Environmental Assessment

For

Little Fir Watershed Restoration Management Project

Montgomery County, Arkansas

Responsible Agency:
USDA Forest Service
Ouachita National Forest
Caddo-Womble Ranger District

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Chapter 1

Purpose and Need for the Proposed Action

Proposed Action

The USDA, Ouachita National Forest, Caddo-Womble Ranger District, proposes to implement restoration management activities in the 16,908-acre project area known as Little Fir that primarily lies within the watershed identified as Little Fir Cemetery – Lake Ouachita. These areas are located in Management Areas 9, 16 and 21 identified in the Revised Land and Resource Management Plan (RLRMP 2005). Compartments 1622, 1623, and 1631 fall completely or partially within the project area, which is located in Township1 South and Township 2 South, Range 23 and 24 West in Montgomery County, Arkansas. (See attached project map). Specifically, the Forest Service proposes the following activities: *

- Seed tree regeneration harvest – 92 acres
- Shelter wood regeneration harvest – 133 acres
- Commercial thinning – 549 acres
- Forest Health Restoration thinning – 288 acres
- Site Prep prescribed burn (National Forest)
- Chemical/Mechanical site preparation for natural regeneration – up to 225 acres
- Timber Stand Improvement – 225 acres
- Pre-Commercial Thinning – 225 acres
- Hand Plant shortleaf pine seedlings – up to 225 acres
- Wildlife stand improvement (WSI)/ Midstory reduction – 12 acres
- Wildlife stand improvement (Commercial) – 162 acres
- Glade restoration – 62.7
- Pond improvements to existing ponds – 6 each
- Pond construction – 4 each
- Linear wildlife opening improvements – 0.22 miles
- Wildlife opening construction – 0.73 acres
- Wildlife opening improvement – 5.4 acres
- Fire line maintenance – 7 miles
- Road construction/reconstruction – 6 miles
- Temporary road construction – 7 miles
- Pre-haul road maintenance – 1 mile
- Non-native invasive plant species treatment throughout project area

* acreages, mileage, etc. are approximate

Purpose of the Action

The purpose of this action is to improve the health and vigor of the Ouachita National Forest in accordance with the requirements of the National Forest Management Act (NFMA). These goals and objectives are designed to meet an ecosystem management approach and each prescription is intended to foster a healthy native system to create more natural appearing mixed pine and hardwood stands, increase biological diversity, reduce the threat of severe wildfires, minimize impacts of non-native invasive species and improve wildlife habitat. These management decisions are based on experience, ecological concepts and scientific research. By implementing these activities, we will provide for a diversity of plant and animal communities throughout the project area, provide early seral stage 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 exist in the Ouachita National Forest that 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 less open understories that are necessary for wildlife food, natural regeneration of pine and oak, and loss of habitat conditions for plants adapted to fire.
- Pine stands contain damaged, poorly formed and diseased trees. The trees are overcrowded or densely stocked, reducing growth and crown development. These conditions result in strees and reduced vigor and health, thus increasing susceptibility to insects and disease.
- There is limited access to those identified stands in need of silvicultural treatment, resulting in the need for temporary 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 seral stage habitat in the form of permanent wildlife openings within the project area. Zero percent of the suitable acres are in 0-10 year old early seral stage habitat.

MANAGEMENT AREA (MA) DESIRED CONDITIONS AS DESCRIBED IN THE REVISED LAND AND RESOURCE MANAGEMENT PLAN (RLRMP) FOR THE OUACHITA NATIONAL FOREST

The following describes the Management Areas within the Little Fir Project Area and their desired conditions:

MA 9: Water and Riparian Communities

Riparian areas, lakes, and ponds have a relatively natural appearance. Permanent roads are minimized but may occur at designated crossings and designated access points. Water quality is good to excellent. Protection for public water sources would be provided. Aquatic ecosystems

function properly and support aquatic biota commensurate with the associated ecoregion. Vegetation consists of native species. Suitable lakes and ponds sustain a diversity of sport fishing experiences. Developed recreation sites containing intensively managed lakes and ponds provide improved visitor access and sport fish populations provide sustained yield. Lakes and ponds managed for primitive use and fishing have limited access but support balanced sport fish populations. Movement of fish and other aquatic organisms in otherwise free-flowing perennial streams and other streams is not obstructed by road crossings, culverts, or other human-caused obstructions.

Management Area 16: Lands Surrounding Lake Ouachita and Broken Bow Lake

A variety of dispersed recreational opportunities are available. Visitors encounter varied forest conditions, from fairly open, "park-like" stands of native pines and hardwoods with a forest floor rich in grasses and forbs to stands having a nearly continuous high canopy and sparse ground layer. Abrupt changes in vegetation are few, limited mainly to small openings in the forest and places where Forest land abuts private land, roads, or developed areas on other public land. Mature forest predominates, but some younger forests may be observed as well. Evidence of prescribed fire is apparent at times. A pattern of mixed hardwood and pine contributes to the visual attractiveness of the area. An adequate variety of sizes and forest conditions are present to support populations of many animal species native to the uplands of the Lake Ouachita and Broken Bow Lake areas. Visitors on the lake or shoreline view the surrounding National Forest lands as predominantly naturally appearing, with resource management activities not usually evident. Lands surrounding the lakes may be accessed by trails and by a variety of roads, but there is little or no addition of road miles to the transportation system.

Management Area 21: Old Growth Restoration

The restoration of pine-grass old growth forests and woodlands is emphasized within MA 21, with the perpetuation of old growth conditions assured by core areas connected to replacement stands that are managed under long rotation (160 years). Regeneration of young trees occurs in some replacement stands on an infrequent basis. Pine stands are generally not densely stocked (total basal area 50-80 square feet) and include many trees over 100 years old. Many trees are large (>20" dbh) and have a "flat topped" appearance. Old growth pine-grass forests and woodlands are fire-maintained communities characterized by relatively open conditions and a grassy understory. MA 21 may include pine in almost pure stands, pine mixed with oak and sometimes hickory, or even patches of relatively pure stands of post oak and blackjack oak. These forests and woodlands are characterized by open stands of old, large, and often widely spaced pines and oaks, occurring in patches and clumps. The forest floor supports a rich mix of grasses, forbs, wildflowers, and low shrubs. Redheart disease, downed woody debris, and snags are common. Visitors encounter evidence of frequent, specific disturbance, particularly fire, in a naturally appearing landscape. While usually associated with management, disturbances are consistent with, and reflect, natural processes. Evidence of vegetation management is visible following thinning operations or infrequent reproduction cutting primarily in replacement stands. Access is from low-standard roads, many of which are closed seasonally or year-round. Fire scars and snags are visible in most areas, but the increased viewing depth, diversity of vegetation, abundance of wildflowers, and age and character of the trees contribute to scenic

quality. Pine-grass old growth provides habitat for a wide range of wildlife. Deer and other early seral stage species are favored by the abundant grassy understory, while woodpeckers and other species associated with mature forests are supported by the mature-tree component. Species requiring cavities and snags (e.g., raptors, bluebirds, woodpeckers) are favored over those highly dependent on hard mast (e.g., squirrels) or dense brush (e.g., gray fox).

Ecological Systems-Ouachita National Forest

The forest is comprised of seventeen ecological systems categorized as Terrestrial, Riparian and Aquatic ecosystems. Within the Little Fir Project Area, the following ecosystems are identified with their desired conditions as described below.

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 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, with an average canopy closure of greater than 70 percent (Basal Area 60 or greater). 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 Dry-Mesic Oak Forest
This system occurs on dry-mesic to mesic sites and gentle to moderately steep slopes. A closed canopy of oak-hickory species typifies this system. 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.

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. This system is influenced by drought and infrequent to occasional fires. This habitat supports five animal and eight plant species of viability concern. 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. Old growth conditions will develop and go through regeneration cycles naturally, supplemented by prescribed fire, in all the acres of this community, which occurs in small patches.

Ouachita Riparian
This system is found along streams within the Project Area. These communities are often characterized by a cobble bar with forest directly adjacent and little or no marsh development. Typical trees include sweetgum, sycamore, river birch, maple species, and oak species. These areas are typically dominated by wetland-obligate species of sedges, ferns, and other herbaceous species. The desired condition for this system is 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.

Ouachita River and Streams
This system consists of flowing water. The desired conditions for this system is good to excellent water, quality, site productivity, channel stability, intact riparian vegetation, sustainability of the sport fisheries, and connectivity of habitats for riparian-dependent species. Aquatic ecosystems function properly. Movement of fish and other aquatic organisms are not obstructed by road crossings, culverts, or other human-caused obstructions.

Ouachita Ponds, Lakes, and Waterholes
Ponds, lakes, and waterholes consist of lentic (still, impounded, or otherwise non-flowing) aquatic systems. 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.

EXISTING VERSUS DESIRED CONDITIONS

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

EXISTING CONDITIONS CONTRASTED TO THE DESIRED CONDITIONS (TABLE 1.1)

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
Provide early seral habitat: Within MA 16, visitors encounter varied forest conditions, from fairly open, "park-like" stands of native pines and hardwoods… to stands having a nearly continuous high canopy and sparse ground layer. (RLRMP, p.36). **WF001**… provide grass-forb or shrub-seedling habitats at the rate of 6% in MA16…. (RLRMP, p. 78) **WF002**… Limit even-age regeneration cutting… to no more than 14%…. except for MA 21… limit to 6% (RLRMP, p. 78) **WF008**… 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 are insignificant acres in MA 16 that qualify as early seral (0-10 age year) habitat. 5.6 acres in early seral wildlife plots, and linear opening.	Provide between 264 acres (6% of the suitable acres) and 617 acres (14% of the suitable acres) of early seral conditions in MA 16. Provide additional wildlife openings	Regeneration harvest of 225 acres in MA 16. These are total stand acres, without riparian, steep slopes or other exclusions. Maintain 5.6 acres of existing wildlife openings. Establish 1 permanent opening for a total of 0.72 acres.
Improve forest health: Improve forest health by reducing the likelihood of insect infestations, disease outbreaks, and establishment of non-native, invasive species on National Forest System lands (RLRMP, p. 58). Improve the forest resource (RLRMP, pp 83, 84): **FI001**… Release approximately 200 pine trees per acre on pine-hardwood management type. **FI002**…Release approximately 100 desirable hardwoods on	Most of the stands to be treated within the Project Area have a basal area of 70 or more. 74% of the stands are over 70 years of age. The combined age and overstocked conditions reduce the health and vigor of the stands and increase susceptibility to damage from insects and disease	Reduce basal area levels in stands that are overstocked Reduce the number of stems per acre in stands that are overstocked	Commercial thinning within 549 acres 225 acres of pre-commercial thinning Other woodland and wildlife stand improvements within 174 acres

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
pine-hardwood management type. **FI005**… Use the basal areas given in Table 3.6 as approximate guides to desired conditions…. **(RLRMP, p. 84)**			
FR013… Following a regeneration harvest cut, a site preparation treatment will be implemented if needed to control competing vegetation…. (RLRMP, p. 82)	Stands proposed for regeneration management activities may not naturally re-seed to the required seedlings per acre.	If natural regeneration is not established, genetically improved shortleaf seedlings will be planted.	Site prep and plant genetically improved shortleaf pine (up to 225 acres)
Improve Wildlife Habitat: Wildlife habitat functions are sustained or improved, including primary feeding areas, breeding areas…. (RLRMP, p.20). **FR008** In pine-hardwood mixed management type, desired hardwood species will be managed to accomplish project level objectives. … Follow-up vegetation management treatments may be used to control species composition and density and to meet other resource needs. (RLRMP, p. 81) **Obj01**… Increase prescribed burning on the forest to help achieve and maintain desired future conditions. (RLRMP, p. 59)	174 acres were identified with large number of stems in the smaller diameter classes. The large number of stems/acre reduce the forage quality of the forest floor	Improve feeding areas Reduce the overall stem density	Improve mast production on 12 acres by removing intermediate and co-dominant trees Develop woodland habitats using Wildlife Stand Improvement (WSI commercial cut) on 162 acres. Reduce small diameter stem density by using fire and/or mechanical means.
HR001 Known historic properties will be protected from project impacts. (RLRMP, p.89)	Various historic sites are located throughout the Project Area.	Sites need to be protected from project impacts.	Sites will be avoided during silvicultural management activities.
Fuels: In the Wildland Urban Interface, …stands will be treated by reducing the number of overstory trees to approximately 50 – 70 square feet basal area…. A	Fire suppression has resulted in excessive fuel accumulations, increasing the risk of damage to resources in the event of wildfire	Reduce fuel loadings to minimize the threat to communities and developments adjacent to the Forest as well as the risk of resource	Prescribe burning on 6,625 acres divided amongst 5 units ranging in size from 361 to 2052 acres. Burning would require 7 miles of fireline maintenance Site Preparation Burns = 225 acres

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
"park-like" or "woodland" condition is the goal in pine and oak types…. (RLRMP, p. 25) Reduce fuel loads of National Forest System lands that have the greatest potential for catastrophic wildland fire. Lands in and around "Firewise Communities" and other "Communities at Risk" are the highest priority…. (RLRMP, p. 68, 69). **Obj42** Treat the highest priority areas at a rate of 500 to 1000 acres per year. **Obj43** Complete 50,000 to 100,000 acres per year of hazardous fuel reduction in the other moderate to high priority area.	Approximately 6,465 acres within the Project Area have been prescribed burned within the past 5 years, and will continue to be burned under the existing Little Fir Prescribed Burn EA. (2010) Urban development exists within 2 miles of all the burn units	damage	Burn as needed to develop and maintain desired future conditions for reaching objective of a Class 2, with ultimate goal of Class 1.
WF003 Provide for and designate areas for mast production at the approximate rate of 20% of each Project Area (RLRMP, p. 78) Wildlife habitat functions are sustained or improved, including primary feeding areas, breeding areas…. (RLRMP, p.20).	There are 271 acres (6%) in hardwood and hardwood-pine forest types age 50 years and older within the Project Area	Increase mast production by managing hardwood and hardwood-pine forest types	Midstory reduction on 12 acres, woodland restoration with midstory reduction on 162 acres.
WF010 Where there is no existing water source, provide at least one wildlife pond per 160 acres…. (RLRMP, p. 79) Quality fish and wildlife habitat and a variety of access opportunities are available to the public (RLRMP, p. 22).	Streams, ponds, and seeps/spring communities provide adequate water sources to meet desired conditions. Ponds within the Project Area have become overgrown with vegetation, have blocked/eroded spillways, or contain unwanted fish species	Provide new pond access. Maintenance of existing recreational and wildlife ponds across the Project Area	Construct 4 new ponds Remove unwanted vegetation from existing pond dams and/or surfaces. Repair spillways
Road Density: **Obj05** For wildlife concerns, strive to achieve	The existing open road density within the Project	Reduce open road density to the greatest	Obliterate 6.89 miles of unauthorized roads/trails

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
an open road density (ORD) of 0.75mile per square mile or less for MA 16 during periods critical for wildlife. (RLRMP, p. 59) **TR005**…. Where the current total open road density is greater than wildlife objectives… use roads analysis to identify opportunities to reduce the density of open roads and OHV trails under Forest Service jurisdiction (RLRMP, p. 91). **TR006**… In MA 16 do not exceed 0.75 miles per square mile where that density of open roads exists (RLRMP, p 91). **WF012**… Where possible, seasonally close roads during critical periods for wildlife (March – August) (RLRMP p. 79).	Area is 1.94 miles per square mile (including Public Roads and unauthorized roads based on MVUM, aerial imagery and GPS data)	extent possible	Correct INFRA database and spatial GIS layers to reflect accurate locations of roads based on GPS data and aerial imagery Installation of 20 barriers. Review and revise travel management classifications to reflect needs. (MVUM)
Transportation System: 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). **TR007**… When a road is needed to provide access, base the road type on such factors as soil and water protection needs…. (RLRMP, p 91) **TR008**… Road locations in habitats of… woodland seeps… will be avoided (RLRMP, p 91). **TR009**… Do not locate	There is limited access to some of the stands proposed for harvest and silvicultural activities. Some of the roads will not support timber hauling in current condition Numerous culverts are rusted and require replacement	Provide access to stands in need of silvicultural treatment Improve road conditions on travel ways proposed for timber hauling Limit resource damage by removing and/or relocating road locations	7 miles of temporary road construction 1 mile of pre-haul road maintenance Review and revise travel management classifications to reflect needs. (MVUM)

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
roads or trails within or immediately adjacent to SMAs unless alternative routes are more environmentally damaging or not in the best public interest (RLRMP, p 91).			
Invasive Species Treatments: Where native species have been displaced by non-native or off-site species, systems will be restored over time to native species composition. (RLRMP, p. 6). Take steps to improve forest health by reducing the likelihood of... establishment of non-native, invasive species…. (RLRMP, p 58). **Obj03**… Treat forest to eliminate non-native, invasive species. (RLRMP, p. 59). **9.02**… Table 3.10 describes permitted and prohibited activities within SMAs. Use aquatic approved pesticides for treatment of invasive non-native and nuisance species within the primary and secondary buffers. (RLRMP, p. 104). **9.13**… Terrestrial vegetation control using herbicides within MA9 may only be conducted… for control of invasive and/or exotic species…. (RLRMP, p. 106).	Nonnative, invasive species presently identified within the Project Area include: • Chinese lespedeza *(Sericea lespedeza)* • mimosa (*Albizia julibrissin)* • honeysuckle (*Lonicera japonica.)* • privet *(Ligustrum sp.)* • autumn olive *(Elaeagnus umbellata)* Others found throughout the forest are: • multiflora rose *(Rosa multiflora)* • trifoliate orange *(Poncirus trifoliata)* • royal paulownia *(Paulownia tomentosa)* • kudzu (*Pueraria montana)* • sacred bamboo *(Nandina domestica)*	Remove known invasive species on NFS lands across the Project Area Treat additional areas as they are identified	Use prescribed fire, mechanical means and/or herbicides to remove invasive species
Recreation Management **Obj24** Maintain all recreation facilities to standard. (RLRMP p.65) **Obj26** Designate and sign a system of roads and trails	Major campgrounds fall under the Army Corps of Engineer's maintenance. Other recreation activities such as hunting are a major component in the		Provide public access to utilize recreation facilities Review travel management classifications to provide adequate access to public facilities such as dispersed camp sites or other recreation needs.

Desired Conditions	Existing Conditions	Site Specific Needs	Proposed Management Activities
suitable for public access…. (RLRMP p.65) **TR018**… Structures such as fences, trails and roads will be designed and built so they minimize movement barriers and hazards for wildlife. (RLRMP p. 92)	watershed.		See Appendix D.
Minerals 9.15 Common variety minerals operations must be designed and implemented so that no mining or mining related activity takes place within water and riparian areas (MA 9) (RLRMP p. 106) Hand collecting of exposed surface mineral specimens … for personal purposes is allowed …. (RLRMP p.95)	Unnamed rock locations for rock collecting	None	Mineral operation permit or contract requests will be analyzed during the review and authorization process to ensure compliance and protection of water resources Areas for surface mineral collection will be identified as requested

Scope of This Environmental Analysis

History of the Planning and Scoping Process

The Caddo-Womble District interdisciplinary team (IDT) initiated internal scoping on August 26th, 2009. External scoping was initiated on January 05th, 2012, and then February 7th, 2012. Scoping letters requesting comments on the proposal were mailed to 150 agencies, groups or individuals. The project was also published in the Ouachita National Forest Schedule of Proposed Actions.

The IDT received five responses during scoping efforts. Two were concerned about potential road access issues, one had questions regarding Project Areas, one was curious why the letter was sent, and one requested burning of private property adjacent to the Forest Service land. Based on information gathered during scoping, the IDT identified issues to be analyzed in depth and developed objectives for the proposed project. The issues are identified and explained below in this section.

Relevant Planning Documents

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

- Revised Land and Resource Management Plan for the Ouachita National Forest (RLRMP or Revised Forest Plan, USDA Forest Service, 2005a), and the accompanying Final Environmental Impact Statement (FEIS, USDA Forest Service, 2005b)
- Biological Evaluation for the Little Fir Watershed Restoration Management Project
- Travel Analysis Report for the Little Fir Watershed Restoration Management Project
- Archeological Investigation in Little Fir Watershed, Womble Ranger District, Ouachita National Forest, Montgomery County, Arkansas

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 (RLRMP, pp. 6-26); Strategies (RLRMP, pp. 27-72); and Design Criteria (RLRMP, pp. 73-123) that apply to the forest lands identified in this proposal are incorporated by reference.

The treatments described in the Little Fir Watershed Restoration Management Project Environmental Assessment are consistent with the management direction of the Revised Forest Plan and are typical of those for which environmental effects are disclosed in the FEIS. This assessment tiers to these documents.

REFERENCE FOR FOREST PLAN DESIGN CRITERIA BY MANAGEMENT AREA (TABLE 1.2)

Management Area	Forest Plan Reference
9. Water and Riparian Communities	Part 3, p. 103-108
16. Lands Surrounding Lake Ouachita…	Part 3, pp. 109-111
21. Old Growth Restoration	Part 3, pp. 118-119

Issues Eliminated From Further Study

This section details issues identified through scoping that are not appropriate for this project, and provides the reasons for which these issues are eliminated from further study.

- Jurisdictional Wetlands

Analysis conducted by district personnel has concluded that there are no known jurisdictional wetlands within or adjacent to the Project Area; they would not be impacted by any of the alternatives

- Prime Farmlands

Analysis conducted by district personnel has concluded that there are no prime farmlands that will be converted within or adjacent to the Project Area; they would not be impacted by any of the alternatives.

- Wild and Scenic Rivers

No activities are planned in or near any rivers designated or proposed for designation as wild and scenic.

- Civil Rights and Minority Groups

The proposed actions would impact minority groups and women in the same manner as all other groups in society. The proposed actions would not violate the civil rights of consumers, minority groups or women, nor would it have disproportionate environmental effects on minority populations or low-income populations

- Federal, State, and Local Laws

All actions proposed would comply with all federal, state, and local laws.

- Forest Fragmentation

Forest fragmentation occurs when large, continuous forests are divided into smaller blocks either by clearing for agriculture, urbanization, roads, or other human development. It is important to distinguish

between fragmentations composed of a mosaic of mature and regenerating stands and those composed of agricultural fields and urban developments. Early successional habitat may cause a temporary reduction in habitat for species relying on mature forests while providing habitat for many species dependent on early successional habitat including neotropical migrants. Agricultural and urban development, however, constitute a permanent loss in forest habitat. Fragmentation usually refers to permanent changes within the landscape such as farmland, or converting forestland into parking lots or residential developments. The proposed management actions would not create a change in land use nor ownership. The activities proposed would only make temporary changes to the landscape; no forest fragmentation would occur.

Issues Further Analyzed

This section details issues identified through scoping that drive the development of alternatives to the Proposed Action.

- Herbicide Use

Forest policy requires analysis of alternatives to herbicide use. Herbicide use will be considered a significant issue for this reason, and the environmental consequences of herbicide use are disclosed throughout Chapter 3. *Source: Forest policy, scoping*

- Air Quality

There is public concern that smoke generated from prescribed burning may degrade air quality. This could cause health problems to those living downwind of the Project Area. *Source: ID Team*

- Heritage, Historic, and Cultural Resources

There is concern that the management activities will impact heritage, cultural and historical resources. *Source: ID Team and respondent*

- Soil Productivity

There is a concern that management actions (road construction, skidding, timber harvest, release treatment, site preparation, prescribed burning, etc.) may cause unacceptable levels of erosion, sedimentation, compaction, and/or nutrient loss and, as a result, a decrease in long-term soil productivity within the Project Area. *Source: ID Team.*

- Water Quality & Municipal Watersheds

There is a concern that management actions, namely timber harvest, road construction, prescribed burning, wildlife pond reconstruction, and the use of herbicides may cause a decrease in water quality in the watersheds which the Little Fir Project Area occurs. Monitoring has shown that lack of road maintenance and increases in OHV use are major issues to water quality. S*ource: ID Team.*

- Floodplains and Riparian Areas

There is a concern that management actions such as road construction, prescribed burning, and timber harvest may cause damage to floodplains and riparian areas within or adjacent to the Project Area. *Source: ID Team*

- Wildfire Hazards & Fuels Accumulation

There is a concern that management actions such as timber harvest, site preparation activities and wildlife stand improvement treatments may cause a short term increase in the accumulation of fuels and result in an increased risk from wildfire. *Source: ID Team*

- Transportation Systems

There is a concern that management actions may require permanent access through road construction and/or reconstruction, and management actions may result in the closure of open roads that provide access for recreational activities. The open road density of the Project Area exceeds the Revised Forest Plan objective. *Source: ID Team*

- Forest Health

Forest health and stand vigor is declining or at risk due to advanced stand age and overcrowded or densely stocked stands. Several non-native invasive species (NNIS) are present throughout the Project Area. *Source: ID Team*

- Wildlife and Fisheries and Habitats

There is a lack of early seral habitat within the watershed. There is a concern that management actions such as timber harvest, road construction, herbicide application, and prescribed burning may cause unacceptable impacts to wildlife and fish populations or habitats. *Source: ID Team*

- PETS Species and Habitats

There is a concern that management actions such as timber harvest, road construction, herbicide application, and prescribed burning may impact PETS or PETS habitats. *Source: ID Team*

- Public Health and Safety

There is a concern that management actions, specifically prescribed burning and the application of herbicides may cause hazards to human health and safety. *Source: ID Team*

- Scenic Resources

There is a concern that timber harvest, road construction, site preparation, and prescribed burning may compromise the scenic integrity of the Project Area. *Source: ID Team*

- Climate Change

There is a concern that management actions such as prescribed burning and timber harvest may cause greenhouse gas (GHG) emissions and contribute to increased climate change. There is also a concern about the effects of climate change on the Little Fir Watershed Restoration Management Project. *Source: ID Team*

Other Relevant Environmental Effects

This section lists effects that based on past experience; the ID Team determined should be disclosed in Chapter 3.

- Prescribed Fire's Effects on Wildfire Hazard and Fuel Loading
- Effects of Management Activities on Early Seral Habitat, Age Class Diversity, Mature Growth, Retention/Recruitment of Hardwoods, Hard Mast Production and Nonnative Invasive Species
- Effects of Management Activities on Local Economy
- Project Financial Efficiency
- Effects of Management Activities on Recreation

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

Introduction

As stated in Chapter 1, in relation to issues identified, the Caddo-Womble District IDT initiated internal scoping on August, 26th 2009. External scoping was initiated on January 5th, 2012 and February 7th, 2012. Scoping letters requesting comments on the proposal were mailed to 150 agencies, groups, or individuals. The project was also published in the Ouachita National Forest Schedule of Proposed Actions. The IDT received five responses during scoping efforts. These were primarily questions regarding proposed actions.

Based on information gathered during scoping, the IDT designed Alternative B: Little Fir Watershed Restoration Management Project to satisfy the needs and meet the objectives of management. The IDT also developed Alternative C: No Herbicide Use in response to Forest direction and public issue identified through scoping. The details of the process and specific design criteria are disclosed in the following section.

Alternative Design and Evaluation Criteria

The District Ranger, working with the IDT, identified and approved the following design and evaluation criteria. These were used by the IDT to design and evaluate the Little Fir Watershed Restoration Management Project. Later, the District Ranger will use these same criteria when making the final selection of which alternative to implement.

Technical Requirements (General)

The Revised Land and Resource Management Plan (RLRMP) for the Ouachita National Forest provides overall technical requirements. ***Specific requirements*** are described within the relevant sections that apply. The IDT reviewed the RLRMP Forest-wide Design Criteria, Management Area-specific Design Criteria, and specialist reports, and identified the following ***general*** project-area requirements:

- Regeneration harvest operations that deviate from the guidelines (RLRMP, p.81, table3.2) are subject to approval by the responsible official.(RLRMP, FI005, p.81)

- 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.

- Resource management activities such as timber harvests, timber stand improvement, prescribed burns and wildlife habitat improvements will be conducted in a manner that promotes Scenic Integrity Objectives (SIO). (RLRMP, RS002, p.90)

Project Objective Requirements

PROJECT OBJECTIVE REQUIREMENTS AND METHOD OF MEASUREMENT (TABLE 2.1)

Objective	Method of Measurement
Restore the health and vigor of forest stands and improve stand quality.	Acres of timber stands treated resulting in reduced basal areas.
Contribute to the economic base of local communities by providing a sustained yield of high-quality wood products.	Volume of timber harvested.
Provide grass-forb and seedling-sapling habitat conditions.	Percent of suitable acres in early seral habitat.
Provide for a diversity of plant and animal communities; reduce fuel loads.	Acres of ecosystem prescribed burning.
Maintain or improve open habitats to provide high quality forage and nesting habitat for wildlife.	Acres of wildlife openings maintained/increased.
Eliminate non-native, invasive species	Acres treated for invasive species eradication.
Reduce open road density.	Miles of open road per square mile.
Develop, operate, and maintain the road system to meet the requirements of the proposed actions, protect the environment, and provide for reasonable and safe access.	Miles of road construction, reconstruction, and pre-haul maintenance.

Monitoring

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

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

For activities that include the use of herbicides, surveillance monitoring would be followed to ensure that all herbicides are used in accordance to label instructions. Form R8-FS-2100-1, Herbicide Treatment and Evaluation Record would be used to monitor all work involving herbicides. Stream samples would also be taken to monitor for offsite movement.

In areas where the risk level is moderate to high for accumulative effects as indicated by the ACE Model, all fish assemblages will be sampled prior to and after any ground disturbing activities occur to determine the ratio of benthic insectivores within that community.

Alternatives Documented in Detail

This section describes the management treatments proposed throughout this assessment. A summary chart is provided at the end outlining the treatments between alternatives. Acres that were described in the original scoping letter dated January 5th, 2012 have been amended throughout this document to more accurately depict actual treatments as they were determined throughout this evaluation. Treatment activities and general locations have not changed. Acres listed in Appendix A of harvest treatments are listed as approximate total acres within a stand. For analysis throughout this document, total acres were used, however, when treatments begin those areas that fall within riparian zones or along steep slopes will be excluded from harvest.

Alternative A: Deferred Harvest (No Action)

In this alternative, the management activities described in the proposed action (those listed in Alternative B 'description of treatments') would be deferred until a later entry. However, ongoing Forest Service permitted and approved activities would continue in the Project Area and could include:

- Road maintenance – normal and emergency road maintenance would continue on all existing roads.
- Power line right of way (ROW) maintenance would continue on existing ROW's.
- Fire suppression – natural caused fires may be suppressed unless appropriate conditions allow for it to be used as a management tool to accomplish resource needs. Human caused fires by accident or intention (arson) would be suppressed.
- Off road vehicle use – ORV use of the area would continue under the Travel Management Plan for the Ouachita National Forest.
- Camping – camping would continue under the current rules of the Ouachita National Forest. Special restrictions would apply during times of fire threat.
- Hunting and Fishing – game hunting and fishing would continue under the rules of the Arkansas Game and Fish Commission.
- Firewood cutting – under the permitting rules of the Ouachita National Forest, the public would continue to harvest firewood.
- Rock gathering – under the permitting rules of the Ouachita National Forest, the public would continue to collect rock for personal use.
- Existing quartz, shale and gravel mining would continue in approved locations.
- Routine maintenance of facilities and administrative sites.
- Prescribed burning and other activities as authorized under Little Fir Prescribed Burning Environmental Assessment (2010).

Alternative B: Little Fir Watershed Restoration Management Project (Preferred Alternative)

Description of Treatments (See Appendix A for complete listing of harvest activities by compartment and stand, Appendix B for all other management activities and Appendix C for forest types)

Timber management can be accomplished by several methods. The following describes two types of harvests designed to provide early seral habitat proposed for Little Fir Watershed Restoration Management Project.

1.) Modified Seed Tree Regeneration (ST) – A timber harvest cut designed to obtain natural regeneration from seed trees left for that purpose. Approximately 10-15 sq. ft. of pine, 5-10 sq. ft. of hardwood basal area per acre is retained in the overstory. Seed trees are retained indefinitely. This cut would establish a two-aged stand. This treatment differs from a traditional seed tree by retaining a mix of hardwoods and pines in the overstory after regeneration. Hardwood trees felled in these areas may be utilized for public firewood or commercial sale. (92 acres proposed)

2.) Modified Shelterwood (SW) – A timber harvest method of regenerating an even-aged stand in which most of the trees are removed leaving a new age class to develop beneath the partially shaded microenvironment provided by the residual trees. The residual basal area will be 25-35 sq. ft. of pine and 5-10 sq. ft. of hardwood to maintain scenic integrity. After new stand establishment, overstory may be reduced to seed tree density. (133 acres proposed)

Within the Project Area, several stands have the potential to exceed the size threshold for regeneration harvesting per the Revised Forest Plan. Boundaries were identified using existing physical topographic features (i.e. drains, ridges, roads) resulting in larger map units. Stands include riparian areas and steep slopes that would be delineated from the harvest area during sale preparation activities. The Plan provides that maximum size of regeneration areas may be exceeded with approval of the Forest Supervisor up to a maximum of 80 acres for pine and pine-hardwood forest types (FR009/Table 3.15, page 110). If, after riparian and slope delineation, the harvest area exceeds forest Plan requirements, the harvest area would be reduced or the Forests Supervisor's authorization would be requested.

It should, however, be noted that these five stands would create early seral habitat openings for wildlife purposes, and provide for increased recreational use by local hunters. (RLRMP, p.78)

To facilitate natural pine regeneration, adequate site preparation is needed to disturb the soil surface in the newly created openings. Competing vegetation may be removed manually with chainsaws, heavy equipment, scarifying, ripping, prescribed fire, herbicide application and/or the use of a large steel drum pulled behind a bulldozer to chop. If warranted, the herbicide triclopyr, imazapyr, imazapic, and/or glyphosate may be applied using either hack-and-squirt or foliar spray by hand method. Prescribed fire will be employed in late summer/early fall months for best results, however may be conducted during the winter or early spring months to combine activities with other wildlife habitat/fuel reduction prescribed burning. When burning is not possible, ripping of the area may be used. Ripping is the process where soil is mechanically sliced or broken to improve tilth, aeration and permeability. When possible, site preparation

activities will coincide with adequate cone crops. If after five years there are fewer than 150 pine seedlings per acre, the area will be hand planted with genetically improved shortleaf pine seedlings.

Where established regeneration is present, seedlings may regenerate too densely causing overcrowded conditions, requiring pre-commercial thinning and/or release. This release may be accomplished manually with hand tools (e.g. chainsaws) or with the herbicides applied as a foliar spray or cut surface application to remove the overtopping and competing vegetation and brush. A foliar spray may be applied to areas with vegetation less than six feet tall and with pine regeneration that does not require thinning. A cut surface application is employed in areas with vegetation greater than six feet tall and/or with pine regeneration requiring thinning. During any pre-commercial thinning and/or release activities, sufficient hardwood trees would be left scattered throughout the stand to ensure a ten to 30 percent hardwood component in the stand. When selecting hardwood trees, preference would be given to mast producers. Final stocking after treatments would be 250-500 pine stems per acre.

Pre-commercial Thinning /Release (PCT) – Regenerated pine stands between 5 and 10 years of age would be thinned to a maximum of 700 trees per acre, averaging a 10 x 10 foot spacing, using hand tools or herbicide application as described above. Leave trees would be free of all competing vegetation such as vines and woody stems to ensure survival, reduced susceptibility to insects and disease, and increase growth of the residual stand. Poorly formed trees would also be removed. The hardwood component would be retained at 10 to 30% of the total trees per acre. These areas may also be made available for commercial sale. (Up to 225 acres proposed)

Commercial Thinning (CT) – Stands will be thinned to a pine residual basal area of 50-60 sq. ft. per acre. For the following stands, the pine residual basal area will be 70-75 sq. ft. per acre: Compartment 1623 stands 9 and 36. Where a hardwood component is present, the target basal area will be 20-35 sq. ft. per acre.

In order for mechanical harvesting equipment to operate within these stands and to reduce the amount of damage to the remaining stand, a minimum spacing between trees of 20 feet is required (127 trees/acre). Stands with average diameters less than 10 inches will be thinned below the basal area guides listed in Table 3.6 Thinning Guide by Community Group (Revised Land and Resource Management Plan). Pursuant to Revised Forest Plan Design Criteria FI005, deviations from these guides are allowable if site-specific conditions warrant, subject to approval by the project Responsible Official. Damaged, diseased, suppressed, and poorly formed trees would be targeted first for removal. Trees harvested will be sold to support the local economy (549 acres proposed).

Forest Health Restoration Thinning – Densely stocked pine plantations with basal areas varying from 108 ft^2 to 113 ft^2 per acre would be thinned to a residual basal area of 50-60 sq. ft. per acre. Stands are normally thinned to a pine residual basal area of 70-75 sq. ft. per acre based on the average stand diameter. However, for mechanical harvesting equipment to operate within these densely stocked pine stands and to reduce the amount of damage to the remaining stand, a minimum spacing between trees of 20 feet is required (127 trees/acre). These stands will be thinned below the basal area guides listed in Table 3.6 Thinning Guide by Community Group

(Revised Land and Resource Management Plan). Pursuant to Revised Forest Plan Design Criteria FI005, deviations from these guides are allowable if site-specific conditions warrant, subject to approval by the project Responsible Official. Damaged, diseased, suppressed, and poorly formed trees would be targeted first for removal. Trees harvested will be sold to support the local economy. (288 acres proposed)

Timber Stand Improvement (TSI) – An intermediate treatment designed to improve the composition, structure, condition, health and growth of existing even aged stands. Competing hardwood poles would be removed to improve pine stand vigor. These areas may be made available for firewood or commercial sale. (Up to 225 acres proposed)

Wildlife Stand Improvements (Commercial) – Wildlife stand improvements are achieved by using a combination of fire, chainsaws, and/or herbicides. Understory and intermediate trees would be removed, reducing competition for light and nutrients among retained species. Oaks, hickories, and beech are favored for retention. These areas may be made available for firewood or commercial sale. The most common treatments to meet the objectives of these areas are woodland stand restoration, woodland stand development, midstory reduction and overstory development.

Midstory Reduction (MSR) – By using a combination of fire, chainsaws and/or herbicides, suppressed and intermediate trees would be removed. Reducing the midstory will allow more light to filter through the forest canopy to spur the growth of understory vegetation. These areas may be available for public firewood and/or commercial.

Glade Restoration – Activities include the restoration of 62.7 acres of glade communities. These areas will be managed to maintain their ecological integrity by using fire as a tool to mimic past fire regimes. These areas may also be made available for firewood or commercial sale.

Chemical Site Preparation – After pine regeneration harvest, hardwoods would be reduced to 20% of the residual basal area of pine using herbicide application in the form of foliar spray, stem injection, and/or chainsaw fell and cut surface spray. A minimum of 5 square feet per acre of basal area of overstory hardwoods would be retained where available. In modified seed tree harvest areas one-half acre clumps of hardwoods per 20 acres of harvest area would be retained in order to create den trees. These areas may be made available for commercial or firewood sale areas. (225 acres proposed= ST+SW)

Mechanical Site Prep - Competing vegetation may be removed manually with chainsaws, heavy equipment and/or ripping. This will be used in lieu of or in addition to other site prep methods to ensure areas are properly prepared for future seed/seedlings. These areas may also be made available for commercial or firewood sale areas. (Up to 225 acres proposed= ST + SW)

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

provided later in this document under ecosystem prescribed burning. (225 acres proposed= ST+SW)

Hand Plant Shortleaf Pine – If adequate amount of pine regeneration (150 trees per acre) is not established within 5 years in natural regenerated areas (ST & SW), pine seedlings would be planted on an 8 X 10 spacing to meet target stocking levels. (92 and 133 acres proposed, respectively)

Wildlife Openings – Activities for maintenance of existing and the creation of wildlife openings include brush hogging, disking, fertilizing, and seeding with native warm and cool season grasses and forbs. Existing wildlife openings total 5.4 acres and a 0.22 mile linear opening. Actions would create an additional 0.73 acres of wildlife opening. These actions may be accomplished through commercial or firewood sale areas.

Pond Construction – Activities would include construction of 4 ponds. New ponds will be constructed with heavy equipment. Disturbed soils will be stabilized with seeding of native seeds and forbs and mulched. The areas may also be utilized for commercial or firewood purposes.

Pond Maintenance – Activities would include repairing spillways, installing signs and clearing vegetation. Disturbed soils will be stabilized with native grasses and forbs and mulched. Traditional methods of controlling nuisance vegetation within and surrounding ponds have proven unsuccessful or impracticable. With Forest Supervisor approval, the use of aquatic labeled herbicides would be used to control non-native or invasive aquatic vegetation. There are 6 ponds within Project Area that would be improved/maintained.

Invasive/Noxious Plant Species Control – Identified invasive species (i.e. Fescue, Japanese Honeysuckle, Chinese Privet, Multi-flora rose) would be eliminated from the road surface, ditches, and forest floor throughout the Project Area using various techniques. These techniques would include a combination of herbicide application, prescribed burning, light disking, and seeding with native warm season grasses.

Ecosystem Prescribed Burning- Will continue as proposed under the Little Fir Burn EA (2010).

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

Temporary Road Construction – Approximately 7 miles of temporary road construction is necessary to access harvest areas. After harvest, these roads would be closed with earthen berms or gates, limed, fertilized, seeded and planted with native warm and cool season grasses and nonpersistent cultivars and utilized as temporary wildlife openings.

System Road Pre-haul Maintenance – Prehaul maintenance would be required on approximately 1 mile of road prior to timber hauling. Activities include brush removal, spot gravel, surface

protection, blading, culvert replacement and drainage reconditioning as necessary to restore the road to its original design function.

System Road Construction – Approximately 2.5 miles of medium standard road construction would be required to access and haul timber from stands proposed for harvest. This road would then be added to the district road inventory and maintained as needed.

System Road Reconstruction – Approximately 5 miles of system road reconstruction would be required to support management activities, reduce erosion and sedimentation, and ensure safe travel on the existing road network. Activities could include any road improvements or realignment that results in an increase of an existing road's traffic service level, expands its capacity, changes its original design function, or relocates an existing road or portions of an existing road and treatment of the old roadway.

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

Road Closures- In order to reduce soil erosion, sedimentation, illegal activities, and to comply with the Travel Management Rule as outlined by the Motor Vehicle Use Management (MVUM) maps, several miles of existing authorized roads and unauthorized roads may be closed with gates or earthen berms as funds are available. See Transportation section for complete outline of changes/corrections to Motor Vehicle Use Management designation and INFRA database.

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

Alternative C: No Herbicide Use

This alternative addresses the Forest direction requiring analysis of alternatives to herbicide use. Herbicide application for invasive species control, site preparation and pre-commercial thinning/release would not occur. These activities would be accomplished manually with chainsaws and/or other mechanical means. All other activities are the same as those proposed under Alternative B.

Protection Measures for Historic Properties – Alternatives A, B, and C
The following measures only apply to cultural resource sites that are unevaluated, eligible for listing, or listed in the National Register of Historic Places.

HP1: Site Avoidance During Project Implementation

Avoidance of historic properties (HP) will require the protection from effects resulting from the undertaking. Effects will be avoided by (1) establishing clearly defined site boundaries and buffers around archeological sites where activities might result in an adverse effect. Buffers will be of sufficient size to ensure that integrity of the characteristics and values which contribute to, or potentially

contribute to, the properties' significance will not be affected, and (2) routing proposed new roads, temporary roads, log landings and skid trails away from historic properties;

HP2: Site Protection During Prescribed Burns

(1) *Firelines.* Historic properties located along existing non-maintained woods roads used as fire lines will be protected by hand-clearing those sections that cross the sites. Although these roads are generally cleared of combustible debris using a small dozer, those sections crossing archeological sites will be cleared using leaf blowers and/or leaf rakes. There will be neither removal of soil, nor disturbance below the ground surface, during fireline preparation. Historic properties and features located along proposed routes of mechanically-constructed firelines, where firelines do not now exist, will be avoided by routing fireline construction around historic properties. Sites that lie along previously constructed dozer lines from past burns where the firelines will be used again as firelines, will be protected during future burns by hand clearing sections of line that cross the site, rather than re-clearing using heavy equipment. Where these activities will take place outside stands not already surveyed, cultural resources surveys and regulatory consultation will be completed prior to project implementation. Protection measures, HP1, HP3, and HP4, will be applied prior to project implementation to protect historic properties.

(2) *Burn Unit Interior.* Combustible elements at historic properties in burn unit interiors will be protected from damage during burns by removing excessive fuels from the feature vicinity and, as necessary, by burning out around the feature prior to igniting the main burn, creating a fuel-free zone. Burn out is accomplished by constructing a set of two hand lines around the feature, approximately 30 to 50 feet apart, and then burning the area between the two lines while the burn is carefully monitored. Combustible features located in a burn unit will also be documented with digital photographs and/or field drawings prior to the burn. Historic properties containing above ground, non-combustible cultural features and exposed artifacts will be protected by removing fuel concentrations dense enough to significantly alter the characteristics of those cultural resources. No additional measures are proposed for any sites in the burn interior that have been previously burned or that do not contain combustible elements or other above ground features and exposed artifacts as proposed prescribed burns will not be sufficiently intense to cause adverse effects to these features.

(3) *Post-Burn Monitoring.* Post-burn monitoring may be conducted at selected sites to assess actual and indirect effects of the burns on the sites against the expected effects. 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 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 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.

Other Past, Present and Reasonably Foreseeable Future Actions

An Environmental Assessment for Little Fir Prescribed Burning was completed in 2010, which includes most of Little Fir Watershed Restoration project. This area included approximately 16,308 acres of ecosystem prescribed burning. Activities would continue as approved in the previous environmental assessment.

In 2001, an ice storm damaged several hundred acres of timber that required salvage resulting in the removal of this timber. Within this region, the potential is high for reoccurrence. Additionally, seedling release/thinning could occur as a result of Southern Pine Beetle outbreak. Salvage timber for ice damage and the control of southern pine beetles would continue as necessary.

Private land ownership – Private owners can be expected to continue their current land use practices (i.e. residential, farming, crystal mining). Persons with vacation homes along the Caddo River would continue to use the river for recreation. Several businesses utilize this river for float trip recreation. Private landowners may develop land *adjacent* to river and/or National Forest System within Project Area.

Other past activities within the Little Fir Watershed Restoration Project Area are evident in descriptions of the present conditions for each resource section analyzed in Chapter 3. Other ongoing activities are listed above in the description of Alternative A: Deferred Harvest (No Action).

SUMMARY COMPARISON OF ACTIONS BY ALTERNATIVE (TABLE 2.2)

Action (measure)	No Action	Alt B	Alt C
Modified Seed Tree Regeneration Harvest (ST) (acres)	0	92	92
Shelterwood Harvest (SW) (acres)	0	133	133
Commercial Thinning (CT) (acres)	0	549	549
Pre-Commercial Thinning with herbicides (PCT) – includes OSR	0	225	0
Pre-Commercial Thinning without herbicides (PCT)- includes OSR	0	0	225
PCT Site Preparation with Herbicides (all regeneration except OSR)	0	225	0
Site Preparation without Herbicides (all	0	0	225

Action (measure)	No Action	Alt B	Alt C
regenerated stands except OSR)			
Prescribed Burn Site Preparation (acres)	0	225	225
Timber Stand Improvement (TSI) (acres)	0	225	225
Midstory Reduction (MSR) (acres)	0	12	12
Hand Plant Shortleaf Pine if Natural Regeneration. fails		225	225
Wildlife Stand Improvement – Commercial Thin	0	162	162
Wildlife Openings (new and existing)	0	6.35	6.35
Pond Improvements (ponds)	0	6 (with herbicides)	6 (no herbicides)
Pond Construction (ponds)		4 ponds	4 ponds
Glade restoration	0	62.7	62.7
Invasive Plant Species Control (acres)	0	50 (for analysis)	0
Fireline Maintenance (miles)	0	7	7
Temporary Road Construction (miles)	0	7	7
System Road Reconstruction(miles)	0	5	5
System Road Construction	0	2.5	2.5
System Road Pre-haul Maintenance(miles)	0	1	1
Install Road Closure Devices (structures)	0	20	20
Road Closure (miles)	0	3.03	3.03
Total area potentially treated with pesticides (Natural Regen(2) + PCT+ invasives) (acres)	0	1,675	0

SUMMARY COMPARISON OF ENVIRONMENTAL EFFECTS BY ALTERNATIVE (TABLE 2.3)

Environmental Effect (measure)		No Action	Alt B	Alt C
Risk to Beneficial Uses (Low, Moderate, High)/ Sedimentation (tons per year)	Watershed			
	80401010306	*Mod/74.30*	*Mod/1,258.42*	*Mod/1,258.42*
		N/A	N/A	N/A
		N/A	N/A	N/A
		N/A	N/A	N/A
Air Quality Meets Air Quality Index		Yes	Yes	Yes
Early Seral Habitat Created/Maintained (acres)		0	225	225
Open Road Density (mi/sq. mile)		1.94	1.0	1.0
Scenic Integrity Objectives Met		Yes	Yes	Yes
Volume Harvested (ccf)		0	3,342	3,342

*Watershed numbers 80401010306 is identified as Little Fir Cemetery – Lake Ouachita. The Little Fir Project Area falls within this watershed.

SUMMARY COMPARISON OF OBJECTIVES MET BY ALTERNATIVE (TABLE 2.4)

Objective (measure)	No Action	Alt B	Alt C
Improve the health and vigor of forest stands and improve stand quality (acres of timber stands treated	0	1,062	1,062

Objective (measure)	No Action	Alt B	Alt C
resulting in reduced basal areas)			
Contribute to the economic base of local communities by providing a sustained yield of high-quality wood products. (volume harvested – 100 cubic feet (ccf))	0	3,242	3,242
Provide grass-forb and seedling-sapling habitat conditions. (percent of suitable acres in early seral habitat)	0.0	5.8	5.8
Maintain or Improve open habitats to provide high quality forage and nesting habitat for wildlife. (acres of wildlife openings maintained/created)	0	6.35	6.35
Eliminate non-native, invasive species. (acres treated for invasive species eradication)	0	Across Project Area (50 acres for analysis)	0
Reduce open road density. (miles of open road per square mile)	1.94	1.0	1.0
Develop, operate, and maintain the road system to meet the requirements of the proposed actions, protect the environment, and provide reasonable and safe access. (miles of road construction: road reconstruction: and pre-haul maintenance)	0	2.5: 2.5: 1	2.5: 2.5: 1

The Preferred Alternative

Alternative B: Little Fir Watershed Restoration Management Project (Proposed Action) is the Caddo-Womble District Ranger's preferred alternative.

Chapter 3

Affected Environment and Environmental Consequences

Introduction

Unless stated otherwise, the spatial bound for cumulative effects analysis is the 16,908 acre Little Fir Watershed Restoration Management Project Area boundary (see location map in Appendix F). The Project Area boundary is completely contained within the Little Fir Watershed.

Analysis tools and data used to estimate the effects of implementation of the alternatives:

Air Quality – VSMOKE is used to analyze the effects of a single prescribed fire. The program estimates smoke concentrations and cross plume sightline characteristics at specified downwind distances from the fire. The conservative nature of VSMOKE estimates allows the model to be used as a screening system to point out the potential for smoke-related hazards. VSMOKE's results are primarily intended to give an overview of the probable air pollution impact from a single prescribed fire. VSMOKE smoke concentrations estimates are applicable along the downwind centerline of the smoke trajectory.

Soils – The Ouachita National Forest Universal Soil Loss Equation (USLE) model is used to determine potential soil erosion on a project site, and the proposed soil disturbing management activities that have the potential for the most erosion. The model was developed by ONF personnel, and modified by Forest Soil Scientists. The USLE model was developed to determine average year soil erosion based on yearly precipitation and rainfall energy derived from 30 years of rainfall data.

Water Quality – The Aquatic Cumulative Effects model (Clingenpeel & Crump 2005) is 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 6.0) is used to determine the financial efficiency of each Alternative. This program is a project analysis tool that utilizes a MS 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.) Human Health and Ecological Risk Assessments were used to analyze the risks associated with the four herbicides proposed for use in this project. Project specific SERA worksheets (version 4.06) were completed for herbicides triclopyr, imazapyr, imazapic, and glyphosate 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.

Heritage, Cultural and Historical Resources – The National Historic Preservation Act requires all federal agencies to address the effects of actions on specific historical and/or cultural items. The Forest Service has a Programmatic Agreement with the State Historic Preservation Office (SHPO) that streamlines specific activities. Any projects that do not fit within this agreement are individually reviewed under Section 106 by the SHPO before conducting any action. The activities outlined in this proposed action have been reviewed and approved by the SHPO.

Air Quality

Present Conditions

Air quality is good within and surrounding the Project Area. As of December 2008, Crittenden County is the only non-attainment area in the state of Arkansas for any of the six criteria air pollutants monitored by the Environmental Protection Agency (EPA). Crittenden County, part of the Memphis metropolitan area, was non-attainment for 8-hour ozone.

The Little Fir Watershed Restoration Project Area lies within lands designated as Class II with respect to the air resource. The Clean Air Act defines a Class II area as "a geographic area designated for a moderate degree of protection from future degradation of the air quality". A Class I Area is a geographic area designated for the most stringent degree of protection from future degradation of air quality. The closest Class I Area to the Project Area is the USDA Forest Service Caney Creek Wilderness Area, approximately 18 miles west of the Project Area.

Other smoke sensitive targets include towns, such as Mount Ida, hospitals, schools, airports, and major roadways. Prescribed burns would be planned so to minimize the negative effects of burning on human health and safety to the extent possible.

Existing emission sources occurring within the Project Area consist mainly of mobile sources. These would include, but are not limited to, combustion engines (such as those found in motor vehicles); dust from unpaved surfaces; smoke from local, county, agricultural, and forest burning; restaurants; and other activities.

The Little Fir Watershed Restoration Management area falls completely within Montgomery County. Based upon the 2002 EPA Emissions by Category Report for "tier-1" sources, no point source emissions were reported to occur within Montgomery County.

POINT SOURCE EMISSIONS OF CRITERIA POLLUTANTS FOR MONTGOMERY COUNTY (TABLE 3.1)

Point Source Emissions in Tons Per Year						
	CO	SO_2	NO_x	PM-10	PM-2.5	VOC
Montgomery	0	0	0	0	0	0

NON-POINT+MOBILE SOURCE EMISSIONS OF CRITERIA POLLUTANTS FOR MONTGOMERY AND GARLAND COUNTIES (TABLE 3.2)

Non-point +Mobile Source Emissions in Tons Per Year						
	CO	SO_2	NO_x	PM-10	PM-2.5	VOC
Montgomery	18,309	254	504	2,686	1,252	4,300

CO-Carbon Monoxide; **SO**- Sulfur Dioxide; **NO**x- Nitrogen Oxides; **PM-10**-Particles < 10 micrometers diameter; **PM-2.5**-Particles < 2.5 micrometers diameter; **VOC**-Volatile Organic Compounds

Miscellaneous, off-highway, highway vehicles and miscellaneous sources are the greatest producers of CO. Highway and off-highway vehicles are the greatest producers of NOx. Miscellaneous sources are the major source of PM-10 and PM-2.5. The greatest area source emissions for SO_2 are emitted from industrial use of fuel oil.

There is public concern that smoke generated from prescribed burning may degrade air quality. This could cause health problems to those living downwind of the Project Area.

Bounding the Effects Analysis

VSMOKE was used to analyze the effects of a single prescribed fire. The program estimates smoke concentrations and cross plume sightline characteristics at specified downwind distances from the fire. For this analysis the largest proposed burn block of 2,052 acres, was used to assess the worst case scenario. Smoke sensitive targets were identified within an approximate 30-mile radius, although it is recognized that smoke transport and dispersal in the atmosphere would exceed this distance

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

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

Indirect effects:
The amount of fuel consumed on each of the prescribed burning blocks would average 4 tons per acre. Under the No Action Alternative, this reduction in fuels would not take place. In the event of a wildfire, this fuel would be present, and because wildfires occur without regards to a prescription, climatic conditions might exist that could contribute to the creation of high levels of ozone, PM-10, and PM-2.5 downwind of the fire.

Cumulative effects:
No cumulative effects are foreseen under the No Action Alternative with regards to degradation of air quality from prescribed burning. However, as discussed in the indirect effects section, there is an increased potential for air quality degradation from wildfires due to the retention of fuels. Over time, with no implementation of fuel reduction, the amount of fuels would increase. As fuels accumulate, the potential for exceeding air quality standards due to a wildfire would increase.

- Alternative B: Little Fir Watershed Restoration Management Project (Proposed Action) - Direct, Indirect & Cumulative Effects

Direct and Indirect effects:
Occasional brief exposure of the general public to low concentrations of drift smoke is more a temporary inconvenience than a health problem. High smoke concentrations can, however, be a very serious matter, particularly near homes of people with respiratory illnesses or near health-care facilities, schools, or on roadways. Human health effects related to particulate matter in smoke include: increased premature deaths; aggravation of respiratory or cardiovascular illnesses; and changes in lung function, structure, and natural defense. Smoke also becomes a safety issue when it affects visibility on roadways. Smoke can also have a nuisance odor.

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

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

Prescribed Burn Plans are required for each burn. Smoke sensitive targets identified for this analysis include the Class I Caney Creek Wilderness Area located approximately 30 miles to the southwest of the Project Area, Also, Bearce Airport, Mena Airport, the towns of Caddo Gap, Black Springs, Mt. Ida, Norman, Glenwood, Hot Springs, and all schools or health care facilities within these towns. Furthermore Highways that may be impacted during the implementation of the prescribed burns include Highway 27N located approximately 1 mile to the west, Highway 188 which serves as the south boundary for this Project Area, and US highway 270E located approximately 5 miles to the south.
Each prescribed burn plan outlines a contingency plan that will be implemented if conditions change from the planned burn. These include 1) Cease firing 2) Monitor the burn if it exceeds management objectives 3) Plow out burn if it exceeds management objectives and 4) Monitor burn until safe to leave. Prescribed burns would be planned so to minimize the negative effects of burning on human health and safety to the extent possible. The direct and indirect effects of smoke on sensitive target areas are listed above. Additionally, a list of agencies is notified prior to ignition of each burn.

The smoke dispersion modeling analysis (using VSMOKE and/or VSMOKE-GIS) for this project was performed for 400.0 acres per hour to be burned on 02/01/2012 at the time period of 1400 hours. This time period has daytime dispersion characteristics to disperse the pollutants from the fire. The location of the fire is at approximately 34.613 degrees latitude and -93.492 degrees longitude (454885.072 meters east and 3830225.445 meters north using US Albers projection). The emission rate of PM2.5 (fine particles) this hour was 3740.9 grams/second, and carbon monoxide was 46021.7 grams/second. The heat release rate was 1384125.4 megawatts. Both emission rates and the heat release rates were

calculated using the Fire Emission Production Simulator (FEPS) model. This model is built into VSMOKE and pulls data to manage fuel characteristics concerning consumption, emissions and heat release. The estimated background concentration of fine particles and carbon monoxide of the air carried with the winds into the fire are 20 micrograms/cubic meter and 4 parts per million, respectively. The proportion of the smoke subject to plume rise was -0.75 percent, which means 75 percent of the smoke is being dispersed gradually as it rises to the mixing height, and 25 percent is dispersed at ground level.

The meteorological conditions used in this model run were:

1.) Mixing height was 5000 feet above ground level (AGL).
2.) Transport wind speed, and surface wind speed were 12 and 5.0 miles per hour, respectively.
3.) The sky had 20 percent cloud cover, and the clouds were located 3000 feet above the ground.
4.) Surface temperature was 225 degrees Fahrenheit, and the relative humidity was 38 percent.
5.) The calculated stability class from VSMOKE was moderately unstable.

The VSMOKE model produces three types of outputs that estimate: a.) The ability of the atmosphere to disperse smoke and the likelihood the smoke will contribute to fog formation, b.) Downwind concentrations of particulate matter and carbon monoxide, and c.) Visibility conditions downwind of the fire.

The Dispersion Index (DI) is an estimate of the ability of the atmosphere to disperse smoke to acceptably low average concentrations downwind of one or more fires. This value could represent an area of approximately 1000 square miles under uniform weather conditions. Typically, the Dispersion Index value should be greater than 30 when igniting a large number of acres within an area. The calculated Dispersion Index value was 50, which predicts the atmosphere has a good capacity to disperse smoke.

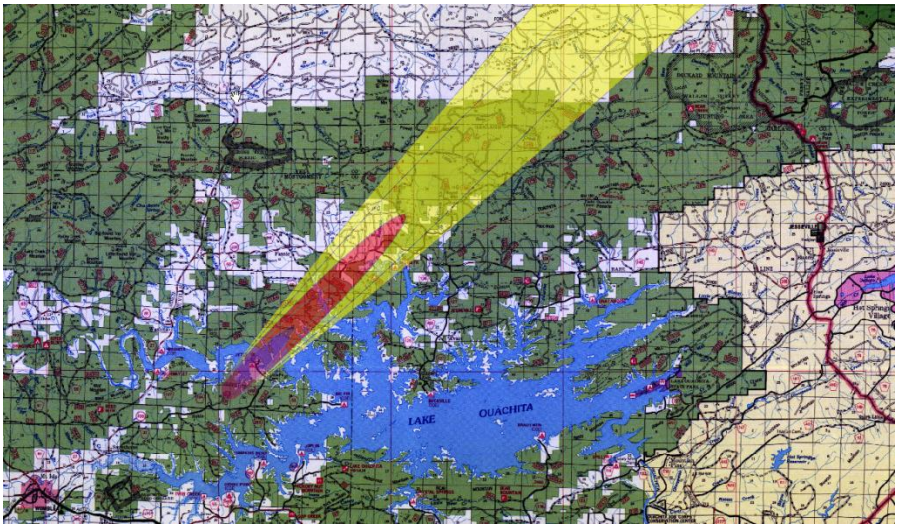
Combining the Dispersion Index and relative humidity values provide an estimate (like those used in insurance actuary tables) of the likelihood of the smoke contributing to fog formation. The Low Visibility Occurrence Risk Index (LVORI) ranges from 1 (lowest risk) to 10 (greatest risk) and usually you want the value to be less than 4. The base line risk of having low visibility as a result of smoke contributing to fog formation is about 1 in 1000 accidents. The Low Visibility Occurrence Risk Index value for this VSMOKE analysis was 1 which is equal to the base line.

High concentrations of particulate matter, especially fine particles (PM2.5), and carbon monoxide can have a negative impact on people's health. The Environmental Protection Agency has developed a color coding system called the Air Quality Index (AQI) to help people understand what concentrations of air pollution may impact their health. When the AQI value is color coded orange then people who are sensitive to air pollutants, or have other health problems, may experience health effects. This means they are likely to be affected at lower levels than the general public. Sensitive groups of people include the elderly, children, and people with either lung disease or heart disease. The general public is not likely to be affected when the AQI is coded orange. Everyone may begin to experience health effects when AQI values are color coded as red. People who are sensitive to air pollutants may experience more serious health effects when concentrations reach code red levels. This analysis shows the air quality at downwind distances less than 12.40 miles from the edge of the fire may have a 1-hour particulate matter concentrations predicted to be code red or worse, while distances less than 31.14 miles are predicted to

be code orange or worse. At distances less than 2.47 miles from the edge of the fire the one-hour carbon monoxide concentrations are predicted to be code red or worse, and distances less than 3.92 miles from the fire are predicted to be coded orange or worse.

Smoke can also have an impact on how far and how clearly we can see on a highway or in viewing scenery. The fine particles in the smoke are known to be able to scatter and absorb light, which can reduce visibility conditions. The visibility estimates from VSMOKE are valid only when the relative humidity is less than 70 percent. Also, the visibility estimates assume the smoke is passing in front of a person who is looking through the plume of smoke. The visibility thresholds used for this modeling analysis were to maintain a contrast ratio of greater than 0.05 and a visibility distance of 0.25 miles. Visibility conditions may exceed the threshold less than 0.62 miles from the edge of the fire.

The VSMOKE-GIS model estimates were for the pre-selected fine particulate matter concentrations (41, 81, 176, 301, and 501 micrograms per cubic meter) to be predicted downwind of the fire. The results (map) are shown below. The VSMOKE-GIS analysis has daytime dispersion characteristics to disperse the pollutants from the fire and this is the same as the VSMOKE analysis. The downwind spacing interval was set at 0.025 kilometers, and the model ceased making downwind estimates at 30 miles from the edge of the fire. The stability class used for the VSMOKE-GIS analysis was moderately unstable and this is the same as the calculated stability from VSMOKE.



VSMOKE or other modeling would be performed on the day of the actual burn, using up-to-date meteorological data. If this modeling shows unacceptable impacts from burning (i.e. extended period of unhealthy smoke concentration levels or impacts to smoke-sensitive sites), the activity would be postponed or altered.

Cumulative effects:
The cumulative effects of prescribed burning on air quality consist of the downwind impact of multiple simultaneous prescribed burns, in addition to the other emissions in the area. These cumulative effects

are rather short-lived. Once the burn is over and the smoke dissipates, the effect is over. Impacts to air quality would generally be confined to no more than a few hours or at most, 1-2 days. VSMOKE provides analysis of cumulative effects to air quality by incorporating not only emissions from the analyzed prescribed burn, but also background particulate levels and carbon dioxide levels. It is acknowledged that multiple simultaneous prescribed burns could cumulatively increase particulate levels. While it is difficult or nearly impossible to quantify such emissions in a planning analysis, voluntary compliance with the State of Arkansas Smoke Management Program insures compliance with applicable Federal and State regulations governing open burning.

Alternative C: No Herbicide Use – Direct, Indirect & Cumulative Effects

Effects are the same as those listed for Alternative B.

Heritage, Cultural and Historical Resources

Present Conditions

Heritage resource surveys were conducted from April 14 through June 6, 2011 and January 30 through February 6, 2012. Archaeological investigations of the Project Area resulted in the survey of 392 acres in addition to previous surveys totaling 986 acres and the identification of 16 archaeological properties. The Ouachita Cultural Resources report No. 339 was prepared and submitted to the State Historic Preservation Office (SHPO), the Arkansas State Archeologist and the federally recognized tribes: Caddo Tribe, Choctaw Nation, Chickasaw Tribe, Osage Nation, and Quapaw Tribe. Letters of concurrence were received from the SHPO on March 23, 2012. On February 9, 2012, the Choctaw Tribal Historic Preservation Officer responded that the Project Area is outside the Choctaw Nations' area of interest. Significant sites will be protected from proposed management activities. If any unknown heritage resources are discovered during stand treatments within the Project Areas, the District and Forest Archaeologists will be notified immediately. They will make an evaluation, in consultation with SHPO and the Tribal Historic Preservation Officers (THPO's), to determine appropriate action. Activity at that location will be suspended until that determination is complete.

Known Cultural Resources Sixteen archeological sites have been identified in or near the Project Area as a result of cultural resources inventory surveys. Of the identified properties, three were determined to be eligible for nomination to the National Register of Historic Places (NHRP) and will be actively protected.

Bounding the Effects Analysis

The scope of the analysis for potential effects to cultural resources includes the entire Little Fir Project Area and considers the proposed activities within treatment areas (see Chapters 1.0 and 2.0), as well as access to these areas.

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

Fir Watershed Restoration Management Project 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.

In general, proposed Project 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 Action Alternative and No Herbicide Alternative

Direct and Indirect Effects

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

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

Cumulative Effects

As noted in Section 2.7 (Other Past, Present, and Reasonably Foreseeable Actions), Forest Service activity in the Project Area and adjacent watershed areas has not been extensive. Project scoping and analysis have not disclosed any definitive plans for use on non-national forest lands in the Project Area. Cumulative effects to cultural resources are not expected to occur. Known or discovered historic properties will be monitored to ensure continued protection.

No Action Alternative

Direct and Indirect Effects

Currently, archeological surface and subsurface site integrity in the Little Fir Watershed Restoration Management 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. With no change in current management activities and direction, adverse effects (and the potential for them) on a number of the archeological sites may continue. With the No Action Alternative, historic properties likely would continue to degrade. Where sites exist in currently accessible areas, such as along roads, there is potential for being impacted, disturbed, or vandalized 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

Cumulative effects are not expected to occur; there are no past or present actions affecting cultural resources, nor is there future actions planned that would affect cultural resources.

Soils

Present Conditions

The soil resource inventory was developed from studying and classifying soils and describing soil mapping units which are the key to land and soil features significant to soil use and management. Guidelines for soil inventory design, mapping and soil taxonomic classification for interpreting soils information are found in the Forest Service Southern Region Soil Resource Guide and from the Natural Resources Conservation Service (NRCS), previously the Soil Conservation Service, Soil Taxonomy Manual (Agriculture Handbook 436), the NRCS Soil Survey Manual (Agriculture Handbook 18) and the NRCS National Soils Handbook.

The Little Fir Watershed Restoration Project Area lies within the Central Mountain subdivision of the Ouachita Mountains Physiographic Region. Topographic features of the area consists mostly of low lying hills with gently sloping to moderately sloping side slopes and level to nearly level floodplains that flood occasionally to frequently. Slope gradients range from 8 to 35 percent on the uplands and 1 to 6 percent in the floodplains and terraces. The topography and soils of the Project Area are derived primarily from the geology and subsequent geomorphological and pedological processes. The topography is primarily gently rolling uplands and ridges with some steeper topography in the extreme western edge of the area. Four geologic formations occupy the Project Area. The Mazarn Shale Formation (Map Symbol – OM) represents over 90 percent of the area, with only the extreme western side underlain with the other formations. The Mazarn Shale Formation is of Early Ordovician age and consists mostly of black shale that is interbedded with some olive-green shale and silty shale. It also includes some thinly laminated gray siltstone, brown sandstone, and dense blue-gray limestone and some bluish black chert. The alternating layers of black and olive-green shale, which commonly have crosscutting cleavage, give the formation a banded appearance. The Womble Shale (Map Symbol – Ow) Formation is of Middle Ordovician Age. It consists mostly of gray-black shale with intervals of dense, bluish-gray limestone and calcareous siltstone. Minor amounts of gray chert, fine grained quartzose

sandstone, and conglomerate are also present. Bengal, Bismarck, Carnasaw and Littlefir soils formed in material weathered from the shale. The Blakely Sandstone Formation (Map Symbol – Ob) is mostly of Middle Ordovician age. It consists of interbedded, thin to fairly massive, fine- to medium-grained, sporadically silty or calcareous, quartzose, brownish-gray sandstones and black to green shales. Clebit, Nashoba, Pirum, and Zafra soils formed in material weathered from the sandstone. Bismarck, Carnasaw, and Littlefir soils formed in material weathered from the shale. The Polk Creek Shale Formation (Map Symbol – Obp) is of Late Ordovician age. It is grayish-black, sooty shale with some very thin, gray chert. Typically, this formation is exposed in narrow strips in valleys adjacent to the Bigfork Chert Formation. Avant and Yanush soils formed in residuum and colluvium from the chert. Bengal soils formed in residuum from the shale.

Within dissected uplands and narrow valleys, local floodplains have developed with the Kenn, Ceda, Dela, and Cupco as the main soils. The stream terraces typically are represented by the Avilla soils.

Soil maps and mapping unit descriptions and interpretations are based upon the fact that different soil types result from different combinations of geology, geomorphology, topography, vegetation and climate which influence land use activities, capabilities, and various interpretations for management. The nature, patterns and extent of these soils give each mapping unit its own set of interpretations for use and management. The Soil Resource Report for the Little Fir Watershed Restoration Project Area has identified and described 29 soil mapping units the Project Area. Soil properties and associated management implications/precautions of these soil units were analyzed with respect to the proposed practices within each alternative. See project file for the Soil Mapping Unit Legend, Soil Mapping Unit Descriptions, Soil Map and other maps of interest.

Erosion is the detachment and transport of individual soil particles by wind, water, or gravity. Ground disturbing management practices influence erosion principally because they remove vegetative ground cover and often concentrate and channel runoff water. In areas proposed for harvest, there are approximately 19 acres of soils with a potential erosion hazard of severe.

Soil compaction increases soil bulk density and decreases porosity. In areas proposed for harvest, there are approximately 12 acres of soils with a compaction hazard rating of severe.

Bounding the Effects Analysis

The Ouachita National Forest Universal Soil Loss Equation (USLE) model is used to determine potential soil erosion on a project site, and the proposed soil disturbing management activities that have the potential for the most erosion. The model was developed by ONF personnel and modified by Forest Soil Scientists. The USLE model was developed to determine average year soil erosion based on yearly precipitation and rainfall energy derived from 30 years of rainfall data. The model calculates total soil loss based on a three year recovery period for the three stands described in the cumulative effects section.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:

Soils in the Ouachita Mountains typically do not have high inherent soil erodibility (high K-Factor) values due to high surface gravel and rock contents and high concentrations of fine roots at the soil surface. Natural erosion from undisturbed forest soils is low. For this analysis area, natural erosion would range from 0.01 to 0.15 tons per acre per year (Little Fir Soil Resource Report). Under Alternative A, no soil disturbing activities are proposed; therefore there would be no direct effects to soils.

Indirect Effects:
Under Alternative A, the prescribed burning proposed would not take place; no reduction in fuels would occur. In the event of a wildfire, this fuel would be present, and because wildfires occur without regards to a prescription, excessive soil heating could occur, killing soil biota, alter soil structure, consume organic matter, and remove site nutrients. Soil erosion and nutrient leaching may occur during later rainstorms.

Cumulative Effects:
No cumulative effects are foreseen under the No Action Alternative with regards to soil impacts from proposed management activities. However, as discussed in the indirect effects section, there is an increased potential for negative effects to soils from wildfires due to the retention of fuels. Over time, with no implementation of fuel reduction, the amount of fuels would increase. As fuels accumulate, the potential for soil damage due to a wildfire would increase. This could impair long-term soil productivity.

- Alternative B: Little Fir Watershed Restoration Management Project –Direct, Indirect & Cumulative Effects

Direct Effects:
There is a concern that timber harvest, road construction and prescribed burning may cause unacceptable levels of erosion, sedimentation, compaction and/or nutrient loss and as a result decrease the long-term soil productivity within the Project Area. Those soil map units with severe erosion and compaction hazards are subject not only to more management requirements but also closer scrutiny and more frequent monitoring. Alternative B proposes timber harvest on 28 acres of soils with a severe erosion hazard. Soils are considered detrimentally eroded when soil loss exceeds soil loss tolerance (i.e. 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 technical requirements described on pages 46-47 and adherence to Revised Forest Plan Design Criteria (SW003 – SW008) would keep erosion at acceptable levels under normal circumstances. In addition, implementation of Best Management Practices (BMP's) or soil conservation treatment measures would minimize the exposure of soils to erosion. Erosion rates approaching or exceeding Forested T-factor rates are rare when soil conservation treatment measures

and water quality BMPs are used. Table 3.3 lists stands that are proposed for commercial harvest that contain soils with a severe erosion potential. There were no areas within high or moderate-high erosion ratings.

AREAS PROPOSED FOR COMMERCIAL HARVEST WITH SEVERE EROSION POTENTIAL (TABLE 3.3)

Compartment	Stand	Soil MU #	Acres
1631	20	175	8.6
1623	11	112	18.9
1623	39	112	0.50

Negative effects to soil from prescribed burning are related to the severity and frequency of the burns. Most burning would occur during the cooler winter or early spring months when flame lengths and fire severity should be low to moderate. Only the upper forest floor litter layer should be consumed. This should leave the underlying layer to protect the mineral soil. This organic layer, along with trees and other vegetation, should prevent or minimize any soil movement. Adherence to Revised Forest Plan Design Criteria (PF001-PF006) would keep erosion at acceptable levels.

Soils are classified on the forest as severe, high or moderately high hazard for compaction. Harvests within the Project Area are proposed on 11 acres of soils with a compaction hazard rating of severe. Compaction increases soil bulk density and decreases porosity as a result of the application of forces such as weight and vibration. All soils can compact, some more so than others. Naturally, soils high in rock content tend to be less compactable. Additionally, some soils can be more susceptible to puddling and compaction during wet soil conditions. 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. Table 3.4 lists stands that are proposed for commercial harvest that contain soils with a severe compaction rating.

AREAS PROPOSED FOR COMMERCIAL HARVEST WITH SEVERE COMPACTION HAZARDS (TABLE 3.4)

Compartment	Stand	Soil MU #	Hazard Rating	Acres
1623	37	60	severe	11
	39	60	severe	

Prescribed burning would not directly cause soil compaction. The use of large machinery in forestry operations has the potential to compact soils, decreasing productivity. To minimize compaction, heavy equipment would be limited to July through November in stands with severe compaction hazards. Operations during December through June are allowed with the use of methods or equipment that does not cause excessive soil compaction. This does not apply to roads, primary skid trails, or log decks. Soil conditions would be monitored and operations would be suspended when soils become wet.

Indirect Effects:
Biomass removal can cause nutrient deficits. However, Masters et al. (1993) did not find that timber harvesting is a nutrient depleting practices in the western Ouachita Mountains but rather serves to reallocate the nutrient capital within the system. They found that the soil nutrient status improved following timber harvest in the Ouachita Mountains on soils similar to those within the Project Area. Nutrient depletion is generally only a concern where soils are initially poor, whole-tree harvest is used, or rotations are short, on the order of 20-35 years (Jorgenson and Wells, 1986). None of these factors are present under Alternative B; therefore nutrient depletion is not expected.

Light to moderate severity fires accelerate the recycling process by releasing nutrients in the soil, thereby stimulating nutrient uptake by vegetation. Even though prescribed fires release some nitrogen gases, overall nitrogen budgets are not significantly affected. Prescribed fires may also help in reducing rates of soil acidification (FEIS, pp. 46, 47).

Any long-term negative effects to the soil would be related to high severity burns or very short (less than 3-year) frequency of the burns. Typical burn severity will 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 will be 3-years or greater which will allow recovery of forest floors and soil biota and will not deplete soil nutrients.

With standard prescribed burning planning and mitigation, negative effects to soil productivity from prescribed fire under the Proposed Action Alternative are not expected. This is because the burns would be light to moderate in severity and cool enough to protect overstory trees, and the lower portion of the litter layer would remain in place.

Cumulative Effects:
Monitoring on the Ouachita National Forest has not detected differences in soil nutrient status in stands managed under different intensities (Ku and Lawson, 1993), suggesting that cumulative effects on nutrient levels are not substantial even under the most intense of typical management regimes. General field observation and expert opinion (Wheeler and Eichman, 1991) also do not support the premise that typical management actions such as those proposed under Alternative B, negatively affect long-term soil productivity.

The Revised Forest Plan Forest-wide design criteria identify maximum allowable soil loss thresholds (USDA-Forest Service 2005a, pp. 74-75). In order to determine whether the proposed practices and connected actions meet these criteria, the Universal Soil Loss Equation (USLE) was used to calculate soil loss resulting from proposed activities on a soil type with a potential erosion hazard of severe and on a soil type with a severe compaction hazard potential. For this analysis area, three scenarios were analyzed to determine if the proposed activities would meet the Revised Forest Plan criteria. The first scenario modeled a commercial thinning harvest in compartment 52 stand 8, soil map unit 112. Soil map unit 112 consists of the Yanush-Avant-Bengal complex with 35 to 60 percent slopes and has a severe erosion and slight compaction potential. Dormant season prescribed burns occurring in years 8 and 15 were also modeled as part of the scenario. The second scenario modeled a commercial thinning in compartment 56 stand 11, soil map unit 60. Soil map unit 60 consists of the Mazarn complex with 0 to 3 percent slopes and severe compaction potential. Dormant season prescribed burns occurring in years 8

and 15 were also modeled as part of the scenario. The USLE analysis results are shown in Table 3.5 below.

COMPARISON OF SOIL LOSS FROM PROPOSED ACTION TO ALLOWABLE SOIL LOSS (TABLE 3.5)

Soil Map Unit	Compartment-Stand	Representing	Soil Loss in Tons Per Acre between Re-entries	
			Proposed Activities	Maximum Allowable
6	1623 - 2	Moderate-High soil disturbance with slight erosion potential	1.33	4.90
112	1623 - 11	Moderate soil disturbance with severe erosion potential	1.34	5.10

* Based on adequately implemented erosion control methods: scarify, waterbar and seed log decks, temporary roads, primary skid trails and firelines.

All the above treatment units shown in Table 3.5 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, therefore, would remain within acceptable limits over the entire Project Area when erosion control measures are adequately implemented.

The specific technical requirements for harvesting/ burning in compactable or erodible soils are as follows:

- Soils would be managed to maintain a minimum of 85 percent of a treatment area in a condition of acceptable soil productivity following land management activities. (RLRMP, SW003, p.74)
- Allow heavy equipment operations on soils with a severe compaction hazard rating only during the months of July through November. Operations during December through June are allowed with the use of methods or equipment that does not cause excessive soil compaction. This does not apply to roads, primary skid trails, or log decks. (RLRMP, SW001, p.74)
- Allow heavy equipment operations on soils with 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 does not cause excessive soil compaction. This does not apply to roads, primary skid trails, or log decks. (RLRMP, SW002, p.74)
    - Erosion control treatments of log decks, temporary roads, and primary skid trails will include installing waterbars and seeding. (Little Fir USLE report)
    - Bulk density would not increase more than 15 percent over the undisturbed level in the upper eight inches of soil. (RLRMP, SW003, p.74)
    - Soil organic matter will remain at least 85 percent of the natural or undisturbed total in the upper six inches of soil. (RLRMP, SW003, p.74)

- Soil loss from management actions would not exceed the estimated Forested T-factor for each soil or soil map unit, based on the cumulative time period between soil disturbing management actions. (RLRMP, SW003, p.74)
- Soil puddling (tire track rutting) will not exceed six inches deep. (RLRMP, SW003, p. 75)
- Soil displacement will not exceed two inches or one-half the humus-enriched "A" horizon, whichever is less, over a surface area greater than 100 square feet that is more than ten feet wide. (RLRMP, SW003, p.74)

➢ Alternative C: No Herbicide Use – Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Water Resources & Quality

Present Conditions

The Project Area boundary is completely contained within the Little Fir Cemetery – Lake Ouachita Huc-6 watershed. Major stream systems which drain the Project Area include Muddy Creek, the Ouachita River, and the South Fork (of the Ouachita River). The primary beneficial use of waters within the Project Area is native fisheries. Downstream beneficial uses (Caddo River) include serving as the public water supply for the communities of Amity, Norman and Glenwood, fisheries, recreation and hydroelectric power. Numerous groundwater sources have been identified within the Little Fir Watersheds project boundary. One notable developed source is the well located in the Little Fir Landing campground area.

Analysis identified public surface water sources that flow through the Little Fir project are the west end of Lake Ouachita, and the United States Corp of Engineers Little Fir source. One ground water source, a well, is located within Little Fir Landing. Another ground water source is located near a campsite owned by the Corp of Engineer's. Additional ground water sources include an unknown number of privately owned water wells.

Section 303(d) of the Clean Water Act requires states to prepare a list of impaired surface waters. Category 5a (high priority) contains stream segments that are impaired and require Total Maximum Daily Load (TMDL) development. In Arkansas, there are 59 stream segments totaling approximately 1,010 stream miles listed in this category. Primary causes of impairment include: Silt, total dissolved solids, copper, pathogens, nitrates, zinc, chlorides, dissolved oxygen, total phosphorus, organic enrichment, temperature, aluminum, and lead. Some segments are impaired by more than one cause. There are no segments identified as 5a within or adjacent to the Project Area. Category 5d (low priority) contains water bodies where water quality data needs verification from additional sampling to truly determine impairment. Lake Ouachita has been identified in the 2008 Arkansas State 303(d) list as having a classification of 5d. Lake Ouachita lies above, around, and below the Project Area.

Water quality is the physical, chemical and biological purity of water. Forest management can impact water quality and stream systems in many ways. It is possible to limit the negative impacts of

management activities on water quality by implementing projects with Best Management Practices (BMPs). BMPs are defined as "methods, measures, or practices selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. "BMPs can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters," (40 CFR 130.2, EPA Water Quality Standards Regulations). BMPs for the Ouachita NF are established in the Revised Forest Plan and the Arkansas State Best Management Practices. These will be implemented during management activities to minimize impacts to water quality.

There is a concern that management actions, namely timber harvest, temporary road construction, prescribed burning, use of herbicides, excessive use of OHV's and insufficient funding to complete road maintenance may cause a decrease in water quality. There is also the concern that prescribed burning will increase mercury levels in the environment. Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act apply to actions affecting waters of the United States. Both laws are administered by the U.S. Army Corps of Engineers (USACE). Nationwide Permits (NWP's) exist which allow work to be done if the conditions set forth in the permit are met, if pre-construction notification thresholds are not exceeded and if nationwide permit regional conditions are followed. Some actions are exempt from these permit requirements, i.e. "construction or maintenance of farm roads or forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained, in accordance with best management practices…" The Arkansas Department of Environmental Quality (ADEQ) Water Division performs all state certifications under Section 401 and Section 402 of the Clean Water Act on behalf of the EPA. ADEQ requires permitting for all actions that may impact waters of the state. Short Term Activity Authorization (STAA) must be obtained for any activity that may cause a violation the Arkansas Water Quality Standard (Reference ADEQ Regulation 2.305 Short Term Activity Authorization) The forest hydrologist will determine any permit requirements necessary and make all appropriate notifications/acquisitions.

Bounding the Effects Analysis

A cumulative effects analysis must be bounded in space and time. For the purposes of project level planning, 6th level watersheds (10,000 to 40,000 acres) are the appropriate spatial bounds for cumulative effects analysis.

Local research has shown that the effects of increased sediment as a result of timber harvests are identifiable for up to 3 years (Miller, Beasley and Lawson 1987). The timeframe of this model is bound by three years prior and one year following the implementation year. This captures the effects of other management activities that may still affect the Project Area. Proposed actions are constrained to a single year. This will express the maximum possible effect that could occur. This is consistent with most project level environmental analyses that have an operability of 5 years. 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.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
The proposed soil disturbing activities and vegetative treatments in this project would not occur; therefore there would be no direct effects to water quality from Alternative A.

Indirect Effects:
Although proposed soil disturbing activities and vegetative treatments in this project would not occur, watershed improvement activities would also not take place. Roads, trails, and gravel pits identified as having active erosion would not be stabilized and would therefore allow for sediment to continue or increase.

Cumulative Effects:
Mercury is widely distributed naturally in the environment and originates from natural and human-induced (anthropogenic) sources, including combustion of coal and vegetation. Mercury evaporates from soils and surface waters to the atmosphere, is re-deposited on land and surface water, and then is absorbed by soil or sediments. After re-deposition on land and water, mercury is commonly volatilized (through burning, for example) back to the atmosphere as a gas or as adherents to particulates. Mercury exists in a number of inorganic and organic forms in water with methylmercury the most common.

Methylmercury is highly bioaccumulative, especially in aquatic food webs. Nearly 100 percent of the mercury that bioaccumulates in upper-trophic-level fish (predator) tissue is methylmercury (EPA, 2001). Cumulative effects from a potential wildfire include possible increases in methylmercury accumulations in fish. Bioaccumulation of mercury requires anaerobic decomposition by bacteria. Anaerobic conditions in which the bacteria could methylate the mercury are present in surface waters. Elemental mercury is available due to deposition as well as trace amounts from rock erosion (Standage, 2007). An intense wildfire could release increased trace amounts from erosion, increased losses from heating of soils and increased levels through volatilization of deposited mercury on vegetation over those levels associated with a low intensity prescribed burn.

To determine cumulative impacts to water quality from sediment from management actions, the Aquatic Cumulative Effects model was used. It analyzes the past, present, and proposed activities for sediment yield. This model is described in the Introduction section of this Chapter under Analysis Tools.

Table 3.6 shows the sediment delivery from the current condition and Alternative A for each watershed in tons per year, and in percent increase over the average annual sediment delivered in an undisturbed watershed condition. Although no management activities are proposed under Alternative A, this sediment is attributed to present or committed activities that are already scheduled to occur within the watersheds on both public and private lands. The risk rating for this alternative is “low” indicating little adverse effects from sediment to aquatic beneficial uses. This risk assessment requires that in addition to the application of the Revised Forest Plan standards and Best Management Practices, that the streams be monitored to determine the health of the aquatic biota. Health would be determined based on the relative abundance population scores for that ecoregion. Watershed number 80401010306 identifies Little Fir Cemetery – Lake Ouachita watershed which comprises the Project Area boundary. The Little Fir Watershed Restoration Management Project Area falls completely within this watershed. The risk associated with sediment delivery from activities that would occur under Alternative A would not change from the current condition.

SEDIMENT DELIVERY FROM "ALTERNATIVE A" BY WATERSHED (TABLE 3.6)

Watershed Name	6th level Watershed ID #	Sediment Delivery		Risk (Alternative A)	Risk (Alternative B & C)
		Tons Per Year	%		
Little Fir Cemetery – Lake Ouachita	80401010306	419.21	672	Low	Low

- Alternative B: Little Fir Watershed Restoration Management Project – Direct, Indirect & Cumulative Effects

Direct Effects:
Direct effects of management activities proposed under Alternative B would result from the impacts of logging equipment and vehicles traversing stream crossings, fireline and road construction through streams, etc. These activities could place pollutants directly into a watercourse and result in direct sedimentation. While it is impractical to eliminate all soil from entering a stream, it is possible to limit the amount that directly enters streams by designing and implementing BMPs found within the Revised Forest Plan and Arkansas Forester's BMPs.

Changes in water quality as a result of road type, location, surface, maintenance and use are well documented in the Ouachita Mountains. (Miller, Beasley and Covert, 1985; Swift, 1985; Vowell, 1985). State BMPs and Forest standards are designed to minimize the effects of roads. Forest effectiveness monitoring has demonstrated that road and temporary road crossings, (Clingenpeel, 1990, Neihardt 1994 and Vestal, 2000) do not have a significant adverse effect on water quality parameters or channel substrate.

Forest monitoring, using a variety of techniques, has demonstrated the adverse effects of unrestricted OHV use on water quality and associated beneficial uses. Unrestricted use in the late 1990s found a large number of user-defined trails and high use levels had resulted in decreases in pool depth and pool volume and increased in percent fines and embeddedness. Trail closure and aggressive restoration demonstrated watershed recovery in 2002 (Clingenpeel, 2002).

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.

Direct effects from prescribed burning include the volatilization of deposited mercury on vegetation and possible release of mercury from the 0 soil horizon. Based on what little data is available, it does appear that prescribed fire could have effects on mercury cycling and bioaccumulation in the aquatic food web (Kolka, 2008). The results of a study in Florida suggests that prescribed fires in the southeastern United States mainly re-emit atmospherically deposited mercury and that such re-emission is small relative to the United States Environmental Protection Agency 1997 inventory of US anthropogenic emissions (estimated prescribed fire re-emission in southeastern United States is about 0.09-0.2% of US anthropogenic emissions). This suggestion is further supported by the fact that most forests are

subjected to low severity prescribed burns in which the 0 horizon is only partially consumed (Dicosty, et al, 2006).

Indirect Effects:
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. Potential indirect effects from prescribed burning include increases in methylmercury levels in fish in surface waters. Indirect impacts to fish in surface waters are expected to be minor. The proposed prescribed burning is within acreage limits regularly occurring annually in the area over the last ten to fifteen years. Mercury depositions are expected to remain fairly constant over the period of the proposed action and increases in methylmercury are not anticipated. Since 1994, measured mercury levels in fish at several locations on Lake Ouachita varied from 0.82ppm and 0.41ppm in 1994, to 0.20ppm and 0.37ppm in 2002, and to 0.51ppm and 0.59ppm in 2008. At present there are no mercury consumption warnings for fish from Lake Ouachita (ADEQ, 2009).

Ash from prescribed fire and nutrients leaching from logging slash are potential indirect sources from activities proposed under Alternative B. 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 harvest are done. (Oklahoma Cooperative Extension Service, OCES, 1994). Nutrient leaching is expected to be small under Alternative B. No stream or lake eutrophication is expected. 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.

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). The effect of nutrients released to streams as a result of management activities is an indirect effect. Beasley, Miller and Lawson (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 is no significant impact to water quality. The management activities wildlife opening construction, road construction, fireline construction, timber harvest (construction of skid trails and log landings, and logging equipment traversing stream crossings) would result in exposed soil or soil disturbance. These activities would result in some erosion, increasing sedimentation. The projected sediment delivery to streams due to harvesting, site preparation, and erosion of forest roads in the Ouachita is about 0.070 tons per acre per year (OCES, 1994).

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. Stream channels in the area are capable of withstanding small increases in flow.

Alternative B proposes the use of the herbicides triclopyr and imazapyr, imazapic, and/or glyphosate for site preparation, release and for the control of non-native invasive species. The control of terrestrial vegetation using herbicides within MA-9 for the control of non-native invasive species would only be with an appropriately labeled formulation for both aquatic and terrestrial site use. When herbicides are applied, there is a risk that the chemical could move offsite, possibly entering streams, ponds, lakes, or infiltrate ground water by vertical seepage into aquifers. The Forest Service has specific regulations for the use and application of herbicides, and the Ouachita NF adheres to additional design criteria for herbicide application in the Revised Forest Plan. When all BMPs or regulations are implemented, there should be no significant 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 only trace amounts of herbicide have ever been detected in streams (Ouachita National Forest, 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 significant threat to beneficial uses. Based on this evaluation, the BMPs used in the transportation, mixing, application and disposal are effective at protecting beneficial uses.

The effect of nutrients released to streams as a result of management activities is an indirect effect. Beasley, Miller and Lawson (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 is no significant impact to water quality.

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.

Cumulative Effects:
In 1989, the Forest began a long-term monitoring effort to determine cumulative effects from silvicultural activities using paired watersheds and Basin Area Stream Survey methods (Clingenpeel and Cochran, 1992). Results found that examining all physical, chemical and biological characteristics, no single factor was indicative of adverse cumulative effects resulting from silvicultural activities (Ouachita National Forest, 1994, Williams et. al, 2001, Williams et. al, 2002, Williams et. al, 2003).

In addition, the Forest developed a model to estimate sediment yields and analyze the cumulative effects of proposed management actions on water quality (USDA Forest Service, Ouachita National Forest, 1990). This early process, and several updates, provided a process to systematically evaluate water quality conditions for watersheds covered in whole or part by forest activities. However, this early process required a considerable amount of data preparation and did not adequately address road interactions and determination of the current watershed condition with respect to risk to fisheries.

The recent version is considerably different. GIS databases have been analyzed and land use, slope, and road data have been summarized by 6th level watersheds. New road and trail sediment coefficients have been developed and a range of risk levels for fish communities have been established by ecoregion sections.

A cumulative effects analysis needs to address pollutants resulting from management activities. Typical activities on the forest include timber harvest, site preparation, road construction and maintenance, and recreation. Monitoring efforts have demonstrated that, with proper implementation of forest standards and state best management practices, direct and indirect impacts are individually insignificant on water quality and associated beneficial uses (Clingenpeel 1989, 1990, USDA Forest Service, Ouachita National Forest 1993, Neihardt 1994, Vestal 2000, and Whitsett 2004). A cumulative assessment determines if these individually insignificant actions collectively have an adverse effect. Pollutants associated with forest management activities (timber harvest, site preparation, road construction and maintenance, and recreation) may include increased sediment, nutrient enrichment, changes in water yield and pesticides within the water column.

A change in water yield is an effect that does not serve as a pollutant until a large change occurs. In addition, water yield models do not characterize the impacts of all management activities such as road construction and the increase in water yield is less than the natural variability. Miller, Beasley and Covert (1985) could not identify increases in peak flow as a result of timber harvest and site preparation, and could only determine significant increases in summer baseflow.

Changes in water nutrients or nutrient fluxes within streams as a result of management activities are minor (Miller, Beasley and Lawson. 1987) and not an appropriate consideration of cumulative effects at the project level.

Sediment is an appropriate measure to determine the effects of management activities on water quality and its associated beneficial uses on forested lands (Coats and Miller, 1981). Sediment increases can adversely affect aquatic biota and habitat including fish productivity and diversity (Alexander and Hansen, 1986), degrade drinking water, and affect the recreational values of streams and rivers.

The potential impacts from a wildfire also include increased mercury release of stored mercury and later deposition. Nearly 100% of mercury stored in plant-derived fuels is emitted to the atmosphere with 85% of that emitted as elemental mercury and particulate mercury accounting for the remainder. Intense wildfires consume much more fuel than moderate to low intensity prescribed burns resulting in more mercury emissions. Newly released elemental mercury enters the global 1 cycle whereas the remaining 15% that is emitted as particulate mercury has the potential to be re-deposited locally during a fire event. Soils are also sources of mercury during fires. Studies indicate that upper soil layers experience significant decreases in mercury following fire (Kolka, 2008). The more severe the fire, the more mercury is released from the soil and more mercury is released from depositions on vegetation since more fuels are consumed.

Changes in land use and other disturbances can be modeled with respect to estimated increases in sediment. This model estimates current condition and the effects of various management alternatives. These predictions are then compared to risk levels established by the effects of sediment increases on fish communities.

To determine cumulative impacts to water quality and fisheries from sediment from management actions, the Aquatic Cumulative Effects model was used. It analyzes the past, present, and proposed activities for sediment yield. The Aquatic Cumulative Effects model is referenced above and is described in the Introduction section of this Chapter under Analysis Tools.

Table 3.7 shows the sediment delivery from the current condition and Alternative B for the watershed in tons per year, and in percent increase over the annual sediment delivered in an undisturbed watershed condition. These levels of sediment increase would decline in subsequent years. The risk rating for this alternative is "low" indicating little adverse effects from sediment increases to aquatic beneficial uses. This risk assessment requires that in addition to the application of the Revised Forest Plan standards and Best Management Practices, that the streams be monitored to determine the health of the aquatic biota. Health would be determined based on the relative abundance population scores for that ecoregion. Because some proposed actions such as harvest, prescribed burning and associated fireline construction or re-construction fall outside the boundaries of this watershed, the effects of these activities will be analyzed for the adjacent watershed that contained them when necessary. The risk associated with sediment delivery from activities that would occur under Alternative B would not change from the current condition.

SEDIMENT DELIVERY FROM "ALTERNATIVE B" BY WATERSHED (TABLE 3.7)

Watershed Name	6th level Watershed ID #	Sediment Delivery		Risk (Current Condition)	Risk (Alternative B)
		Tons Per Year	% Increase		
Little Fir Cemetery – Lake Ouachita	80401010306	430.71	677	Low	Low

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

Direct Effects:
Direct effects of management activities proposed under Alternative C would be the same to those under Alternative B with the exception that no herbicides would be used. Harvest activities, road construction, fireline construction, prescribed burns, etc. would all occur under this alternative. Site preparation activities would not use herbicides under this alternative; however, there is still a need to create an adequate seedbed for natural regeneration to occur. Under this alternative, all site preparation activities would use manual or mechanical means to prepare the seedbed for natural regeneration. These activities could cause soil disturbance and may increase sedimentation. Non-native, invasive species control would not utilize herbicides under this alternative as well. Manual means to control and eliminate these species would be employed. This could involve cutting down the vegetation, burning in the form of fuel reduction burns, or manually pulling the vegetation from the ground. Because these species have a high propensity to sprout, manual methods to control these species are not always successful or cost effective.

Indirect Effects:
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.

Potential indirect effects from prescribed burning include increases in methylmercury levels in fish in surface waters. Indirect impacts to fish in surface waters are expected to be minor. The proposed prescribed burning is within acreage limits regularly occurring annually in the area over the last ten to fifteen years. Mercury depositions are expected to remain fairly constant over the period of the proposed action and increases in methylmercury are not anticipated. Since 1994, measured mercury levels in fish at several locations on Lake Ouachita varied from 0.82ppm and 0.41ppm in 1994, to 0.20ppm and 0.37ppm in 2002, and to 0.51ppm and 0.59ppm in 2008. At present there are no mercury consumption warnings for fish from Lake Ouachita (ADEQ, 2009).

Ash from prescribed fire and nutrients leaching from logging slash are potential indirect sources from activities proposed under Alternative C. 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 harvest are done (OCES, 1994). Nutrient leaching is expected to be small under Alternative C. No stream or lake eutrophication is expected. Small increases in nutrient concentrations may have a beneficial effect on these typically nutrient-poor stream systems.

Increases in water yield are generally proportional to decreases in vegetative cover. Because vegetative cover would to some extent decrease under Alternative C, water yield increases are expected to be small (OCES, 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). The effect of nutrients released to streams as a result of management activities is an indirect effect. Beasley, Miller and Lawson (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 is no significant impact to water quality.

The management activities wildlife opening construction, road construction, fireline construction, timber harvest (construction of skid trails and log landings, and logging equipment traversing stream crossings) would result in exposed soil or soil disturbance. These activities would result in some erosion, increasing sedimentation. The projected sediment delivery to streams due to harvesting, site preparation, and erosion of forest roads in the Ouachita is about 0.070 tons per acre per year (OCES, 1994).

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. Stream channels in the area are capable of withstanding small increases in flow.

The effect of nutrients released to streams as a result of management activities is an indirect effect. Beasley, Miller and Lawson (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 is no significant impact to water quality.
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.

Cumulative Effects:
The background and description of the cumulative effects process for Alternative C is the same as that described in Alternative B. The cumulative effects under this alternative are the same as those listed under Alternative B. Harvest activities, road construction, fireline construction, prescribed burns, etc would all occur under this alternative. Site preparation activities would not use herbicides under this alternative; however, there is still a need to create an adequate seedbed for natural regeneration to occur. Under this alternative, all site preparation activities would use manual or mechanical means to prepare the seedbed for natural regeneration. These activities could cause soil disturbance and may increase sedimentation. Non-native, invasive species control would not utilize herbicides under this alternative as well. Manual means to control and eliminate these species would be employed. This could involve cutting down the vegetation, burning in the form of fuel reduction burns, or manually pulling the vegetation from the ground. Because these species have a high propensity to sprout, manual methods to control these species are not always successful or cost effective.

To determine cumulative impacts to water quality and fisheries from sediment from management actions, the Aquatic Cumulative Effects model was used. It analyzes the past, present, and proposed activities for sediment yield. The Aquatic Cumulative Effects model is described in the Introduction section of this Chapter under Analysis Tools.

Table 3.8 shows the sediment delivery from the current condition and Alternative C for each watershed in tons per year, and in percent increase over the annual sediment delivered in an undisturbed watershed condition. These levels of sediment increase would decline in subsequent years. The risk rating for this alternative is "low" indicating little adverse effects from sediment increases to aquatic beneficial uses. This risk assessment requires that in addition to the application of the Revised Forest Plan standards and Best Management Practices, that the streams be monitored to determine the health of the aquatic biota. Health would be determined based on the relative abundance population scores for that ecoregion. Risk associated with sediment delivery from activities that would occur under Alternative C would not change from the current condition.

SEDIMENT DELIVERY FROM "ALTERNATIVE C" BY WATERSHED (TABLE 3.8)

Watershed Name	6th level Watershed ID #	Sediment Delivery		Risk (Current Condition)	Risk (Alternative C)
		Tons Per Year	% Increase		
Little Fir Cemetery – Lake Ouachita	80401010306	430.71	677	Low	Low

Riparian Areas and Floodplains

Present Conditions

There are 610 acres of riparian areas within the Project Area. Soil units identified as 100-year floodplains comprise 186 acres. These floodplains are located along the perennial stream courses. All or part of a floodplain may be included as part of the stream's riparian area.

There is a concern that the management actions of timber harvest, prescribed burning, temporary road construction, and fireline construction may cause damage to floodplains and riparian areas within the Project Area.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No activities are proposed under Alternative A, therefore there would be no direct effects to riparian areas.

Indirect Effects:
No indirect effects are expected under Alternative A to riparian areas.

Cumulative Effects:
No cumulative effects are expected under Alternative A to riparian areas.

- Alternative B: Little Fir Watershed Restoration Management Project – Direct, Indirect & Cumulative Effects

Direct Effects:
Riparian areas are protected by implementation of stream side management areas (SMAs). SMAs include at a minimum the first 100 feet adjacent to perennial drainages and water bodies greater than ½ acre and the first 30 feet adjacent to other defined drainages and ponds less than ½ acre. Log loading areas and wheeled or crawler vehicles outside of designated crossings are not permitted within SMAs. The use of temporary roads and skid trails would impact riparian areas at designated crossings, as well as construction of firelines for prescribed burns. These effects would be minimized by adhering to

Revised Forest Plan Design Criteria (9.20-9.24). Additional protection measures for SMA's are outlined on pg 104 of the RFLP.

Only limited use of aquatic labeled herbicides for terrestrial vegetation control of invasive plant species would be permitted within riparian areas. When treating invasive plant species within riparian areas, only direct foliar application or cut and spray methods are to be utilized.

Only low intensity backing fires would be utilized in riparian areas and floodplains. This type of fire typically consumes only the dry surface fuels. It does not consume the duff layer, damage the mineral soil, or kill overstory vegetation.

Timber harvest is proposed on approximately 3.2 acres of soil units identified as 100-year floodplains. Most 100-year flood plains are located within stream side management areas; however due to elevation some soil units identified as 100-year floodplains are located outside of the stream side management areas. By adhering to Revised Forest Plan Design Criteria, no direct effects to floodplain function are expected.

Indirect Effects:
By adhering to Revised Forest Plan Design Criteria, no indirect effects to floodplain function are expected. This is supported from monitoring results and modeling efforts discussed under the Soils section, pages 35 and 42-47.

Cumulative Effects:
By adhering to Revised Forest Plan Design Criteria, no cumulative effects to floodplain function are expected. This is supported from monitoring results and modeling efforts discussed under the Soils section, pages 35 and 42-47.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The impacts from this alternative would be the same as those described for Alternative B with the exception of no herbicide would be used in riparian areas.

Wildfire Hazards and Fuels Accumulation

Present Conditions

Site specific fuel loads for the Little Fir Project Area have not been determined, however, based on site observations and lack of fire history, it has been determined that the areas selected for prescribed burning do not meet the desired conditions of the Forest Plan. The main community types on the ONF are Ozark-Ouachita shortleaf pine-oak forest, Ozark-Ouachita dry-mesic oak forest and Ozark-Ouachita shortleaf pine-bluestem woodland (LANDFIRE 2010), henceforth referred to as pine-oak forest, oak forest, and pine woodland, respectively. LANDFIRE's Existing Vegetation Type (EVT) layer for the Continental US (LANDFIRE 2010) was used to select transect locations within planned burn units in 2010 and 2011. Forty Brown's transects were established within each community type throughout the

forest for a total of 120 transects. Each transect was 50 feet long, permanently marked with rebar at each end and followed Brown's protocol (Brown 1974). A ten factor prism was used to obtain basal area and species composition of trees at the origin of each transect. The plot design was developed to measure fuel consumption on prescribed fires on the Ouachita National Forest of Arkansas in 2010. These plots were established to measure pre and post burn fuel loads. Fuels tallied were unattached (dead and down) woody fuel that bisects the transect line. Current average fuel loads for the forest are 9.5 – 14.6 tons/acre (Average of 12.0 tons/acre).

February through April and July through August are the times of the year with the highest percentage of wildfires. The months of September through December have a slightly lower percentage of fires. The Ouachita National Forest experiences an average of 120 to 150 fires per year, burning an average 3,000 acres per year. Nearly 80 percent of the fires are controlled at less than 10 acres, and less than 3 percent exceed 100 acres (Caffin, Robertson, Miller, 2001). Historically, large fires have occurred when the wind was blowing out of the south, with a majority of the large fires spreading to the northwest. There have been prescribed burns conducted within this Project Area during the past five years although additional rotational burning is needed to move this area to the desired condition class I. There is a concern that management actions such as timber harvest, pre-commercial thinning, and site preparation may cause an increase in the accumulation of fuels and result in an increased risk from wildfire.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
Under Alternative A, no management actions that would produce slash, such as timber harvest, pre-commercial thinning, and site preparation would occur. Some increased accumulation of fuels would occur naturally. However, there would be no increase in accumulation of fuels from the proposed management activities.

Indirect Effects:
There are no indirect effects of Alternative A specific to management activities increasing fuel loading, thus increasing the risks from wildfire.

Cumulative Effects:
There are no cumulative effects of Alternative A specific to management activities increasing fuel loading, thus increasing the risks from wildfire.

- Alternative B: Little Fir Watershed Restoration Management Project - Direct, Indirect & Cumulative Effects

Direct Effects:
Under Alternative B, slash would be produced from timber harvests, wildlife stand improvements, pre-commercial thinning and site preparation activities. This slash would add to the fuel loading within the Project Area.

Measured fuel loadings on the Ouachita NF have shown that the 100 hour fuels (1 to 3 inch diameter) increased by an average of 1.7 tons per acre post-harvest (Clingenpeel, 2002). This is a result of slash or woody debris left on-site from timber harvesting.

A summary of the type and size of slash that would result from the other activities is listed below.

FUEL LOADING PRODUCED BY ALTERNATIVE B (TABLE 3.9)

Management Activity	Fuel Loading Produced Forest Type - Diameter
Precommercial Thinning	Pine< 5 inches at breast height
	Hardwood< 8 inches at breast height
Site Preparation	Pine- None
	Hardwood- No diameter limit

In addition to slash, the site preparation activities and release activities proposed in Alternative B would result in an increase of standing dead fuels. These fuels would act as ladder fuels in the presence of fire, and could facilitate crown fires.

Indirect Effects:
As a result of management activities slash, woody debris and standing dead fuels could accumulate and increase fuel loading across the Project Area. The increased fuel loading and presence of ladder fuels could increase wildfire activity.

Cumulative Effects:
As a result of management activities, slash, woody debris and standing dead fuels could accumulate and increase fuel loading across the Project Area. However, proposed fuel reduction and site preparation burns would reduce the increased fuel loading resulting from management actions where they occur.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Prescribed Fire on Fuels and Wildfire Hazard

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
Approximately 6,465 acres within the Project Area have been prescribed burned within the past 5 years, and will continue to be burned under the existing Little Fir Prescribed Burn EA. (2010)

Indirect Effects:
In the absence of prescribed fire, the fine fuels, small, and large fuels would continue to accumulate on the forest floor. In the event of a wildfire, fuel loading would be higher, increasing the risks of damage to natural resources and property from wildfires.

Cumulative Effects:
The perpetuation of no prescribed burning over time would allow fuels to accumulate, and through time the risks of damage from wildfires would continue to escalate.

- Alternative B: Little Fir Watershed Restoration Management Project -Direct, Indirect & Cumulative Effects

Direct Effects:
Approximately 6,465 acres within the Project Area have been prescribed burned within the past 5 years, and will continue to be burned under the existing Little Fir Prescribed Burn EA. (2010)

Indirect Effects:
In the event of a wildfire, the reduction of fuel loading resulting from prescribed burning would reduce the risk of damage to resources and property.

Cumulative Effects:
This existing schedule of burning under the Little Fir Burn EA (2010) would maintain a level of fuel reduction through time and therefore reduce the risk of wildfire's damage to resources. With reduction of fuel loads, wildfires will be easier to control, thus reducing the risk to private property.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Transportation & Infrastructure

Present Conditions

National Transportation Management Rule (36 CFR 212, Subpart B, Designation of Roads, Trails, and Areas for Motor Vehicle Use) - The Federal Register Notice (73 FR 74689) for the final travel management directives was published on December 9, 2008. The directives became effective January 8, 2009. The highlights of that rule are as listed:

- The rule requires each national forest or ranger district to designate those roads, trails, and areas open to motor vehicles.
- Designation will include class of vehicle and, if appropriate, time of year for motor vehicle use. A given route, for example, could be designated for use by motorcycles, OHVs, or street-legal vehicles.
- Once designation is complete, the rule will prohibit motor vehicle use off the designated system or inconsistent with the designations.
- Designation decisions will be made locally with public input and in coordination with state, local and tribal governments.
- Designations will be shown on a motor vehicle use map. Use inconsistent with the designations will be prohibited.

The National Travel Management Rule (Travel Rule) requires that public motor vehicle use be confined to designated roads, trails, areas and camping or game retrieval corridors. Cross-country travel inconsistent with these designations is not allowed. On January 4, 2010, a *Decision Notice and Finding of No Significant Impact* was signed by the Forest Supervisor to implement the Travel Management Project on the Ouachita National Forest (USDA FS 2010). These areas are identified on the Motorized Vehicle Use Map (MVUM) and can be obtained at any District Ranger office. Any changes to the travel status of roads must be analyzed and approved with appropriate environmental documentation.

As a response to this rule and increasing evidence of resource damage from motorized use, the Ouachita National Forest has designated where motorized vehicles, including street legal vehicles and a wide variety of off-highway vehicles (OHVs) can be legally operated. The Travel Analysis Report (TAR) (filed as project documentation) shows a table of current status and recommended changes for roads within the Little Fir Project Area. Maps indicating the current and proposed road status can be found in Appendix F.

The Little Fir Watershed Restoration Management Project Area is located approximately 4 miles north of Mount Ida, Arkansas in Montgomery County. Main access into the Project Area is supplied by County Roads MG 194, MG 197, State Highway 188A and Forest Service RD7492.

The Little Fir Watershed Restoration Management Project Area is comprised of the Little Fir Cemetery – Lake Ouachita Huc-6 level watershed and encompasses approximately 16,908 acres of privately owned and Forest Service lands. Approximately 18.59 miles of roads are open (either yearlong or seasonally) and 2.65 miles are closed throughout the Project Area with an additional 6.89 miles of unauthorized roads. 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 Areas open road density. The ORD for the Little Fir Project Area is currently 1.94 miles per square mile. Many of the open roads within the Project Area are under county or state jurisdiction and cannot be closed because they serve as important travel ways for people and goods. This limits the opportunity for road management on Forest Service lands and hinders the ability to reduce ORD. The TAR outlines all current conditions of the road system. During the analysis it was determined that the forest road database (INFRA) has several errors when compared to GPS data collected and aerial imagery. The following is a list of roads and corrections needed:

W31H- Decommission entirely

W31G - Close entire length of road. (Currently ½ is open, ½ is closed) Place barrier at entrance.

W23A- Spatially correct north segment shown on GPS data. Remove middle segment entirely shown in INFRA database which is not on ground. Rename south segment to W23E.

W23E- Remove entirely from INFRA.
W23B- Spatially correct to match GPS data. End road at .8 miles. Berm at end and add barrier where intersects AR188.

W22- Spatially correct to .3 miles. Remove remaining unauthorized segment. Place barrier just past entrance to private land.

W23C- Spatially correct to length denoted in INFRA. Remaining is unauthorized. Place barrier at end. No change to MVUM.

W22C- Remove all segments not GPS'd from INFRA. Place barrier at end.

There were 6.89 miles of unauthorized roads identified within the project boundary. These roads will be obliterated, barriers placed to prevent entrance and returned to natural habitat.

The principle resources served by the roads within the Project Area are access to private residences/lands, recreation and timber management. The road system is used primarily by private residences and hunters. Other user includes OHV riders and those driving for pleasure.

There is a concern that management actions may require permanent access through road construction and/or reconstruction and management actions may result in the closure of open roads that provide access for recreational activities. The current open road density of the Project Area exceeds the Revised Forest Plan objectives. The open road density objectives for the Management Areas (MAs) occurring within the Project Area are 0.75 miles per square mile for MA 16 (March to August) and 1.0 for the remainder of the year.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No activities are proposed under Alternative A, therefore there would be no direct effects to access within the Project Area, and there would be no direct effects to the open road density. Open Road Density would remain unchanged.

Indirect Effects:
No activities are proposed under Alternative A, therefore there would be no indirect effects to access within the Project Area, and there would be no indirect effects to the open road density. Open Road Density would remain unchanged.

Cumulative Effects:
No activities are proposed under Alternative A, therefore there would be no cumulative effects to access within the Project Area, and there would be no cumulative effects to the open road density. Open Road Density would remain unchanged.

- Alternative B: Little Fir Watershed Restoration Management Project –Direct, Indirect & Cumulative Effects

Direct Effects:
Alternative B would result in approximately 13.13 miles of open system (either yearlong or seasonally) roads and 12.35 miles of closed roads, which included the obliteration of unauthorized roads. Several

roads are incorrectly mapped on the MVUM and in the INFRA database and will be corrected when the new one is published. See maps in Appendix F.

After this decision, approximately 6.89 miles of unauthorized roads will be obliterated and barriers placed to prevent access. W31G will be closed the entire length of the road. There will be 1.28 miles of Forest Service roads open yearlong, reducing the ORD to 1.0 miles per sq mile yearlong. Most of the roads (14.94 miles) within the Project Area are non-Forest Service and cannot be closed.

The management activities proposed would require approximately 2.2 miles of newly constructed roads, 1.0 miles of pre-haul road maintenance, 3.75 miles of system road reconstruction, and 7 miles of temporary road construction in order to meet resource management needs, protect environmental resources and provide for reasonable and safe access. These numbers are based on worse case scenarios and not all roads may be built or reconstructed. Newly constructed roads and temporary roads will be closed to public access at the end of harvest. See Proposed Harvest Area map in Appendix F.

Indirect Effects:
Restricting access could result in an increase in illegal road use by OHV riders, or increase OHV use in other parts of the district. Additionally, a reduction in dumping along closed roads may occur.

Cumulative Effects:
Restricting access could result in an increase in illegal road use by OHV riders, or increase OHV use in other parts of the district.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Vegetation

Present Conditions

The Little Fir Watershed Restoration Management Project Area is comprised of the Little Fir sixth level watershed and is approximately 16,908 acres in size. Approximately 8,262 acres are Forest Service, while the remaining 8,646 acres are private or other non-Forest Service lands. Out of the 8,262 Forest Service acres, 4,463 acres are located on the Caddo-Womble Ranger District while the remaining 3,799 acres are located on the Jessieville/Winona/Fourche Ranger District. Of the 4,463 Caddo-Womble acres, pine forest types dominate with 2,674 acres or 60% of the Project Area, while pine/hardwood forest types follow next with 1,509 acres or 34% of the area. Hardwood/pine forest types total 207 acres or 4% of the area, with hardwood forest types having 73 acres or 2% of the remaining area. Forest Service lands are classified as suitable or unsuitable for timber production. Within the Project Area approximately 59 acres are classified as unsuitable for timber production due to excessive slope, lack of access, or poor site conditions. The remaining 4,404 acres are suitable for timber production. At this time, none of the watershed's suitable acres are currently in regeneration.

Calculating all land (suitable and unsuitable) within the Project Area, the largest age class, 24%, falls into 91-100 years. 74% of the area is over 70 years of age, while 0% is 10 years or less. There are 2,653 acres of mature pine and pine/hardwood forest types (80+ years), while the mature hardwood and hardwood/pine types account for 271 acres (50+ years). The following table illustrates age class distributions.

FOREST TYPE BY AGE CLASS (TABLE 3.10)

Age Class			Forest Type[1]											
			Pine			Pine-Hardwood			Hardwood-Pine			Hardwood		
Years	Acres	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total
0-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-20	71	2	71	2.7	1.6	0	0	0	0	0	0	0	0	0
21-30	468	10	459	17.2	10.3	0	0	0	9	4.3	0.2	0	0	0
31-40	271	6	271	10.1	6.1	0	0	0	0	0	0	0	0	0
41-50	91	2	68	2.5	1.5	23	1.5	0.5	0	0	0	0	0	0
51-60	139	3	0	0	0	0	0	0	139	67.2	3.1	0	0	0
61-70	133	3	100	3.8	2.2	0	0	0	0	0	0	33	45.2	0.7
71-80	599	13	338	12.6	7.6	200	13.2	4.5	46	22.2	1.1	15	20.5	0.3
81-90	888	20	332	12.4	7.4	519	34.3	11.6	13	6.3	0.3	24	32.9	0.5
91-100	1,048	24	519	19.4	11.6	528	35	11.8	0	0	0	1	1.4	0.1
101+	755	17	516	19.3	11.6	239	16	5.4	0	0	0	0	0	0
Total Forested	4,463	100	2,674	100	59.9	1,509	100	33.8	207	100	4.7	73	100	1.6

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

Hardwood stands, primarily oak-hickory, generally occur on north-facing slopes of greater than 35% slope, and streamside zones. Midstory and understory associates on north aspects include flowering dogwood, red maple, eastern hophornbeam, sweetgum and blackgum. Species found on slopes less than 35% on north aspects are flowering dogwood, vacciniums, rusty blackhaw and witch hazel.

Pines usually dominate southern aspects. Midstory and understory associates include oaks and hickories, flowering dogwood, blackgum, and vacciniums. Species often found on ridge tops include grasses, forbs, serviceberry, eastern redcedar, blackjack oak and hickories.

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

Traditional methods of controlling nuisance NNIS vegetation within and surrounding ponds have proven unsuccessful or impracticable. With Forest Supervisor approval, the use of approved aquatic labeled herbicides would be used to control invasive or nuisance aquatic vegetation.

Feral hogs have been identified throughout the Project Area. The Arkansas Game and Fish Commission has a feral hog program that is being implemented on federal lands to minimize the number of hogs. They are working in conjunction with the Forest Service wildlife personnel to determine the most efficient way to manage this invasive speices.

Effects of Management Activities on Early Seral Habitat

There is a lack of early seral habitat within the watershed. Forest health and stand vigor is declining or at risk due to advanced stand age and overcrowded or densely stocked stands.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
Alternative A proposes no management activities that would result in the creation of additional early seral habitat within the watershed. No direct effects on forest health and stand vigor would occur. The only early seral habitat existing would be powerline and road ROW's.

Indirect Effects:
In the absence of fire or other vegetation management activity, trees would grow in and grow up and shade out shrubs, forbs and grasses and reduce their quantities. In the absence of management activities such as thinning and regeneration harvests, forest health would be at risk due to increased potential for pest infestations such as the southern pine beetle.

Cumulative Effects:
As discussed in the indirect effects section, there is a potential for trees to grow in. Over time, with no implementation of vegetation management, the amount of trees would increase, and the area of land in early seral habitat would decrease from the current 3.2% to less than 1%. Forest health and stand vigor would continue to decline.

- Alternative B: Little Fir Watershed Restoration Management Project –Direct, Indirect & Cumulative Effects

Direct Effects:
The amount of early seral habitat within the watershed of suitable acres would increase by approximately 670 acres (from less than 0% to 5% through the year 2020) through regeneration harvests, wildlife stand improvements and wildlife opening maintenance.

Under Alternative B, diseased, damaged and suppressed trees would be removed through commercial thinning activities on approximately 549 acres of pine stands. This would have an immediate positive effect on the health of these stands. Activities such as wildlife stand improvement (162 acres) would also result in reduced basal areas and improved stand health. Dormant season, low intensity prescribed burning top-kills woody stems of three inches and less. This would hinder the in-growth of trees and maintain existing early seral habitat. Grass production should increase during the first year after a dormant season burn.

Indirect Effects:
By reducing stand densities through thinning, stand vigor would improve.

Cumulative Effects:
With repeated prescribed burning, existing early seral habitat would be retained over time. Forest pests usually attack older, weaker trees, and are less damaging to trees that are growing vigorously. Increased stand vigor would result in increased resistance to forest pests such as Southern pine beetle.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Management Activities on Age Class Diversity

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No activities are proposed under Alternative A, therefore there would be no change to age class structure within the Project Area, except the current age structure would naturally shift from 11-20 year-old would become 21-30, etc. over time.

Indirect Effects:
No activities are proposed under Alternative A, therefore there would be no change to age class structure within the Project Area, and no indirect effects age class diversity.

Cumulative Effects:
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.

- Alternative B: Little Fir Watershed Restoration Management Project -Direct, Indirect & Cumulative Effects

Direct Effects:
Approximately 43 acres of the 61-70 year age class of pine, 46 acres of the 81-90 year age class of pine and 136 acres of the 91-100 year age class of pine would shift to the 0-10 year age class through even-aged regeneration harvests. Approximately 6.5 acres of hardwood forest types would be maintained in early seral habitat through wildlife opening maintenance, improvement, and construction activities.

Indirect Effects:
No indirect effects to age class diversity would occur.

Cumulative Effects:
No cumulative effects to age class diversity would result from Alternative B because there are no other past, present, or foreseeable future actions within the analysis area that would affect age class diversity.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Management Activities on Mature Growth

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No management activities would occur under Alternative A, therefore no direct effects on mature growth would occur.

Indirect Effects:
No management activities would occur under Alternative A, therefore no indirect effects on mature growth would occur.

Cumulative Effects:
In the absence of natural disturbance or active management, the forest would continue to age, moving more pine and hardwood acreage into mature growth.

- Alternative B: Little Fir Watershed Restoration Management Project -Direct, Indirect & Cumulative Effects

Direct Effects:
Approximately 225 acres of even-aged regeneration harvest is proposed in mature pine or pine – hardwood forest types (older than 60 years). This would reduce the existing mature growth acreage in pine and pine/hardwood types by 5%, from 40% to 35%.

Indirect Effects:
Mature growth would temporarily be reduced on the 225 acres of even-aged regeneration harvests.

Cumulative Effects:
There would be no cumulative effects to mature growth from Alternative B. Over time, the forest would continue to age, moving more acreage into mature growth. The residual mature growth pine habitat exceeds the Revised Forests Plan design criteria of 5% of mature growth habitats over the Project Area.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Management Activities on Retention and Recruitment of Hardwoods

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No management activities would occur under Alternative A, therefore no direct effects on the retention and recruitment of hardwoods would occur.

Indirect Effects:
No management activities would occur under Alternative A, therefore no indirect effects on the retention and recruitment of hardwoods would occur.

Cumulative Effects:
No management activities would occur under Alternative A, therefore no cumulative effects on the retention and recruitment of hardwoods would occur.

- Alternative B: Little Fir Watershed Restoration Management Project -Direct, Indirect & Cumulative Effects

Direct Effects:
No regeneration harvests are proposed in hardwood or hardwood-pine management types. Stands proposed for regeneration harvest are pine or pine-hardwood management types. 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). A minimum of 10 percent hardwood would be retained or maintained through the life of the stand where possible. Hardwoods would be removed in regeneration harvest areas through subsequent seedling release treatments. Recruitment of hardwoods within these stands could also be impeded by these activities.

Prescribed fire would remove litter from the ground surface, aiding in the germination of hardwood seeds. In regards to hardwood retention, dormant season burns do not kill rootstocks of hardwoods. Top-killing could occur, but the hardwoods re-sprout. In areas that are managed for a woodland condition, growing season burns will reduce the number of hardwood sprouts and result in a more 'park like' habitat. This will result in a more grass-forb ecosystem that provides habitat for ground nesting birds and small mammals.

Indirect Effects:
No indirect effects to the recruitment and retention of hardwoods would occur from activities proposed in Alternative B. Hardwoods would be maintained throughout the life of each stand in which timber harvesting takes place (RLRMP, FR001, p.80).

Cumulative Effects:
No cumulative effects to the recruitment and retention of hardwoods would occur from activities proposed in Alternative B. Hardwoods would be maintained throughout the life of each stand in which timber harvesting takes place (RLRMP, FR001, p.80).

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Management Activities on Hard Mast Production

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No management activities would occur under Alternative A, therefore no direct effects on hard mast production would occur.

Indirect Effects:
No management activities would occur under Alternative A, therefore no indirect effects on hard mast production would occur.

Cumulative Effects:
No management activities would occur under Alternative A, therefore no cumulative effects on hard mast production would occur.

- Alternative B: Little Fir Watershed Restoration Management Project -Direct, Indirect & Cumulative Effects

Direct Effects:
Under Alternative B, 434 acres of overstory mast development are proposed. Within these areas, selected hard and soft mast producing trees would be released from competition, thus increasing mast production. Removing hardwoods during site preparation activities could reduce hard mast production.

Indirect Effects:
Under Alternative B, 174 acres are proposed in Wildlife Stand Improvement and Midstory reduction. Within these areas, selected hard and soft mast producing trees would be released from competition, thus increasing mast production.

As discussed under Effects of Management Activities on Retention and Recruitment of Hardwoods section, hardwoods would be removed in regeneration harvest areas through subsequent site preparation

and seedling release treatments. This could reduce hard mast production in the future within these pine stands.

Cumulative Effects:
No cumulative effects on hard mast production are expected to occur because all management activities will follow Forest wide design criteria. Specifically, WF003 and VM004 address hard mast production.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Management Activities on Non-Native Invasive Species

Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No management activities would occur under Alternative A, therefore no direct effects on non-native invasive species would occur.

Indirect Effects:
Ongoing activities such road maintenance, off-road vehicle use, and camping could spread existing populations or introduce new populations of NNIS into the Project Area. Indirectly, the lack of active non-native invasive species control would allow the plants to continue to produce seed and opportunistically spread throughout the area.

Cumulative Effects:
No cumulative effects are expected to occur to NNIS under this alternative.

- Alternative B: Little Fir Watershed Restoration Management Project –Direct, Indirect & Cumulative Effects

Direct Effects:
Under this alternative the populations of NNIS within the Project Area would be reduced. All identified populations of NNIS across the Project Area would be treated with a combination of herbicide application and prescribed burning. Monitoring would be performed and a follow-up treatment of herbicides may be necessary to control sprouting. Some areas of exposed mineral soil may be lightly disked and seeded with native warm and cool season grasses and forbs to discourage NNIS establishment. The Forest Botanist has developed a list of recommended seeding mixtures to be used throughout the Forest. Recommended warm season grasses are little blue stem, switch grass, Indian grass or any native warm season grass or forb. The cool season grasses recommended are annual ryegrass or any native cool season grass or forbs.

Indirect Effects:
Ground-disturbing activities such as timber harvest, road construction, road maintenance, fireline construction, fireline maintenance, and wildlife opening construction could increase the population and spread of non-native invasive species by destroying individual stems which would result in prolific

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

Cumulative Effects:
Under this alternative, activities such as road maintenance, off-road vehicle use, camping, and private land management could introduce new populations of NNIS to the Project Area.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

Direct Effects:
Under this alternative activities to control NNIS would not occur. Because NNIS have a high propensity to sprout, ground disturbing activities could result in increased populations and spread of NNIS across the Project Area.

Indirect Effects:
The indirect effects would be the same as those listed under Alternative B.

Cumulative Effects:
The cumulative effects would be the same as those listed under Alternative B.

Wildlife, Fisheries & Habitat – Management Indicator Species (MIS)

Present Conditions

The Revised Forest Plan addresses the fundamental habitat requirements of a diverse array of fish and wildlife populations on National Forest lands in Arkansas and Oklahoma. These habitat requirements include essentials such as an adequate source of forage or prey needed to meet daily energy requirements, ample cover for times of travel and rest, and areas conducive to reproduction and rearing of young, as well as many factors unique to groups or individual species across the landscape. The Revised Forest Plan also addresses another vitally important issue related to the long-term sustainability of fish and wildlife populations on the ONF: *the impacts that people, their actions, and Forest management practices have on native fish and wildlife populations and their habitats.*

As part of the overall effort to ensure that habitat requirements of all native vertebrates, invertebrates, and plants are considered in the planning, implementation, and monitoring of Forest management practices, the Revised Forest Plan lists 24 species (Table 3.13), that should adequately address the effects of Forest management practices on fish and wildlife populations and their habitat needs, as well as demand species and species of special interest. These 24 species, termed "Management Indicator Species" (MIS), represent a broad array of habitats covering diverse geographic areas within the ONF, as well as inhabiting areas with diverse management objectives.

Management Indicator Species (MIS) Selected for This Project: The entire list of 24 MIS was reviewed and a subset was selected as MIS for the actions proposed in this EA for the Little Fir Watershed Restoration Management Project Area. The MIS selected included 6 terrestrial species and 8 fish species. Species not known to occur within the action area, lacking suitable habitat, or not tied to an appropriate evaluation objective were not selected as MIS for the Little Fir Watershed Project Area EA, as indicated in the far right column of Table 3.13.

MANAGEMENT INDICATOR SPECIES AND ASSOCIATED PURPOSES (TABLE 3.13)

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**
White-tailed deer	*Odocoileus virginianus*	To help indicate effects of management on public hunting demand	**Yes**
Eastern wild turkey	*Meleagris gallapavo*	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 an Endangered species and to help indicate effects on management of shortleaf pine-bluestem woodland community	**No** (Action area is outside of Management Area 22)
Pileated woodpecker	*Dryocopus pileatus*	To help indicate effects of management on mature forests and snags and snag-dependent species	**Yes**
Scarlet tanager	*Piranga olivacea*	To help indicate effects of management on mature forest communities	**Yes**
Prairie warbler	*Dendroica discolor*	To help indicate effects of management on early successionalal component of forest communities	**Yes**
Ponds and Lakes (No fishing ponds/lakes **within** action area; Lake Ouachita adjacent to but outside of action area)			
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 (Action area occurs outside of the Arkansas River Valley Ecoregion)			
Yellow bullhead	*Ameiurus natalis*	To help indicate effects of	**No**

Common Name	Scientific Name	Primary Reason(s) for Selection	Selected as MIS for Project (Yes/No)
Central stoneroller	*Campostoma anomalum*	management on aquatic habitat and water quality in streams within the Arkansas River Valley Ecoregion	**No**
Redfin darter	*Etheostoma whipplei*		**No**
Green sunfish	*Lepomis cyanellus*		**No**
Longear sunfish	*Lepomis megalotis*	To help indicate effects of management on aquatic habitat and water quality in streams within the Arkansas River Valley Ecoregion	**No**
Gulf Coastal Plain Ecoregion Streams (Action 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**
Central stoneroller	*Campostoma anomalum*		**No**
Creek chubsucker	*Erimyzon oblongus*		**No**
Green sunfish	*Lepomis cyanellus*		**No**
Longear sunfish	*Lepomis megalotis*		**No**
Ouachita Mountain Ecoregion Streams			
Central stoneroller	*Campostoma anomalum*	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** (Glover & Mountain Fork Rivers only)
Orangebelly darter	*Etheostoma radiosum*		**Yes**
Redfin darter	*Etheostoma whipplei*		**No** (does not occur in analysis area)
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** (Glover & Mountain Fork Rivers only)
Forest-wide			
Smallmouth bass	*Micropterus*	To help indicate the effects of	**Yes**

Common Name	Scientific Name	Primary Reason(s) for Selection	Selected as MIS for Project (Yes/No)
	dolomieu	management on meeting public fishing demand in streams	

MIS Forest-wide Trends

The 6 selected terrestrial MIS were modeled using the CompPATS wildlife model to compare predicted future habitat capabilities over the next decade (years 2013-2023) for each of the 3 alternatives evaluated in the Little Fir Watershed Restoration Management Project Area EA (Table 3.14). Projected numbers of terrestrial MIS per square mile were compared against the current "pre-existing habitat condition" (year 2013) which will serve as the baseline for the proposed activities.

Response of Selected Management Indicator Species to Alternatives by Decade of Implementation (Table 3.14) – *HABITAT CAPABILITY MODEL*

Alternative & Year	Management Indicator Species					
	Northern Bobwhite	White-tailed Deer	Eastern Wild Turkey	Pileated Wood-pecker	Scarlet Tanager	Prairie Warbler
	Individuals per square mile					
"No Action" Alternative						
-2013	12	12	5	31	28	2
-2023	12	12	5	33	29	< 1
"Proposed Action" Alternative						
-2013	240	95	31	58	80	354
-2023	93	61	21	107	95	53
"No Herbicides" Alternative						
-2013	240	95	31	58	80	354
-2023	93	61	21	107	95	53

* *It should be noted that this model assumes that all treatments occur within the same year (when, in fact, treatments may occur over the course of the 10 year planning period; therefore, actual habitat capability could differ from the projections presented here).*

Previous Forest-wide trends for the 6 terrestrial and 8 aquatic MIS species selected for the proposed activities within the Little Fir Watershed Restoration Project Area EA will be discussed individually, based on the FEIS, as well as the Ouachita National Forest Monitoring and Evaluation Report for the Land and Resource Management Plan (USDA Forest Service, 2009). These documents summarize monitoring information for MIS species over the past decade, while providing an assessment of each MIS species' current status and conservation needs.

Northern bobwhite: In the period between 2000 and 2009, birds heard per stop during quail call counts have varied from a high of 1 bird call per stop in 2005 to a low of 0.33 bird calls per stop in 2009. Over this period of time, the Ouachita region averaged 0.64 bird calls per stop per year. These data indicate a slight decreasing trend.

Since 1997, the Forest has been conducting bird surveys on over 300 Landbird monitoring points. Bobwhite data recorded through these surveys indicate a slight downward trend in birds detected over this 13 year period.

The CompPATS, habitat capability estimate for the bobwhite continues to decline slightly. Early successionalal habitat creation has not yet reached the Plan objective of 5,500 acres per year.

Breeding Bird Survey data, collected over the past 41 years (1966 through 2007), indicate a 3.5 % decline for the Ozark - Ouachita Plateau, a 3.0% decline for Arkansas, and a 3.0% decline range-wide. Data for the more recent time period of 1980 – 2007 shows a greater bobwhite decline of 4.6 % for the Ozark – Ouachita Plateau.

Northern bobwhite landbird point data indicate a decrease in bobwhite and estimated habitat capability for bobwhites indicate a decreasing trend for the Ouachita National Forest. Declining population trends for the Ozark-Ouachita Plateau region are reported. Regional and range-wide declines are primarily attributed to the loss of habitat on private and agricultural lands and changes in agricultural practices. The Ouachita National Forest has pursued aggressive prescribed fire and thinning programs that are providing habitat improvements, and it is expected that these management actions will soon positively act to overcome the downward trends.

White-tailed deer: Based on annual spotlight survey data collected between 2000 to present, average deer density has varied from a low of 29 deer per square mile in 2001, to 95 deer per square mile in 2008. The average density for the Forest for all years is 51 deer per square mile. Although the 2009 data indicate a decreasing trend from the previous year, data from the last 10 years indicate that deer density for the Ouachita National Forest is increasing. This level exceeds Forest Plan objectives of an optimum population of 13.7 deer per square mile.

Deer harvest data indicate an increasing harvest in the counties encompassed by the Forest with the highest harvest year in 2006. Deer harvest has increased from a low of 7,394 in 2002 to over 20,000 in 2006 and now, down to 18,738 in 2009. Deer harvest can be a relative indicator of deer abundance; however, the influence generated from changes in hunting regulations and harvest limits cannot be easily determined. These data are provided by the Arkansas Game and Fish Commission and the Oklahoma Department of Wildlife Conservation.

The slight decreasing habitat capability for the past few years as estimated by CompPATS may be related to the creation of (or lack of) acres in grass/forb habitat (forest types ages 0-10 years) preferred by deer. Although acres of created early successionalal habitat have not met the desired Plan levels, deer densities for 2008 are the highest in the last nine years and double the 2000 deer density. Overall data indicate an increasing deer density on the Ouachita National Forest.

Eastern wild turkey: The number of turkey poults per hen has varied from 3.5 poults per hen in 2000 to 1.4 poults per hen in 2009 in the Ouachita region of Arkansas. There is a downward trend for successful turkey reproduction.

Spring turkey harvest has varied from a high of 4,017 birds in 2003 to 1, 872 in 2008. The spring 2009

harvest was slightly more than the 2008 harvest. The wild turkey trend detected on the Forest landbird point surveys is similar to the drop in harvested birds and poults per hen and is showing a declining trend.

The Breeding Bird Survey data for the Ozark-Ouachita Plateau indicate a 2.9 % increase in the turkey population from 1966 to 2007. The overall habitat capability also indicates an increasing trend with an average habitat capable of supporting 16,204 turkeys in 2009, above the Plan projection of 9,177.

Breeding Bird Survey data and turkey habitat capability would indicate an overall positive trend in the turkey population whereas the number of poults per hen, harvest data, and landbird point surveys indicate a downward trend.

Pileated woodpecker: Population trend and habitat capability data are mixed. The Breeding Bird Survey data indicate a slight downward trend of –0.6 % for the period of 1966 – 2007 for the Ozark-Ouachita Plateau but more recent data for the period of 1980-2007 shows an upward trend of +1.0 %. Habitat capability within pine and pine-hardwood forest types indicates an upward trend for the pine and pine-hardwood types on the Forest. The current population density and habitat capability exceed the Forest Plan population objectives. Landbird monitoring data on the Ouachita National Forest indicate the long term trend for this woodpecker to be stable to slightly decreasing. The Pileated woodpecker and its habitat appear to be secure within the Forest.

Scarlet tanager: The Breeding Bird Survey data indicate a non-significant increasing trend of + 1.0 % for the period of 1966 – 2007, and + 2.7 % for the time period of 1980 – 2007 for the Ozark-Ouachita Plateau, and a non-significant decline of –0.1% throughout its range survey-wide. Data are supporting a conclusion of a non-significant increasing population trend within the Ozark-Ouachita Plateau where mature hardwood and mixed types are represented. Habitat capability predictions and landbird point data for the Forest indicate a stable trend for the scarlet tanager. The scarlet tanager and its habitat are secure within the Ouachita National Forest.

Prairie warbler: The Breeding Bird Survey data indicate a significant declining trend for two periods of consideration, –4.6 % for 1966-2007 and –4.0 % for 1980-2007 for the Ozark-Ouachita Plateau, as well as a decline throughout its range survey-wide. Habitat capability predictions and landbird point counts also indicated a decline in numbers. The prairie warbler has a declining population trend within the Ouachita National Forest and throughout its overall range. Although declining, the population viability on the Ouachita National Forest should not be threatened.

Aquatic species:

Ouachita Mountain Ecoregion Streams:

Central stoneroller: Central stonerollers generally inhabit small to medium streams with cool, clear water and gravel, cobble or exposed bedrock substrates. They are sometimes found in upland impoundments and slow-moving, turbid water (Robison and Buchanan 1988). Central stonerollers are common across the Forest, with populations fluctuating from year to year. Many factors, biotic and abiotic, natural and man-caused contribute to these fluctuations. Over time, these populations appear to be stable. The conservation of this species across the forest is not in question. Based on Basin Area

Stream Surveys (BASS) and other Forest stream surveys, there appear to be no adverse effect on central stoneroller populations as a result of forest management activities.

Orangebelly darter: Orangebelly darters occur in a variety of habitats from small, gravelly, high-gradient streams, to larger, more sluggish lowland rivers. This darter is sensitive to the effects of siltation and seems to be most common in clear, gravel cobble-bottomed streams with moderate to high gradient. Orangebelly darters are relatively abundant in the Ouachita National Forest, particularly in the Lower Ouachita Mountain Ecoregion. Population densities appear to fluctuate while remaining relatively stable over time. The conservation of this species across this ecoregion is not in question. Based on BASS and other Forest stream surveys, there appears to be no adverse effect on Orangebelly darter populations from forest management activities.

Northern studfish: Northern studfish occur in the Ozark and Ouachita mountains in clear streams and rivers of moderate to high gradient and permanent flow. It is usually found in quiet, shallow waters along the margins of pools having rock and gravel substrate. Population densities appear to fluctuate while remaining relatively stable over time. The conservation of this species is not thought to be in question because of its common occurrence across a wide area. There are no adverse implications for Northern studfish populations as a result of Forest management activities.

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

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

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

Striped shiner: The striped shiner is abundant in the Ozark and Ouachita mountains and seems to prefer small to moderate-sized perennial streams with permanent flow, clear water, and rocky or gravel substrate. It occurs in some current, but avoids strong current preferring the pool habitats within the streams. Based on stream surveys and BASS inventory data, there appear to be wide fluctuations in populations of striped shiners on the Forest, with no apparent upward or downward trends. Striped shiners are common throughout the Lower Ouachita Mountain Ecoregion. The conservation of this species in the Ouachita National Forest is not in question. Based on BASS inventory data and other Forest stream surveys, Forest management activities appear to have no adverse effect on striped shiner populations.

Ouachita Mountain Ecoregion Streams and Forest-wide:

Smallmouth bass: The smallmouth bass is mainly an inhabitant of cool, clear mountain streams with permanent flow and rocky bottoms. This species is common only on the southern part of the Ouachita National Forest. The smallmouth bass is more intolerant to habitat alteration than any of the other black basses, and it is especially intolerant of high turbidity and siltation. BASS data on the Ouachita National Forest indicate that both site occurrence percentages and population densities are similar between reference and managed watersheds. This implies that Forest Service management activities are having no adverse effects on smallmouth bass populations.

Issues

There is a concern that the proposed activities, including diverse timber management practices, wildlife habitat improvements, prescribed burning, herbicide application, and erosion control for watershed protection may impact wildlife and fisheries populations or habitats.

Effects on project MIS

The following ***specific activities*** have been proposed under the Preferred Alternative ("Proposed Action") for implementation within the action area of the Little Fir Watershed Restoration Management Project Area:

- Seed tree regeneration harvest – 92 acres
- Shelter wood regeneration harvest – 133 acres
- Commercial thinning – 549 acres
- Forest Health Restoration thinning – 288 acres
- Site prep prescribed burn (National Forest)
- Chemical/Mechanical site preparation for natural regeneration – up to 225 acres
- Timber Stand Improvement – 225 acres
- Pre-Commercial thinning – 225 acres
- Hand plant shortleaf pine seedlings – up to 225 acres
- Wildlife stand improvement (WSI)/ Midstory reduction – 12 acres
- Wildlife stand improvement (Commercial) – 162 acres
- Glade restoration – 62.7 acres
- Pond improvements to existing ponds – 6 each

- Pond construction – 4 each
- Linear wildlife opening improvements – 0.22 miles
- Wildlife opening construction – 0.73 acres
- Wildlife opening improvement – 5.4 acres
- Fire line construction – 7 miles
- Road construction/reconstruction – 6.5 miles
- Temporary road construction – 7 miles
- Pre-haul road maintenance – 1 mile
- Nonnative invasive plant species treatment throughout Project Area

*All figures are approximate

Each specific activity listed above as part of the "Proposed Action" was evaluated to determine all potential effects to each of the 14 MIS species being considered in this EA. The most likely ***general effects*** from the specific activities listed above are as follows:

- Could impact or crush individual plants and animals on the ground directly by heavy equipment operation or tree skidding
- Could burn individual plants and animals on the ground directly by exposure to fire from prescribed burns
- Could impact individual plants on the ground through contact with herbicides, although no herbicides would be applied in close proximity to PETS species
- Would create or maintain small patches of early successionalal habitat
- Would create and improve amphibian habitat and wildlife water sources
- Would cause temporary soil disturbance
- Could temporarily increase sedimentation

Many of these activities are similar in nature, and more importantly, their effects are similar in nature. This allows us to group and consolidate the specific effects into 7 basic impacts which will be evaluated individually for every MIS species being evaluated in this EA:

- **Soil disturbance impacts**
- **Heavy equipment/tree skidding impacts**
- **Sedimentation impacts**
- **Early successionalal habitat creation impacts**
- **Pond creation impacts**
- **Prescribed fire impacts**
- **Herbicide impacts**

Following the table of herbicide toxicity ratings, the 7 impacts listed above will be evaluated for the 14 MIS species that occur or may occur within the action area of the Little Fir Watershed Restoration Management Project Area.

Herbicide Toxicity Ratings (Table 3.15)

	Terrestrial Invertebrates	*Birds*	*Mammals*	*Fish and Aquatic Invertebrates*
Glyphosate	***Relatively non-toxic***	***Slightly toxic***	***Low***	***Practically non-toxic***
Imazapic	***Non-toxic***	***Practically non-toxic***	***Low to practically non-toxic***	***Low***
Imazapyr	***Non-toxic***	***Very low***	***Practically non-toxic***	***Low***
Triclopyr	*Relatively non-toxic*	***Practically non-toxic to slightly toxic***	***Practically non-toxic***	***Practically non-toxic***

References: EPA 1993, 1998; SERA 2003, 2004, 2009

MIS "Demand Species" and "Adequate Early Forest Stage Cover", Northern bobwhite

"No Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
No direct effects would result from the No Action Alternative.

Indirect Effects:
Under this alternative, lack of any new management activities could prevent or substantially delay the creation of early successionalal and open forested habitats needed by this species. The habitat capability model indicates that current quail populations are far below the projected plan levels. Indirectly, habitat for this species would continue to deteriorate resulting in a continued decline as indicated in the Forest trend data. Although declining forest health could promote disease and insect outbreaks, and catastrophic wildfires which would temporarily increase the amount of early successionalal habitat needed by this species, the periodicity and intensity of these events would be uncertain and may not produce and maintain sufficient early successionalal habitat within this ecosystem. The current habitat capability for this species is insufficient to meet the minimum population projections in the Forest Plan.

Cumulative Effects:
Cumulatively, this alternative would perpetuate conditions that would keep quail numbers well below plan projections and may eventually jeopardize the viability of this species within this ecosystem. Forest-wide trends indicate a downward trend for this species. Cumulatively, this alternative would likely have a negative impact on the Forest population trend for this species.

Species Trend Effects: The "No Action" alternative would be expected to negatively affect the Forest-wide trend for this species.

"Proposed Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn nests, eggs, or young quail on the ground. Adults are highly mobile and should not be directly impacted.

Soil disturbance, sedimentation, creation and maintenance of early successionalal habitat, and creation of wildlife nesting habitat should not directly affect quail. Although direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could potentially harm quail, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Based on these toxicity ratings, these 4 herbicides should not have any substantial direct effects on this species. Overall, any negative direct effects would be far outweighed by the beneficial indirect and cumulative effects of this alternative.

Indirect Effects:
Under the proposed activities, quail habitat would be enhanced through the creation of early successionalal habitat that could be maintained using prescribed fire, heavy equipment operation and associated soil disturbances, and increased openings in the forest canopy following thinning operations. Herbicide applications could help create and maintain additional patches of early successionalal habitat. These applications could also reduce the amount of non-native invasive plants and promote the growth of native plants that are beneficial to quail. Thinning of forest stands would promote the growth of beneficial ground cover used by quail, increasing foraging and nesting habitat. Sedimentation and nest box construction should have no indirect effects on this ground-nesting terrestrial species. Overall, the indirect effects on quail under this alternative would be very beneficial because of the improved habitat quality in this ecosystem, which currently has very little quality quail habitat.

Cumulative Effects:
Cumulative effects under this alternative would be beneficial due to the creation and maintenance of early successionalal habitat needed by quail within the Little Fir Watershed Restoration Management Project Area. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinning's would all promote and help maintain a mosaic of open forest stands with patches of early successionalal habitat. Herbicide applications would also be beneficial by reducing non-native invasive plants and reducing the potential for them to spread outside of their current locations and promoting native grasses and forbs needed by this bird. Sedimentation and creation of wildlife nesting habitat for cavity nesters would not have any substantial cumulative effects on quail. Overall, the proposed management activities under this alternative would ensure more quality, long-term habitat for this species. With sustained habitat improvements, the quail population may slow its current decreasing trend and possibly increase in this ecosystem. Any such favorable quail population response should also improve hunting and wildlife viewing opportunities for Forest users.

Species Trend Effects: The "Proposed Action" alternative should positively affect the Forest-wide trend for this species.

"No Herbicides" Alternative - Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on northern bobwhite under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative *are negligible* overall. Under the "No Herbicides" alternative, the chemical site preparation and release activities would not be accomplished using herbicides, but would be replaced with manual site preparation and release activities. Even though different "tools" would be used (i.e. chainsaws versus

herbicides), both methods would result in more open stands and more early successionalal habitat for quail. Non-native invasive plant treatment would not be accomplished using herbicide under this alternative and non-natives may continue to persist where present. Non-natives may spread outside of their current location and choke out native plants that are beneficial to quail. Although the "No Herbicides" alternative would eliminate the use of herbicides, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Given the very low potential for any herbicide effects on quail, and given the very low numbers of quail presently found within this area, there should be *no substantial differences in direct, indirect, or cumulative effects between the "No Herbicides" and "Proposed Action" alternatives.*

Species Trend Effects: The "No Herbicides" alternative should positively affect the Forest-wide trend for this species.

MIS "Demand Species", White-tailed deer

"No Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
No direct effects would result from this alternative.

Indirect Effects:
Under this alternative, lack of any new management activities could further delay the creation of early successionalal patches and open forest stands needed as a component of balanced deer habitat. Indirectly, habitat for this species would remain unbalanced, unless natural catastrophic events, such as wildfires, insect/disease outbreaks, or storm damage occurred, creating forest openings and early successionalal habitat. The periodicity and intensity of such natural events would be uncertain and may not produce and maintain sufficient early successionalal habitat within this ecosystem.

Cumulative Effects:
The cumulative effect of the "No Action" alternative is that the amount of early successionalal habitat needed by deer in this ecosystem would remain unbalanced and decline unless created through random natural disasters. As habitat needs decline with no management, so would the number of deer. However, the deer population is not currently facing any viability issues, and this alternative should have minimal impacts on the forest population trend for this species.

Species Trend Effects: The "No Action" alternative should not affect the Forest-wide trend for this species.

"Proposed Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may injure or kill young fawns on the ground. Adults are highly mobile and should not be directly impacted. Soil disturbance, sedimentation, creation and maintenance of early successionalal habitat, and creation of

wildlife nesting habitat should not directly affect deer. Although direct contact with herbicides (or feeding on vegetation that has been exposed to herbicides) could potentially harm deer, herbicides glyphosate, imazapic, imazapyr, and triclopyr are considered relatively non-toxic to having low toxicity levels toward mammals (EPA 1993, 1998; SERA 2003, 2004, 2009). Based on these toxicity ratings, these 4 herbicides should not have any substantial direct effects on deer. Overall, any negative direct effects would be far outweighed by the beneficial indirect and cumulative effects of this alternative.

Indirect Effects:
Under the proposed activities, deer habitat would be enhanced through the creation of early successionalal habitat that could be maintained using prescribed fire, heavy equipment operation and associated soil disturbances, and increased openings in the forest canopy following thinning operations. Herbicide applications could help create and maintain additional patches of early successionalal habitat, help eliminate non-native invasive plants, and promote beneficial native plants important to deer diet. These early successionalal areas are an important part of balanced deer habitat, providing important herbaceous and woody vegetation needed by deer for foraging. Sedimentation and creation of nest boxes should have no indirect effects on this terrestrial species. Overall, the indirect effects on deer under this alternative would be very beneficial because of the improved habitat quality in this ecosystem, which is currently lacking any substantial early successionalal habitat.

Cumulative Effects:
Cumulative effects under this alternative would be beneficial due to the creation and maintenance of early successionalal areas needed as a critical habitat component by deer. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinning would all promote and help maintain a mosaic of open forest stands with patches of early successionalal habitat. Herbicide applications would also be beneficial by preventing the spread of non-native invasive plant species within and outside of the watershed area. Sedimentation and creation of wildlife nesting habitat would not have any substantial cumulative effects on deer. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species, specifically, a mixture of early successionalal habitat needed for cover and browsing, as well as the mature mast producing hardwoods needed for fall and winter foraging. With sustained forest health and habitat diversity, the deer population should remain stable or increase with this alternative. The population increase should also improve hunting and wildlife viewing opportunities for Forest users. This alternative should have a positive effect on the Forest population trend for this species.

Species Trend Effects: The "Proposed Action" should positively affect the Forest-wide trend for this species.

"No Herbicides" Alternative - Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on deer under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative *are negligible* overall. Under the "No Herbicides" alternative, the chemical site preparation and release activities would not be accomplished using herbicides, but would be replaced with manual site preparation and release activities. Even though different "tools" would be used (i.e. chainsaws versus herbicides), both methods would result in more open stands and early successionalal habitat for deer. Non-native invasive plant treatment would not be accomplished using herbicides under this alternative and non-natives may

continue to persist where present. Non-natives may spread outside of their current location and choke out native plants that are beneficial to deer. Although the "No Herbicides" alternative would eliminate any herbicide use, glyphosate, imazapic, imazapyr, and triclopyr are considered relatively non-toxic to having low toxicity levels toward mammals (EPA 1993, 1998; SERA 2003, 2004, 2009). Given the very low potential for any herbicide effects on deer, there should be *no substantial differences in direct, indirect, or cumulative affects between the "No Herbicides" and "Proposed Action" alternatives.*

Species Trend Effects: The "No Herbicides" alternative should positively affect the Forest-wide trend for this species.

MIS "Demand Species", Eastern Wild Turkey

"No Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
No direct effects would result from this alternative.

Indirect Effects:
Under this alternative, lack of any new management activities could further delay the creation of early successionalal habitat patches and open forest stands needed as a component of balanced turkey habitat. These early successionalal habitats are needed for bugging and foraging grounds for turkeys, especially young poults. Indirectly, habitat for this species would remain unbalanced, unless natural catastrophic events, such as wildfires, insect/disease outbreaks, or storm damage occurred, creating forest openings and early successionalal habitat. The periodicity and intensity of such natural events would be uncertain and may not produce and maintain sufficient early successionalal habitat within this ecosystem.

Cumulative Effects:
Under this alternative, the current habitat capability for turkeys would remain at levels just above the minimum projected levels in the Forest Plan. The cumulative effect of the No Action alternative is that the variety of habitat needed would be reduced over the long-term. However, this alternative should have minimal cumulative effects on the Forest population trend for this species due to current Forest habitat capability levels.

Species Trend Effects: The "No Action" alternative is not likely to impact the Forest-wide trend for this species.

"Proposed Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn nests, eggs, or young turkey poults on the ground. Adults are highly mobile and should not be directly impacted. Soil disturbance, sedimentation, creation and maintenance of early successionalal habitat, and creation of wildlife nest boxes should not directly affect turkeys. Although direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could potentially harm turkeys, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b),

glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Based on these toxicity ratings, these 4 herbicides should not have any substantial direct effects on turkeys. Overall, any negative direct effects would be far outweighed by the beneficial indirect and cumulative effects of this alternative.

Indirect Effects:
Under the proposed activities, turkey habitat would be enhanced through the creation of early successionalal habitat that could be maintained using prescribed fire, heavy equipment operation and associated soil disturbances, and increased openings in the forest canopy following thinning operations. Herbicide applications could help create and maintain additional patches of early successionalal habitat, reduce the amount of non-native invasive plants, and promote the growth of native plants that are beneficial to turkeys. Early successionalal habitat areas are an important part of balanced turkey habitat, providing bugging and foraging grounds for young poults and brushy nesting sites for adults. Sedimentation and creation of nest boxes should have no indirect effects on this terrestrial ground-nesting species. Overall, the indirect effects on turkeys under this alternative would be beneficial due to the improved habitat quality in this ecosystem.

Cumulative Effects:
Cumulative effects under this alternative would be beneficial due to the creation and maintenance of early successionalal areas needed as a critical habitat component by turkeys. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and forest thinnings would all promote and help maintain a mosaic of open forest stands with patches of early successionalal habitat. Herbicide applications would also be beneficial by reducing non-native invasive plants and promoting native grasses and forbs needed by this bird. Sedimentation and creation of wildlife nest boxes would not have any substantial cumulative effects on turkeys. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species, specifically, a mixture of early successionalal habitat needed for nesting and poult rearing, as well as the mature forests needed for roosting and hard mast forage production. With sustained forest health and habitat diversity, the turkey population should remain stable or increase with this alternative. The population increase should also improve hunting and wildlife viewing opportunities for Forest users. This alternative should have a positive effect on the Forest population trend for this species.

Species Trend Effects: The "Proposed Action" should positively affect the Forest-wide trend for this species.

"No Herbicides" Alternative - Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on turkeys under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative *are negligible* overall. Under the "No Herbicides" alternative, the chemical site preparation and release activities would not be accomplished using herbicides, but would be replaced with manual site preparation and release activities. Even though different "tools" would be used (i.e. chainsaws versus herbicides), both methods would result in more open stands and more early successionalal habitat for turkey. Non-native invasive plant treatment would not be accomplished using herbicides under this alternative and non-natives may continue to persist where present. Non-natives may spread outside of their current location and choke

out native plants that are beneficial to turkeys. Although the "No Herbicides" alternative would eliminate the use of any herbicides, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Given the very low potential for any herbicide effects on turkey, there should be *no substantial differences in direct, indirect, or cumulative affects between the "No Herbicides" and "Proposed Action" alternatives.*

Species Trend Effects: The "No Herbicides" alternative should positively affect the Forest-wide trend for this species.

MIS "Adequate Mature Pine Forest Cover," "Adequate Mature Hardwood Forest Cover," and "Snags and Snag Dependent Species", Pileated woodpecker

"No Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
No direct effects would result from this alternative.

Indirect Effects:
Under this alternative, there should be no substantial indirect effects on this woodpecker, given the stability of the mature forests that it inhabits. The Little Fir Watershed Restoration Management Project Area contains suitable habitat in its current condition.

Cumulative Effects:
Under this alternative, there should be no substantial cumulative effects on this woodpecker, given the stability of the mature forests that it inhabits and the stable population trend it holds across its overall range. The long-term persistence of this species on the Forest is not in question; population levels far exceed the projected levels in the Forest Plan.

Species Trend Effects: The "No Action" alternative should not affect the Forest-wide trend for this species.

"Proposed Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
Given the highly mobile nature of these birds, direct effects on individuals are very unlikely under this alternative. Tree felling or heavy equipment may impact nests and eggs of this cavity nester, but the old snags they prefer for nesting are rarely felled or pushed over during management activities. Soil disturbance, heavy equipment operation, tree skidding, prescribed fire, creation and maintenance of early successionalal habitats, creation of nest boxes, and sedimentation should not have any direct effects on this species. Although direct contact with herbicides (or feeding on insects that have been exposed to herbicides) could potentially harm woodpeckers, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Based on

these toxicity ratings, these 4 herbicides should not have any substantial direct effects on this species. Overall, there should be no substantial direct effects on this woodpecker under this alternative.

Indirect Effects:
Heavy equipment and fire may cause trees to fall or burn down, but these activities would also help create new snags. Heavy equipment, tree skidding, and prescribed fire may disturb woodpeckers and cause them to move temporarily out of operating areas during these activities. The proposed activities would protect overall forest health. Improving the health and vigor of mature forest stands would produce more open woodlands with faster growing trees. Such habitat is preferred by this species. Creating new snags to meet Forest Plan design criteria under this alternative would also benefit this species since it is snag-dependent. Soil disturbance, sedimentation, creation/maintenance of early successionalal habitat, and herbicide application should have no indirect effects on this species.

Cumulative Effects:
Under this alternative, management activities would protect the overall health of mature forests preferred by Pileated woodpeckers. Soil disturbance, heavy equipment operation, tree skidding, herbicide application, prescribed fire, creation and maintenance of early successionalal habitats, creation of wildlife nest boxes, and sedimentation should have no substantial cumulative effects on Pileated woodpeckers. The current population density and habitat capability exceed the Forest Plan population objectives for the Pileated woodpecker and its habitat appears to be secure within the Forest.

Species Trend Effects: The "Proposed Action" alternative should not affect the Forest-wide trend for this species.

"No Herbicides" Alternative - Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this woodpecker under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative *are negligible* overall. Under the "No Herbicides" alternative, the chemical site preparation and release activities would not be accomplished using herbicides, but would be replaced with manual site preparation and release activities. Even though different "tools" would be used (i.e. chainsaws versus herbicides), both methods would result in similar vegetation manipulations. These treatments would largely occur outside the preferred habitat of this woodpecker, and neither treatment should have any substantial direct, indirect, or cumulative effects on this bird. Non-native invasive plant treatment would not be accomplished using herbicides under this alternative and non-natives may continue to persist where present and may spread outside of their present locations. Although the "No Herbicides" alternative would eliminate the use of herbicides, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Given the very low potential for any herbicide effects on this woodpecker, there should be *no substantial differences in direct, indirect, or cumulative affects between the "No Herbicides" and "Proposed Action" alternatives.*

Species Trend Effects: The "No Herbicides" alternative should not affect the Forest-wide trend for this species.

MIS "Adequate Mature Pine Forest Cover" and "Adequate Mature Hardwood Forest Cover", Scarlet tanager

"No Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
No direct effects would result from this alternative.

Indirect Effects:
Under this alternative, there should be no substantial indirect effects on this species, given the stability of the mature forests that it inhabits. The Little Fir Watershed Restoration Management Project Area is comprised of suitable habitat for this species in its current condition.

Cumulative Effects:
Under this alternative, there should be no substantial cumulative effects on this tanager, given the stability of the mature forests that it inhabits and the stable population trend it holds across its overall range.

Species Trend Effects: The "No Action" alternative should not affect the Forest-wide trend for this species.

"Proposed Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn nests, eggs, or young birds on the ground. Adults are highly mobile and should not be directly impacted. Soil disturbance, sedimentation, creation and maintenance of early successionalal habitat, and creation of wildlife nest boxes should not directly affect this species. Although direct contact with herbicides (or feeding on insects that have been exposed to herbicides) could potentially harm tanagers, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Based on these toxicity ratings, these 4 herbicides should not have any substantial direct effects on this species. Overall, there should be no substantial direct effects on this species under this alternative.

Indirect Effects:
Under the proposed activities, heavy equipment, tree skidding, and prescribed fire may disturb tanagers and cause them to move temporarily out of operating areas during these activities. Prescribed fire may cause trees to burn down that may have nests built in them. However, management activities would protect overall forest health. Maintaining the health of mature pine and hardwood stands will ensure

long-term habitat availability for this bird species. Soil disturbance, herbicide application, creation and maintenance of early successionalal habitats, creation of nest boxes, and sedimentation should have no indirect effects on tanagers.

Cumulative Effects:
Under this alternative, management activities would protect the overall health of mature forests preferred by scarlet tanagers. Soil disturbance, heavy equipment operation, tree skidding, herbicide application, prescribed fire, creation and maintenance of early successionalal habitats, creation of wildlife nest boxes, and sedimentation should have no substantial cumulative effects on this species. The scarlet tanager has a stable population trend across its overall range, and its long-term persistence on the Forest is not in question.

Species Trend Effects: The "Proposed Action" alternative should not affect the Forest-wide trend for this species.

"No Herbicides" Alternative - Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this tanager under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative *are negligible* overall. Under the "No Herbicides" alternative, the chemical site preparation and release activities would not be accomplished using herbicides, but would be replaced with manual site preparation and release activities. Even though different "tools" would be used (i.e. chainsaws versus herbicides), both methods would result in similar vegetation manipulations. These treatments would largely occur outside the preferred habitat of this tanager, and neither treatment should have any substantial direct, indirect, or cumulative effects on this bird. Non-native invasive plant treatment would not be accomplished using herbicides under this alternative and non-natives may continue to persist where present. Non-native plants may spread outside of their current location and choke out native plants. Although the "No Herbicides" alternative would eliminate the use of any herbicides, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Given the very low potential for any herbicide effects on this bird species, there should be *no substantial differences in direct, indirect, or cumulative affects between the "No Herbicides" and "Proposed Action" alternatives.*

Species Trend Effects: The "No Herbicides" alternative should not affect the Forest-wide trend for this species.

MIS "Adequate Early Forest Stage Cover", Prairie Warbler

"No Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
No direct effects would result from this alternative.

Indirect Effects:

Under this alternative, lack of any new management activities could prevent or substantially delay the creation of early successionalal and open forested habitats needed by this species. Indirectly, habitat for this species would continue to deteriorate resulting in a continued decline as indicated in the Forest trend data for this warbler. Although declining forest health could promote disease and insect outbreaks, and catastrophic wildfires which would temporarily increase the amount of early successionalal habitat needed by this species, the periodicity and intensity of these wildfires would be uncertain and may not produce and maintain sufficient early successionalal habitat within this ecosystem.

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

Species Trend Effects: The "No Action" alternative would be expected to negatively affect the Forest-wide trend for this species.

"Proposed Action" Alternative - Direct, Indirect & Cumulative Effects

Direct Effects:
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn nests, eggs, or young birds on the ground. Adults are highly mobile and should not be directly impacted. Soil disturbance, sedimentation, creation and maintenance of early successionalal habitat, and creation of wildlife nest boxes should not directly affect this species. Although direct contact with herbicides (or feeding on insects that have been exposed to herbicides) could potentially harm warblers, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Based on these toxicity ratings, these 4 herbicides should not have any substantial direct effects on this species. Overall, there should be no substantial direct effects on this species under this alternative.

Indirect Effects:
Under the proposed activities, prairie warbler habitat would be enhanced through the creation of early successionalal habitat that could be maintained using prescribed fire, heavy equipment operation and associated soil disturbances, and increased openings in the forest canopy following thinning operations. Herbicide applications could help create and maintain additional patches of early successionalal habitat. Thinning of forest stands would promote the brushy understory used by this species for nesting and foraging habitat. Sedimentation and creation of nest boxes should have no indirect effects on this terrestrial species. Overall, the indirect effects on this species under this alternative would be very beneficial because of the improved habitat quality in this ecosystem.

Cumulative Effects:
Cumulative effects under this alternative would be beneficial due to the creation and maintenance of early successionalal habitat needed by this warbler, and presently very low in this ecosystem. Prescribed fire, herbicide applications, heavy equipment operation and associated soil disturbances, and

forest thinnings would all promote and help maintain a mosaic of open forest stands with patches of early successionalal habitat. Sedimentation and creation of wildlife nest boxes would not have any substantial cumulative effects on warblers. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for this species. With sustained habitat improvements, the prairie warbler population should increase. The population increase should also improve wildlife viewing opportunities for Forest users. This alternative should have a positive effect on the Forest population trend for this species.

Species Trend Effects: The "Proposed Action" alternative should positively affect the Forest-wide trend for this species.

"No Herbicides" Alternative - Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this warbler under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative *are negligible* overall. Under the "No Herbicides" alternative, the chemical site preparation and release activities would not be accomplished using herbicides, but would be replaced with manual site preparation and release activities. Even though different "tools" would be used (i.e. chainsaws versus herbicides), both methods would result in more open stands and more early successionalal habitat for prairie warblers. Non-native invasive plant species would not be treated with herbicides under this alternative and may continue to persist and possibly spread outside of current locations. Although the "No Herbicides" alternative would eliminate the use of herbicides, imazapic is considered practically non-toxic to birds (SERA 2009, SERA 2004b), glyphosate is considered no more than slightly toxic to birds (EPA 1993, SERA 2003a), imazapyr is considered to have very low toxicity to birds (SERA 2004b, c), and triclopyr is considered to be practically non-toxic to slightly toxic to birds (SERA 2003b). Given the very low potential for any herbicide effects on this bird species, there should be *no substantial differences in direct, indirect, or cumulative affects between the "No Herbicides" and "Proposed Action" alternatives.*

Species Trend Effects: The "No Herbicides" alternative should positively affect the Forest-wide trend for this species.

Fisheries & Habitat

MIS "Ouachita Mountain Ecoregion Streams", Central stoneroller, Orangebelly darter, Northern studfish, Northern hog sucker, Green sunfish, Longear sunfish, Striped shiner, Smallmouth bass

The "No Action" Alternative would have no appreciable direct, indirect, or cumulative effects on stream habitats or the associated MIS (*Ouachita Mountain Ecoregion Streams*) due to the lack of active management. Protection is the only "management" undertaken within these systems of the Little Fir Watershed Restoration Project Area.

The "Proposed Action" and "No Herbicides" Alternatives would have no appreciable direct, indirect, or cumulative effects on stream habitats (*Ouachita Mountain Ecoregion Streams*) and the associated aquatic MIS. All streams would be protected under the Revised Forest Plan from the direct effects of logging, road construction, wildlife habitat improvement activities, and prescribed burning activities.

Indirect effects of soil disturbance, creation/maintenance of early successionalal habitat, and sedimentation caused by these activities may lead to temporary sedimentation reaching streams in the area. However, these activities would largely take place outside of SMAs. Any effects would be minimal given the habitat conservation measures established in the Forest Plan and FEIS (USDA 2005a, b). Heavy equipment may be used to improve aquatic species upstream access to allow for fish passage of migratory fish species. There should be no substantial soil disturbance or sedimentation resulting from heavy equipment use given the conservation measures in the Forest Plan and FEIS (USDA 2005 a, b) that would be followed for this type of work. The improvement of fish access outweighs any short-term impacts from heavy equipment use and associated disturbances. The stream banks would be stabilized after fish passageways are complete.

Only aquatic registered herbicides may be used in SMAs. No other herbicides would be used in SMAs and therefore, streams and fish would be protected from effects of these herbicides. Approved, aquatic registered herbicides are considered low to practically non-toxic to fish. Herbicides would be applied directly to vegetation and not to the water. If any herbicide did reach water, it would be after a rain event. In that case, only some herbicide may reach the water and since these herbicides are approved for aquatic areas, any effects would be minimal. Herbicide use would not affect the Forest-wide trend for any of these aquatic species.

The greatest concern from prescribed burns on aquatic environments is sediment deposition into the aquatic ecosystems. As discussed previously in the Soils section of this Chapter, the Forest Plan (USDA FS 2005a) identifies maximum allowable soil loss thresholds. Using the Universal Soil Loss Equation (USLE) to predict the quantity of soil loss associated with common Forest management practices, activities from the "Proposed Action" alternative fell within the accepted soil loss rates. The model predicts the amount of soil loss resulting from these activities would be below the maximum allowable soil loss for all timeframes. Therefore, no cumulative effects on aquatic habitat are expected from the "Proposed Action" and "No Herbicides" Alternatives.

MIS "Forest-wide", Smallmouth bass

The No Action Alternative would have no appreciable direct, indirect, or cumulative effects on stream habitats or the associated MIS (*Forest-wide*) due to the lack of active management. Protection is the only "management" undertaken within the Little Fir Watershed Restoration Management Project Area. The No Action Alternative should not have any effect on meeting public fishing demand in streams within the Little Fir Watershed.

The "Proposed Action" and "No Herbicides" Alternatives would have no appreciable direct, indirect, or cumulative effects on smallmouth bass. These alternatives should not have any effect on meeting public fishing demand in streams within the Forest Health Thinning Project Area. All streams would be protected under the Revised Forest Plan from the direct effects of logging, road construction, wildlife habitat improvement activities, and prescribed burning activities. Indirect effects of soil disturbance, creation/maintenance of early successionalal habitat, and sedimentation caused by these activities may lead to temporary sedimentation reaching streams in the area. However, these activities would largely take place outside of SMAs. Any effects would be minimal given the habitat conservation measures established in the Forest Plan and FEIS (USDA 2005a, b). Heavy equipment may be used to improve aquatic species upstream access to allow for fish passage of migratory fish species. There should be no

substantial soil disturbance or sedimentation resulting from heavy equipment use given the conservation measures in the Forest Plan and FEIS (USDA 2005 a, b) that would be followed for this type of work. The improvement of fish access outweighs any short-term impacts from heavy equipment use and associated disturbances. The stream banks would be stabilized after fish passageways are complete.

Only aquatic registered herbicides may be used in SMAs. No other herbicides would be used in SMAs and therefore, streams and fish would be protected from effects of these herbicides. Approved, aquatic registered herbicides are considered practically non-toxic to fish. Herbicides would be applied directly to vegetation and not to the water. If any herbicide did reach water, it would be after a rain event. In that case, only some herbicide may reach the water and since these herbicides are approved for aquatic areas, any effects would be minimal. Herbicide use would not affect the Forest-wide trend for this aquatic species.

The greatest concern from prescribed burns on aquatic environments is sediment deposition into the aquatic ecosystems. As discussed previously in the Soils section of this Chapter, the Forest Plan (USDA FS 2005a) identifies maximum allowable soil loss thresholds. Using the Universal Soil Loss Equation (USLE) to predict the quantity of soil loss associated with common Forest management practices, activities from the "Proposed Action" alternative fell within the accepted soil loss rates. The model predicts the amount of soil loss resulting from these activities would be below the maximum allowable soil loss for all timeframes. Therefore, no cumulative effects on aquatic habitat and smallmouth bass are expected from the "Proposed Action" and "No Herbicides" Alternatives.

Proposed, Threatened, Endangered and Sensitive Species (PETS) and Habitats

Present Conditions

This discussion documents the possible effects of the proposed actions, including diverse timber management practices, wildlife habitat improvements, prescribed burning, herbicide application, and erosion control for watershed protection on known and potential populations and habitat of the Ouachita National Forest (ONF) Proposed, Endangered, Threatened (USDI FWS 1999), and Sensitive (PETS) species. This discussion is based on the Biological Evaluation (BE), an attachment to this EA and incorporated by reference (USDA Forest Service 2013), which is in accordance with direction given in Forest Service Manual 2672.43 (USDA Forest Service, 2005e). All of the PETS species known to occur on the Caddo-Womble Ranger District (CWRD) have been considered for evaluation in this discussion and were evaluated and/or inventoried according to Forest Service Manual 2672.43 (USDA Forest Service, 2005e). The BE lists all of the ONF PETS species and indicates whether or not each is known to occur within the action area of the Little Fir Watershed Project Area. The status of each species within the CWRD and within the action area is based on known surveys, literature review, the Revised Forest Plan, the FEIS, and information as cited in the BE. Additionally, USDA Forest Service personnel, including the District Wildlife Biologist and Wildlife Technicians, conducted site inspections within the Little Fir Watershed Project Area to identify resource needs and look for PETS species and potential PETS habitat. As expressed in the BE for each PETS species listed, additional surveys are not needed at this time to provide more definitive information to improve upon the determination of effects on the evaluated PETS species.

Based on Arkansas Natural Heritage Commission records, FS personnel field inspections, and other pertinent information as cited, 7 PETS species are known to occur or may potentially occur within the action area. The 7 species are considered Sensitive by the USFS, and this group is composed of 1 butterfly species, 1 bird species, 1 bat species, and 4 plant species (see ***Appendix A*** of the BE). Survey needs for the 7 evaluated species are listed in ***Appendix A*** and follow the direction of Forest Service Manual 2672.43 (USDA FS 2005e). Only these 7 species will be evaluated in this BE for potential impacts from the proposed actions.

PETS species that occur or potentially occur on the Project Area (TABLE 3.16)

	Common Name	**Scientific Name**	**Status**
1	Diana fritillary	*Speyeria diana*	**S**
2	Bald eagle	*Haliaeetus leucocephalus*	**S**
3	Eastern small-footed bat	*Myotis leibii*	**S**
4	Nuttall's cornsalad	*Valerianella nuttallii*	**S**
5	Waterfall's sedge	*Carex latebracteata*	**S**
6	Southern lady-slipper	*Cypripedium kentuckiense*	**S**
7	Open Ground Draba	*Draba aprica*	**S**

T – Federally 'Threatened' species
S – Forest Service 'Sensitive' species

Issues. There is a concern that the proposed activities, including diverse timber management practices, wildlife habitat improvements, prescribed burning, herbicide application, and erosion control for watershed protection may impact PETS or PETS habitats.

Effects on PETS: The impacts to each of the 7 PETS species, by each of the 3 Alternatives ("No Action", "Proposed Action" and "No Herbicides") are summarized below. Refer to the BE (***Appendix E***) for more detailed discussions on the life history, distribution, and other relevant information for each of the 7 evaluated PETS species.

Species Information, Effects and Determination of Effects

Many of the proposed management activities are similar in nature, and more importantly, their effects are similar in nature (*see MIS section above for specific activities and resulting general effects*). This allows us to group and consolidate the specific effects into 7 basic impacts which will be evaluated individually for each PETS species being evaluated in the BE:

- **Soil disturbance impacts**
- **Heavy equipment/tree skidding impacts**
- **Sedimentation impacts**
- **Early successionalal habitat creation impacts**
- **Pond creation impacts**
- **Prescribed fire impacts**
- **Herbicide impacts**

These 7 impacts will be evaluated below for the 7 PETS species that occur or may occur within the action area.

PETS Species "Diana Fritillary"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects-
If "No Action" is taken within the action area, forest health would likely decline due to overstocking of trees. Initially, dense canopy closure could cause a decrease in herbaceous plants needed for nectar food sources and egg-laying sites used by this species. However, overstocked forests could promote disease and insect outbreaks, and catastrophic wildfires which would eventually open the forest canopy. If such openings were created, this would temporarily promote a flush of herbaceous growth used by this species.

Cumulative Effects-
Under this alternative, forest health would likely decline due to overstocking of trees. The long-term cycling of canopy closure from overstocked stands, followed by disease and insect outbreaks, and catastrophic wildfires, could lead to unpredictable increases and decreases in suitable habitat for this species over time. Periodicity and intensity of these events would be unpredictable under the "No Action" approach.

- Alternative B –Little Fir Watershed Project Proposed Action - Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may impact larva and eggs on the ground by crushing or burning individuals. Adults are highly mobile and should not be directly impacted. Soil disturbance, sedimentation, and creation and maintenance of early successionalal habitat and ponds should not have any direct effects on this species. Although herbicide application could potentially harm larva and eggs on the ground or adults making contact with treated vegetation, glyphosate, imazapic, imazapyr, and triclopyr are considered non-toxic to relatively non-toxic toward terrestrial invertebrates when applied according to registered label directions (SERA 2003, 2004, 2009; see ***Appendix B*** of the BE).

Indirect Effects-
The proposed management actions would protect overall forest health and promote a flush of beneficial herbaceous growth, especially in areas where prescribed fire or heavy equipment has reduced competition, disturbed soils, and created or maintained early successionalal habitats often containing plants preferred by this butterfly. Increases in herbaceous cover would provide greater foraging and reproduction opportunities for this species. Sedimentation or creation of ponds should have no indirect effects on this terrestrial species which does not depend on aquatic systems for survival. Although

herbicide use could temporarily reduce the abundance of herbaceous vegetation used by this butterfly, herbicide treatments would target non-native plants, and not the plants these butterflies prefer. Herbicide treatments would not likely persist for greater than 12 months and would cover less than < 1% of this species' available habitat within the Forest.

Cumulative Effects-
Under the *Preferred Alternative*, soil disturbance from heavy equipment operation, tree skidding and creation and maintenance of additional early successionalal habitat through mechanical means and prescribed fire would help sustain growth of beneficial herbaceous plants. These activities would provide more and better long-term habitat for this species. Sedimentation and creation of ponds within the action area should have no cumulative effect on this terrestrial species. Given that the herbicides glyphosate, imazapic, imazapyr, and triclopyr are considered non-toxic to relatively non-toxic toward terrestrial invertebrates when applied according to registered label directions (SERA 2003, 2004, 2009; see ***Appendix B*** of the BE), cumulative effects should be negligible within the action area, which represents a very small fraction of this species' available habitat Forest-wide (< 1% of available habitat).

Determination of Effects: *The proposed activities "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" for the Diana fritillary. Overall, the benefits from increased foraging and reproductive habitat created indirectly and maintained cumulatively under the Preferred Alternative outweigh any negative direct effects on this species.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this butterfly species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
The "No Herbicides" alternative would eliminate the use of glyphosate, imazapic, imazapyr, and triclopyr to treat non-native invasive plant species and conduct site preparation/release activities. However, these herbicides are considered non-toxic to relatively non-toxic toward terrestrial invertebrates when applied according to registered label directions (SERA 2003, 2004, 2009; see ***Appendix B*** of the BE). Under the "No Herbicides" alternative, negative direct effects on larva and eggs may be reduced by not using herbicides.

Indirect Effects-
As an indirect effect under the "No Herbicides" alternative, habitat availability for this butterfly species may be increased by not using herbicides which could temporarily kill beneficial vegetation used for foraging and reproduction. However, these reduced impacts would be equally offset by the damage mechanical release activities could do to the same beneficial vegetation used by this species. The non-native invasive plant treatment using herbicides would not occur under this alternative and in some areas, non-native plants may continue to expand and choke out beneficial native vegetation if herbicides are not used.

Cumulative Effects-
The overall cumulative effects on this butterfly species were considered beneficial, but negligible, due to the very limited area of habitat impacted under the "Proposed Action" alternative, which included the use of herbicides (see "Proposed Action" section above). It would be logical and consistent to conclude that the "No Herbicides" alternative would likewise also have negligible cumulative effects. The area proposed for herbicide treatment represents a very small fraction of this species' available habitat Forest-wide (< 1% of available habitat).

PETS Species "Bald Eagle"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects-
If "No Action" is taken within the action area, forest health would likely decline due to overstocking of trees. Overstocked forests could promote disease and insect outbreaks, and catastrophic wildfires which could reduce the amount of suitable roosting and potential nesting trees within the area. However, since no known nesting or roosting locations are within the action area, it is unlikely that such activities would cause any disturbance to bald eagles.

Cumulative Effects-
Under this alternative, forest health would likely decline due to overstocking of trees. Although bald eagles are not known to currently use the action area, the "No Action" alternative may prevent bald eagles from using the action area in the future if suitable roosting and nesting trees are lost due to disease and insect outbreaks, or catastrophic wildfires.

- Alternative B –Little Fir Watershed Project Proposed Action - Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, heavy equipment operation, tree skidding, and prescribed fire should have negligible direct effects on bald eagles because they are highly mobile animals and would leave the area during activities if present. Although direct contact with herbicides (or carrion that have been exposed to herbicides) could potentially harm eagles, the herbicides glyphosate, imazapic, imazapyr, and triclopyr are considered low to practically non-toxic to birds when applied according to registered label directions (EPA 1993,1998; SERA 2003, 2004, 2009; see ***Appendix B*** of the BE). Based on herbicide toxicity ratings, these 4 herbicides should not have any substantial direct effects on this species. Soil disturbance, creation and maintenance of early successionalal habitat, sedimentation, and creation of wildlife ponds would not have any direct effects on bald eagles.

Indirect Effects-
The use of heavy equipment, tree skidding, and prescribed fire may disturb wintering bald eagles and cause them to move temporarily from roosting and foraging areas. Heavy equipment or prescribed fire may also remove or burn down some suitable nesting and roosting trees. However, since no known

nesting or roosting locations are within the action area, it is unlikely that such activities would cause any disturbance to bald eagles. Soil disturbance, creation and maintenance of early successionalal habitat, sedimentation, creation of wildlife ponds, and herbicide application would not indirectly affect the bald eagle (see ***Appendix B*** of the BE).

Cumulative Effects-
No substantial cumulative effects on bald eagles are expected from soil disturbance, heavy equipment operation, tree skidding, sedimentation, creation and maintenance of early successionalal habitat, creation of wildlife ponds, prescribed fire, and herbicide application (see ***Appendix B*** of the BE). Bald eagles are highly mobile and would move from the action area if disturbed during land management activities. Ultimately, the cumulative effects from protecting overall forest health would protect potential nesting and roosting habitat for the bald eagle.

Determination of Effects: *The proposed activities should have "no impact" on the bald eagle. The action area does not contain any current nesting and roosting habitat for this species, and the occurrence of eagles within the Project Area is likely limited to occasional individuals flying over. Although management activities would ultimately promote overall forest health, the proposed activities should have no impacts specifically on bald eagles or their preferred habitat.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this bird species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
This alternative would eliminate any chance for bald eagles to come in contact with glyphosate, imazapic, imazapyr, and triclopyr. However, these herbicides are considered non-toxic to slightly toxic to birds when applied according to registered label directions (EPA 1993, 1998; SERA 2003, 2004, 2009; see ***Appendix B*** of the BE).

Indirect Effects-
See Alternative B section above for indirect effects.

Cumulative Effects-
No substantial cumulative effects on bald eagles are expected from the "No Herbicide" alternative. Bald eagles are highly mobile and would move from the action area if disturbed during any of the no-herbicide related proposed actions.

PETS Species "Eastern Small-footed Bat"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects-
If "No Action" is taken within the action area, forest health would likely decline due to overstocking of trees. Dense forest stands would limit the amount of bat use in such stands because they do not provide the open flight space that bats prefer. Overstocked forests could promote disease and insect outbreaks, and catastrophic wildfires which could reduce the amount of suitable roosting trees within the area. Insect outbreaks would provide more forage for bats and catastrophic wildfires could open up the forest canopy and provide better flight space for bats.

Cumulative Effects-
Under this alternative, forest health would likely decline due to overstocking of trees. The "No Action" alternative may limit bats from using the action area in the future if dense forest stands continue to persist without management and suitable roosting trees are lost due to catastrophic wildfires. Overall habitat required for this species would continue to decline.

- Alternative B –Little Fir Watershed Project Proposed Action- Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, tree felling and prescribed fire may crush or burn individuals roosting in trees. However, this activity is unlikely to impact bats because they are highly mobile. Timber harvesting and prescribed fire would only impact bats if conducted during warm months when bats may be using trees as roosting sites. Hibernating bats would not be impacted by these proposed activities. Heavy equipment operation, tree skidding, creation/maintenance of early successionalal habitat and ponds, soil disturbance, and sedimentation should not have any direct effects on this species at any time of the year when these activities may occur. Although direct contact with herbicides (or insects that have been exposed to herbicides) could potentially harm bats, the herbicides glyphosate, imazapic, imazapyr, and triclopyr are considered relatively non-toxic to having low toxicity levels toward mammals (EPA 1993,1998; SERA 2003, 2004, 2009; see ***Appendix B*** of the BE). Based on herbicide toxicity ratings, these 4 herbicides should not have any substantial direct effects on this species.

Indirect Effects-
Under the proposed activities, small patches of early successionalal habitat would be created or maintained through the use of tree removal, heavy equipment, herbicide applications, and prescribed fire. Open areas would increase flight space for bats and increase sunlight on the forest floor, increasing herbaceous growth for bats' insect prey (Taylor 2006). An increase in herbaceous growth and creation of ponds would increase prey diversity and abundance. Temporary soil disturbance from heavy equipment use, tree skidding and prescribed fire would also help to promote beneficial herbaceous growth and increase the abundance and diversity of insects. Although prescribed fire may eliminate some snags for roosting, fire would also create new roost trees for bats. Sedimentation should not have any indirect effects on this terrestrial species.

Cumulative Effects-

Under the proposed activities, heavy equipment and prescribed fire resulting in temporary soil disturbance events and creation/maintenance of small patches of early successionalal habitat would help sustain herbaceous plant growth and increase prey diversity and abundance. Thinning would also help create and maintain early successionalal habitat and promote beneficial herbaceous growth for prey and improve flight space for bats. These activities, along with creation of ponds, would provide more and better long-term habitat for this species. Based on toxicity ratings for herbicides (see ***Appendix B*** of the BE), herbicide application is not expected to have any substantial cumulative effects on this bat species should any direct contact occur. Sedimentation should not have any cumulative effects on this terrestrial species.

Determination of Effects: *The proposed activities "may impact individuals but is not likely to cause a trend to Federal listing or loss of viability" for the eastern small-footed bat. The benefits from improved foraging habitat indirectly created or maintained cumulatively under the proposed activities outweigh any negative direct effects on this species.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this mammal species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
This alternative would eliminate any chance for bats to come in contact with glyphosate, imazapic, imazapyr, and triclopyr. However, these herbicides are considered relatively non-toxic to having low toxicity levels toward mammals when applied according to registered label directions (EPA 1993, 1998; SERA 2003, 2004, 2009; see ***Appendix B*** of the BE).

Indirect Effects-
See Alternative B section above for indirect effects.

Cumulative Effects-
No substantial cumulative effects on bats are expected from the "No Herbicide" alternative. Overall, any cumulative effects would be beneficial by providing better flight space, an increase in forage, and potential additional roosting habitat.

PETS Species "Nuttall's Cornsalad"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects
Under the "No Action" alternative, overstocked forests could result in periods of dense canopy closure, followed by disease, insect outbreaks, and catastrophic wildfires. This plant responds well to moderate

disturbance, therefore such indirect effects would likely be beneficial; however, the periodicity and intensity of these disturbances would be unpredictable under the "No Action" approach.

Cumulative Effects-
Under the "No Action" alternative, declining forest health could result in disease and insect outbreaks, catastrophic wildfires, and very diverse canopy conditions throughout the action area. Cumulative effects on this plant species, which can benefit from moderate disturbances, would likely be minimal however due to the unpredictable periodicity and intensity of catastrophic forest health events under the "No Action" approach.

- Alternative B –Little Fir Watershed Project Proposed Action- Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, heavy equipment, tree skidding, soil disturbance, or prescribed fire may crush or burn individual plants on the ground. Given that this plant occurs in diverse habitats, many of which are outside the normal operating limits of land management activities, any direct effects should not be substantial. Sedimentation, creation and maintenance of early successionalal habitat and ponds should not have any critical direct effects on this species as these activities would largely occur outside of its preferred habitat. Herbicides should not directly impact this species because all areas within the Little Fir Watershed Project Area containing known locations of Nuttall's cornsalad will be protected by all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b). Given these conservation measures, this Sensitive plant should be protected from herbicide applications and any associated direct effects. Overall, any direct effects from the proposed activities on this species would be minimal due to the small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
The proposed activities would indirectly create and maintain small patches of early successionalal habitat and a more open forest canopy, beneficial to this species which responds to moderate disturbances. In the short-term, localized soil disturbance from heavy equipment operation, tree skidding, and prescribed fire activities may indirectly affect this plant, but given that this plant occurs in diverse habitats and tolerates disturbance well, these indirect effects should be negligible. Sedimentation and creation of wildlife ponds should have no indirect effects on this terrestrial plant species. Given conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b), this plant should be protected from indirect effects related to herbicide applications (see "*Direct effects"* section above).

Cumulative Effects-
Under the proposed activities, management actions would result in creation and maintenance of small patches of early successionalal habitat, localized soil disturbances from heavy equipment, tree skidding and prescribed fire, and patches of open forest canopy, all of which are beneficial to this plant species. These cumulative effects are expected to be minimal, however, given the comparatively small area of habitat that would be impacted by the proposed activities. Sedimentation and creation of wildlife ponds should have no cumulative effects on this terrestrial plant species, and conservation measures

established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b) would protect Nuttall's cornsalad from any cumulative herbicide impacts.

Determination of Effects: *The proposed activities "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" for Nuttall's cornsalad. Given that this plant occurs in diverse habitats, many of which are outside the normal operating limits of land management activities, any negative direct, indirect, or cumulative effects should not be substantial. In the small fraction of this species' habitat where disturbances may occur as a result of the proposed activities, the overall effects are expected to be beneficial to the long-term viability of this Sensitive species, which responds well to moderate disturbances.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this Sensitive plant species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
Since all areas within the Little Fir Watershed Project Area containing known locations of Nuttall's cornsalad are protected from herbicide treatment following compliance with all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Revised Forest Plan and FEIS, direct effects on this plant species would be the same under both the "Proposed Action" and "No Herbicides" alternatives. Overall, any direct effects from the proposed activities on this species would not result from herbicide use and would be minimal due to the small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
Acknowledging that there were no substantial indirect effects on this plant species under the "Proposed Action" alternative, which included the use of herbicides, the "No Herbicides" alternative would likewise be expected to have no substantial indirect effects on this species.

Cumulative Effects-
Given that the cumulative effects on this Sensitive plant were negligible under the "Proposed Action" alternative, which included the use of herbicides, it would be logical and consistent to conclude that the "No Herbicides" alternative would likewise have negligible cumulative effects. This plant occurs in diverse habitats, most of which are outside the normal operating limits of land management activities, and this factor provides additional protection from any substantial cumulative management effects.

PETS Species "Waterfall's Sedge"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects
Under the "No Action" alternative, overstocked forests could result in periods of dense canopy closure, followed by disease, insect outbreaks, and catastrophic wildfires. Following these catastrophic events, many forested stands would exhibit a very open canopy throughout the action area. Given that this plant responds to disturbance, indirect effects would likely be beneficial, but very minor due to the small size of the action area compared to Forest-wide habitat acreage available for this plant.

Cumulative Effects-
Under the "No Action" alternative, declining forest health could result in disease and insect outbreaks, catastrophic wildfires, and very diverse canopy conditions throughout the action area. Periodicity and intensity of these catastrophic events would be unpredictable under the "No Action" approach. Cumulative effects on Waterfall's sedge, which prefers moderate disturbances, should be minimal, however, given the small size of the action area compared to Forest-wide habitat acreage available for this plant.

- Alternative B –Little Fir Watershed Project Proposed Action- Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn individual plants on the ground. Fireline maintenance, temporary road construction, and pond construction could be detrimental to Waterfall's sedge by uprooting individual plants following extreme soil disturbance. Given that this plant occurs in diverse habitats, most of which are outside the normal operating limits of land management activities, any direct effects should not be substantial. Soil disturbance, sedimentation, and creation and maintenance of early successionalal habitat should not have any critical direct effects on this species as these activities would largely occur outside of its preferred habitat. Herbicides should not directly impact this species because all areas within the Little Fir Watershed Project Area containing known locations of Waterfall's sedge will be protected by all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b). Given these conservation measures, this Sensitive plant should be protected from herbicide applications and any associated direct effects. Overall, any direct effects from the proposed activities on this species would be minimal due to the small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
The proposed activities would indirectly create and maintain small patches of early successionalal habitat and a more open forest canopy, beneficial to this species which responds to moderate disturbances. In the short-term, localized soil disturbance from heavy equipment operation, tree skidding, and prescribed fire activities may indirectly affect this plant, but given that this plant occurs in diverse habitats, most of which are outside the normal operating limits of land management activities, these indirect effects should be negligible. Sedimentation and creation of wildlife ponds should have no indirect effects on this terrestrial plant species. Given conservation measures established under the

Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b), this plant should be protected from indirect effects related to herbicide applications (see "*Direct Effects"* section above).

Cumulative Effects-
Under the proposed activities, management actions would result in creation and maintenance of small patches of early successionalal habitat, localized soil disturbances from heavy equipment, tree skidding and prescribed fire, and patches of open forest canopy, all of which are beneficial to this plant species. These cumulative effects are expected to be minimal, however, given the comparatively small area of habitat that would be impacted by the proposed activities. Sedimentation and creation of wildlife ponds should have no cumulative effects on this terrestrial plant species, and conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b) would protect Waterfall's sedge from any cumulative herbicide impacts.

Determination of Effects: *The proposed activities "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" for Waterfall's sedge. Given that this plant occurs in diverse habitats, most of which are outside the normal operating limits of land management activities, any negative direct, indirect, or cumulative effects should not be substantial. In the small fraction of this species' habitat where disturbances may occur as a result of the proposed activities, the overall effects are expected to be beneficial to the long-term viability of this Sensitive species, which responds to moderate disturbances.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this Sensitive plant species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
Since all areas within the Little Fir Project Area containing known locations of Waterfall's sedge have been removed from consideration for herbicide treatment following compliance with all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Revised Forest Plan and FEIS, direct effects on this plant species would be the same under both the "Proposed Action" and "No Herbicides" alternatives. Overall, any direct effects from the proposed activities on this species would not result from herbicide use and would be minimal due to the small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
Acknowledging that there were no substantial indirect effects on this plant species under the "Proposed Action" alternative, which included the use of herbicides, the "No Herbicides" alternative would likewise be expected to have no substantial indirect effects on this species.

Cumulative Effects-
Given that the cumulative effects on this Sensitive plant were negligible under the "Proposed Action" alternative, which included the use of herbicides, it would be logical and consistent to conclude that the "No Herbicides" alternative would likewise have negligible cumulative effects. This plant occurs in

diverse habitats, most of which are outside the normal operating limits of land management activities, and this factor provides additional protection from any substantial cumulative management effects.

PETS Species "Southern Lady-slipper"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects-
Under this alternative, overstocked forests could promote disease, insect outbreaks, and catastrophic wildfires. These factors could potentially result in a more open canopy along streamside management areas, decreasing the amount of mesic, closed-canopy habitat preferred by this plant.

Cumulative Effects-
Under this alternative, declining forest health could result in disease and insect outbreaks, catastrophic wildfires, and could potentially result in a decrease in the amount of mesic, closed-canopy habitat preferred by these plants. Periodicity and intensity of these catastrophic events would be unpredictable under the "No Action" approach.

- Alternative B –Little Fir Watershed Project Proposed Action- Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn individual plants on the ground. Fireline maintenance or temporary road construction could be detrimental to this species by uprooting individual plants following extreme soil disturbance. However, such impacts are not likely due to conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b) for SMAs and seeps/springs preferred by these plants. Such areas are protected from heavy equipment operation, and are generally too wet to sustain intense fires. Sedimentation, creation and maintenance of early successionalal habitat, and creation of additional wildlife ponds should not have any substantial direct effects on this species as these activities would occur outside of their preferred habitat. Herbicides should not directly impact this species because herbicide applications will be conducted according to all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b). Given these conservation measures, these plants should be protected from herbicide applications and any associated direct effects. Overall, any direct effects from the proposed activities on this species would be minimal due to the relatively small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
Under the proposed activities, management actions would protect overall forest health. Indirect effects from the proposed activities would be minimal due to the conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b) for streamside management areas and seeps/springs preferred by this species. Minimal areas of mesic habitat would be impacted by soil

disturbance, heavy equipment operation, tree skidding, prescribed fire, creation and maintenance of early successionalal habitat, sedimentation, and creation of additional wildlife ponds. Such activities would largely occur outside of this species' preferred habitat. Given conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b), these plants should also be protected from indirect effects related to herbicide applications (see "*Direct Effects"* section above).

Cumulative Effects-
Under the proposed activities, management actions would protect overall forest health and provide long-term, mesic, closed-canopy habitat in streamside management areas and seeps/springs preferred by these plants. Soil disturbance, heavy equipment operation, tree skidding, prescribed fire, creation and maintenance of early successionalal habitat, sedimentation, and creation of additional wildlife ponds within the action area would largely occur outside of this species' preferred habitat; therefore, any negative cumulative effects would be minimal. Given conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b), these plants should be protected from herbicide applications and should not experience any cumulative effects associated with herbicides. Overall, the net cumulative effects would be beneficial, due to maintenance of quality habitat under the proposed activities.

Determination of Effects: *The proposed activities "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" for southern lady-slipper. Impacts on this species would be minimal due to the relatively small area of mesic habitat that would be impacted by the proposed activities. Overall, the cumulative effects under the proposed activities would be beneficial, due to protection of forest health and sustenance of long-term, mesic, closed-canopy habitat in streamside management areas and seeps/springs preferred by this species.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this Sensitive plant species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
Since all areas within the Little Fir Watershed Project Area containing known locations of Southern lady-slipper have been removed from consideration for herbicide treatment following compliance with all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Revised Forest Plan and FEIS, direct effects on these plant species would be the same under both the "Proposed Action" and "No Herbicides" alternatives. Any direct effects, as discussed in the "Proposed Action" alternative section, would not result from herbicide applications, but rather from heavy equipment operation, skidded trees, or prescribed fire crushing or burning individual plants on the ground. However, such impacts are not likely due to conservation measures established under the Revised Forest Plan and FEIS for streamside management areas and seeps/springs preferred by these plants.

Indirect Effects-
Acknowledging that Southern lady-slipper locations will not be treated with herbicides due to conservation measures under the Revised Forest Plan and FEIS, indirect effects on these plant species would be the same under both the "Proposed Action" and "No Herbicides" alternatives. Indirect effects

on this species from proposed actions other than herbicide treatment would be minimal due to the relatively small area of mesic habitat that would be impacted by these proposed activities.

Cumulative Effects-
Given that the cumulative effects on these Sensitive plant species were not substantial under the "Proposed Action" alternative, which included the use of herbicides, it would be logical and consistent to conclude that the "No Herbicides" alternative would likewise have negligible cumulative effects. Overall, the net cumulative effects would be beneficial, due to maintenance of quality habitat under the proposed activities.

PETS Species "Open Ground Draba"

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects-
No direct effects would result from this alternative.

Indirect Effects
Under the "No Action" alternative, overstocked forests could result in periods of dense canopy closure, followed by disease, insect outbreaks, and catastrophic wildfires. Following these catastrophic events, many forested stands would exhibit a very open canopy throughout the action area. Given that this plant responds well to disturbance, indirect effects would likely be beneficial, but very minor due to the small size of the action area compared to Forest-wide habitat acreage available for this plant.

Cumulative Effects-
Under the "No Action" alternative, declining forest health could result in disease and insect outbreaks, catastrophic wildfires, and very diverse canopy conditions throughout the action area. Periodicity and intensity of these catastrophic events would be unpredictable under the "No Action" approach. Cumulative effects on open ground draba, which prefers moderate disturbances, should be minimal, however, given the small size of the action area compared to Forest-wide habitat acreage available for this plant.

- Alternative B –Little Fir Watershed Project Proposed Action- Direct, Indirect & Cumulative Effects and Determination of Effects

Direct Effects-
Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn individual plants on the ground. Given that this plant occurs in glade communities, most of which are outside the normal operating limits of land management activities, any direct effects should not be substantial. Soil disturbance, sedimentation, creation and maintenance of early successionalal habitat, and creation of wildlife ponds should not have any critical direct effects on this species as these activities would occur outside of its preferred habitat. Herbicides should not directly impact this species because herbicide applications will be conducted according to all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b). Given these conservation measures, these plants should be protected from herbicide applications and any associated direct effects. Overall, any direct effects from the proposed

activities on this species would be minimal due to the relatively small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
The proposed activities would indirectly create and maintain small blocks of early successionalal habitat and a more open forest canopy, beneficial to this species which responds well to openings, increased sunlight, and a reduction in competition. Prescribed fire would be beneficial to this plant since it is a fire dependent species and may help increase populations of this plant. In the short-term, localized soil disturbance from heavy equipment operation and tree skidding may indirectly affect this plant, but given that this plant occurs in glade habitats, most of which are outside the normal operating limits of land management activities, these indirect effects should be negligible. Sedimentation and creation of wildlife ponds should have no indirect effects on this terrestrial plant species. Given conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b), this plant should be protected from indirect effects related to herbicide applications (see "*Direct Effects"* section above).

Cumulative Effects-
Under the proposed activities, management actions would result in creation and maintenance of small blocks of early successionalal habitat, localized soil disturbances from heavy equipment and prescribed fire, and patches of open forest canopy, all of which are beneficial to this plant species. These cumulative effects are expected to be minimal, however, given the comparatively small area of habitat that would be impacted by the proposed activities. Sedimentation and creation of wildlife ponds should have no cumulative effects on this terrestrial plant species, and conservation measures established under the Forest Plan (USDA FS 2005a) and FEIS (USDA FS 2005b) would protect open ground draba from any cumulative herbicide impacts.

Determination of Effects: *The proposed activities "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" for open ground draba. Given that this plant occurs in glade habitats, most of which are outside the normal operating limits of land management activities, any negative direct, indirect, or cumulative effects should not be substantial. In the small fraction of this species' habitat where disturbances may occur as a result of the proposed activities, the overall effects are expected to be beneficial to the long-term viability of this Sensitive species, which responds well to disturbances.*

- Alternative C - No Herbicides- Direct, Indirect & Cumulative Effects

Differences between the direct, indirect, and cumulative effects on this Sensitive plant species under the "No Herbicides" alternative and those discussed above under the "Proposed Action" alternative are negligible overall:

Direct Effects-
Since all areas within the Little Fir Watershed Project Area containing known locations of open ground draba have been removed from consideration for herbicide treatment following compliance with all applicable "Herbicide Use" Conservation Measures (HU001 – HU018) summarized in the Revised Forest Plan and FEIS, direct effects on this plant species would be the same under both the "Proposed Action" and "No Herbicides" alternatives. Overall, any direct effects from the proposed activities on

this species would not result from herbicide use and would be minimal due to the small area of habitat that would be impacted by the proposed activities.

Indirect Effects-
Acknowledging that there were no substantial indirect effects on this plant species under the "Proposed Action" alternative, which included the use of herbicides, the "No Herbicides" alternative would likewise be expected to have no substantial indirect effects on this species.

Cumulative Effects-
Given that the cumulative effects on this Sensitive plant were negligible under the "Proposed Action" alternative, which included the use of herbicides, it would be logical and consistent to conclude that the "No Herbicides" alternative would likewise have negligible cumulative effects. This plant occurs in diverse habitats, most of which are outside the normal operating limits of land management activities, and this factor provides additional protection from any substantial cumulative management effects.

CONSULTATION HISTORY WITH THE U.S. DEPARTMENT OF THE INTERIOR – U.S. FISH AND WILDLIFE SERVICE

Based on legal direction established under the Endangered Species Act of 1973 (Amended) regarding Section 7 formal consultation requirements, the Ouachita National Forest has requested and received consultation from the U.S. Fish and Wildlife Service (USFWS) on all activities associated with the Revised Land and Resource Management Plan for the Ouachita National Forest (USDA FS 2005a). The USFWS (2005) has concurred with the findings and evaluations presented in the Biological Assessment (*Appendix D*) of the Environmental Impact Statement for the Revised Land and Resource Management Plan (USDA FS 2005d). All but one of the findings for Proposed, Endangered, or Threatened species fell into one of the three following categories: 1) "No Effect", 2) "Not Likely to Adversely Affect" (Discountable), or 3) "Not Likely to Adversely Modify Critical Habitat" (Discountable). A determination of "likely to adversely affect" was made for one species, the American burying beetle, which is not known to occur within approximately 16 miles of the Little Fir Watershed Project Area. Furthermore, there is no Critical Habitat on the Caddo-Womble Ranger District. In light of USFWS concurrence with the "no effect" and "not likely to adversely affect" determinations for all PETS known or likely to occur in the analysis area, no further consultation was invoked for the Little Fir Watershed Project Area EA.

The proposed activities for the Little Fir Watershed Project Area will be in compliance with all requirements and conservation/mitigation measures set forth in the abovementioned Biological Assessment, thereby maintaining USFWS concurrence without the need for additional USFWS formal consultation.

Public Health and Safety

Present Conditions

Refer to the present conditions described in the Air Quality section and the Water Resources & Quality section of this chapter. There is a concern that prescribed burning and the application of herbicides may cause hazards to human health and safety.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
The prescribed burning and the application of herbicides prescribed in Alternative B would not take place under Alternative A. Therefore, there would be no direct effect to public health and safety specific to these activities under Alternative A.

Indirect Effects:
Under the No Action alternative, controlled fuel reductions burns would not take place. This 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 indirect effects to public health and safety in regards to the application of herbicides.

Cumulative effects:
Under the No Action alternative, controlled fuel reductions burns would not take place. This 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 cumulative effects to public health and safety in regards to the application of herbicides.

- Alternative B: Little Fir Watershed Restoration Management Project – Direct, Indirect & Cumulative Effects

Direct Effects:
Refer to the Air Quality section of this chapter for disclosure of direct 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.

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

Herbicide applications were monitored for effectiveness in protecting water quality over a five-year period on the Ouachita NF (Clingenpeel, 1993). The objective was to determine if herbicides are present in water in high enough quantities to pose a threat to human health or aquatic organisms. From 1989 through 1993, 168 sites and 348 water samples were analyzed for the presence of herbicides. Of those samples, 69 had detectable levels of herbicide. No concentrations were detected that would pose a significant threat to human health or aquatic organisms.

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

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

Project specific SERA worksheets (version 4.06) 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 4.06) 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.

Active ingredient imazapic may be used at a rate of 0.10 pounds/acre under this analysis. It will generally be applied as a foliar application to the non-native invasive species. Typical exposures to imazapic do not lead to estimated doses that exceed a level of concern. For workers, no exposure scenarios, acute or chronic, generate a level of concern even at the upper ranges of estimated doses. For members of the general public, the upper limits for hazard quotients are below a level of concern except for the accidental spill of a large amount (> 200 gallons) of imazapic into a very small pond. Immediate consumption of water from this pond would reach a level of concern (SERA 2004a, pgs 3-22 to 3-24.).

Measures are taken to help ensure that these accidental spills do not happen and that the general public does not come in contact with herbicides. For example, by establishing buffer zones of non-treatment around private property, and streams; carefully transporting only enough herbicide for one days 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 preplanning and emergency spill plans in place.

Project specific SERA worksheets (version 4.06) 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.

Project specific SERA worksheets (version 4.06) were also completed for triclopyr-ester formulation at the maximum prescribed rate of 0.76 pounds per acre. The lower application volume is 5 gallons per acre, central application volume is 21 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: accidental/incidental exposure of workers to contaminated gloves for 1 hour, 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-ester 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.

- Alternative C: No Herbicide Use - Direct, Indirect & Cumulative Effects

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.

Scenic Resources

Present Conditions

Scenic Integrity Objectives (SIOs) are desired levels of excellence based on physical and sociological characteristics of an area. They refer to the degree of acceptable alterations to the landscape character. SIOs range from very high to low. The SIOs occurring within the Project Area are high, moderate and low. No areas were found to be very high. Approximately 804 acres of timber harvest activities are proposed within high SIO areas: 364 acres of commercial thinning harvests, 177 acres of forest health restoration, 156 acres of wildlife stand improvements, 45 acres of shelter wood and 62 acres of seed tree. Prescribed burning activities are also proposed within high SIO areas and those areas were analyzed in the Little Fir Prescribed Burn EA completed in 2010. SIOs are defined as follows:

High: Human activities are not visually evident to the casual observer. Activities may only repeat attributes of form, line, color, and texture found in the existing landscape character.

Moderate: Landscapes appear slightly altered. Noticeable human-created deviations must remain visually subordinate to the landscape character being viewed.

Low: Landscapes appear moderately altered. Human-created deviations begin to dominate the valued landscape character being viewed but borrow from valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed.

The Region 8 scenery treatment guide provides recommended techniques to achieve Scenic Integrity Objectives and Landscape Character. Consultation with the Ouachita Forest Landscape Architect was performed for this project.

Open roads MG56, MG308, MG 194, AR188A, W31H, W23C (Seasonal), portions of W31G and closed roads W23B and W31G fall within high scenic integrity objectives. With the completion of this EA, W31H is proposed to be decommissioned and all of W31G is to be closed. Where commercial timber operations fall adjacent to Highway 188 and MG56 the following treatments will be implemented.

- Trees should be selectively removed to improve scenery within high use areas. Stems should be cut to within 6 inches of the ground within the immediate foreground (within 100 ft) where practicable.

- Slash should be treated to within an average of 2 feet to the ground when visible within 100 feet on either side of roads.

- During temporary road construction or permanent road construction/reconstruction within these stands, slash and root wads should be eliminated or removed from view in the immediate foreground (within 150 ft) to the extent possible.

- Flowering and other visually attractive trees and understory shrubs are favored when leaving vegetation.
- Root wads and other unnecessary debris should be removed or placed out of sight within 150 feet of key viewing areas.

- Leave tree marking or unit boundary is applied so as not to be visible within 100 feet of open roads.

- Log landings, roads, and bladed skid trails should be located out of view, when possible, to avoid bare mineral soil being seen from open roads.

- Utility rights-of-ways are located and maintained to conform with natural-appearing patterns of vegetation to the extent possible.

- The visual impact of roads and constructed firelines should be blended so they remain subordinate to the existing landscape character in size, form, line, color, and texture.

- Openings should be organically shaped. Edges should be shaped and/or feathered where appropriate to avoid a shadowing effect in the cut unit.

- Cut and fill slopes are revegetated to the extent possible.

- All harvest areas within a high SIO will be cut to an irregular shape and following the landscape/contours.

There is a concern that prescribed burning, timber harvest, and site preparation activities may compromise the scenic integrity of the Project Area.

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
By not implementing the proposed activities, this Alternative would not alter scenic integrity.

Indirect effects:
Scenic integrity may be compromised by not implementing harvest activities in this area. Densely stocked stands result in reduced vigor or health, which cause susceptibility to insects and disease. Infestations could result in tree death, negatively impacting visual quality.

In the event of a wildfire, crown fires, or those that sweep through the canopy, there would be a visible change to the landscape. Snags would appear as black, brown, and gray "skeletons". Other trees would show burn scars. Burn scars on tree trunks or "torched trees" remain visible for a long time. Understory vegetation would quickly green up, however the standing burned vegetation would remain.

Cumulative effects:
No cumulative effects are expected from implementation of this alternative. The changes in the landscape would continue to appear natural to the observer.

- Alternative B: Little Fir Watershed Restoration Management Project – Direct, Indirect, and Cumulative Effects

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

Proposed site preparation would result in a loss of midstory and understory vegetative screening, and produce slash on the forest floor. Because these activities target hardwoods, a loss of spring and fall colors would be evident. Although the application of herbicides may coincide with the seasonal browning of leaves in autumn, standing dead vegetation may be evident for two or three years after application. Changes in color and texture would result from exposed soil in roads, skid trails, and firelines. Prescribed fires that burn along the ground tends to create short-term color changes. Prescribed burning would temporarily reduce the amount of understory vegetation, allowing for greater viewing depth into the forest. Burning would create a charred appearance on tree trunks and the forest floor. These effects would diminish in three to six months due to regrowth of vegetation on the forest floor, as well as natural leaf shedding. The landscape would regenerate within 1 to 2 years following the disturbance, allowing greening-up and limiting far distant views into the landscape. Changes in color and texture would also result from exposed soil in temporary roads and skid trails. During active logging operations, harvest equipment and log truck activity would be noticeable.

Indirect effects:
An indirect effect of timber harvest activity would be enhanced viewing depth and contrasting tree density. Harvest treatment would also result in a direct effect of logging or thinning residue (slash) such as treetops and branches accumulating on the ground. Slash would eventually decay resulting in reduced long-term effect to scenery

Cumulative effects:
No cumulative effects would result from Alternative B. Scenic Integrity Objectives would be met.

- Alternative C: No Herbicide Use– Direct, Indirect, and Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above with the exception of the effects of herbicide application.

Climate Change

Effects of proposed actions on climate change

Forests play a major role in the global carbon cycle by storing carbon in live plant biomass (approximately 50% of dry plant biomass is carbon), in dead plant material and in soils. Forests contain three-fourths of all plant biomass on earth, and nearly half of all soil carbon. The amount stored represents the balance between absorbing 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 and Harmon, 2006).

Through the process of photosynthesis, carbon is removed from the atmospheric pool. About half the carbon absorbed through photosynthesis is later released by plants through respiration as they use their own energy to grow. The rest is either stored in the plant, transferred to the soil where it may persist for a very long time in the form of organic matter, or transported through the food chain to support other forms of terrestrial life. When plants die and decompose, or when biomass or its ancient remains in the form of fossil fuels are burned, the original captured and stored carbon is released back to the atmosphere as 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, et al.).

- Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No management activities would occur under Alternative A, therefore no direct effects on greenhouse gases (GHG) emissions and carbon cycling would occur.

Indirect Effects:
Because no management activities would take place under this alternative, 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, et al.). 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.

- Alternative B: Little Fir Watershed Restoration Management Project – Direct, Indirect, and Cumulative Effects

Direct Effects:
The proposed harvest operations would result in a release of carbon and reduce carbon storage in the forest both by removing organic matter (trees) and by increasing heterotrophic soil respiration. However, much of the carbon that is removed is offset by storage in forest products. Forest management that includes harvesting provides increased climate change mitigation benefits over time because wood-decay CO_2 emissions from wood products are delayed (Malmsheimer, Heffernan, Brink, et al.). 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 a 3 to 7 year cycle would reduce fuel loading and could be expected to reduce fire intensity and severity as well.

Indirect Effects:
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.

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

- Alternative C: No Herbicide Use– Direct, Indirect, and Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Effects of Climate Change on the Proposed Project

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

Recreation Resources

Present Conditions

Possible mixes or combinations of activities, settings, and probable experience opportunities are arranged along a spectrum, or continuum. This continuum is called the Recreation Opportunity Spectrum (ROS) and is divided into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs. The following ROS classes are present in the Little Fir project.

Roaded Natural: Predominately natural environment with evidence of moderate permanent alternate resources and resource utilization. Evidence of the sights and sounds of man is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from sights and sounds of man.

Semi-Primitive Motorized: Predominantly unmodified natural environment in a location that provides good to moderate isolation from sights and sounds of man except for activities/travel routes sufficient to support motorized recreational travel opportunities which present at least moderate challenge, risk and a high degree of skill testing.

The primary recreational activities occurring within the Project Area, camping at developed campsites (Army Corps of Engineers), lake fishing, hunting (deer, turkey, squirrel), hiking along the Womble trail and driving for pleasure. Associated with hunting is hiking along old roads. Currently there are special uses permits for the Deborah G. Dunston Senior Retreat Center and power line access in the Project Area.

Alternative A: Deferred Harvest (No Action) - Direct, Indirect & Cumulative Effects

Direct Effects:
No management activities would occur under Alternative A, therefore no direct effects on recreation resources would occur.

Indirect Effects:
No management activities would occur under Alternative A, therefore no indirect effects on recreation resources would occur.

Cumulative Effects:
No management activities would occur under Alternative A, therefore no cumulative effects on recreation resources would occur.

- Alternative B: Little Fir Watershed Restoration Management Project – Direct, Indirect, and Cumulative Effects

Direct Effects:
Immediate or direct effects to the recreation resource would include a disturbance in the recreation experience by the sights, sounds, and smells of management activities such as logging operations and prescribed burning.

There are approximately 92 acres of modified seed tree regeneration harvests, 133 acres of shelter wood regeneration harvests, 549 acres of commercial thinning, 288 acres of forest health restoration thinning, 225 acres of site preparation with herbicides, 7 miles of fireline maintenance, 5 miles of system road reconstruction, 7 miles of temporary road construction, 1 mile of pre-haul maintenance, 3.03 miles of road closures, 4 road barriers, 6 wildlife ponds to be maintained, 6.35 acres of wildlife opening maintenance, and 162 acres of wildlife stand improvement (commercial). Noise from logging and road construction, as well as increased dust, would be a temporary disturbance while management activities are being performed. All road construction and reconstruction segments within this management area would be closed following completion of management activities. Results from the harvest and thinning operations would result in increased wildlife viewing and recreational opportunities.

Indirect Effects:
Within Management Area 16 Lands Surrounding Lake Ouachita regeneration treatments would show the greatest evidence of human disturbance. Activities associated with these regeneration harvests such as site preparation and release could increase the probability of visitors experiencing the sights and sounds of humans and temporarily detract from the overall tranquility of the area.

Cumulative Effects:
Management activities within Management Area 16 Lands Surrounding Lake Ouachita could detract somewhat from the natural appearance of the landscape and detract from a visitors feeling of isolation from the sights and sounds of humans.

- Alternative C: No Herbicide Use– Direct, Indirect, and Cumulative Effects

The effects of Alternative C would be the same as those listed under Alternative B above.

Chapter 4

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Chapter 5

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Chapter 6

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Appendices

(A) List of Harvest Activities by Compartment and Stand
(B) List of All Other Activities by Compartment and Stand
(C) MVUM chart
(D) Biological Evaluation
(E) Project Maps
- **Project Location/Boundary**
- **Management Areas**
- **Watershed**
- **Wildlife**
- **Harvest Activities (silviculture)**
- **MVUM (current and proposed)**