Fourche Mountain salamander since actions would occur in disturbed areas unsuitable to salamanders.

No Herbicide

No herbicide alternative would have no direct, indirect or cumulative effects on Fourche Mountain salamander as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Proposed Action Alternative.

No Action

No Action alternative would have no direct, indirect or cumulative effect on this sensitive salamander species.

- **Diana fritillary** (*Speyeria diana*) **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management
(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

Since adult butterflies are highly mobile it is extremely unlikely that they would be directly affected by timber management actions. However, there is the possibility of direct effects to

eggs and larvae if trees are felled or equipment impacts larva in the leaf litter. Although timber management actions may directly affect eggs and larvae of butterflies these same actions (timber removal, TSI, WSI) 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.

The proposed timber management actions would have no cumulative effects on Diana fritillary. All treatment actions would create some disturbance to the understory vegetation and could result in the temporary loss (one growing season) of some woody shrubs, and annual, and perennial broadleaf herbaceous plant species that provide shelter and food sources (nectar) 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.

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

The Mena RD is proposing the use of the following herbicide active ingredients for site preparation, seedling release, and control of non-native invasive species: clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr. Given the great diversity of species of terrestrial invertebrates, the use of data from a single species (Bee - Apis mollifera) for the risk characterization obviously 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 effect of herbicide application would most likely come in the temporary loss of some woody shrubs, and annual, and perennial broadleaf herbaceous plant species that provide shelter and food sources (nectar) 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. No long term cumulative impacts are anticipated due to the limited scope of treatments in both space and time.

Table 3.16. Summary of LD50 Values for Each Proposed Herbicide Active Ingredient

Active Ingredient	LD50*	Toxicity Risk to Bee - Apis mollifera	Risk Assessment
Fluroxypyr	>25µg/bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2009
Glyphosate	>100 µg/bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2003a

Imazapic	No LD50 stated	Nontoxic	Syracuse Environmental Research Associates, Inc. 2004a
Imazapyr	No LD50 stated	Nontoxic	Syracuse Environmental Research Associates, Inc. 2004b
Metsulfuron Methyl	>25µg/bee	Relatively Nontoxic to bees and White butterfly (Brassica nepus)	Syracuse Environmental Research Associates, Inc. 2004c
Triclopyr	>100 µg/bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2003b
Clopyralid	>100 µg/bee	Relatively Nontoxic	Syracuse Environmental Research Associates, Inc. 2004d

LD50*- lethal dose for 50% of population tested

Direct, indirect and cumulative effects/impacts for manual control methods would be the same as those determined for timber management treatments.

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

No direct impacts from prescribed burning are anticipated on adult Diana fritillary since adult butterflies are naturally adept at avoiding natural and prescribed fire. There is the possibility that prescribed burning may directly impact eggs and larvae over-wintering in the leaf litter. However prescribed burning 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. No cumulative effects are anticipated from proposed burning activities.

Fish Passage Restoration and Resource Protection-Gate Installation

Since proposed fish passage actions would occur outside of habitats preferred by this butterfly species no direct, indirect or cumulative impacts are anticipated.

Pond and Wildlife Opening Rehabilitation

Direct, indirect and cumulative effects would be the same as timber and non-native invasive weed treatments.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. No direct impacts to Diana fritillary are anticipated since actions would be to close currently open roads, reassign designation of existing roads and rehabilitate impacted areas. It is likely proposed actions would indirectly benefit butterflies by allowing these areas to re-vegetate thus

providing potential foraging habitat. Cumulatively the preferred alternative would increase the amount of suitable foraging area in the analysis area for the next 5-10 years until these areas are reclaimed by surrounding habitats.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Direct, indirect, and cumulative impacts would be the same as those determined for timber management and soil restoration treatments.

Nest/Roost Box Installation

No direct or indirect impacts are anticipated as a result of placing roosting or nest boxes within the analysis area. Placement would require minimal ground disturbance and would not result in the loss of vegetation upon which Diana fritillary is dependent. Bats or bat colonies using bat houses are unlikely to pose any added predatory risk to Diana fritillary since this is a diurnal butterfly species and bats are nocturnal feeders. No cumulative impacts associated with addition of nest boxes.

No Herbicide

No herbicide alternative would have no direct, indirect or cumulative effects on Diana fritillary as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in proposed alternative.

No Action

No action alternative would have no direct effects on Diana fritillary. Indirect and cumulative 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 (nectar) for this butterfly species. Without the continued presence of early seral stage habitats Diana fritillary populations would be expected to decline.

- **Red-cockaded woodpecker** (*Picoides borealis*) **Endangered**
- **Bachman's sparrow** (*Aimophilia aestivalis*) **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management

(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

Timber management treatments all have the potential to both positively and negatively affect red-cockaded woodpeckers and Bachman's sparrow within the analysis area. For instance, falling trees could directly affect nesting birds. Roosting sites could potentially be felled or damaged by falling trees. Some disturbance may occur in foraging areas but this would only be temporary and foraging birds would be expected to move to alternative foraging locations. Thinning of forest stands could indirectly alter foraging areas and temporarily change insect populations and densities within treatment areas. Insects populations would likely increase with increased plant diversity due to more open conditions and increased openness of the forest mid-story would also benefit foraging birds by easing movement through the forest. No direct or indirect effects would occur to red-cockaded woodpeckers and Bachman's sparrow as no RCW colonies exists in the analysis area.

Herbicide Treatments (timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

The Mena RD is proposing the use of the following herbicide active ingredients for site preparation, seedling release, and control of non-native invasive species: clopyralid, fluroxypyr, glyphosate, imazapic, imazapyr, metsulfuron methyl, and triclopyr. Direct effects to red-cockaded woodpeckers and Bachman's sparrow could be likely due to herbicide applications for timber stand improvement and non-native invasive species treatments occurring in already disturbed areas from timber harvest or road side applications. Both positive and negative indirect effects could occur from potentially reducing/increasing vegetation and consequently the insect population numbers of diversity in treatment areas.

Direct and indirect effects for manual control methods would be the same as those determined for timber management treatments.

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

Prescribed burning would only indirectly effect red-cockaded woodpeckers and Bachman's sparrow in the winter because of the changes to the understory reducing vegetation and loss of some insect populations. Fire from prescribed burning could directly affect red-cockaded woodpeckers and Bachman's sparrow by burning up nest or killing trees that would provide for more forage for the RCW's but would be unlikely because the majority of burns occur in the dormant growing season. Indirect effects of prescribed burns would be to possibly reduce the amount of understory vegetation that inhibits free bird movement and foraging activity by maintaining uncluttered foraging pathways and easier access to forage trees and disturbance from smoke may also cause birds to temporarily abandon treatment sites but actions would not likely exclude birds from foraging in treatment areas. Proposed burns would occur over the majority of the project area and would be burned in sections during the 10-year period covered by this document. The variety of fire intensities that would occur due to environmental conditions would provide a habitat mosaic with varying degrees of

midstory vegetation removal and occasional overstory tree mortality. Prescribed fire would help maintain and create habitat that would be beneficial for these bird species.

Fish Passage Restoration

Sites do not contain suitable habitats capable of supporting these species. No direct or indirect impacts to red-cockaded woodpeckers and Bachman's sparrow are anticipated.

Pond and Wildlife Opening Rehabilitation

Wildlife ponds and openings play and important role in the foraging ecology of woodland bird species. Many bird species take advantage of wildlife ponds for drinking and foraging since openings often support a high concentration of insects and a rich diversity of insect populations. The uncluttered flying space provided by openings allows birds to freely maneuver, find and catch insect prey and expend less energy than they normally would in a more heavily forested habitat.
Ponds provide important ecological niche habitats essential to certain species of amphibians, birds, reptiles and insects as well as mammals. 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 excellent foraging habitats for bats.

The direct and indirect effects of rehabilitating the existing ponds and openings would be similar to those for timber harvest and non-native invasive treatments.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments would be used to protect wildlife, soil and water resources. No direct effects to red-cockaded woodpeckers and Bachman's sparrow are anticipated since actions would be to close currently open and closed roads/trails and rehabilitate impacted areas. Indirect benefits would be likely since proposed actions would provide linear flight corridors and linear foraging areas for birds.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Direct or indirect effects/impacts would be the same as those determined for timber management and soil stabilization and restoration treatments.

Nest/Roost Box Installation

No direct or indirect impacts are anticipated as a result of placing roosting or nest boxes within the analysis area.

Resource Protection - Gate Installation

Gates would be 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 analysis area. No direct or indirect impact to these bird species is anticipated.

Dispersed Campsite Closure

Direct and indirect effects/impacts would be the same as those determined for soil stabilization and restoration treatments.

No Herbicide

No herbicide alternative would have no direct, indirect or cumulative effects on Red-cockaded woodpecker and Bachman's sparrow as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in proposed alternative.

No Action

No action alternative would have no direct effects on Red-cockaded woodpecker and Bachman's sparrow. Indirect and cumulative effects would include the continued maturing of the forest leaving the basal area too high in the mature forest that would remove any habitat that could possibly be found in the watershed. This process could result in an overall decline of some possible forage habitat that would be found currently in the watershed.

Sensitive Plant Species of Streamside Management Areas

The following five species are all riparian species and will be discussed as a group in sections of this document below. Known occurrences are discussed briefly, based on previous surveys and records.

- **Ouachita leadplant** (*Amorpha ouachitensis*) **Sensitive**
- **Southern lady's-slipper** (*Cypripedium kentuckiense*) **Sensitive**
- **Narrowleaf ironweed** (*Vernonia lettermannii)* **Sensitive**
- **Ouachita Mountain goldenrod** (*Solidago ouachitensis*) **Sensitive**
- **Harperella** (*Ptilimnium nodosum*) **Endangered**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management

(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

The above actions are proposed for upland shortleaf pine, pine/hardwood and hardwood stands that do not support habitats conditions conducive to these sensitive plant species. These plants prefer streamside management areas and are protected by the standards in the Revised Forest Plan. The proposed timber management actions would have no direct, indirect or cumulative impact on these sensitive plant species.

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

Direct, indirect and cumulative impacts from herbicide application or manual control methods for timber stand improvement treatments would be the same as those determined for timber management treatments.

Herbicide application and manual control methods for NNIS species would be allowed throughout the proposed planning area as needed for elimination/control of non-native invasive weeds. Direct effects to these sensitive plant 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 98% of NNIS treatments occurring outside suitable habitats, streamside management area protection buffers (aquatic habitats) and following RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13). Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010). Indirect effects would be reduced competition for resources from control of encroaching non-native invasive weeds. 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. No cumulative effects are anticipated.

Prescribed Burning (Fuel reduction, site preparation and fire restoration treatments**)**

Prescribed burns would occur over approximately12 to 16 percent of the analysis area sometime during the 10 years following implementation of the proposed project. Effects would vary due to fire intensity, aspect, and slope and it would be expected that some degree of forest floor cover would be removed. Overall prescribed fire is not likely to directly impact these sensitive plant 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. No cumulative impacts are anticipated as a result of the proposed treatments.

Fish Passage Restoration

Botanical field surveys of the proposed fish passage restoration sites found no occurrence of these sensitive plant species. No direct, indirect, or cumulative impacts are anticipated.

Pond and Wildlife Opening Rehabilitation

Botanical field surveys of the proposed sites found no occurrence of these sensitive plant species. No direct, indirect, or cumulative impacts to these sensitive plant species are anticipated.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV page 11 for descriptions) would be used to protect wildlife, soil and water resources. No direct effects would occur to these sensitive plant species since botanical surveys found either, no occurrence, that sites do not support habitat conditions conducive to these sensitive plant species or presently, sites do not contain suitable habitat for these sensitive plant species due to impacts of over use. Indirect and cumulative effects anticipated from rehabilitation of these sensitive plant species habitats are reduced stream siltation, soil compaction and sedimentation.

Resource Protection - Gate Installation

Since proposed actions would occur outside of habitats preferred by these sensitive plant species no direct, indirect or cumulative impacts are anticipated.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

Surveys found that proposed sites do not contain suitable habitats capable of supporting these sensitive plant species except at stream crossings and riparian habitats. Firelines used for prescribed burning would take advantage of existing natural barriers such as existing roadways and streams and utilizing 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, indirect or cumulative effects are not anticipated because of the limited amount of disturbance to preferred habitats.

No Herbicide

No herbicide alternative would have no direct, indirect or cumulative effects on these sensitive plant species as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Proposed Action.

No Action

No Action would allow natural processes to occur without human intervention. Only natural disturbances would cause changes to these sensitive species and their associated habitats

which are at the edges of streams, in seeps, wetland and riparian areas. These changes would be expected to be within the normal range of habitat fluxuation that occurs naturally and to which these species are adapted. The No Action alternative would have no direct, indirect or cumulative effect on these sensitive plant species as a result of deferred management.

Sensitive Plants Preferring Moderate Disturbance

The next two sensitive plant species receive some natural protection from human disturbance by the diversity of their preferred habitats, as described below. Many of the locations on NF lands are on sites that are outside the normal operating limits and activities. Several of the sites on NF lands are protected from habitat-altering activities by virtue of being within glade and riparian communities, Wilderness Areas, and Research Natural Areas. There are also sites located within areas that have had timber management activities, road and trail construction and in areas that have been burned repeatedly.

These sensitive plant species prefer moderate disturbances to help sustain their populations. Soil disturbances, creation of small blocks of early successional habitat, reduction in competition for water and nutrients from neighboring plants, and exposing bare mineral soil for seed contact are some of the benefits they gain by disturbances such timber management actions.

- **Pineoak jewelflower** (*Streptanthus squamiformis*) **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management

(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

Botanical field surveys found no occurrence of Pineoak jewelflower within proposed timber treatment areas. The proposed timber management actions would have no direct or indirect impact on Pineoak jewelflower.

Herbicide Treatments (Timber stand improvement and non-native invasive control)
Manual Treatments for Non-Native Invasive Control

Direct, indirect and cumulative effects for timber stand improvements would be the same as those determined for timber management treatments.

Herbicide application and manual control methods for NNIS species would be allowed throughout the proposed planning area as needed for elimination/control of non-native invasive weeds. Direct effects to Pineoak jewelflower could occur as a result of direct contact with herbicide or with personnel conducting control activities but are expected to be

limited due to NNIS treatments occurring within less than 1% of available habitats, and following RFP protections and conservation measures:

The RFP only allows herbicide use within MA 9 for control of vegetation on dams or for control of invasive and/or exotic species. Application would be approved by the Forest Supervisor following site-specific analysis and a monitoring plan (design criteria 9.13). Only a non-soil active herbicide with appropriately labeled formulation for both aquatic and terrestrial site use would be used. Also, no herbicide is to be aerially applied within 300 feet, or ground-applied within 60 feet of any threatened, endangered, proposed, or sensitive plant. RFP exceptions provide for treatment using herbicide when necessary to protect the PETS plant or to prevent the loss or significant degradation of its habitat (HU010).
Positive indirect effects are likely to occur from reducing densities and competition from non-native invasive plants 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. No cumulative effects are anticipated.

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

Prescribed burns would occur over approximately 12 to 16 percent of the analysis area sometime during the 10 years following implementation of the proposed project. Effects would vary due to fire intensity, aspect, and slope and it would be expected that some degree of forest floor cover would be removed. Vegetative portions of plants and some seed loss would likely occur depending on intensity and duration of burn events. It is likely that Pineoak jewelflower would benefit indirectly from burning due to the removal or top-killing of competing vegetation. This benefit would be most obvious in areas of rocky, shallow soils were post fire plant competition would be less. There would be no cumulative effects to this plant as a result of the application of prescribed fire.

Fish Passage Restoration

Botanical field surveys of the proposed fish passage restoration sites found no occurrence of Pineoak jewelflower. No direct or indirect impacts are anticipated.
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Pond and Wildlife Opening Rehabilitation

Botanical field surveys of the proposed sites found no occurrence of this sensitive plant species. No direct, indirect, or cumulative impacts to this sensitive plant species are anticipated.

Soil Stabilization and Restoration

Proposed soil stabilization and restoration treatments (see section IV for descriptions) would be used to protect wildlife, soil and water resources. No direct effects would occur to Pineoak jewelflower since botanical surveys found either, no occurrence, that sites do not support habitat conditions conducive to this sensitive plant species or presently, sites do not contain suitable habitat for these sensitive plant species due to impacts of over use. Indirect

effects anticipated from rehabilitation of sensitive plant species habitats are reduced stream siltation, soil compaction and sedimentation.

Road/Fireline Construction, Reconstruction and Maintenance Treatments

No direct or indirect effects would occur to Pineoak jewelflower since botanical surveys found either, no occurrence, that sites do not support habitat conditions conducive to this sensitive plant species or presently, sites do not contain suitable habitat for these sensitive plant species due to impacts of over use.

Resource Protection - Gate Installation

Botanical field surveys of the proposed sites found no occurrence of Pineoak jewelflower. No direct or indirect impacts are anticipated.

No Herbicide

No Herbicide alternative would have no direct, indirect or cumulative effects on Pineoak jewelflower as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Alternative 2.

No Action

No Action alternative would have no direct effect on Pineoak jewelflower which occurs in a wide variety of habitats, but does seem to prefer moderate disturbance which would only occur due to natural causes under the No Action alternative. Populations would be expected to remain stable and viable. No cumulative effects are anticipated as a result of deferred management.

- **Ozark chinquapin** (*Castanea pumila ozarkensis*) **Sensitive**

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action

Timber Management
(commercial thinning, regeneration harvest (seed-tree with reserves, shelterwood) manual or mechanical site preparation, hand planting, firewood gathering, manual or mechanical timber stand improvement and midstory reduction)

Botanical field surveys of the proposed timber management areas found no occurrence of Ozark chinquapin. No direct or indirect impacts to this sensitive plant species are anticipated.

Herbicide Treatments (Timber stand improvement and non-native invasive control)

Manual Treatments for Non-Native Invasive Control

No direct or indirect impacts would occur to Ozark chinquapin from herbicide application in timber stand improvement areas because botanical surveys found no occurrence of Ozark chinquapin in the proposed treatment areas.

Herbicide application and manual control methods for NNIS species would be allowed throughout the proposed planning area as needed for elimination/control of non-native invasive weeds. Botanical field surveys found no new locations of Ozark chinquapin and known locations are outside of any proposed treatment areas. All proposed herbicide treatments would follow Forest Plan (USDA 2005) direction and exclude Ozark chinquapin from treatment. No direct, indirect or cumulative impacts to Ozark chinquapin are anticipated.

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

Prescribed burns would occur over approximately12 to 16 percent of the analysis area sometime during the 10 years following implementation of the proposed project. Effects would vary due to fire intensity, aspect, and slope and it would be expected that some degree of forest floor cover would be removed. Overall prescribed fire is not likely to be directly detrimental to Ozark chinquapin. Individuals may be set back but would be expected to re-sprout from stumps. No cumulative impacts to Ozark chinquapin are anticipated as a result of the application of prescribed fire.

Soil Stabilization and Restoration

Direct, indirect and cumulative impacts would be the same as those determined for soil stabilization and restoration treatments for sensitive plants of streamside management areas.

All other proposed management activities (see descriptions in section IV.)

Botanical field surveys of the proposed treatment areas found either, no occurrence, or that sites do not support habitat conditions conducive to Ozark chinquapin. No direct, indirect, or cumulative impacts are anticipated to Ozark chinquapin.

No Herbicide

No Herbicide alternative would have no direct, indirect or cumulative effects on Ozark chinquapin as a result of deferred herbicide use. However, direct, indirect and cumulative effects from mechanical/non-herbicide treatments would be the same as in Alternative 2.

No Action

Ozark chinquapin occurs entirely as stump sprouts due to chestnut blight a condition in which it has persisted for decades. Individual plants within the analysis area would be expected to remain stable as long as stumps continue to persist. No action alternative would

have no direct, indirect or cumulative effect on this sensitive plant species as a result of deferred management.

Terrestrial, Riparian and Aquatic Ecosystems of the Ouachita National Forest Selected for this Project

Table 3.17 summarizes the terrestrial, riparian and aquatic ecosystem composition of the project area.

Table 3.17. Percentage of Terrestrial, Riparian and Aquatic Communities within project area.

Terrestrial Communities		**Percentage of Project Area (5460 ac)**
Ouachita Shortleaf Pine-Oak Forest and Woodland: (3 subsystems)		
	Ouachita Shortleaf Pine-Oak Forest	60 (3309 ac)
	Ouachita Shortleaf Pine-Oak Woodland	14 (760 ac)
	Ouachita Shortleaf Pine- Bluestem (Red-cockaded Woodpecker Habitat)	0
West Gulf Coastal Plain Pine-Hardwood Forest		0
Ouachita Dry-Mesic Oak Forest		12 (650 ac)
Ouachita Mesic Hardwood Forest		0
Ouachita Montane Oak Forest		0
Ouachita Dry Oak Woodland		0
Ouachita Novaculite Glade and Woodland		0
Central Interior Highlands Dry Acidic Glade and Barrens		<1 (2 ac)
Central Interior Acidic Cliff and Talus		<1 (8 ac)
Calcareous Prairie		0
Riparian and Aquatic Communities		**Percentage of Project Area**
Ouachita Mountain Forested Seep		0
Ouachita Riparian		13 (731 ac)
West Gulf Coastal Plain Small Stream and River Forest		0
South Central Interior Large Floodplain		0
West Gulf Coastal Plain Wet Hardwood Flatwoods (Red Slough)		0
Ouachita Rivers and Streams		(included in Ouachita Riparian)
Ouachita Ponds, Lakes and Waterholes		(included in Ouachita Riparian)

Effects Analysis on Ouachita National Forest Terrestrial, Riparian and Aquatic Ecosystems

Pine Dominated Communities:

Ouachita Shortleaf Pine-Oak Forest
This subsystem represents the closed-canopy, somewhat fire-dependent, more densely forested component of pine-oak dominated systems on the Forest. The defining characteristic of this subsystem is canopy closure in excess of 70 percent. This habitat supports 25 animal and 4 plant species of viability concern.

Desired Condition: The desired condition for vertical structure is 6-14 percent in grass/forb or seedling/sapling/shrub condition and 60-90 percent in the mature forest condition. At least 50 percent of the spatial extent of the pine-oak forest is treated with prescribed fire every 5-7 years with an occasional growing season fire.

Ouachita Shortleaf Pine-Oak Woodland
This subsystem represents the more open canopy, fire-dependent, less densely forested component of pine-oak dominated systems on the Forest. The defining characteristics of this subsystem are canopy closure of less than 60 percent, abundant herbaceous groundcover, and a mix of pine and oak among the dominant canopy trees. This habitat supports eight animal species of viability concern.

Desired Condition: The desired condition for vertical structure is 6-14 percent in grass/forb and seedling/sapling/shrub and 60-90 percent in the mature woodland condition. Prescribed fire is applied to at least 50 percent of this community every 3-5 years, with an occasional growing season fire.

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action & No Herbicide
Timber management and related actions would affect both the Ouachita Shortleaf Pine-Oak Forest (33%) and Ouachita Shortleaf Pine-Oak Woodland (0%) ecological communities. Positive direct effects would occur on 33% of the Ouachita Pine-Oak Forest by maintaining healthy mature forest conditions achieved mainly through thinning, but also having negative direct and cumulative effects occurring on 16% due to transitioning the pine-oak forest community toward Ouachita Shortleaf Pine-Oak Woodland community. Management for Pine-oak woodland ecological communities within the SCOR project area moves toward the optimal desired conditions identified in the Forest Plan (USDA Forest Service, 2005). No indirect effects are anticipated.

Prescribed burning would directly affect approximately 100% the Ouachita Short-leaf Pine-Oak Forest and Ouachita Shortleaf Pine-Oak Woodland communities within the project area. Since pine-oak ecosystems are fire dependent, periodic burning would indirectly benefit plant and animal communities within these systems. Burning would help thin overstocked stands, create and maintain early seral components, increase nutrient flow and aid the natural

recruitment and establishment of native plant communities. No cumulative effects are anticipated.

All of the other proposed treatments would have minimal or no direct effects on these pine ecological communities within the project area. No indirect or cumulative effects are anticipated.

No Action
The No Action alternative would allow forested lands to change without the interference of landscape scale land management resulting in no direct, indirect or cumulative effects on these pine ecological communities.

Hardwood Dominated Communities:

Ouachita Dry-Mesic Oak Forest
This system is found throughout the Ozark and Ouachita Highlands. It occurs on dry mesic to mesic sites and gentle to moderately steep slopes. Soils are moderately drained to well-drained and more fertile than those associated with drier, more open oak woodlands. A closed canopy of oak-hickory species typifies this system. Maples may occur on more mesic sites. Wind, drought, lightning and occasional fires influence this system. This habitat supports 20 animal and four plant species of viability concern.

Desired Condition: The desired condition for vertical structure is 4-10 percent in grass/forb and seedling/sapling/shrub and 60-90 percent in the mature forest condition. To mimic natural fire regimes, many of these communities will receive prescribed burns. Prescribed fire is applied to at least 50 percent of this community every 5-7 years with an occasional growing season fire.

Ouachita Mesic Hardwood Forest
This system is found on toeslopes and valley bottoms within the region, as well as on north slopes. Northern red oak increases in abundance compared to dry-mesic habitats. American beech, sugar maple, chinquapin oak, American basswood, and redbud may be locally common. These habitats are usually small, isolated, and/or disjunct. They are maintained primarily through naturally occurring circumstances, such as elevation, moisture regime, soil productivity, slope, and aspect. This habitat supports 29 animal and 12 plant species of viability concern.

Desired Condition: The desired condition for vertical structure is 0.5-5 percent in grass/forb and seedling/sapling/shrub and 80-98 percent in the mature forest condition with mostly closed canopy and infrequent fire. Old growth conditions will develop and go through regeneration cycles naturally on most of the acres in mesic hardwood forests, which are represented by small to medium patches on the Forest.

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action & No Herbicide

Timber management and related actions would directly affect approximately 27 acres (4%) of the Ouachita Dry-Mesic Oak Forest within the project area. Mid-story reduction treatments would reduce subcanopy woody vegetation allowing for oak species seed establishment and future recruitment. No indirect or cumulative impacts are anticipated.

Prescribed burning would affect approximately 650 acres (100%) of Ouachita Dry-Mesic Oak Forest community within the project area by allowing for infrequent growing or dormant season fire. The frequency of fire application would help maintain hardwood communities and would meet the optimal desired conditions identified in the Forest Plan (USDA Forest Service, 2005). No indirect or cumulative effects are anticipated.

All of the other proposed treatments would have minimal or no direct effects on Ouachita Dry-Mesic Oak Forest community within the project area. No indirect or cumulative effects are anticipated.

All proposed treatments would occur outside of Ouachita Mesic Hardwood Forest community and thus would have no direct, indirect or cumulative effects.

No Action
The No Action alternative would allow forested lands to change without the interference of landscape scale land management. This alternative would have no direct, indirect or cumulative effects on the various hardwood community forest types.

Glade and Talus Communities:

Central Interior Highlands Dry Acidic Glade and Barrens
This system is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions. It occurs along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, igneous and/or sandstone bedrock with well-drained to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter. Grasses dominate this system, with stunted oak species and shrub species occurring on variable depth soils. This system is influenced by drought and infrequent to occasional fires.

Desired Condition: The desired condition is an open glade structure maintained by periodic fire. The fire regime should reflect that 50-85 percent of the dry acidic glades and barrens system and a 100-meter buffer are burned every 5-10 years, including an occasional growing season fire.

Central Interior Acidic Cliff and Talus
This system is found primarily in the Interior Highlands. Sandstone outcrops and talus ranging from moist to dry typify this system. It is typically sparsely vegetated; however, on moister sites with more soil development, several fern species and sedges (*Carex* spp.) may become established. Wind, fire, and water erosion are the major natural forces that influence this system. This habitat supports six animal species of viability concern.

Desired Condition: The desired condition is an open, rocky, herbaceous-dominated system with sparse woody vegetation occasionally influenced by natural or prescribed fires.

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action & No Herbicide
Non-native invasive species control would affect 50% Central Interior Highlands Dry Acidic Glade and Barrens community and prescribed burning would affect approximately 100% of both the Central Interior Highlands Dry Acidic Glade and Barrens and the Central Interior Acidic Cliff and Talus communities. Positive direct and cumulative effects would be elimination of non-native invasive plants and restoration of vegetation and habitat within these glade communities and frequency of fire application would help maintain glade and talus communities and would meet the optimal desired conditions identified in the Forest Plan (USDA Forest Service, 2005).

All other proposed treatments would occur outside of glade and talus communities and thus would have no direct, indirect or cumulative effects on these communities.

No Action
The No Action alternative would allow forested lands to change without the interference of landscape scale land management. This alternative would have no direct, indirect or cumulative effects on these communities.

Riparian and Aquatic Ecosystems:

Ouachita Riparian
This system is found along streams and small rivers within the Ozark and Ouachita regions. In contrast to larger floodplain systems, this system has little to no floodplain development and often contains cobble bars and steep banks. Ozark-Ouachita Riparian communities are typically higher gradient than larger floodplains and experience periodic, strong flooding. These communities are often characterized by a cobble bar with forest directly adjacent and little or no marsh development. Canopy cover can vary within examples of this system, but typical trees include sweetgum, sycamore, river birch, maple species and oak species. The richness of the herbaceous layer varies from species-rich to species-poor. Likewise, the shrub layer can vary considerably, and small seeps can often be found within this system, especially at the headwaters and terraces of streams. These areas are typically dominated by wetland-obligate species of sedges, ferns and other herbaceous species. Flooding and scouring strongly influence this system and prevent the floodplain development found on larger rivers. This habitat supports 24 animal and 11 plant species of viability concern.

Desired Condition: The desired condition for this system is a largely undisturbed, mature or old growth community with intact hydrologic functions and processes within a minimum protective buffer of 100 feet on each side of perennial streams and 30 feet on each side of defined channels. Water quality is good to very good and riparian vegetation remains intact during and after vegetation management activities, such as harvesting, prescribed burning, road or fireline construction and pesticide application.

Ouachita Mountain Forest Seep
Forested seeps occur in the Ouachita Mountains of Arkansas and Oklahoma. Examples may be found along the lower slopes of smaller valleys where rock fractures allow water to seep out of the mountainsides and into the riparian zones of larger creeks, sometimes extending upslope along small ephemeral drains. The soil remains saturated to very moist throughout the year. The vegetation is typically forested but is highly variable in canopy composition. Red maple, black tupelo, sweetgum, and white oak are common and typical; American beech and/or umbrella magnolia may be present. Canopy coverage may be moderately dense to quite open. The subcanopy is often well developed and characteristically includes American holly, umbrella magnolia, and ironwood. This habitat supports eight animal and four plant species of viability concern.

Desired Condition: The desired condition for this system is a largely undisturbed, mature community with a protective buffer 100 feet from the seep boundaries. Old growth seep communities develop and regenerate naturally in relatively small patches.

Ouachita Ponds, Lakes, and Waterholes
Ponds, lakes, and waterholes consist of all lentic (still, impounded, or otherwise non-flowing) aquatic systems on the forest. These systems provide a water source for a wide range of plants and animals. In addition, these waterbodies provide critical reproductive habitat for amphibians and critical foraging habitat for bald eagles. Most of the lakes and ponds over one-half acre are managed for sustainable sport fishing. Enhancement of sport fisheries through stocking, habitat enhancement, and fertilization/aquatic weed control is practiced by the Forest in cooperation with the appropriate state fish and wildlife agencies. This habitat supports eight animal species of viability concern.

Desired Condition: The desired condition for unstocked ponds and waterholes is habitat suitable for amphibians and other wildlife and a source of water for upland wildlife species. The desired conditions for fishable waters are high-quality angling opportunities and good to excellent water quality, site productivity, associated vegetation, and habitat for associated riparian and aquatic dependent species.

Direct, Indirect and Cumulative Effects of each Alternative

Proposed Action & No Herbicide
All of the proposed treatments would occur outside of riparian and aquatic ecosystems with the exceptions of prescribed burning, fish passage restoration, non-native invasive species and roads treatments and thus would have no direct, indirect or cumulative effect on these communities.

Roads and fish passage and stream restoration treatments would have direct affects and prescribed burning and non-native invasive species treatments would have indirect affects to the Ouachita Riparian communities but, collectively these effects would be <2% percent of the Ouachita Riparian community within the project area. Prescribed fire would be allowed to move into riparian areas resulting in low intensity and sporadic burning. Fireline construction would be done by hand line at right angles to stream crossings, thus limiting

potential for impacts. No cumulative effects are anticipated due to the limited area of impacts from the Proposed Action or the No Herbicide alternatives.

No Action
The No Action alternative would allow forested lands to change without the interference of landscape scale land management. This alternative would have no direct, indirect or cumulative effects on the Ouachita Riparian aquatic communities.

Public Health and Safety

Current Conditions

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

Direct and Indirect Effects

Proposed Action

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 RLRMP 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 meaningful threat to human health or aquatic organisms.

SERA Human Health and Ecological Risk Assessments were used to analyze the risks associated with the seven herbicides proposed under this Alternative. Project specific SERA worksheets were completed for glyphosate, imazapyr, and triclopyr.

Project specific SERA worksheets (version 6.0) were completed for glyphosate at the maximum prescribed rate of 2 pounds of active ingredient per acre. The lower application volume is 5 gallons per acre, central application volume is 10 gallons per acre, and upper application volume is 25 gallons per acre. Hazard Quotients are at acceptable levels (less than 1) for all exposure scenarios except for the following: The risk characterization of acute/accidental exposures to water consumption, accidental spill for a child at upper level applications, and consuming contaminated vegetation for an adult female at upper level applications.

Project specific SERA worksheets (version 6.0) were completed for imazapyr at the maximum prescribed rate of 0.75 pounds of active ingredient per acre. The lower application volume is 5 gallons per acre, central application volume is 10 gallons per acre, and upper application volume is 20 gallons per acre. All Hazard Quotients are at acceptable levels (less than 1) for all worker exposure scenarios and all general public exposure scenarios.

Project specific SERA worksheets (version 6.0) were completed for triclopyr-amine formulation at the maximum prescribed rate of 2 pounds of active ingredient per acre. The lower application volume is 5 gallons per acre, central application volume is 21.5 gallons per acre, and upper application volume is 40 gallons per acre. Hazard Quotients are at acceptable levels (less than 1) for all exposure scenarios except for the following: general exposure for 8 hours of application per day for a backpack worker treating 1 acre per hour. The Hazard Quotient can be reduced to an acceptable level for backpack workers applying triclopyr-amine formulation by limiting application to 7 hours a day, or reducing the area treated to 0.625 acres per hour. Hazard Quotients are at acceptable levels (less than 1) for all exposure scenarios except the following: acute (short term) exposures for the direct spray of a whole child at upper level applications; the direct spray of an adult female's feet and lower legs at central and upper level applications; vegetation contact by an adult female wearing shorts and t-shirt at central and upper level applications; the consumption of contaminated fruit by an adult female at upper level applications; the consumption of contaminated vegetation by an adult female at lower, central and upper level applications; and water consumption from an accidental spill by a child at upper level applications; Chronic (longer term) exposures for the consumption of contaminated vegetation by an adult female at central and upper level applications.

No Herbicide

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.

No Action

The prescribed burning and the application of herbicides prescribed in the Proposed Action would not take place. Lack of fuel reduction burns could pose a risk to public health and safety in the form of an increase in the likelihood and intensity of wildfires occurring within the area and spreading to private or other populated areas. Under the No Action Alternative there would be no application of herbicides; therefore, there would be no effects to public health and safety in regards to the application of herbicides.

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.

Climate Change

Current Conditions

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 CO_2 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 tmosphere as CO_2 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 CO_2. 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 (CO_2) 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).

Direct & Indirect Effects

Proposed Action and No Herbicide

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 CO_2 emissions from wood products are delayed (Malmsheimer, Heffernan, & Brink, 2008). Prescribed burning activities, although a carbon neutral process, would release CO_2, other green house gases, and particulates into the atmosphere. However, implementing the proposed prescribed burns on approximately 3 to 7 year cycle would reduce fuel loading and could be expected to reduce fire intensity and severity as well.

Indirectly, implementation of the proposed actions would increase the overall health, vitality and growth within the project area, reduce the susceptibility to insects and disease, as well as reduce fuel accumulations and lower the risk for a catastrophic wildfire from occurring in the project area. This would serve as a way to increase carbon storage within the project area and mitigate carbon accumulation in the atmosphere.

No Action

No management activities would occur under the No Action alternative , 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). In the absence of prescribed fire, fuel loadings would continue to increase and accumulate on the forest floor. In the event of a wildfire, fuel loading would be higher, increasing the risks of catastrophic damage to natural resources. This would result in a large release of GHG and carbon into the atmosphere. By deferring timber harvest activities, the forests would continue to increase in density. Over time this could pose a risk to density dependent mortality, insects, and disease. This could result both in a release of carbon from tree mortality and decomposition as well as hinder the forests ability to sequester carbon from the environment because live, vigorous stands of trees retain a higher capacity to retain carbon.

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.

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, no direct, indirect, or cumulative effects from climate change on the proposal are anticipated.

Chapter 4
Persons and Agencies Consulted

Coordination

Jade Ryles	NEPA Coordinator
Cordero France	Forester
Chris Morgan	Silviculturist
Jonathan Thomas	Wildlife Biologist
Rhonda Huston	Wildlife Biologist
Maria Schelidt	Archeologist
Edwin Spence	Timber Management Assistant
Adam Strothers	Fire Management Officer
Russell Standingwater	Other Resources Assistant
Jeff Olson	Forest Soil Scientist

Chapter 5
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Appendices

Appendix A: Activities by Compartment and Stand

The following tables list the specific actions proposed for each Forest compartment and stand. All treatments, except nest structures, and fish passage restoration 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.

Table A.1 Proposed Activities by Compartment and Stand

Compartment 852							
Stand	**Seed Tree with Resrves**	**Commercial Thinning**	*Stand Improvement* **Release** (herbicide)	*Stand Improvement* **PCT** (manual)	**Fuel Reduction Prescribed Burn**	**Fish Passage Restoration**	**Nest Boxes**
	acres	acres	acres	acres	acres	#	#
1					94		
2					178		
3					67		
4					226		
5					178		
6		46			47		
7					84		
8					31		
9					55		
10					146		
11	18		18	18	18		1
12		12			12		
13					188	1	
14					42		
15					89		

Compartment 855								
Stand	**Seed Tree with Reserves**	**Commercial Thinning**	*Stand Improvement* **Release** (herbicide)	*Stand Improvement* **PCT** (manual)	**Fuel Reduction Prescribed Burn**	**Woodland Restoration**	**Midstory Reduction**	**Fish Passage Restoration**
	acres	acres	acres	acres	acres	acres	acres	#
1					105			
2					63			
3					105			
4					80			
5					127			
6					28	28		
7					187			
8					45	45	45	
9		65			65	65		
10					38	38		
11		45			45	45		
12					75	75		
13		40			35	35		
18	39		39	39	39	39		
19					23			
20					24	24		
21					86	86		
22					80			1
23					63	63		

Compartment 856									
Stand	**Seed Tree with Reserves**	**Commercial Thinning**	*Stand Improvement* **Release** (herbicide)	*Stand Improvement* **PCT** (manual)	**Fuel Reduction Prescribed Burn**	**Woodland Restoration**	**Midstory Reduction**	**Fish Passage Restoration**	**Nest Boxes**
	acres	acres	acres	acres	acres	acres	acres	#	#
1					50				
2					70				
3					49				
4					92				
5		48			48				
6					61	61			
7		35			35	35			
8					38				
9		52			52	52	52		
10					47				
11					92			1	
12		36			37				
17	41		41	41	38				
18					35	35			
19	39		39	39	34				1

Compartment 857						
Stand	**Commercial Thinning**	**Fuel Reduction Prescribed Burn**	**Woodland Restoration**	**Midstory Reduction**	**Fish Passage Restoration**	**Nest Boxes**
	acres	acres	acres	acres	#	#
1	78	78	78			2
2		135				
3		69				
4	32	33	32			
5		37		37		
6	56	56				
7		127				
8		13				
9		64				
10		117			1	
11		60				
12	31	32	32			
13		7	7			
14	16	17				
15	31	31				

Compartment 859								
Stand	**Seed Tree with Reserves**	**Commercial Thinning**	*Stand Improvement* **Release** (herbicide)	*Stand Improvement* **PCT** (manual)	**Fuel Reduction Prescribed Burn**	**Midstory Reduction**	**Wildlife Opening Restoration**	**Nest Boxes**
	acres	acres	acres	acres	acres	acres	acres	#
1		1			13			
2					43			
3					188			
4					38			
5					28	28		
6		56			61			
7		39			40			
8					45			
9					42			
10					28			
11					30			
12					79		1.4	2
13		38			38			
14	32		32	32	32			
15					60			
16					31			
17					84			
18					14			
21	38		38	38	38			
22	18		18	18	20			
23		42			42			

Appendix B: Project Maps

Management Areas
Proposed Siviculture Activities
Proposed Wildlife Habitat Improvements
Prescribed Fire Activities
Transportation Analysis

Appendix C: Biological Evaluation