United States
Department
of
Agriculture

Forest
Service

August 2014

Final

Environmental Assessment

Three Knob Project

Pope and Johnson Counties, Arkansas

Ozark-St. Francis National Forests
Big Piney Ranger District

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Chapter I

Purpose and Need for Action

This chapter describes the proposed action, the purpose and need for action and the project area. This chapter also references direction from the Forest Plan and includes decisions to be made, other issues, concerns and opportunities.

A. The Proposed Action (PA)

The Ozark-St. Francis National Forests (OSFNFs), Big Piney Ranger District, are proposing the following management activities in the Three Knob area of the district.

The specific proposed activities include the following:
Improvements to vegetation and wildlife habitat;

- Pine seed tree regeneration harvest on 1,504 acres
- Pine shelterwood regeneration harvest on 385 acres
- Pine seed tree preparation harvest on 692 acres
- Pine seed tree removal harvest on 82 acres
- Pine thinning on 2,220 acres
- Pine seedling release and pre-commercial thinning on 78 acres
- Hardwood shelterwood harvest on 863 acres
- Hardwood commercial thinning on 1,483 acres
- Timber stand improvement (TSI) manual thinning on 2,161 acres
- TSI thinning with herbicide on 395 acres
- Thinning of Eastern red cedar on 47 acres
- Commercial salvage on up to 500 acres
- Management of wildlife openings by new construction and reconstruction 75 acres
- Woodland treatment of not more than 10 acres around each opening (this would include herbicide treatments)
- Drop and reforest10.5 acres of existing openings
- Glade restoration on 6 acres
- Non-Native Invasive Species (NNIS) control throughout the project area (up to 500 acres annually)
- Construction/reconstruction of 37 wildlife ponds. Pond dam reconstruction/maintenance on 34 existing wildlife ponds
- Native cane restoration on 31 acres
- Placement of large woody debris in streams
- Prescribed burning as needed on 1,771 acres
- Commercial surface rock collection within some timber sale units

Improvement of road access and recreational opportunities;

- Reconstruction of 1 mile of road

- Maintenance of 132 miles of existing roads
- Rehabilitation and closure of 57 miles of existing closed roads
- Decommission 7.5 miles of existing roads
- Closure of 4 miles of existing roads
- Temporary Roads 20 miles
- Close and convert 3 miles of FS # 1800A to an OHV trail
- Remove 6 miles of roads from OHV designated routes list
- Protect/restoration of Heritage site

Included in this proposal are associated activities such as clearing slash and debris, brush hogging, and planting of various grasses and forbs. Firewood collection would also be allowed.

B. Location of Project Area

The Three Knob Project area contains portions of the following townships, and ranges and sections:
Township 11 North, Range 21 West, Sections – 10, 11, 13-16, 21-28, and 33-36
Township 10 North, Range 21 West, Sections – 1, 2, and 12
Township 11 North, Range 20 West, Sections – 19, 30-32
Township 10 North, Range 20 West, Sections – 3, 4, 6-10, 14-17, 19-28, and 36
Township 10 North, Range 19 West, Sections – 30 and 31

Figure 1: Vicinity Map of Project Area

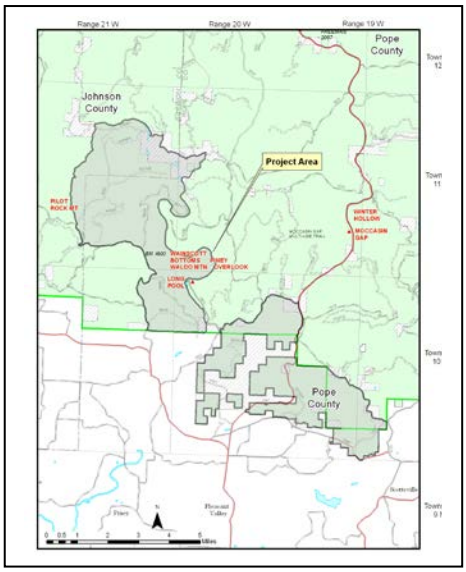


Figure 2: Project Area

The Three Knob project area is located in western Pope and eastern Johnson counties. It is approximately eight miles north of the town of Dover. Portions of the project are on both sides of State Highway 7 between the Broomfield and Granny's Gap roads and include the Three Knob Mountain. The rest of the project area is west of Big Piney Creek from the National Forest proclamation boundary on the south up to Phillips Ford (point where FS Road # 1802 crosses Big Piney Creek). The west boundary is the Pilot Rock Road (FS Road # 1800) from the south

until it intersects with FS Road # 1802, from that point the west boundary is Trace creek (a tributary which enters Big Piney Creek just upstream from Phillips Ford).

C. Purpose and Need

The primary developmental forces for this project are as follows:
The actions proposed for this project attempt to address the following current conditions within the project area:

- The area is currently comprised of aging overstocked stands with too many trees for optimum growth which has created an unhealthy overall condition. Timber management (thinning, shelterwood, and seed tree) will attempt to address these conditions. Road management would be needed to facilitate timber management.
- Begin restoration of loblolly pine forest types back to native forest types on lands acquired by the National Forest. A portion of the project area includes lands that were previously owned by timber companies. The majority of these areas have been converted to loblolly pine forest types. While loblolly pine will grow and thrive in this area, it is out if its historic native range. A portion of the proposed management activities focus on removing the loblolly and restoring the overstory back to native forest types as stated in the RLRMP.
- Currently there are remnants of past woodlands on dry and xeric sites throughout the project area. Without disturbance these areas continue to shrink in size. Proposal of restoration of some woodlands and glades along with prescribe fire on a periodic basis would attempt to meet the desired future condition as stated in the RLRMP for a portion of this area. Some control (dozer) line construction would be needed to accomplish prescribed burning activities.
- Wildlife openings play an important role in fulfilling the need of permanent early seral habitat. The existing openings in the project area are small and many have woody species growing in them from a lack of maintenance. By expanding some of the existing openings, creating additional ones and dropping the openings which are in places that make them not efficient to maintain the area would have more permanent early seral habitat.
- The Three Knob Project area has a lack of water sources along the ridge tops. Activities for pond construction/reconstruction included in this proposal would attempt to address this shortage.
- Inventories and observations have revealed damage to some forest roads (designated routes) from OHV use due to the unsustainable location of those roads. A portion of the Proposed Action will attempt to address this problem.
- Stream surveys have indicated remnants of native cane along stream banks and a lack of large woody debris within streams. Proposed cane restoration and placement of large woody debris in streams would attempt to address these conditions.
- Biological inventories have identified numerous Non-Native Invasive Species (NNIS) throughout the project area. Some actions proposed are needed to reduce the spread and/or eradicate NNIS species. Without these treatments NNIS would continue to spread and replace native species.

- The Big Piney Ranger District regularly receives requests to collect rock from commercial rock collectors. Rock collection is proposed to address this need.

1.) Management Areas:
Contrasts between current and desired conditions illustrate the need for the proposed management activities. The Revised Land and Management Plan (RLRMP or Forest Plan) for the Ozark- St. Francis National Forests describes Desired Conditions for the Management Areas (MAs) and the ecological systems that occur within these MAs. The following describes the desired conditions of the Management Areas within this project area:

MA 3E High Quality Forest Products- Approximately 56% of the project area. These lands support a balanced age class distribution of forest stands containing native tree species capable of sustained, high-value timber production. Tree growth rates and vigor are high. Incidence of insect and disease outbreaks is low. In this MA on areas with site index above 50 areas recommended to be thinned have a target basal area of 80 square feet.

The landscape character is naturally appearing with mixtures of hardwood, mixed hardwood/pine and pine/hardwood, and pine forest communities. Management activities may be visually evident in portions of these areas. Evidence of management activity may include active timber harvest operations, tree stumps, temporary roads, skid trails, and log landings. Layout of timber sale boundaries, retention of individual trees and clumps, and seeding of exposed soil reduce visual impacts.

High quality, well-maintained roads through the MA are designed to facilitate timber removal and protect water quality. Designated roads through the area also provide recreation opportunities for OHV and passenger-vehicle travel. These areas provide a variety of motorized and non-motorized recreation opportunities including hunting, fishing, hiking, bicycling, berry picking, dispersed camping, driving for pleasure, and viewing scenery and wildlife.

MA 3B Oak Woodland –Approximately 8% of the project area. Area is characterized by a mosaic of woodland and forest with oak woodland occupying approximately 60% of dry and xeric sites. Patches of oak woodland are well connected incorporating other fire dependent communities such as glades. Oak woodlands have open canopies (10-60% canopy closure), sparse midstories, and well developed understories dominated by grasses and forbs.

Evidence of fire is common and results in a variety of vegetation conditions across the landscape. The abundance of oak woodlands provides optimal habitat for many indicator and rare species as well as species in demand for hunting such as wild turkey and whitetail deer.

MA 3C Mixed Forest- Approximately 17% of the project area. These lands are managed to ensure the health and sustainability of the pine, pine/hardwood, hardwood/pine, and hardwood forest types across the landscape. Timber will be a by-product of vegetation management aimed at maintaining sustainable ecosystems. This area is suitable for timber production. Thinning, prescribed fire at regular intervals, and regeneration harvests are common silvicultural treatments. Stands are regularly thinned to reduce stress as trees age.

MA 1H Scenic Byway Corridors (Hwy 7) – Approximately 6% of the project area. These areas are characterized by a predominance of mid- and late-successional forests. Forest structure varies according to ecological factors, but largely consists of a mature overstory; a fairly open midstory; and a well-developed herbaceous and shrubby understory. Understory vegetation includes a variety of native deciduous and evergreen flowering trees, shrubs, and wildflowers. Even-aged, two-aged, and uneven-aged forest communities along with medium and small patches of late successional
to old-growth forest communities continue to develop throughout the area. Exceptional opportunities for motorized recreation, especially scenic driving exists in this MA. The views along the different byways vary, and include a variety of landscape characters, ranging from natural appearing to pastoral, historic, and cultural. They provide colorful accents and interesting textures, which change with the seasons. Road corridor improvements and interpretive facilities are evident changes to the natural environment. These man-made alterations fit well with the character of the surrounding landscape. Other management activities are not evident to the average visitor.

Vegetation is influenced both by natural processes and humans. Biological communities are maintained or improved to provide an attractive setting for visitors while providing for the protection of rare communities and threatened, endangered, sensitive, and locally rare species. Forest management activities maintain the natural characteristics that make the area scenic. Commercial timber harvest is appropriate to maintain the long-term goals of a diverse and vigorous forest with sensitivity to dispersed recreation and scenic values. Timber harvesting operations focus on what is retained in the stand, not on wood fiber production. Timber harvest practices are visually subordinate to the surrounding landscape. The MA is suitable for timber production. Prescribed fire and other management treatments are appropriate vegetative management tools available to be used to enhance the byway corridors in conjunction with other resource values.

MA 1C Designated Wild and Scenic Rivers (Big Piney Creek) – Approximately 11% of the project area. This MA is managed to enhance and protect the outstandingly remarkable values and unique qualities of each river and its surroundings. For Big Piney Creek these values are Scenic, Recreational, Geologic, Fish and Wildlife and Botanical. The landscape character is "naturally appearing" or "pastoral" with high scenic integrity. Natural processes (floods, windstorms, and fires) would be the primarily cause of disturbances. Lands are classified as unsuitable for timber production, although management of vegetation is permitted within the river corridor to maintain outstandingly remarkable values. Vegetation management may be used for scenic enhancement or rehabilitation to provide wildlife viewing opportunities; maintain developed recreation facilities; improve threatened, endangered, sensitive, and locally rare species habitat; restore native vegetative communities; restore riparian ecosystems; reduce unnatural fuel buildups; or control non-native invasive vegetation. Visitors enjoy a natural setting but sights and sounds of human activity and motorized vehicles may be present. The special interest areas below are within the boundary of the Big Piney Wild and Scenic River designation.

MA 1G Special Interest Areas (, Wainscott Bottoms and Waldo Mtn.) – Approximately 2% of the project area. SIAs are managed for their unique geological, botanical, biological,

zoological, scenic, or cultural features. The features are unique enough that they are not found on large areas anywhere else on the Forests, or they provide the best representation of similar areas on the Forests. These areas are designated as SIAs because of their unique features, complexity, and degree of interest. They are managed for their unique recreational and educational values, and are intended for public use and interpretation. Each SIA will have a comprehensive management plan completed before capital investments are implemented. These areas are unsuitable for timber production.

MA 3I Riparian Corridors- Less than 1% of the project area. These corridors are managed to retain, restore, and enhance the inherent ecological processes and functions of the components within the corridors. The use of management activities provide diversity and complexity of native vegetation; rehabilitate both natural and human caused disturbances; provide for visitor safety; or accommodate appropriate recreational uses.

2.) Areas of Concern or Special Emphasis identified by Leadership:
Former Forest Service Chief, Dale Bosworth delineated four threats to the health of the National Forest and Grassland system and subsequent Chiefs have emphasized other concerns. Where opportunity exists, this EA will attempt to address these issues within the project area. The identified concerns include:

Fire and Fuels: The natural role of fire has been withheld from the National Forests for many years. Research shows that National Forest System (NFS) areas at high risk from wildland fire and ecological degradation (Class 3) come to 51 million acres, or 26 % of the NFS. Areas at moderate risk (Class 2) amount to 80.5 million acres, or 41%. Areas currently within their historical range (Class 1) come to 65 million acres, or 33%. On the NFS, 73 million acres in Classes 2 and 3 were identified as the highest priority for fuels reduction and ecosystem restoration treatments. Treatments to reduce fuels and restore ecosystems involve various techniques, including thinning, prescribed burning, and clearing forest debris.

Invasive Species: Invasive species are major threats to our Nation's aquatic and terrestrial ecosystems. Invasives destroy fish and wildlife habitats, alter nutrient cycling and natural fire regimes, and can reduce biodiversity and degrade native ecosystem health. Invasive aquatic species pose a significant risk to the 220,000 miles of streams, over 2 million acres of lake, and 15,000 miles of coastline cross the NFS. There are more invasive species per unit of aquatic ecosystems than in terrestrial ecosystems. All invasives combined cost Americans more than $137 billion a year in total economic damages and associated control costs. Infestations of invasive plants have reached epidemic proportions, spreading rapidly over hundreds of millions of acres, across all landscapes and ownerships. Invasive forest diseases, such as chestnut blight, wiped out entire forest species in the East (i.e., the American chestnut) and Dutch elm disease virtually eliminated an urban forest tree- the American Elm. Invasive species have been found distributed throughout the project area. There is a need to conserve the native biological diversity of plant communities, species and populations. It is necessary to prevent the displacement of native species and the disruption of plant communities through the introduction of aggressive, persistent, self-replicating, long lasting non-native vegetation into managed or natural plant communities.

Loss of Open Space: America is losing important working forests and rangelands to development across the Nation at a rate of more than 3 acres a minute. Loss of open space (1) affects our air, water and vegetation, (2) degrades wildlife habitat, and (3) reduces outdoor based economic opportunities. Loss of open space is a result of the division of forested landscapes into smaller, more isolated patches. This is of concern because it poses a threat to the health, sustainability, and viability of ecosystems and rural communities, and impacts biodiversity.

Unmanaged Recreation: The number of OHV users has climbed seven fold in the past 30 years, from approximately 5 million in 1972 to 36 million in 2000. Unmanaged OHV use has resulted in unplanned roads and trails, erosion, watershed and habitat degradation, and impacts to cultural resource sites. Compaction and erosion are the primary effects of OHV use on soils. Riparian areas and dependent species are particularly vulnerable to OHV use. Studies indicate that the survival and reproduction of some wildlife species may be affected by excessive noise and disturbance. Local forest designation of roads, trails, and areas for OHV use provides forest visitors with opportunities to enjoy recreation experiences while protecting natural and cultural resources. Use of OHVs in the national forests is addressed through the forest plans or through separate access and travel management plans. Management of OHV impacts include use of designated roads, trails, and areas for recreation; closure of sensitive areas; user education; enforcement; and use monitoring. Within the project area, there is a need to protect resources by providing better management of OHV roads and trails as well as a need to provide for recreational opportunities.

3.) Other Developmental Forces:

Protection of watersheds was one of the driving forces behind the establishment of the National Forests, and, as human populations increase, both the quality and quantity of water itself become more important. Development that permanently removes forest cover can impact both by increasing sedimentation and/or runoff reducing the groundwater recharge.

Forest products resulting from achieving the desired future conditions within this area contribute to the social and economic well-being of the people living in the surrounding areas, as well as meeting the need for timber products.

This project area was once a fire-dominated ecosystem (Guyette, Spetich, Stambaugh, 2006). Frequent fires limited shade tolerant species from the understory and provided ample forage for many species of wildlife. Past forest management practices have created a situation where shading and buildup of duff or needle layers has reduced or possibly eliminated grasses and forbs. The loss of these grasses and forbs is reducing the number of small mammals, seed eating birds, as well as some species such as deer and wild turkey. In addition, this build-up of duff, needle, debris from recent ice storms, and understory has created a condition that could result in a damaging wildfire situation (Federal Register, vol.66 160, Friday, August 17, 2001). To address these conditions, fire needs to be reintroduced into the ecosystem.

The project area contains many open roads that are currently used to access the area. Some of these roads are used by the public but create an unfavorable situation for wildlife through unnecessary disturbance and added soil loss through erosion. To remedy these problems, some

open roads need to be seasonally or permanently closed. The roads that are closed to motorized traffic are closed with mounds. In areas where OHVs go over these mounds to access the area, gates may be installed. The district has found that the installation of gates tends to reduce the number of violations, and occurrences of the disturbance to soils and wildlife.

RLRMP Objectives that Support the Need of this Project:

The Proposed Action's activities mentioned above if implemented would move the forest closer to the desired forest objectives stated in the RLRMP. Some of those objectives are stated below.

1) Restore and maintain at least 22,000 acres of oak woodland over the first decade, with a long-term objective of 110,000 acres (RLRMP page 2.10)
2) Across all community types, maintain a range of 3.8 to 6.8 [percent of the total forest and woodland acreage in regeneration forest conditions (0-10 years old)]. (RLRMP page 2.10)
3) Across all community types, annually burn an average of 120,000 acres under prescribed burn conditions. Burn approximately one-third of this acreage within the growing season (April 1 through October 15) (RLRMP page 2.11)
4) Reduce the risk of oak and pine mortality events by thinning and regenerating at least 150,000 acres within the first decade (RLRMP page 2.12)
5) Treat at least 200 acres per year for reduction or elimination of non-native, invasive species (RLRMP page 2.12)
6) Improve and maintain bobwhite quail habitat on 5,000 acres per year for the first decade (RLRMP page 2.13)
7) Improve and maintain habitat for whitetail deer on 10,000 acres per year for the first decade (RLRMP page 2.13)
8) Improve and maintain habitat for eastern wild turkey on 10,000 acres per year for the first decade (RLRMP page 2.13)
9) Improve and maintain habitat for black bear on 8,000 acres per year for the first decade (RLRMP page 2.13)
10) Maintain or restore large woody debris (LWD) levels in perennial streams/rivers at 75 to 200 pieces per mile for all LWD larger than 3.3 feet long and 3.9 inches in diameter in the first decade (RLRMP page 2.16)
11) Maintain or restore LWD levels in perennial streams/rivers at 8 to 20 pieces /mile for all LWD larger than 16.4 feet long and 19.7 inches in diameter in the first decade. (RLRMP page 2.16)
12) In conjunction with designing low-maintenance standard roads, develop a system of motorized trails that address the needs of OHV enthusiasts (RLRMP page 2.19).
13) Evaluate historic sites for appropriate management. Develop site management plans for noteworthy heritage resources wherever they occur. (RLRMP page 2.21)
14) Decommission roads and trails unnecessary for conversion to either the road or trail system through the roads analysis process (RAP) (RLRMP page 2.24)
15) Identify by the first decade all system roads that should be obliterated (RLRMP page 2.24)
16) Within 15 years, restore 15 to 20 percent of all ecological communities into Fire Regime Condition Class 1 (RLRMP page 2.26)

17) Annually complete 50,000 to 100,000 acres of hazardous fuel reduction (RLRMP page 2.26)
18) Provide 731 MMBF (146MCF) per decade of saw timber and pulpwood (RLRMP page 2.28)
19) . In MA3E (High Quality Forest Products) on areas with site index above 50 stands recommended to be thinned have a target basal area of 80 square feet.(RLRMP page F-4 & F-5 in tables F-1 & F-2)
20) In MA3E (High Quality Forest Products) and appropriate portions of other MAs, apply appropriate silviculture prescriptions to provide the following forest products: 18" to 20" saw-timber with grade 1 or 2 butt logs and /or yellow pine 18' saw-timber. (RLRMP page 2.28)
21) Treat up to 300 acres per decade to meet the habitat needs of riparian area species groups. (RLRMP page 2.76)

D. Objective of the Proposed Action

The purpose of this project is to move the existing conditions of the project area toward the desired conditions as referenced in the Revised Land Resource Management Plan.

E. Related Documents That Influence the Scope of This Proposed Action

Vegetation management includes the use of fire, manual, chemical, and mechanical treatments of plants in the service of ecosystem management objectives. The Final Environmental Impact Statement (FEIS) for the forests compares and analyzes the impacts of a variety of treatments needed to achieve the desired future conditions identified in the RLRMP (pages 1.18-1.49). This EA tiers to the following documents:

- The Revised Land Resource Management Plan and accompanying Environmental Impact Statement for the Ozark-St. Francis National Forests (2005)
- Biological Evaluation for the Three Knob Project
- Heritage Resource Report for the Three Knob Project (Covered under SECO Phase II HRR)
- Region 8 Scenery Treatment Guide (2008)

The Revised Land and Resource Management Plan identifies Forest Wide Standards (pages 3.1-3.21) and MA Standards (pages 3.22-3.38) that will be applied to all methods of vegetation management. This direction is incorporated into this EA's design criteria (see Appendix E).

F. Issues Eliminated From Further Study

These issues were identified through scoping and are addressed, but are not considered as "issues studied in detail". The following are the reasons for which they were 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 and therefore would not be impacted.

Civil Rights and Minority Groups- The proposed actions would impact minority groups in the same manner as all other groups in society. The proposed actions would not violate the civil rights of consumers or minority groups.

G. Issues Studied in Detail

To help develop the "issues studied in detail" necessary to focus the analysis, the ID Team sought comments from within the agency, the general public, adjacent landowners, other agencies, and Tribal governments (see Appendix C for further details). This process led to the identification and development of "issues studied in detail" to be addressed in the subsequent analysis. The issues studied in detail are:

1.) Herbicide Use

Herbicide use has been identified as an important issue with the public. For this reason herbicide use will be considered as an issue studied in detail. The environmental consequences of herbicide use are disclosed throughout Chapter 3.

H. Other Concerns and Relevant Effects

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- There is a concern that management actions, namely timber harvest, road construction, prescribed burning, wildlife pond construction, and construction of large openings may cause a decrease in water quality in the watershed which the Three Knob Project area occurs. *Source: ID Team*

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 and Public Responses*

Recreation- There is a concern that timber harvest, road construction, site preparation, opening construction, and prescribed burning may degrade the recreational experience of forest visitors within the project area. *Source: ID Team*

Visual Resources- There is a concern that timber harvest, road construction, site preparation, construction of openings, and prescribed burning may compromise the scenic integrity of the project area. *Source: ID Team*

Vegetation- 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. Several non-native invasive species (NNIS) are present throughout the project area. *Source: ID Team*

Heritage Resources- There is a concern that management actions could impact both historic and prehistoric sites through project implementation and by exposing workers or forest visitors to areas containing sensitive cultural sites. *Source: ID Team and Public Responses*

Wildlife and Fisheries- There is a concern that management actions such as timber harvest, road construction, and prescribed burning may cause unacceptable impacts to wildlife and fisheries populations or habitats. *Source: ID Team and Public Responses*

Threatened, Endangered, and Sensitive (TES) Species and Habitats- There is a concern that management actions such as timber harvest, road construction, and prescribed burning may impact populations of TES or their habitats. *Source: ID Team*

Climate Change- There is a concern that management actions such as prescribed burning and timber harvest may cause or contribute to greenhouse gas (GHG) emissions and contribute to increased climate change. There is also a concern about the effects of climate change on the Three Knob Project. *Source: ID Team*

Human Health Factors- 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 and Public Responses*

I. Decision to Be Made

The District Ranger will select one of the following and determine if the selection would or would not significantly affect the quality of the human environment.

1. Select management action described in the Proposed Action (PA).
2. Decide not to implement any action by selecting Alternative 1 (the No Action Alternative).
3. Select management actions described in Alternative 2 (the No Herbicide Alternative).
4. Select management actions described in the PA with some modifications or an alternative with some modifications

J. Noted Changes Between the Draft and Final EA

Listed below are specific changes which were made between the Draft and Final EA. Some of the changes were where numbers were transposed, words were misspelled or grammar was incorrect. Other changes were made to improve the understanding of the analysis of potential effects. They are as follows;

- In Chapter 2 under “H” the site specific design criteria has been included
- Updated the reference section. Appendix B
- Comments received and agency responses to those comments have been attached as Appendix F.

There were no changes to the alternatives nor were any of the findings of the analyses changed; therefore, there is no need to undergo a new public comment period.

Chapter II

Alternatives Including the Proposed Action

The Big Piney Ranger District Interdisciplinary Team (IDT) initiated internal scoping for the Three Knob Project on February 2013. A project notification letter was mailed out in August 2013. Scoping letters (328) requesting comments on the proposal were mailed to tribes, agencies, groups, or individuals. The legal notice was posted in Russellville's, *The Courier,* on August16th, 2013. The project was also published in the Ozark- St. Francis National Forests Schedule of Proposed Actions and on the Forests planning website.

A. Process Used to Develop the Alternatives

The IDT represents the range of resources across the Forests, such as recreation, timber, wildlife, soils, and water. The IDT considered the following elements when they developed the alternatives for this analysis:

- The goals, objectives, and desired future conditions for the project area as outlined in the Revised Land and Resource Management Plan (RLRMP) for the Ozark–St. Francis National Forests.
- Comments received from the public, State and other agencies during the scoping process.
- The laws, regulations, and policies that govern land management on national forests.

B. Alternatives Considered

A "No Action" Alternative (Alternative 1) and a "No Herbicide Use" Alternative (Alternative 2) were developed in this environmental analysis. Each action alternative was designed to be consistent with RLRMP direction and respond to "Key" issues:

The Proposed Action (PA)

The following descriptions and tables display the proposed activities and treatments in detail.

Improvements to Vegetation and Wildlife Habitat

Pine Seed Tree Regeneration Harvest on 1,504 Acres

The seed tree timber harvesting method is designed to regenerate aging pine stands, create early seral stage habitat, balance age classes, improve forest health, and encourage a mixed pine and hardwood community. Approximately 10-20 square feet of residual pine and hardwood basal area (10-15 trees per acre) per acre are retained in the overstory after harvesting is complete. Following pine regeneration harvests, competing vegetation would be reduced to create an adequate seedbed for regeneration using an herbicide application (see table 10). Some areas would be regenerated naturally by the seed trees left on the area. Within these areas, if an

adequate amount of pine regeneration (300-500 trees per acre) is not established within 5 years of harvest, the area would then be replanted with pine seedlings to meet target stocking levels.

The percentage of proposed Seed Tree (regeneration) acres for this project may appear measurably higher because the project area includes 5,228 acres acquired by the National Forest which was being managed primarily for timber production by a timber company. The majority of the acquired lands have been converted to Loblolly Pine. While loblolly pine will grow and thrive in this area, it is out if its historic native range. RLRMP page 1-30 states for Loblolly Pine under desired condition; "once mature, they are harvested for wood products and restored to native forest communities appropriate to site conditions. As a result, abundance of this community decreases over time". For that reason 443 acres (30%) of the total 1,504 acres proposed to have a Seed Tree Harvest are Loblolly Pine that is mature enough to start transitioning those stands back to native forest community types.

Regeneration areas outside burning areas are not suitable for natural regeneration efforts because of the absence of periodic prescribed burning to control brush and other competing vegetation. These areas would be planted with shortleaf pine seedlings following site preparation activities to a stocking level of approximately 680 trees per acre. Herbicide release of established regeneration (young trees) is also included in this action (see herbicide use table). Residual seed trees may be removed once adequate regeneration has been established. These areas may be utilized for public firewood sale.

Table 1: Pine Seed Tree Table

Area #	Acres		Area #	Acres		Area #	Acres		Area #	Acres
31	37		**84**	78		**125**	31		**154**	49
60	47		**87**	46		**134**	32		**156**	25
71	49		**89**	74		**136**	39		**158**	23
73	73		**90**	52		**137**	28		**160**	39
***75**	90		**93**	70		***139**	85		**161**	43
77	30		**105**	47		**143**	44			
78	74		**120**	76		**147**	46			
80	49		**122**	46		***149**	82			

***Note: Areas 75,139 &149 exceed the maximum acreage limit for a regeneration cut of 80 acres. Final harvested acres will not exceed 80 acres per area.**

Pine Shelterwood Regeneration Harvest on 385 Acres

The shelterwood timber harvesting method is designed to regenerate aging pine stands, create early seral stage habitat, and encourage a mixed pine and hardwood community. Approximately 20-35 square feet of residual pine and hardwood basal area per acre are retained in the overstory after harvesting is complete. These areas have a higher hardwood component (more hardwood tress) per acre than the seed tree areas and need the additional residual basal area to help retard the development of hardwood competition by reducing sunlight. This will allow for better establishment of planted short leaf pine and promote a mixed (both pine and hardwood) stand

after harvest. Following pine regeneration harvests, competing vegetation would be reduced to create an adequate seedbed for regeneration using an herbicide. Areas would be planted with shortleaf pine seedlings following site preparation activities to a stocking level of approximately 680 trees per acre (see table 10). Herbicide release of established regeneration (young trees) is also included in this action. Residual seed trees may be removed once adequate regeneration has been established. These areas may be utilized for public firewood sale.

Table 2: Pine Shelterwood Table

Area #	Acres		Area #	Acres
24	80		**96**	36
34	22		**115**	82
43	67		**144**	40
47	32		**148**	26

Pine Seed tree Preparation Thinning on 692 acres

This is not a regeneration type of harvest, this method is similar to a pine thinning, but the average age of the trees are older than 60 years. The seed tree preparation harvest is designed to prepare a fully mature stand of trees for regenerating in 15-20 years by opening up the canopy in an attempt to encourage development of advanced regeneration. An herbicide application in the form of foliar spray, stem injection, basal spray and/or chainsaw fell and cut surface spray may also be used to aid in controlling understory species and promoting the establishment, development, and growth of advanced regeneration.

Table 3: Pine Seed tree Preparation Thinning Table

Area #	Acres		Area #	Acres		Area #	Acres		Area #	Acres
72	164		**88**	163		**104**	63		**145**	62
74	77		**92**	18		**112**	40			
83	47		**103**	33		**141**	25			

Pine Thinning on 2,220 Acres

These areas would be commercially thinned to an average residual basal area of 80 square feet per acre based on the average stand diameter in order to improve the growth and health of the stands and the development of higher quality trees. Currently, these areas are overstocked (too many trees per acre) reducing health and vigor and creating susceptibility to catastrophic fire, insects and disease. Trees selected for removal (harvest) would be those that were damaged, diseased, suppressed, and poorly formed. Spacing of remaining trees would then serve as the determinant for removal. Applying this treatment would leave a healthier and more vigorous stand of trees that are more resistant to natural disturbances such as wildfire and insect/disease outbreaks.

Table 4: Pine Thinning Table

Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres
5	79		**46**	55		**61**	11		**79**	52		**106**	88
9	84		**48**	24		**64**	61		**82**	31			

Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres
12	99		**51**	187		**65**	17		**85**	35			
19	54		**53**	57		**66**	289		**86**	69			
27	45		**58**	23		**69**	49		**94**	80			
44	44		**59**	37		**70**	28		**98**	81			

Hardwood Shelterwood Harvest 863 Acres

The shelterwood timber harvesting method is designed to regenerate aging hardwood stands, create early serial stage habitat, balance age classes, and encourage a mixed hardwood and pine community. This harvesting method would remove trees from selected stands in order to create an environment for the development and growth of advanced regeneration. Approximately 20-40 square feet of hardwood basal area per acre (15-30 trees per acre) are retained in the overstory after harvesting is complete. This harvesting method would be used in hardwood species followed by manual or herbicide site preparation (see table 10), prescribed burning, planting (if natural regeneration doesn't develop), and herbicide release (see table 10) of established regeneration (young trees). The minimum stocking level for hardwood species is 250 trees per acre following harvest operations. Residual shelterwood trees may be removed once adequate regeneration has been established. These areas may be utilized for public firewood sale.

Table 5: Hardwood Shelterwood Table

Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres
***3**	46		***11**	44		***18**	43		***39**	44		***54**	53
4	21		**14**	24		***29**	44		***40**	46		***56**	47
6	47		***15**	44		**35**	33		***42**	44		**63**	40
***8**	49		***17**	46		**36**	38		***50**	46		**68**	34
10	30												

***Note: Area numbers with asterisks exceed the maximum acreage limit for a regeneration cut of 40 acres. Final harvested acres will not exceed 40 acres per area.**

Hardwood Commercial Thinning on 1,483 Acres

These areas would be commercially thinned to a residual basal area of 60-80 square feet or basal area per acre based on the average stand diameter in order to improve the growth and health of the stands and the development of higher quality trees. Currently, these areas are overstocked (too many trees per acre) reducing health and vigor and creating susceptibility to catastrophic fire, insects and disease. Trees selected for removal (harvest) would be those that were damaged, diseased, suppressed, and poorly formed. Spacing and species of remaining trees would then serve as the determinant for removal. Applying this treatment would leave a healthier and more vigorous stand of trees that are more resistant to natural disturbances such as wildfire and insect/disease outbreaks. These areas may be utilized for public firewood sale.

Table 6: Hardwood Commercial Thinning Table

Area #	Acres		Area #	Acres		Area #	Acres
1	56		**33**	279		**62**	132
2	163		**38**	19		**67**	81
13	47		**45**	75		**107**	63

Area #	Acres		Area #	Acres		Area #	Acres
16	65		**49**	234		**110**	31
23	51		**52**	142			
30	32		**57**	13			

Timber Stand Improvement (TSI) Thinning on 2,161 Acres
These areas consist of trees that are approximately 30-70 years old that are crowded (too many trees per acre) reducing tree health and vigor. Selected trees would be released (freed) from overtopping/competing vegetation using hand tools (chainsaws or brush saws). Trees selected to be cut would be those that were damaged, diseased, suppressed, and poorly formed. Spacing and species of remaining trees would then serve as the determinant for removal. Applying this treatment would leave a healthier and more vigorous stand of trees. These areas may be utilized for public firewood sale.

Table 7: Timber Stand Improvement (TSI) Thinning Table

Area #	Acres		Area #	Acres		Area #	Acres		Area #	Acres
7	61		**97**	134		**126**	11		**153**	20
20	22		**99**	125		**128**	375		**155**	47
22	8		**100**	138		**129**	237		**157**	38
25	38		**101**	93		**133**	86		**159**	181
28	28		**113**	47		**135**	79			
76	44		**114**	55		**142**	21			
91	57		**117**	170		**151**	46			

Timber Stand Improvement (TSI) Thinning with Herbicides on 395 Acres
These areas consist of trees that are approximately 30-70 years old that are crowded (too many trees per acre) reducing tree health and vigor. Selected trees would be released (freed) from overtopping/competing vegetation using hand tools (chainsaws or brush saws) or a herbicide application in the form of foliar spray, stem injection, basal spray, and/or chainsaw fell and cut surface spray. Trees selected to be cut/treated would be those that were damaged, diseased, suppressed, and poorly formed. Spacing of remaining trees would then serve as the determinant for removal. Applying this treatment would leave a healthier and more vigorous stand of trees. These areas may be utilized for public firewood sale.

Table 8: Timber Stand Improvement (TSI) Thinning with Herbicides Table

Area#	Acres		Area#	Acres		Area#	Acres
26	43		**41**	52		**124**	36
32	57		**55**	20		**131**	26
37	61		**123**	71		**162**	29

Pine Seed Tree Removal Harvest on 85 Acres
Area number 81 (35 acres) and 102 (50 acres) were harvested in the past leaving approximately 20 square feet of residual pine and hardwood basal area (10 – 15 trees) per acre in the overstory after harvesting. Following the original harvest these areas were planted with shortleaf pine seedlings following site preparation activities and have reached a stocking level of approximately 680 trees per acre. Because these areas are stocked the pine seedtree removal harvest method will

remove (harvest) the 20 square feet of residual pine and hardwood basal area (10 – 15 trees) per acre left after the regeneration harvest. A release (thinning) of young seedlings from overtop/competing vegetation using hand tools (chainsaws or brush saws) or an herbicide application would also be a part of this action (see herbicide use table page II-12). This will increase the growth and development of the young seedlings. Following the release treatment, 3-7 years, a pre-commercial thinning treatment would be done using the same methods as outlined above.

Seedling Release and Pre-Commercial Thinning on 78 Acres
Area #108 (35 acres) and 111 (43 acres) were harvested in the past and have established seedlings (young trees) that are crowded (too many trees per acre) reducing tree health and vigor. Selected seedlings would be released (freed) from overtopping/competing vegetation using hand tools (chainsaws or brush saws) or a herbicide application in the form of foliar spray, stem injection, basal spray, and/or chainsaw fell and cut surface spray. Following the release treatment, 3-7 years, a pre-commercial thinning treatment would be done using the same methods as outlined above.

Thinning of Eastern Red Cedar on 47 acres
Area 21 (47 acres) would be thinned commercially or manually (chainsaw) to a residual basal area of 10-50 square feet per acre based on the average stand diameter. Thinning would promote the growth and development of forbs and grasses on these less productive sites.

Commercial Salvage of Timber on up to 500 Acres
The project area has had numerous events occur in the past which damaged or destroyed timber resources. Trees would be salvaged only in the event of a disaster such as a tornado or strong wind event. This would expedite making utilization of damaged timber resources and reforestation efforts. If it has been determined the work could be performed safely, proposed salvage areas would be revisited by Heritage staff to ensure historical properties (if present) would be protected from adverse effects of activities.

Management of Wildlife Openings for High Quality Forage by a Combination of Constructing New Openings, Enlarging Existing Openings, and Management and Reconstruction of Existing Openings, for a Total of 75 acres. (Some existing opening acres (10.5) would be dropped.)
New construction and enlargement of openings (15 total) are proposed in areas where the slope of the land would allow the creation and management of wildlife openings. New construction of openings could include short sections of roads for access as part of this proposal. Opening size would not exceed five acres. All trees would be removed (harvested) and the area prepared for planting by using a dozer or other mechanical equipment to clear the debris from harvested trees and remove the stumps. The area would be further prepared for planting of warm and/or cool season native and non-invasive non-native species that provide good forage and cover for wildlife by mechanical equipment. Management of these openings would be accomplished by mowing, haying, liming, seeding, fertilizing, prescribed burning, and/or the use of herbicides to control invasive, woody or encroaching species of vegetation. Management of existing openings would be in the same manner as outlined above. Openings proposed to be dropped would have existing vegetation removed using herbicides and then planted in native trees, forbs, and grass species, or they may be allowed to regenerate naturally if free of non-native invasives and they show signs of regeneration potential and success. Opening reconstruction would involve

removing tree and brush islands from within the clearings and put it into the same management as the openings. One opening would involve re-contouring along with the other maintenance activities.

Woodland Management of up to 10 Acres Around Each 5-Acre Wildlife Opening (total of 150 acres)

Within the project area there would be a total of 150 acres (up to 10 acres around each proposed 5-acre wildlife opening) of woodland which would be thinned commercially, manually (chainsaw) and with herbicide to permit sunlight to reach the forest floor to promote the development of native grasses and forbs. The goal is to have mature open woodland dominated by native grasses and forbs in the understory. Thinning would reduce tree cover to 40-60 feet of basal area per acre, based on site specific conditions. In order to reach the desired condition, herbicides would be used to control woody species in these areas. This would be done manually (chainsaws or brush saws only) or by a basal spray, stem injection, or cut surface herbicide treatment on brush more than 6 feet in height and using herbicide foliar spray treatment on brush less than 6 feet to control competition. In conjunction with prescribed burning, treatments would increase grasses, forbs and overall habitat diversity.

Glade Restoration on 6 Acres

One glade has been identified within this project area which needs to be restored due to encroachment by Eastern red cedar and other hardwood species. The tree cover would be reduced to less than 40 feet of basal area per acre and an herbicide treatment could be used to control re-sprouting of primarily woody species.

Construction of 37 Wildlife Ponds

The construction of wildlife ponds (< ½ acres) would be implemented in order to improve wildlife habitat in the vicinity. These ponds provide permanent water sources to allow for a more even dispersal of wildlife throughout the project area. Pond locations would be identified during implementation when test pits can be dug to determine suitable sites.

Pond Dam Reconstruction/Maintenance of 34 Existing Wildlife Ponds

The project area currently has 34 (<1/2 acres) wildlife ponds distributed across it. Inspections have discovered that a portion of these ponds need to have the dam reconstructed and this would be accomplished through the use of heavy equipment. The reconstructed dams would be seeded and fertilized to establish herbaceous vegetation on them. Other ponds have woody vegetation growing on and around the dams that need to be controlled so the integrity of the pond dams would not be compromised. This vegetation could be removed manually or by using a herbicide application in the form of foliar spray, stem injection, basal spray and/or chainsaw fell and cut surface spray.

Native Cane Restoration on 31 Acres

Areas of native cane were once more prevalent along Big Piney Creek and its tributaries. Due to agricultural clearing and fire suppression, populations of native cane have been reduced in this area. Commercial/non-commercial thinning of overstory and understory trees within the native canes' range would be done to restore and promote the expansion of existing communities. In

order to reach the desired condition, herbicides would be used to control woody species in these areas. This would be done manually (chainsaws or brush saws only) or by a basal spray, stem injection, or cut surface herbicide treatment on brush more than 6 feet in height and using herbicide foliar spray treatment on brush less than 6 feet to control competition. Cane would also be planted in strategic locations to promote the further expansion of this community.

Non-Native Invasive Species (NNIS) Control on Approximately 500 Acres (Annually)
Herbicide treatment(s) (see table 10) would be used to control identified non-native invasive species (NNIS) and roadside woody vegetation on up to 500 acres annually. These non-indigenous plant species degrade the diversity of wildlife habitat in forest openings, primarily along roads, but will be treated elsewhere where they occurr. Control of existing infestations would aid the reestablishment of native vegetation.

Table 9 identifies the NNIS believed to occur in the project area and the herbicides that would be used to control them.

Table 9: NNIS/ Herbicide treatment Table

Non-Native Invasive Species Treated	Herbicide Treatment
Privet -*ligustrum spp.*	Glyphosate or Metsulfuron methyl
Paulownia- *paulownia tomentosa*	Imazapyr (large stems) Triclopyr (sprouts)
Tree of Heaven- *Ailanthus altissima*	Imazapyr (large stems) Triclopyr (sprouts)
Exotic Lespedezas- *cuneata* and *bicolor*	Metsulfuron methyl or Triclopyr
Japanese Honeysuckle- *Lonicera japonica*	Triclopyr
Nonnative Rose- *Rosa multiflora*	Imazapyr or Metsulfuron methyl
Mimosa- *Albizia julibrissin*	Imazapyr (large stems) Triclopyr (sprouts)
Japanese stiltgrass- *Microstegium vimineum*	Glyphosate

Recommended controls are provided by:
Invasive Plant Responses to Silvicultural Practices in the South - Evans, Moorhead, Bargeron and Douce and ***Nonnative Invasive Plants of Southern Forests*** – James H. Miller

As new NNIS are discovered, they would be treated using appropriate methods, following application rates on herbicide lables. Application rates will be in accordance with manufacture's label.

Placement of Large Woody Debris in Streams
To improve overall stream habitat up to 10 trees, greater than 12 inches in diameter at breast height (DBH) per mile would be felled into streams within the project area. These streams include perennial, intermittent and larger ephemeral streams.

Prescribed Burning as Needed on 1,771 Acres
These acres could be repeatedly burned over a 10-year period for fuel reduction, to improve wildlife habitat, or for site preparation in advance of planting seedling trees. The project area is a fire adapted ecosystem in which fire has been absent for many years creating an overall unnatural condition. The use/reintroduction of fire into this system would assist in restoring the area to its desired future condition. Fire-lines may be established along the Wildland Urban Interface (WUI) adjacent to private property where landowners do not want the use of fire on

their property. As a result, approximately 2 miles of (dozer) fire-line construction could be necessary. The remainder of the control lines would use existing roads or natural fuel breaks such as streams, this would minimize control line construction. Additionally, mechanical treatments could be used (areas of heavy fuels, WUI areas, hard to access areas, etc.) to reduce fuel loading and to facilitate prescribed burning operations. After burns are completed, the control lines would be water barred and may be seeded with native grasses and forbs where needed to restore vegetative cover. In order to minimize control line construction, some burn blocks extend to natural or existing man-made fuel breaks, such as streams or roads.

Prescribed burning would be done on NFS lands, during dormant or growing season.

-Dormant season burning- takes place in fall and winter months, (generally Oct. 1 – April 30) and involves the application of controlled, low to moderate intensity fire to reduce accumulated fuels, stimulate growth of native vegetation, and improve wildlife habitat. Some duff is retained for soil protection. Vegetation 1 ¼ inches or less in diameter would be targeted for reduction to create an open understory, stimulating growth of native grassed and forbs, and increasing forage for browsing animals.

-Growing season burning- takes place in spring and summer months (generally May 1 – Sept. 30 and involves application of controlled, low to moderate intensity fire to control competing vegetation, prepare sites for seeding, and perpetuate fire dependent species. These burns are implemented during the time between leaf emergence and leaf fall. Vegetation three inches and less in diameter would be targeted. This will result in less competition for seedlings and other fire dependent species, while creating an open understory. Other added benefits would include reducing accumulated fuels, stimulate growth of native vegetation, and improve wildlife habitat.

Commercial Rock Collection

Public need would be met by allowing surface rock collection (over no more than one percent of the total project area) within commercially harvested timber units where Biological Evaluations, Heritage surveys and other permit requirements have been completed.

Improvement of Road Access and Recreational Opportunities

Maintenance on a Total of 132 Miles of Existing Roads, 75 Miles are Open Roads, and 57 Miles of Existing Closed Roads would have maintenance then closed after Activities are completed as Recommended by the Travel Analysis Process (TAP) Report

Existing system roads would be maintained to facilitate access and hauling of timber from stands proposed for commercial harvest. Work includes, but is not limited to, widening of roads, improving alignment, providing natural turnouts, and improving sight distance that improves safety, slide and slump repair, surface blading, spot surfacing with gravel, maintenance of drainage structures, culvert replacement, ditch cleaning, and the clearing the roadside of vegetation. The Travel Analysis Report in the process file contains additional information about each individual road.

Reconstruction of One Mile of Road

One mile of road would be reconstructed to facilitate access and hauling of timber from stands proposed for commercial harvest.

Decommission 7.5 Miles Existing Roads
Decommissioning of 7.5 miles of existing roads no longer needed for the transportation system in this project area would occur. Methods of decommissioning range from blocking the road entrance to full obliteration, and may include re-vegetation, water-barring, culvert removal, establishing drain-ways, removing unstable road shoulders, and restoring natural slopes.

Closure of 4 Miles of Existing Open Roads
One mile would be permanently closed and 3 miles would be closed by installing gates and have administrative use only on them. The project area contains many open roads that are currently used to access the area. Some of these roads are used by the public but are creating problems due to soil loss and erosion. Other roads being used in the area also create an unfavorable situation for wildlife through unnecessary disturbance. Signs, gates, and/or earthen berms would be used to seasonally and/or permanently close some existing roads to resolve a number of these problems. For road specific information the Travel Analysis Process table is attached as Appendix G. The entire Travel Analysis Process Report is contained in the process file at the Jasper office.

Temporary roads 20 miles
Temporary roads are needed to facilitate access to activity areas in order to complete siliviculture actions. These roads would be closed once the activity has been completed.

Recreational Opportunities and Access
Convert three miles of FS road # 1800A, currently open to full sized motor vehicles, to an OHV trail. Road numbers 1800F, 93212A, 93698A and 93698D are currently included on the OHV designated routes list. Inspections have shown safety issues related to resource damage from OHV use (identified on accompanying maps), these roads would be removed from the designated routes list and OHVs would no longer be allowed on these routes. That would result in a total of six miles being removed from the OHV designated routes list.

Protection/Restoration of Heritage Site
A Heritage site has been identified within this project area which needs protection. The site is currently being used as a dispersed campsite by forest visitors. The campsite would be closed and the site rehabilitated by placing a layer of protective fabric over it, and covering the site with six inches of gravel or fill material. The site would be monitored by district Heritage staff.

Table 10 shows the number of acres, herbicides used, and method of application for the treatments proposed in the PA :

Table 10: Herbicide Use Table

Treatment	Glyphosate	Metsulfuron methyl	Triclopyr (ester)	Triclopyr (amine)	Imazapyr	Triclopyr & Fluroxypyr	Acres
Wildlife Opening Management	Foliar	Foliar		Foliar		Foliar	75
Transition Areas around Openings	Cut surface		Basal Spray	Foliar &/or stem injection	Stem Injection		150*
NNIS Control	Foliar	Foliar		Foliar &/or stem injection	Stem Injection		Up to 500 annually
Pine Seed tree, Shelterwood, and Seed tree Removal	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		1,974*
Hardwood Shelterwood	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		863
Timber Stand Improvement and Release and pre-commercial Thinning			Basal Spray	Foliar &/or cut surface	Foliar &/or Stem Injection		473**
Cane Restoration	Cut surface			Foliar &/or cut surface	Stem Injection		31
Pine Seed tree Prep.	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		692
Total							4,758

* - Includes 385 acres of pine shelterwood, 85 acres of pine seed tree removal, and 1,504 of pine seed tree.

** - Includes 395 acres of timber stand improvement and 78 acres of release and pre-commercial thinning.

Notes: Tank mixes and adjuvants (such as Cide-Kick) may be added to the herbicide to improve effectiveness and control of target species. All herbicides will be applied at rates and use only application methods specified on the label. Additional spot treatments would be needed to reach the desired future condition in some areas.

Alternatives to the Proposed Action

Alternative 1: No Action
This alternative would not implement any part of the Proposed Action but ongoing National Forest permitted and approved activities would continue.

Alternative 2: No Herbicide Use
Herbicide application totaling 4,758 acres, as outlined in table 10 would not occur, these activities would be accomplished manually by mechanical means. All other activities would be the same as outlined in the Proposed Action.

Past, Present and Reasonably Foreseeable Future Actions
Within the project area there are some past, present, and reasonably foreseeable treatments that are **NOT** part of the Proposed Action **or** any part of the alternatives to the Proposed Action, but have occurred or are expected to occur within the foreseeable future. Table 11 shows the treatments considered in this EA as cumulative effects:

Table 11: Table Showing Past, Present and Future Management Activities

Treatments (On USFS Land)	Acres/ Miles	Year Treated
Permanent land clearing	8ac	2011
Wildlife opening rehabilitation	45ac	2012
Well pad (Graves Creek)	2ac	2011
(ERFO) Road Repair Project	4.5mi	2012
Future Actions	**Approx. Acres or Miles**	**Approx. Year**
High Mtn. Project 2014	See Table 12	2014

Table 12: High Mountain Project Treatments Table

High Mountain Project Treatments 2014-2017	Acres or Miles
Recreation	
Horse/ATV trail Construction/Relocation (mi.)	3.2
Horse/ATV trail Decommission/Obliteration	3.3
Multiuse Trail Construction for Buzzard Roost Access (mi.)	1.5
Construction of 2 Day Use Parking areas for Buzzard Roost access (Acres)	2.0
Construction of Hiking Trail South from Long Pool Rec. Area (mi.)	2.5
Emergency closure gate(s) and turnaround on Long Pool entrance road (Acres)	1.0
Wildlife	
Field Mgt. for Improved Forage	465*
Non-Native Invasive Species Control	500*yr
Wildlife Ponds (no.)	25
Native Cane Restoration	323

High Mountain Project Treatments 2014-2017	Acres or Miles
Placement of Large Woody Debris	Yes
Forestry	
Existing Woodland Management	224*
Woodland Management	407*
Pine Seed Tree Regeneration Harvest	871*
Pine Shelterwood Harvest	980*
Pine Seed Tree Removal	111*
Hardwood Shelterwood Harvest	822*
Hardwood Commercial Thinning	1,911
Pine Commercial Thinning	3,326
Hardwood Thinning for Firewood	99
Seedling Release and Pre-commercial Thinning	521*
Pre-commercial Thinning	684
Timber Stand Improvement Thinning	578*
One time Site Preparation Burning for Planting	1,657
Prescribed Burning as needed	751
Road Management	
Temporary Roads (mi.)	20
Road Reconstruction (mi.)	18
Road Maintenance (mi.)	52
Maintenance and Road Closure (mi.)	24
Road Decommissioning of (mi.)	24
Road Closure of (mi.)	14

Note: * Herbicides would be used as part of these treatments

C. Comparison of Alternatives

This section provides a summary of the actions involved in implementing each alternative.

Table 13: Comparison of Alternatives

Treatments and Acres	PA	Alternative 1	Alternative 2
Wildlife			
Create and improve wildlife openings	80ac*	27ac**	80ac
Mgt. of areas around openings	150*	0	150
Non-Native Invasive Species Control	500*yr	0	0
Wildlife Ponds (including reconstruction)	71	34**	71
Native Cane Restoration	31	0	31
Placement of Large Woody Debris	Yes	0	Yes
Forestry			

Treatments and Acres	PA	Alternative 1	Alternative 2
Pine Seed Tree Regeneration Harvest	1,504*	0	1,504
Pine Shelterwood Harvest	385*	0	385
Pine Seed Tree Removal	85*	0	85
Pine Seedtree Preperation Harvest	692*	0	692
Hardwood Shelterwood Harvest	863*	0	863
Hardwood Commercial Thinning	1,483	0	1,483
Pine Commercial Thinning	2,220	0	2,220
Eastern Red Cedar Thinning	47	0	47
Commercial Salvage of Damaged Timber	500	0	500
Seedling Release and Pre-commercial Thinning	78*	0	78
Manual Timber Stand Improvement Thinning	2,161	0	2,161
Timber Stand Improvement Thinning with Herbicides	395*	0	0
Prescribed Burning as needed	1,771	0	1,771
RX Burn Control (Dozer) line construction(mi.)	2	0	2
Road Management			
Temporary Roads (mi.)	20	0	20
Road Reconstruction (mi.)	1	0	1
Road Maintenance (mi.)	75	0	75
Maintenance and Road Closure (mi.)	57	0	57
Road Decommissioning of (mi.)	8	0	8
Road Closure of (mi.)	4	0	4

Note: * Herbicides would be used as part of these treatments
**** These openings and ponds already exist, but would not receive treatments under Alternative 1**

D. Effects Comparison of Treatments to Alternatives

Table 14: Comparing Treatments to Alternatives

Treatments	Proposed Action	Alternative 1	Alternative 2
*Soil Productivity Reduction%	9	0	9
**Sediment Created (tons)	3,628	3,367	3,628
Herbicide Use (acres)	4,758	0	0
*** Early Successional Habitat%	20	0	20

*** RLRMP states not more than 15% of an activity area can sustain a reduction in soil productivity.**
**** Naturally occurring sediment in this project area is 3,270 tons**
***** Includes regeneration treatments and wildlife openings.**

E. Protective Measures

In order to protect the environment and lessen possible negative impacts, the measures contained in the Forest Wide (FW) Standards of the RLRMP and management area standards for the Ozark/St-Francis National Forest (OSFNF) would be applied to the PA and Alternatives and are incorporated in this EA. Best Management Practices (BMP) Guidelines for Silviculture Activities in Arkansas would also apply as standard protective measures for all proposed actions.

F. Project Designs

A project design is a direction that is applied to similar areas on all projects and is not site specific to one project area, stand, road, or area. A list of applicable project designs is incorporated into this document as Appendix E and is taken directly from the Ozark-St Francis Revised Land Resource Management Plan.

G. Monitoring

1) Monitoring would be accomplished through harvest and contract inspections conducted by certified timber sale administrators and contract inspectors. Appropriate standards and guidelines would be implemented and maintained through active treatment to protect soil productivity, water quality and all other resources.

2) In order to determine how well treatments are achieving the desired future conditions, baseline monitoring would be established prior to or concurrent with treatments to evaluate selected habitat. This would include species that are likely to benefit from habitat changes as well as those that may receive impacts. It may also include invasive species in order to evaluate their response to treatments.

3) For those actions prescribing the use of herbicides, monitoring to ensure that herbicide label instructions are being followed would be conducted as part of the “on the ground” contract administration. To monitor any off-site movement of herbicides, water sampling would be conducted on 10% of sites where herbicides are used.

4) A review of all known occurrences of proposed, endangered, threatened or sensitive species (PETS) has been conducted. In addition, field surveys have been made on all stands to be impacted. If any new proposed, threatened or endangered species are discovered, the activity will be halted and the District Biologist will be contacted to determine what, if any, consultation with the US Fish and Wildlife service is needed, and what specific measures to implement to avoid any adverse effects.

H. Site Specific Design Criteria

The landscape Architect's site specific design criteria for the Three Knob Project are as follows:

- Area #s – 60, 73 & 76 pine seedtree leave a 50-60 basal area for a minimum 100' buffer along Pilot Rock Mountain Road to reduce the Visual Impact on a highly traveled path. Slash disposal after harvest for 50-100 feet off of the road is also recommended.

- Area # - 122 pine seedtree minimum 100 foot buffer along northeast boundary highly visible from highway 7 leave a 50-60 basal area of residual trees.

- Area # - 120 pine seedtree minimum 100 foot buffer along east boundary highly visible from highway 7 leave a 50- 60 basal area of residual trees.

- Area # - 71 pine seedtree minimum 100 foot buffer along east boundary highly visible from Long Pool Recreation Area leave a 50-60 basal area of residual trees.

- Area#s – 1, 2 & 45 (hardwood thinning) and 46 & 66 (pine thinning) within the Wild and Scenic River Corridor harvesting activities will be excluded from April-May and October. The scenic integrity of the river corridor must be maintained. Where the above areas get within sight distance of the river, they need to be laid out to minimize the visibility of the activity from the river. The boundary location will vary depending on the topography of the area. While the thinning of the trees may be noticed from the river the edge of the activity area should not be visible from it. Additionally, log landings and skidder trails should not be visible from the river.

- Scenic class was determined using a broad brush approach. The scenic analysis I have performed shows that all activity areas outside of the Wild and Scenic River Corridor, Highway 7 State Scenic By-way and along Pilot Rock Road (FS Road # 1802) need to be reclassified as moderate scenic class.

- This project area includes 6,335 acres which were acquired after the initial 2005 Forest Plan Revision. These acres have not been evaluated to determine their scenic class. I recommend 96 acres on the northwest facing slope above Grimmit Springs be placed in a high scenic class due to visibility along the road accessing Long Pool Recreation area. I recommend that 172 acres on the northeast facing slope of Three Knob Mountain be placed in a high scenic class due to the visibility of this mountain side from Highway 7. I recommend 96 acres along highway 7 be placed in a high scenic class since highway 7 is a state designated scenic highway. The balance of unclassified acres (5,971) I recommend to be placed in a moderate scenic class since they are located in less visible and less frequently accessed areas.

The scenic analysis report is available for review in the process file at the Jasper office.

Chapter III

Environmental Effects

A. SOILS

Existing Condition

The analysis area for soils will evaluate the activity areas within Compartments 212, 225, 226, 231, 232, 233, 697, 698, 709, 710, 781, 782, and 783 for soils. The Project Area is located in a heavily dissected section called the Boston Mountains. Project Area elevation varies from about 1880 feet in the southwestern corner of the project area on Pilot Rock Mountain to 521 feet above mean sea level on the floodplain of Big Piney Creek in Wainscott Bottom in the south central part of the project area. Several types of topography exist in this Boston Mountain section. Most of the timber harvest will occur on a common stair-stepped landform, called "Bluff-Bench" topography, that developed from the long term weathering/erosion of sedimentary layers of different hardness, mainly shales and sandstones. The remainder of the topography varies from nearly level to rolling mountain tops that developed from weathering of level bedded sandstones to narrow to very narrow alluvial areas along Little Creek, Dry Branch, Levi Branch and Big Piney Creek. Most of the mountain tops and creek bottoms and some wider benches now or have been under cultivation or in pastures, and some are still under private ownership. Project area topography varies from 0-3% slope on mountain tops, benches, and creek bottoms, to fairly steep 40-60% on the 200 to 300 foot slopes between the benches and just above the stream bottoms.

The soils in the project area are mostly stable. A few small soil slumps and landslides along Forest Development Road 1802 have been repaired recently. Soils are mostly well drained and range from shallow to deep. There are some small areas of poorly drained hydric soils in depressions included in Spadra sandy loam soil map units on the floodplain along Big Piney Creek.

There are some stumps and healed skid trails in previously harvested stands, and there is some evidence of detrimental soil disturbance in isolated small areas. There are a few small-healed gullies in compartment 783 stands 13 and 29. Most of the soils have 100% cover consisting of leaf litter, twigs, limbs, logs, gravel, stones, have vegetation growing on them, and have an intact root mat.

The Proposed Action

<u>Direct/Indirect Effects</u>
Soils in the proposed treatment areas are well to moderately suited for use of harvesting equipment, soil rutting hazard is slight to moderate with severe hazard on floodplain soils, and the hazard of off-road erosion is slight to moderate for the soils in the units proposed for harvesting.

Detrimental soil disturbance includes all of the physical factors that adversely affect soil, including erosion, displacement, puddling, severe burning, and compaction. A threshold has been established in the RLRMP (Forest Wide Standard #85) that no more than 15% of the activity area should be detrimentally impacted to maintain soil productivity. To estimate the amount of disturbance; coefficients for each harvest method are multiplied by the number of acres harvested by each method then added together and divided by the total acres harvested. The result is multiplied by 100 to produce the percentage of predicted detrimental soil disturbance. Miles of road and fireline to be constructed are converted to acres. For cumulative effects, the same process is used, adding in the 2nd entry to seed tree/ shelterwood cuts. The coefficients for the harvest methods are based on monitoring done on harvested units from 1993 to 2002. The spreadsheet used is the Soil Disturbance Calculations Spreadsheet which is included in the process file.

Approximately nine percent (747 acres) of the harvested area would sustain a temporary reduction in soil productivity (20-25 year recovery period based on monitoring done in 1981 and 2001 on the Mt. Magazine R.D.) due to harvesting operations. Soil productivity would be lost on approximately 0.5 acres due to road reconstruction. Approximately one acre of the harvested area would sustain a temporary reduction in soil productivity due to fire-line construction and maintenance. An additional 34 acres would sustain a temporary reduction in soil productivity due to temporary road construction. Seven and a half miles of road are proposed for decommissioning which will return approximately 13 acres of soil to a productive state.

Total expected temporary reduction of soil productivity would be 770 acres (10% of the activity area), including skidding, road reconstruction, fire-line maintenance and construction, and temporary road construction. Road decommissioning would reduce the net acreage of soil disturbance to 757 acres (about 9% of the activity area). Temporary roads, primary skid trails, and landings would be disked, seeded and closed following harvesting to speed the recovery of the soil productivity. Fire-lines would be bladed and seeded when prescribed burning is completed to speed recovery of soil productivity and to prevent erosion. Road reconstruction will stabilize roads and prevent loss of productivity on soils adjacent to these roads and will reduce erosion and sedimentation. Road maintenance will also prevent the loss of productivity on soils adjacent to the roads by helping to control runoff. Less than 15% of an activity area can sustain a reduction in soil productivity, according to the RLRMP standard. If more than 15% of the activity area sustains a reduction in soil productivity, mitigation measures must be installed. The documentation for temporary reduction in soil productivity can be found in the analysis file.

Construction of new wildlife openings, construction and reconstruction of ponds and enlargement of existing wildlife openings will cause some on-site soil erosion until plants become established. Soil productivity is not expected to be impacted by the construction and reconstruction because seeding and fertilization will follow these activities.

Cane restoration along Levi Branch is expected to improve the riparian area and to add stability by developing an extensive root mat and by providing soil cover.

The use of herbicides would have no impact on soil disturbance because stems and roots of treated plants would remain in place until they decay. Soil microbes will break down any

herbicide residue that reaches the soil.

Cumulative Effects
Cumulative effects include the combination of direct and indirect effects from past, present, and reasonably foreseeable activities. Direct, indirect, and cumulative effects on soils are measured within each activity area.

There is a potential for additional temporary loss in soil productivity in the stands that are proposed for shelterwood harvest and seed tree harvest and follow-up shelterwood and seed tree removal harvests that are planned a few years into the future. Two hundred forty eight acres of these units are estimated to sustain a temporary loss in soil productivity due to the initial harvest. One hundred ten acres of additional temporary loss of soil productivity is estimated for these units due to the follow-up shelterwood and seed tree removal harvest. The existing and estimated additional temporary loss in soil productivity equals 358 acres, which is 13 percent of the shelterwood and seed tree harvested area. The cumulative effects are not considered measurable because the existing and estimated temporary loss in soil productivity is expected to be within the thresholds set in the RLRMP. Erosion control would be done on skid trails in the harvested areas to speed the recovery of soil productivity.

There was little to no evidence of detrimental soil disturbance in the previously harvested units that are proposed for treatment in the project area, so no cumulative effects are expected to result from the proposed treatments.

Alternative 1: No Action

Direct/Indirect/Cumulative Effects
The roads and the adjacent area proposed for reconstruction, maintenance, closure and decommissioning would continue to deteriorate and erode. Roads that are proposed for closure would not be closed which would lead to erosion and compaction of the road bed and adjacent areas and make more area available for creation of illegal OHV trails and potential soil impacts. At this time, there are no other specific reasonably forseeable forest management actions planned within the area of effects.

Alternative 2: No Herbicide Use

Direct/Indirect/Cumulative Effects
The direct, indirect, and cumulative effects would be the same as those for the Proposed Action because the manual treatments used to control vegetation would cause little to no detrimental soil disturbance.

B. Water Quality

Existing Condition

Watersheds in the United States are divided into progressively smaller units known as hydrologic units, recognized by the U.S. Geological Survey (USGS) as regions, sub-regions, basin, and sub-basin units. This hierarchical division of watershed boundaries is useful for assigning address-

like codes to drainage basins. This project area falls within the Arkansas-White-Red region (11), the Lower Arkansas sub-region (1111), the Lower Arkansas-Fourche La Fave basin (111102), and the Dardanelle Reservoir sub-basin unit (11110202) (U.S. Geological Survey, 2003). The Ozark-St. Francis National Forests further classify land areas into two progressively smaller units: watersheds and sub-watersheds. The proposed project falls into the Lower Big Piney Creek (1111020208) and Lower Illinois Bayou (1111020210) watersheds. At the smallest scale, the proposed project is located within three sub-watersheds as noted in the Table 15. These sub-watersheds or 6th level hydrologic unit code (HUC) areas will serve as the analysis area for the proposed project with respect to water resources. Figure 3 on the following page shows the project area within the associated sub-watersheds, along with the High Mountain Project area which occupies a portion of one of these three watersheds.

Table 15: Watershed Table

Watershed Number	Watershed Name	Total Acreage	Project Area Acreage Included
111102020803	Spring Creek-Big Piney Creek	19,027	3,713
111102020804	Mill Creek-Big Piney Creek	30,206	10,258
111102021002	Little Creek-Illinois Bayou	32,338	4,551

There are approximately 48 miles of streams within the project area, which falls within the analysis area that contains approximately 212 miles of streams. The primary streams found in the project area include Big Piney Creek, Graves Creek, Dry Creek and Levi Branch plus several unnamed tributaries to these streams. Big Piney Creek, a designated Extraordinary Resource Water (ERW), runs through the northern portion of the project area and forms the eastern border along approximately seven miles of the project area. Another ERW, Illinois Bayou, flows through the southern part of the analysis area approximately one half mile southeast of the project area. An ERW may be defined as a combination of the chemical, physical, and biological characteristics of a water body and its watershed characterized by scenic beauty, aesthetics, scientific values, broad scope recreation potential, and intangible social values. Tributaries to Big Piney Creek also extend into the project area.

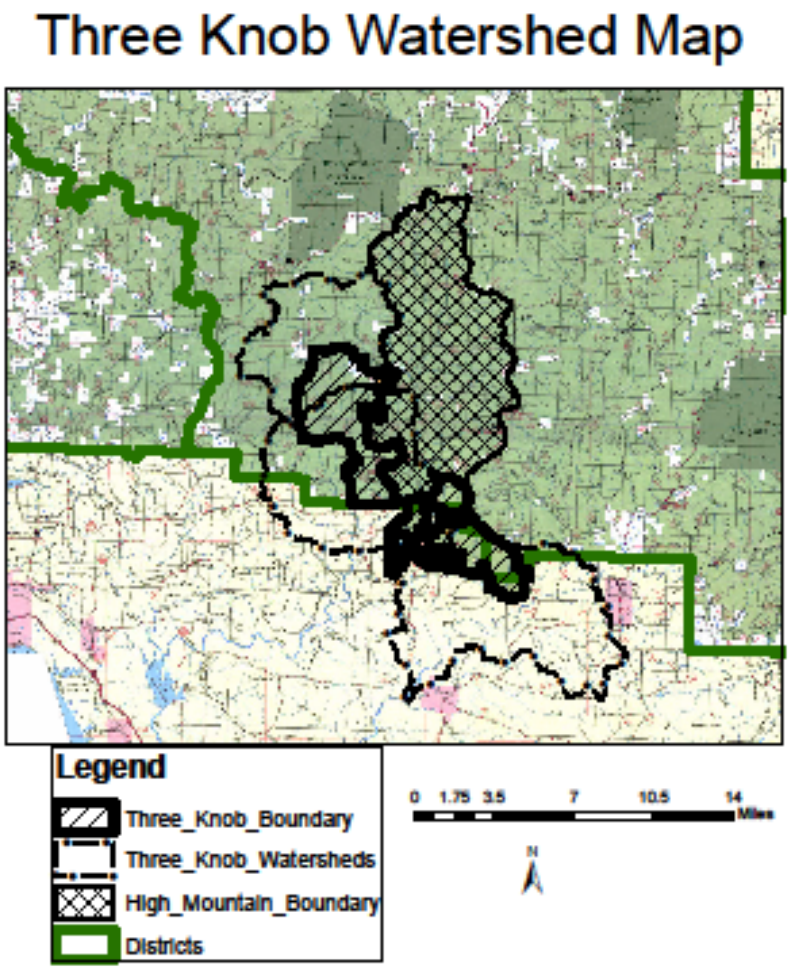


Figure 3: Three Knob Watershed Map

This portion of the Forest is located primarily in the Boston Mountain eco-region with deeply dissected drainages into the Bloyd Formation (McFarland, 2004). Approximately 4,600 acres of the Mill Creek sub-watershed are located within the Arkansas River Valley eco-region, which is associated with Arkansas River alluvium.

Precipitation for the project area averages approximately 46 inches annually. Mid-winter and late summer is found to be the driest portions of the year. This, combined with high summer temperatures, suggests that stream flow would typically be lowest during the late summer.

Within the 6th level watershed analysis area, approximately 52% of the land is administered by the Forest Service. This leaves a sizable portion of the land within the watersheds as privately owned. Land use within these sub-watersheds is approximately 90% forested. The balance of the land uses are mainly pastures.

Forested land uses indicate a stable landscape that results in minimal amounts of natural or background erosion, especially for Arkansas (Miller and Liechty, 2001). For many parts of the Ozark-St. Francis NFs, the prevalent soil cover contains many rocks and rock fragments that

ultimately limit the erosive susceptibility of the soils. Measured erosion for minimally disturbed forestlands rarely exceeds 0.25 tons per acre. Soil erosion from cropland has been estimated at 3.8 tons per acre (Patric et al., 1984).

Within the analysis area, roads exist both within the forest boundary and outside the forest boundary. There are approximately 365 miles of roads within the analysis area and 122 miles of roads within the project area. Within the project area, there are approximately 11 stream crossings where the current road system crosses or intersects a stream.

According to the National Wetland Inventory Database, there are no mapped wetlands located within the project area. Small, unmapped wetlands may exist along the edges of streams, especially at lower elevations where floodplains have developed. These inclusions are likely less than one-half acre in size and are directly associated with the adjacent stream. If any are located, appropriate measures will be taken to protect these resources.

Floodplains are identified on the forest within the project area. These features were mainly found to occur along Big Piney Creek and portions of Levi Branch. Floodplains and any associated riparian areas occur in narrow strips near the stream channels.

The proposed project is located in the Boston Mountain and Arkansas River Valley ecoregions as identified by the Environmental Protection Agency (EPA) as a revision of work produced by Omernick (1987). These are the same ecoregion divisions recognized by the state for use in defining water quality standards. Thus, water quality standards for the project area, and the Arkansas Pollution Control and Ecology Commission Regulation 2 – Water Quality Standards for Surface Water (2011), determine the sub-watershed analysis areas for this project. The designated uses assigned to the surface waters in the project area are as follows: for all waters, secondary contact recreation, domestic, industrial and agricultural water supply. For surface water where the watershed is greater than 10 square miles, and all lakes and reservoirs, the designated uses are the same as above but include primary contact recreation and perennial Arkansas River Valley fishery. There are no 303d listed streams (impaired water bodies) within these watershed analysis area boundaries.

The U.S. Geological Survey's Ozark Plateaus National Water Quality Assessment Program has studied existing land uses in the region and their impacts on water quality. Trends show increased nitrogen, phosphorous, and coliform bacteria concentrations occur with increases in agricultural and urban land uses but forested land use has a much lower concentration of these constituents (Davis and Bell, 1998).

Changes in land use and other disturbances can be modeled with respect to estimated increases in sediment. The Water Resource Analysis for Cumulative Effects (WRACE) model estimates current conditions 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 for different ecoregions. The model analyzes watersheds individually, adding effects from activities of other projects to the estimated effects of the proposed project.

Proposed Action and Alternative 2

Direct/Indirect Effects

Activities, which could cause effects, are those of vegetation management, silvicultural site preparation, road, parking lot, trail construction, dozer line construction, and prescribed burning.

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

Using paired watershed studies for regions of the United States, Stednick (1996) depicted effects of silviculture practices on annual average stream discharge. In this study, the actions necessary for producing measurable increases in water yield from forests in Arkansas was determined to be a 50% reduction in basal area across an entire watershed. This level of vegetation harvest would result in an increase of roughly six inches above normal runoff values for the first year. The recovery period for water yield to return to pretreatment level was found to be a function of vegetation re-growth. For Arkansas, this means that water yields should return to pretreatment level within three years (Van Lear et al., 1985); however; changes to peak flow and storm flow timing may continue if drainage patterns are altered by activities such as road construction. Any changes to runoff timing should not result in impacts to current water uses or quality.

Because the model predicts no difference in cumulative effects to water quality between the Proposed Action and the No Herbicide Alternative, discussion applicable to the use of herbicides is presented in this section. Herbicide use under the Proposed Action would not be broadcasted but applied by direct injection, cut surface, or foliar spray. For these purposes, herbicide use in forestry would occur only once or twice over 25 to 75 years, and direct application methods, as opposed to broadcast spraying, would minimize off-site movement. Forest-wide Standards and specific herbicide label rates for herbicide application would be followed as well as appropriate BMPs designed to limit risk to water quality. Monitoring for herbicides used on the forest has been a continuous policy on Ozark-St. Francis National Forests for over 10 years. Results from this monitoring have not documented any substantial concentrations of herbicides off-site from their application (unpublished reports). Other monitoring suggests that subsequent to runoff producing precipitation events, concentrations of herbicide (triclopyr) in ephemeral streams with BMP protections were very small and well below any sizeable risk concentration (unpublished

report). When herbicide fate is measured in runoff water, two common outcomes are apparent. First, measured peak concentrations are of short duration and may be measured in hours depending on precipitation concentration. Second, the highest concentrations occur when buffer strips are not used on streams (Neary and Michael, 1996).

Exposure is determined by such things as application rate, chemical behavior in the environment and biological factors. Herbicides for forestry applications occur annually in amounts roughly equivalent to10 percent of their use in agriculture settings and at application rates of less than 2 kilograms per hectare (Neary and Michael, 1996). Neary et. al. (2009) states that the risks to water quality posed by modern silvicultural chemicals is very low due to infrequent use over the rotation of a forest stand, lack of bioaccumulation by the pesticides, and the function of forest soil organic matter and microorganisms in adsorbing and decomposing pesticide residues.

Chemicals can enter streams through a variety of mechanisms - by direct application, drift, mobilization of residues in water, overland flow, and leaching. The most noteworthy transport pathways would be direct application, drift, and mobilization during periods of heavy precipitation and overland flow. The most effective means for reducing this likelihood is to maintain a buffer between the area for use and water bodies, and to plan appropriately for application periods.

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

Forestry use of herbicides poses a low pollution risk to groundwater because of its use pattern. Herbicide use in forestry is likely to occur only once or twice over rotations of 25 to 75 years (Neary and Michael, 1996). The greatest potential hazard to groundwater comes from stored concentrates, not operational application of diluted mixtures (Neary and Michael, 1996). Regional, confined, groundwater aquifers are not likely to be affected by silviculture herbicides (Neary, 1985). Surface unconfined aquifers in the immediate vicinity of herbicide application zones have the most potential for contamination. These aquifers are directly exposed to leaching of residues from the root zone.

The only known long term potential effects of proposed use of herbicides to water resources are groundwater contamination incidents of importance (contamination of bedrock aquifers, persisting more than 6 months, concentrations in excess of the water quality standard, etc.) in the Southeastern United States, where higher amounts of forestry herbicides are used, involved extremely high rates of application, or spills of concentrates. In these situations, herbicide residue was detected in ground water four to five years after the contamination. These situations

are definitely not typical of operational use of forestry herbicides. Proper handling precautions during herbicide transport, storage, mixing-loading, and clean-up are extremely important for preventing groundwater contamination (Neary and Michael, 1996).

Although short term, low-level stream contamination has been observed for ephemeral to first order streams draining studied sites, levels of herbicides in these streams have been neither of sufficient concentration nor of sufficient residence time to cause observable impacts on aquatic ecosystems (Michael et al., 2000). These studies have confirmed, with a few exceptions, the absence of measurable contamination of surface water. Thus, herbicides used properly can help protect water quality in the reduction of sediment in streams while accomplishing forest management goals.

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

Roads are generally considered to be the major source of sediment to water bodies from harvested forest lands. They have been found to contribute up to 90 percent of the total sediment production from forestry activities (EPA, 2005). Road-generated sediment may result from the erosion of cut and fill slopes, ditches, road surfaces, and road maintenance operations. Unpaved roads paralleling and crossing streams pose specific risks to water quality as they often maintain direct linkages with the stream channel. Roads result in three primary effects on forested lands. They can intercept rainfall directly, concentrate flow, and divert or reroute water from traditional hydrologic pathways. Through these actions, road systems mimic the stream channel network, effectively increasing the drainage density of streams in the landscape by constructing new pathways that intercept surface runoff. This may result in modifications to the timing of water delivery to stream systems; however, this is not expected to produce a substantial nor measurable difference from current conditions. The activities of the Proposed Action and Alternative 2 would work toward ‘disconnecting’ the road system from the stream network.

Road work activities planned for this project include road reconstruction, road maintenance, road closure, and road decommissioning. These activities, when properly conducted, should result in a net decrease in sediment production by correcting or preventing erosion issues and allowing some open roads to revert to a vegetated state, thus a benefit. Guidance provided in the RLRMP and the Arkansas Forestry Commission’s Best Management Practices for Water Quality Protection outline the mitigation measures necessary to conduct these activities while controlling contributions to non-point source pollution.

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

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

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

According to results from the WRACE model, the direct and indirect impacts from this project are not expected to contribute to degradation of the current water quality. Implementation of the activities associated with the Proposed Action and Alternative 2 would result in some of the above mentioned effects to water quantity and quality; these effects have been shown from past research to be minimal and last less than three years (Van Lear et al., 1985). The most likely effects from the Proposed Action and Alternative 2, beyond current conditions, are a short-term increase in sediment resulting mainly from road activities and minimal increases in water production. With the application of the Arkansas Forestry Commission's Best Management Practices for Water Quality Protection, current Forest Plan standards, and any other site specific protection measures noted in this EA, the activities of the Proposed Action or the No Herbicide Alternative should not result in sizeable effects to the water resources. Road stabilization through maintenance and reconstruction, erosion control through re-vegetation of disturbed ground, and streamside management zones around surface water features are typical measures used to ensure the mitigation of negative effects that could occur.

Long-term implications of nutrient loading after timber harvest for streams in the South were described in a study by Lynch and Corbett (1990). In this study best management practices were used that include 100 foot wide perennial buffers, logging slash removed from streams, sale units were monitored by a responsible party, operations ceased during wet weather, roads laid out by professionals, roads not exceeding 10% grade, culverts used to cross perennial streams and removed when done, water bars utilized, roads gated, and filtration strips maintained. The results indicated that nutrients would not exceed water quality standards and that only during the treatment year would nutrients show a measurable increase. An important conclusion was the demonstration of the effectiveness of BMPs for controlling nutrient export.

The activities described in the Proposed Action or Alternative 2 are not expected to affect wetland areas or floodplains due to implementation of practices such as those discussed above.

Cumulative Effects

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

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

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

The water resource cumulative effects analysis was completed based on the activities described in this document. The results of this analysis are displayed in Table 16. Two of the three

affected sub-watersheds are currently determined to have a low concern level and the concern level for the Proposed Action and each alternative is estimated to remain low for the future watershed condition. The Little Creek-Illinois Bayou sub-watershed, however, has a high risk level for the current sediment increase and the risk level remains high for the Proposed Action as well as the No Herbicide and No Action alternatives. The high risk rating is likely due to the large percentage of private land ownership and high amount of pasture in this sub-watershed. As previously discussed, forested landscapes result in minimal amounts of erosion.

The High Mountain project contains 5,330 acres within the Mill Creek sub-watershed. This project was started in 2012 and is expected to continue into 2015 which will coincide with the timeline for the Three Knob project. Therefore, activities from the High Mountain Project have been included in the sediment model run for the Three Knob Project.

Table 16: Results of Sediment Cumulative Effects

	Percent increase of sediment above undisturbed conditions							
	Current		Future					
			Proposed Action		No Action		No Herbicide	
Sub-Watershed Analysis Area	% Increase	Concern Level	% Increase	Concern Level	% Increase	Concern Level	% Increase	Concern Level
Spring Creek	171	Low	174	Low	171	Low	174	Low
Mill Creek	351	Low	367	Low	353	Low	367	Low
Little Creek	812	High	837	High	824	High	837	High

The activities proposed by the Forest Service for the Proposed Action would result in a slight overall increase in sediment yield compared to current conditions. It is most likely that the proposed activities would take place over a 3 to 5 year period instead of instantaneously as predicted by the analysis, thus reducing acute effects. The use of RLRMP standards and Arkansas Forestry Commission BMPs is expected to reduce the impacts of the proposed activities. Monitoring in the form of subsequent fisheries evaluation and BMP compliance checks should be adequate to discern any adverse effects that may result from the implementation of the Proposed Action or Alternative 2.

Alternative 1

Direct/Indirect/Cumulative Effects

There would be no direct effects from this alternative because no activities would result from the selection of this alternative. The current trends and conditions would be expected to continue. Indirect effects would continue to result from the existing conditions of the project area. The effects of vegetation on water yield within the watershed would continue through

evapotranspiration processes. Roads that do not receive necessary maintenance would continue to pose a chronic threat to water quality as problem erosion areas would continue to exist, or worsen.
Roads are the most common source of accelerated erosion on National Forest lands. Roads generate sediment from the erosion of excavated surfaces, ditches, and road maintenance operations. Raw ditch lines and roadbeds would be a continual source of sediment, usually due to lack of maintenance, inadequate maintenance, excessive ditch line disturbance, or poorly timed maintenance. As a result of Alternative 1, roads in need of maintenance and reconstruction would not receive the necessary upgrades to minimize resource conditions. Unpaved roads paralleling and crossing streams would continue to pose specific risks to water quality as they often maintain linkages with the stream channel.

C. Air Quality

Existing Condition

Air pollution can impact both human health as well as the environment. The Clean Air Act established standards on six pollutants (carbon monoxide; CO, sulfur dioxide; SO_2, particular matter 10 microns is size; PM_{10}, nitrogen dioxide; NO_2, ozone and lead). In recent years, air quality standards have refined the particular matter size to 2.5 microns ($PM_{2.5}$). The reason for this is $PM_{2.5}$ is the size of particles which when breathed in by humans will lodge deep in the lung tissue potentially causing respiratory disease. 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; cooking exhausts from restaurants; and other activities.

For the purpose of this analysis the two main air pollutants of concern on the Ozark-St. Francis National Forests are ozone and fine particulate matter. When prescribed burn activities are implemented, ozone and fine particulate matter are the two greatest pollutants released into the air. At elevated ambient concentrations, ground level ozone can cause respiratory distress in sensitive populations, and can cause negative growth impacts to vegetation. Fine particulate matter (PM2.5) causes cardiopulmonary symptoms in certain individuals, and significantly contributes to regional haze. Because of these concerns, the U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards, called the NAAQS, for these two pollutants. There are both primary and secondary NAAQS. Primary standards set limits to protect public health, particularly the health of sensitive populations such as children and the elderly. Secondary standards are set to protect public welfare, including visibility, crops, vegetation, animals and buildings.

State air quality agencies monitor for both ozone and PM2.5 across the state including one station in Deer, Arkansas, within the Ozark-St. Francis National Forests. Measured concentrations are compared to the NAAQS for each of the pollutants. There are both a 24-hour and an annual NAAQS for PM2.5. Currently, there is one NAAQS for ozone, based on 8-hour average concentrations. Areas that exceed the NAAQS are designated non-attainment, and a

State Implementation Plan (SIP) must be prepared to demonstrate how the area will come back into attainment with the NAAQS.

Additionally, air quality agencies issue an air quality forecast in the form of the Air Quality Index (AQI) for both pollutants. The AQI is color coded in the following manner. An AQI of code orange or worse means that air quality in the area is predicted to exceed the NAAQS.

Table 17: Air Quality Index Table

Air Quality Index Table

AQI Code	*Description*
Green	Good
Yellow	Moderate
Orange	Unhealthy for Sensitive People
Red	Unhealthy
Purple	Very Unhealthy
Maroon	Hazardous

As of 2011, there were no counties in Arkansas in non-attainment for ozone or fine particulate matter.

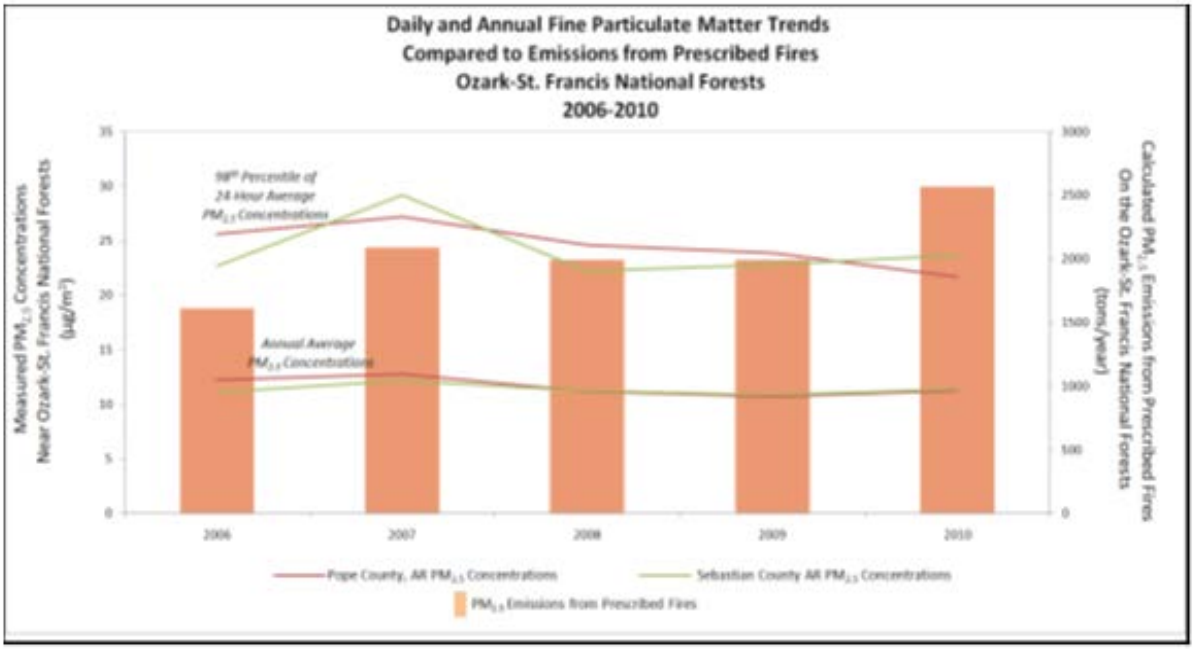
Air quality is recognized in the RLRMP for Ozark-St. Francis National Forests as an important parameter to measure forest health. The plan lists the following forest-wide standards relating to air quality.

- FW93: Prescribed burning will be conducted in, or adjacent to, counties with forecasted high Air Quality Index (AQI) values (AQI equals orange or higher) only if meteorological conditions indicate that smoke will be carried away from the high AQI area.

- FW94: Conduct all National Forest management activities in a manner that does not result in (1) a significant contribution to a violation of National Ambient Air Quality Standards (NAAQS) or (2) a violation of the applicable provisions in the State Implementation Plan (SIP).

Standard FW93: The use of prescribed fire emits PM2.5, along with other pollutants. With the growing prescribed fire program, it is important for the National Forests to be aware of downwind concentrations of fine particulate matter to ensure that prescribed fire emissions are not contributing to any violations of the NAAQS. There are three PM2.5 monitors near or in the Ozark-St. Francis. As the Table 18 shows, there does appear to be a correlation between prescribed fire emissions and measured fine particulate matter concentrations near or in the Forest.

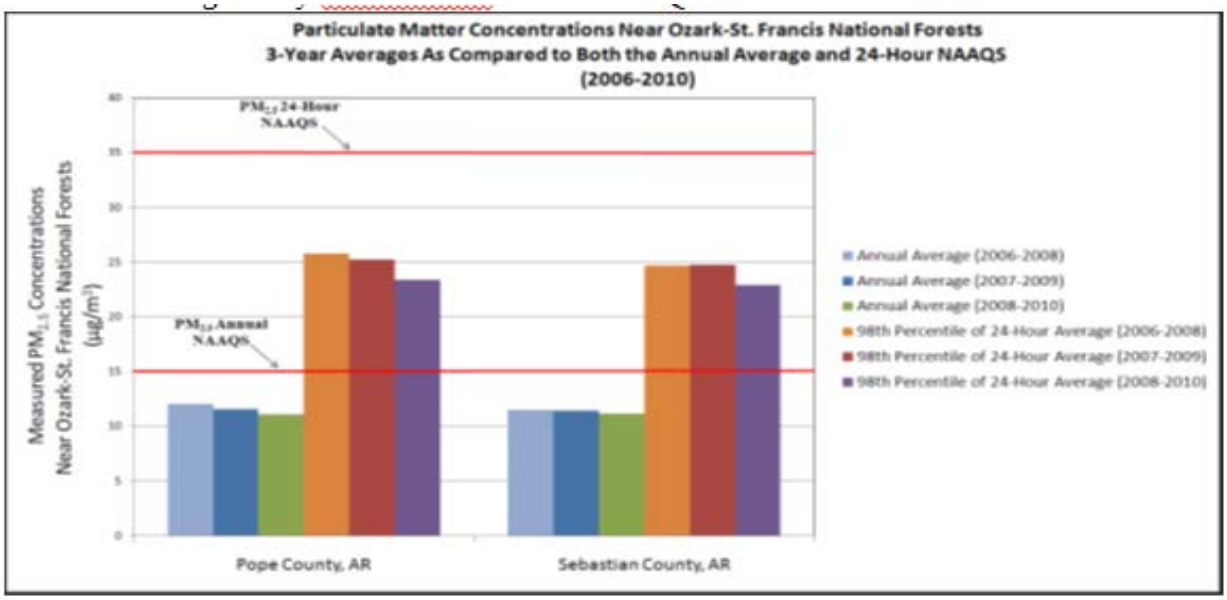
Table 18: Daily and Annual Fine Particulate Matter Trends



However, the concentrations of fine particulate matter, both on a daily and an annual basis are not higher than the PM2.5 NAAQS, which are 35 and 15 µg/m3, respectively. Thus, while prescribed fire is contributing to nearby concentrations of PM2.5, the area is still meeting the NAAQS for this pollutant.

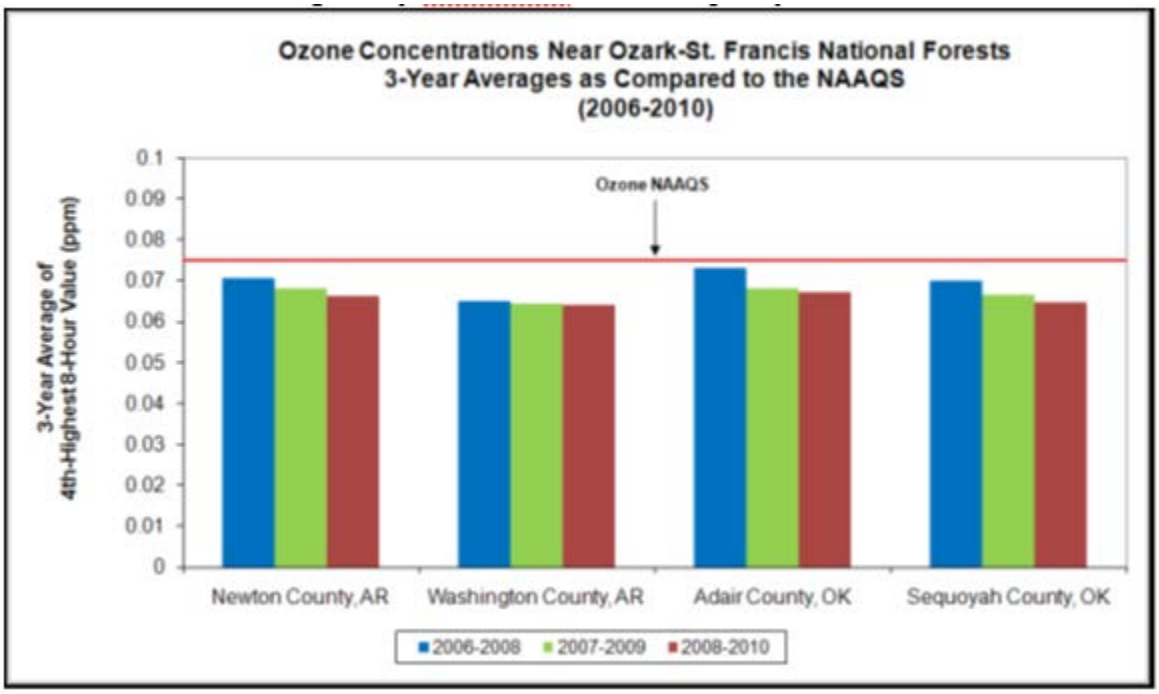
Standard FW94: The National Ambient Air Quality Standards are based on three-year averages of the measured concentrations. Using 2006 through 2010 data, the measured concentrations near the Ozark-St. Francis National Forests were compared to the 24-hour and the annual PM2.5 NAAQS. As shown in Table 19, these monitors have not documented any that surpass the PM2.5 NAAQS over the past several years. Thus, it can be concluded that forest management activities are not exceeding the NAAQS for PM 2.5.

Table 19: Particulate Matter Concentration near Ozark-St. Francis National Forests



Ozone concentrations are also measured at several locations near or in the Ozark-St. Francis National Forests. The NAAQS is based on a three-year average of the 4th highest 8-hour ozone concentration. Table 20 shows the nearby ozone concentrations as compared to the NAAQS. As shown, ozone levels are not exceeding the NAAQS, and thus no forest management activities are contributing to exceeding the air quality standards.

Table 20: Ozone Concentrations near Ozark-St. Francis National Forests



Class I Air Quality Related Values (AQRVs). The Clean Air Act and its amendments designate specific wilderness areas and national parks as mandatory Class I areas, and these areas are provided special protection against degradation of air quality related values such as visibility. The Ozark-St. Francis National Forests manages one Class I area, the Upper Buffalo Wilderness. The Clean Air Act requires federal land managers with the 'affirmative responsibility' to protect the air quality related values at these Class I areas, and to consider whether a proposed new or modified source of air pollution may adversely impact these values. The Ozark-St. Francis National Forests work with state regulatory agencies in Arkansas and Oklahoma to determine if new or existing industry would impact air quality at Upper Buffalo Wilderness through the Prevention of Significant Deterioration (PSD) permitting process. No permit actions in the past five years have been shown to cause an adverse impact to the Upper Buffalo Wilderness.

Effective fire control, beginning in the early 1900's influenced the existing vegetation. Accounts of early travelers through northern Arkansas frequently describe wildfires and large burned over areas. Dendrochronology studies conducted on the Big Piney Ranger District also indicate that fire has long been a part of the landscape (Guyette 2006). Due to the removal of fire over the last 100 years, the fuel composition has changed from a grass fuel model to a brush fuel model (Guyette 2006). Fires in grass fuels can be easier to suppress and respond quicker to weather influences such as relative humidity. Models such as LANDFIRE indicate that this landscape is in Condition Class II and III, meaning it has departed from a reference condition for vegetation, fuels, and disturbance regimes.

Proposed Action and Alternative 2

Direct Effects

Burning could be implemented multiple times over a 10-year period, on 1,771 acres for multiple purposes and would continue moving the landscape toward Condition Class 1. The majority of this area has been previously burned under other Environmental Analysis decisions. For the Proposed Action and Alternative 2 the prescribed burn acres would remain the same. The PA would not have an effect on the Class I air shed, due to the distance (over 30 miles northwest) of the project area. Based on local observations, the predominate wind rarely blows from the southeast which would be required to put smoke in the direction of the Class I air shed from the project area. When similar burns have been implemented closer to the Class I air shed, the NAAQS have not been exceeded. Community protection and firefighter safety would be enhanced by decreasing fuel loading by an estimated 1.5 tons per acre. Emissions from burns would produce PM-10 and PM 2.5 particulate matter during the burns. PM-2.5 is particularly important because this size of particle when ingested remains in the body. Herbicides may be used within burn blocks (except Alternative 2). The manufacturer's label recommendations would be followed to determine when it is appropriate to burn following herbicide application so there would be no negative effects to air quality from herbicide. There is a Forest Wide standard (#153) which states; no treatment area will be prescribed burned sooner than 30 days after herbicide application.

Burns would be conducted during both the growing and dormant seasons, and each season would have different effects on the vegetation. Dormant season burns typically top-kill smaller

diameter woody plants, 1 inch or less in diameter, while growing season burns will top-kill slightly larger woody plants, from 1 to 3 inches in diameter.

Indirect Effects

The public could be exposed to low concentrations of drift smoke, which would create a nuisance rather than a health problem. There is potential for roadways to be impacted by smoke, which could decrease visibility and cause traffic on roadways to slow down. Monitoring of smoke is standard on every prescribe burn implemented. If smoke starts becoming thick enough to impede traffic the prescribed burn plan would implement traffic control measures. There would be no indirect effect on the Class I air shed from the PA.

Based on the nature of the proposed management activities in the Proposed Action and Alternative 2 there should be no expected long-term impacts on air quality within the analysis area. The dust generated by logging activities would have a minor localized impact on air quality. The impact would be short term (lasting only as long as the logging) and sporadic (any rainfall during the harvest activities would prevent dust from being air borne). Since this type of activity has occurred over many areas within the air-shed and the air quality is still of high quality, there is no reason to suspect there would be anything other than some localized short term impacts to air quality from this project.

For the Proposed Action and Alternative 2 the potential exists for smoke to cause temporary local effects on private homes and farms, and to the rural communities. Air quality effects could include temporary decreased visibility on roads, discomfort for local residents with respiratory problems, and the nuisance of the smell of smoke in and around residences. The mitigation measures described in the Burn Plan would be applied. These measures are designed to ensure that state smoke management guidelines, EPA standards, and the requirements of the Clean Air Act are met, and that local effects to air quality are acceptable. Key is the development of a burn plan prior to implementation that considers wind direction and other smoke dispersal factors. The burn plan would be prepared for each burn to ensure that the combustion products (smoke) to minimize effects in smoke-sensitive areas. Burning would only occur when conditions are right for adequate smoke dispersal. Proposed burn areas proposed in the PA and Alternative 2 are large enough for efficient burning but small enough to allow burning to be completed by mid-afternoon so that most smoke is dispersed by nightfall. With these measures, effects from smoke for the Proposed Action and Alternative 2 are expected to be small and localized within acceptable levels.

Based upon this most recent EPA-air quality data; potential emissions being below the lower limit acceptable by EPA; our compliance with NAAQS; and our meeting general conformity and meeting the intent of the Regional Haze Regulation, the prescribed treatments should not detrimentally impact the quality of air in the proposed project area or in the Class 1 air shed.

Cumulative Effects

Burning will continue by other state and Federal agencies as well as private landowners. Based on the IMPROVE monitoring station in Deer Arkansas the air quality in and around the project area is good and there are no areas in threat of reaching non-attainment status or exceeding air quality standards. There would be no cumulative effects on the class I air shed from the PA.

Alternative 1 (No Action)

Direct Effects
The No Action Alternative does not include prescribed burning and therefore has negligible potential for affecting air quality other than that which may occur under a wild fire situation. The No Action Alternative would have no direct effect on the class I air shed.

Indirect Effects
The public could be exposed to lower concentrations of drift smoke, which would create a temporary nuisance rather than a health problem. There is still potential for roadways to be impacted by smoke, which could temporarily decrease visibility.

Potential would exist for a more serious wildfire in the acres that would not be prescribed burned. If a wildfire did occur within these areas, smoke concentrations would be higher. Roads could be temporarily closed leading to an inconvenience for local people living in the communities close by. There would be no indirect effects on the Class I air shed.

Cumulative Effects
Burning will continue by other state and Federal agencies as well as public landowners. Based on the IMPROVE monitoring station in Deer, Arkansas, the air quality in and around the project area is good and there are no areas in threat of reaching non-attainment status or exceeding standards. Over time without moving the landscape toward the reference Condition Class, fuels would continue to build up and potential increases for a serious wildfire to occur in this area. The No Action Alternative would have no cumulative effect on the Class I air shed.

Fuel loading on 1,771 acres would not be decreased, condition class on these acres would remain the same, and there would be no contribution to Objectives 55, 56, and 57 of the Revised Land and Resource Management Plan. There would be an increased risk of a more serious wildfire in and around the adjacent private property.

Given the mobility of the pollutants considered, the scale for cumulative effects is the Forests. With similar projects, as described here, proposed on a yearly basis throughout the Forests, the sources of the pollutants would be similar (e.g., vehicle exhaust, dust from logging and travel on dirt roads, smoke and particulates from fires). Due to the distance of this area from major metropolitan areas or heavy concentrations of heavy industry, and due to favorable weather patterns keeping the atmosphere well mixed, the area should continue to exceed the NAAQS. Therefore, no significant cumulative effects are anticipated from implementing any of the alternatives described.

D. Recreation/Visual Quality

Existing Conditions

The Three Knob Project area is located northwest of the community of Dover. The project area is bounded on the north and east by the Big Piney Creek to Long Pool Recreation Area then Old Highway 7 becomes the north boundary to State Highway 7 South, and on the west by Big Piney Creek. The project area is located in, northwest Pope and northeast Johnson counties.

This portion of the Ozark National Forest (NF) receives moderate to heavy pressure of several types of recreational use. Uses include: dispersed camping, hunting (deer, squirrel, turkey, and bear), pleasure driving, hiking, horseback riding, OHV use (dirt bikes and ATVs), and paddling on Big Piney Creek. The area users are mainly visitors within a day's drive; however visitors from adjacent states also frequently visit the area.

Even though the previous LRMP and the RLRMP restricted OHV use from general forest and closed roads, evidence of motorized use has remained moderate to heavy in certain areas. Under the current RLRMP, guidance has been imposed which follows the National direction associated with unmanaged recreation and OHV National policy to use designated routes only, attempting to focus recreational motorized use on specific routes and trails. The opportunities within the project area for OHVs are average and the number of routes is shown on the 2012 Travel Management Map. The Three Knob Project has limited OHV opportunity lower than the historic use in the area.

General dispersed recreation abounds within and adjacent to the project area involving hunting, sight-sightseeing, hiking, floating and horseback riding cross country. The project area includes the following designations:

- Big Piney Creek Wild and Scenic River (portion within the project area and eastern most boundary of a portion of the project)
- Wainscott Bottoms and Waldo Mountain SIA are mostly in the project area
- State designated Scenic 7 Highway is within the southern portion of the project
- Long Pool Developed Recreation Areas is adjacent to the project
- Piney Creeks Wildlife Management Area, Ozark National Forest Wildlife Management Area, an Arkansas Game and Fish Commission Designation

Hunting for whitetail deer, black bear, squirrel and eastern wild turkey is a popular dispersed recreational activity in the general forested area. Evidence of dispersed camping can be found mostly from hunters, hikers or visitors seeking solitude with some sites inside or just outside the project area. These sites receive moderate use with the peak use in spring and fall. However along Big Piney Creek dispersed camping extends throughout the summer months. Other activities include recreational driving interior roads in passenger vehicles and ATVs, wildlife viewing and firewood gathering within the project area.

Equestrian use and ATVs have a historical foundation within this area. Numerous local landowners ride throughout the project area on existing roads and cross country. The equestrian use and motorized use do clash at times creating use conflicts but these incidents are rare. Currently, horse use and motorized use have created paths (undesignated/unauthorized trails) located throughout the general forest and along old woods roads (not drivable in a passenger vehicle). These created paths can and are degrading the forest where a high/continual volume of traffic is occurring, adding to the issue of unmanaged recreation. Most of the impacts from unmanaged recreational use would recover in time if the use were stopped.

The effects on recreation can be described in terms of three principle components: the recreational activity, the setting in which it takes place, and the resulting experience. These three components make up the Recreation Opportunity Spectrum (ROS) that was originally completed

in 1986. However, during each Environmental Assessment, ROS for the area is reviewed and updated as needed. The setting includes both environmental and social factors. The environmental setting is characterized by physical and natural features as well as the amount of apparent modification from human activity. The social setting of an area is characterized by the amount of contact among the visitors using it and the probability of their experiencing isolation from the sights and sounds of non-recreation human activity. The experience is the desired psychological outcome realized by participating in a preferred activity in a preferred environmental and social setting. Different combinations of these components provide a range of recreation opportunities. The ROS is a way to classify this range of opportunities and to identify the capability of the Forest to provide them. There are five classes of ROS in the Forest Plan: Semi-primitive non-motorized (SPNM), Semi-primitive motorized (SPM), Roaded Natural (RN), Rural (R) and Urban (U). The Forest Plan objective is to maintain a balance of Recreation Opportunity Spectrum on the Ozark- St. Francis National Forests. This project area contains three of the five ROS classifications with the following acres:

- **Rural** approximately 68 acres associated with residential development along Old Highway 7 and Scenic State Highway 7.
- **Roaded Natural** approximately 14,476 acres associated with the majority of the area along the main forest roads, the major drainages and ridges which include the highways that border the project.
- **Semi-primitive motorized** approximately 4,203 acres associated with areas that are more difficult to access between drainages of Trace Creek and Short Hollow, a portion of Big Piney Creek, Graves Creek, and an area North of Graves Creek that includes two tributaries of Big Piney Creek.

Semi-primitive motorized areas are characterized by a predominantly natural or natural-appearing environment of moderate to large size. Motorized use is permitted. In roaded natural, the area is characterized by predominantly natural appearing environments with moderate evidences of the sights and sounds of man that usually harmonize with the natural environment. Evidence of vegetation management is acceptable because treatments are relatively short-lived, 3-5 years.

The majority of the overstory in the project is predominately older than 70 years old (56%). Several environmental events have happened in this project area which has shaped the visual landscape; red oak borer infestation, tornados, ice damage and small landslides. This resulted in a shift from a more uniform canopy to a broken, more open canopy with stressed and dying trees creating the appearance of a damaged forest. The broken canopy has allowed more light to reach the forest floor producing an increase in understory vegetation. These events have created an unsightly brushy condition which limits viewing opportunities.

The RLRMP (pg. 2.20) priorities are to maintain or enhance the visual character of the Forests by establishing scenic integrity objectives (SIOs). The intent is to manage landscapes and use the best environmental design practices to harmonize changes in the landscape to reduce visual effects of management. The Scenic Class numbers range from 1 to 6 with 1 representing high public value and 6 as moderate/low public value which usually is found in unseen areas. A landscape architect has been consulted as per FS Standard 110 found on page 3-15 of the

RLRMP. The Landscape Architect's site specific project designs will be incorporated in this EA in Chapter II.

The management area combined with the scenic class number identifies the Scenic Integrity Objectives for the Three Knob Project which is as follows;

* **High -** (Appears unaltered – Retention) Scenic integrity refers to landscapes where the valued landscape character "appear" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident. For this project (4,727 acres or 25%) the foreground and middle ground along Scenic Highway 7, Old Hwy 7 and Pilot Rock Mountain Road are designated with a high SIO.

*__Moderate__ – (Slightly Altered –Partial Retention) Scenic integrity refers to landscapes where the valued landscape character "appear" slightly altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed. For this project (6,348 acres or 33%) this SIO is located between the High SIO Pilot Rock Mountain Road and the Scenic River Corridor intermingled with Low and Unseen scenic classes within the middle and back ground along interior roads, northern portion of the project.

*__Low__ – (Moderately Altered- Modification) Scenic integrity refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. For this project (415 acres or .02%) these small areas are intermingled within the Moderate scenic class within the middle and back ground. The areas designated as low SIO are seldom visible except by an occasional visitors hiking or riding through the back country.

Unseen – This Scenic class is similar to Low with the exception that it has the potential to be classified higher if it is located within a known point of interest that would attract the public to the area. However, no points of interest fall within the Unseen scenic class (1,225 acres or .07%).

Unclassified – This is a portion of the forest that was acquired from a timber company that was intensely managed and never incorporated within the Scenic Class. The adjacent Scenic Integrity Objective is mostly moderate and a few places adjoin High. For this project (6,335 acres or 33%) most of the acquired land would be classified as Moderate to Low with only areas along Broomfield Road and the paved access road to Long Pool Campground receiving a High designation.

The analysis area is forested. Sight-seeing is limited along the state highways and gravel roads because the terrain and the vegetation offer little opportunity of vistas with the exception of few locations on Pilot Rock road. Areas that have been previously prescribed burned also allow a greater sight distance for viewing of the interior of the forest for short duration of approximately three years.

Table 21 shows SIOs by Management Area showing the Objectives of High, Moderate, and Low scenic classes can be found in the RLRMP Appendix D. The table below shows the distribution of the SIO by Management Areas within the project. The southern portion of the project was acquired after the RLRMP and has not been classified into desired scenic classes. These lands were acquired by the National Forests and were previously under intensive timber management.

Table 21: Scenic Integrity Opportunity Table

Management	Inventoried Scenic Class				
Areas	1	2	3	4	5-6
	Scenic Integrity Objectives				
1.C Designated Wild and Scenic Rivers	High	High	High	High	High
1.G. Special Interest Areas	High	High	High	Low	Low
1.H. Scenic Byway Corridors	High	High	High	High	High
3.B Oak Woodland	High	Moderate	Low	Low	Low
3.C Mixed Forest	High	High	Moderate	Low	Low
3.E. High Quality Forest Products	High	Moderate	Low	Low	Low
3.I Riparian Corridors	High	High	Moderate	Low	Low

The RLRMP, pg.2-20, for Scenery Management identifies priorities for the analysis area as follows:

- Maintain or enhance the visual character of the Forest by using the Scenery Management System (SMS) to achieve scenic integrity objectives.
- Manage landscapes and build elements in order to achieve scenic integrity objectives.
- Promote the planning and improvement of infrastructure along scenic travel routes. Use the best environmental design practices to harmonize changes in the landscape and to advance environmentally sustainable design solutions.
- Restore landscapes to reduce visual effects on nonconforming features.
- Manage scenic restoration to be consistent with other management area objectives.
- Maintain the integrity of the expansive, natural landscapes, and traditional cultural features that provide the distinctive character of places. Maintain the character of key places in order to maintain their valued attributes.

The general landscape character of the area is predominately a mature closed forest canopy with the exceptions of areas where natural events (ice storms, tornados, red oak borer infestation, landslides and general decline due to age of the forest) along with pastures and openings on private property. The RLMP has classified the scenic value for the majority of the project as Moderate to High and Unclassified that would be mostly incorporated within Moderate. It should be understood that Forest Plan mapping was completed using a “broad brush” approach and was mapped at a large scale over the entire Forests.

In the case of SIOs Forest Plan mapping was based on foreground and middle ground from existing roads without consideration of topography, vegetation or the amount or type of traffic the roads received. The Forest Plan mapped many areas as “seen or unseen” but did not include factors such as, terrain, viewer positions, vegetative screening or frequency or type of traffic etc.

that are considered at the project level. For that reason, areas may be identified as scenic level High that is located in "unseen" areas; these areas would receive standard project designs to achieve a more acceptable visual composition. Other areas in seen locations would each be identified with specific measures as needed based on the desired future conditions of the management area and scenic level. A map showing SIOs is contained in the process file at the Jasper office.

Proposed Action and Alternative 2

Direct/Indirect Effects

Recreation

The proposed vegetation management activities include practices such as, tree cutting, skid trails, temporary road construction, slash, etc. which would have a direct temporary negative effect on the recreational setting, but the activities would not exceed the current ROS classifications, (see definitions above). The current classification for Rural, Roaded Natural and Semi-primitive motorized expects forest visitors to encounter resource utilization while traveling Forest Service roads, hunting or while cross country hiking. Impacts are expected to be temporary (three to five years) with an increase in non-recreational human activity. Indirectly, the areas where vegetation management activities take place could experience a temporary reduction in recreational use.

Vegetative treatments have been implemented over the years within the vicinity. However, the amounts of activities proposed are higher due to management direction to manage on a watershed scale, seeking to improve overall conditions of the forested areas. An example of this follows: the vegetative treatments would produce younger trees, reduce unsightly brushy conditions, create wildlife viewing opportunities, improve forest health by reducing competition for food and sunlight, and in time generally enhance the visitors' recreational experience. These increased viewing opportunities would take place where ever vegetative management occurs and be available to visitors along roads, portions of OHV routes, and cross country riding or hiking. Noticeable deviations in the above management areas would be present.

Commercial surface rock collection would be allowed in areas which have activities proposed and an abundance of rock, but would not be allowed on more than 30 percent of the activity area. The effects of rock collection on recreation are less than timber harvest activities and while it could have a negative effect on a recreational users experience this would only be a temporary condition until the vegetation in an area where collection has taken place recovers, generally one growing season.

A portion of Forest Service Road (FSR) 1800A would be closed to passenger vehicles due to resource damage and safety concerns, which include steep grades, severely eroded roadbed and an entrenched road template (site visit Fall of 2013). The road would be converted to a trail after the proposed activities were implemented. The rationale behind this is to reduce the size/weight of the vehicles using the road. That way the template would not become washed out from passenger vehicles use. This would allow the public access along this road/trail for recreational use. After proposed activities were implemented FSR 1800A would be stabilized for resource protection and monitored to see if limiting the size of vehicles improves the current situation. If limiting the size of vehicle is not successful then FSR 1800A would be closed to all motorized

traffic. The PA and Alternative 2 would close a portion of OHV route FSR 93698F (0.75 miles) due to a wildlife opening being constructed. The goal is to provide access to meet the public need for recreational activities to point of interests, OHV routes is one tool that helps us move closer to that goal.

Cumulative Effects

The project area has similar timber activities occurring due to storm damage, red oak borer infestation, and opening roads that previously limited access from passenger vehicles. These proposals would increase the overall managed recreational experience by temporarily opening more roads (life of timber sales) which would provide more opportunities for hiking and driving. This fits within the niche that has been identified for the district, primarily day use activities.

Commercial surface rock collection would have no lasting effect on recreation as the area where rock has been collected generally heals over within one growing season. Overall recreational impacts from timber, wildlife, prescribed burning, and recreational construction would be limited to the life of the activities implementation, usually three years or less. The response time of vegetation after treatments is typically an additional three years for re-vegetation of soil disturbed area. These effects of treatments on other resource areas that occur within the Big Piney Scenic River Corridor or the general forest are incorporated below under the Wild and Scenic section.

The area immediately to the north and east of the Three Knob Project has recently been analyzed for vegetated management in the foreseeable future under the High Mountain Project. Due to the broken terrain and being separated by Big Piney Creek no activity is anticipated to affect the recreational user experience for any duration of time.

Direct/Indirect Effects

Scenery/Visual

The Proposed Action and Alternative II would see a temporary increase in direct negative effects on the aesthetic and scenic quality in the area where activities are proposed. During implementation, and for a period of a few years after, the area of the proposed activities could look visually unappealing. A Regional Scenery Treatment Guide with suggested mitigation measures based on type of activities within the different Scenic Class and Management Areas has been incorporated. Also, site specific project designs are being developed by a landscape architect. The site specific project designs will be included in Chapter II as such. Additionally, they would be included in the decision if the Proposed Action or Alternative II is chosen. The site specific project designs would minimize the negative visual effects from the proposed activities.

Indirectly, with approximately 2/3 of the total project area having activities proposed, fewer visitors may visit the area because of an increase in vegetation management work taking place. Visitors who do visit the area where activities may take place might not return for some time if they perceive the management activities as visually negative. The site specific project designs would minimize many of the negative visual effects.

The activities proposed would create wildlife viewing opportunities, improve forest health by reducing competition for food and sunlight, enhance the visitors' visual experience, produce younger trees, and reduce unsightly brushy conditions created by past natural events. These increased viewing opportunities would be available along roads, OHV routes, and cross country riding or hiking. Commercial surface rock collection could have a temporary negative effect on scenic quality within specific activity areas but no more than 30 percent of the activity area would be approved for this. No indirect effects on the scenic quality if commercial surface rock collection is allowed. The effects are less than vegetative treatments and would be within proposed activity areas. The activities impacts would began to lessen as vegetation growth cover soil disturbed areas and as the new growth ages. Approximately three years after implementation (once treated area is vegetated) impacts would not be measurable. As the contrast in vertical and horizontal lessen, the impacts would be minimized by degrees. The degree of visual impact would vary dependent upon the degree of change from the existing conditions. Example: thinning of trees would have less impact visually since the treated area would maintain the majority of its original composition limiting recovery to three to five years. Whereas, a shelterwood regeneration treatment would have removed the majority of the overystory trees requiring a time frame of thirty to forty years to achieve a similar composition as the current condition. Visually the area would be re-established within three to ten years.

Cumulative Effects

The existing project area has had similar timber activities occurring from storm damage and red oak borer infestation. The potential negative effects from the Proposed Action and Alternative 2 would be a temporary condition as management activities are completed and the vegetation grows. Any negative visual effects become less evident as each growing season passes and the vertical and horizontal contrast lessens. These impacts would be minimized by site specific project designs to help meet the management directions outlined in the Forest Plan under Scenic Integrity Objectives.

There would be no cumulative effects of commercial surface rock collection on scenic quality within proposed activity areas. The impacts are less than those from timber harvesting or wildlife stand improvement activities. Additionally, rock collection would be allowed within proposed activity areas. The area immediately to the north and east of the Three Knob Project has recently been analyzed for vegetated management in the foreseeable future under the High Mountain Project. Due to broken terrain and being separated by Big Piney Creek no activity is anticipated to affect the scenic integrity for any duration of time.

Direct/Indirect/Cumulative Effects

Special Use Permits and Outfitter guide permits-

The proposed activities within the project area would have a temporary negative effect (an inconvenience) to private property owners and outfitter guides during implementation, due to heavy equipment use on the Forest Service roads, increased traffic and potential user conflicts with increased use to the area in general. Once activities are completed, the increased use will have ended and the access would be improved providing a positive effect over the long term. In addition to improved access, vegetation treatments would increase sight distances that would enhance the wildlife viewing opportunities.

Alternative 1 – No Action

Direct/Indirect Effects
No management would be proposed. The amount of OHV routes would remain the same as they are currently. The public demand for a variety of activities and settings would stay the same with no new designation of trails or OHV routes. Safety issues would still be addressed as they are found, but resource issues of poorly located trail and routes would remain unchanged. Visually, the general landscape character of the area would remain the same, predominately a mature closed forest canopy, with the exceptions of broken canopy areas where natural events such as, ice storms, tornados, red oak borer infestation, landslides with an appearance of a general forest decline due to age. The demands for enhancement or additional recreational needs would remain the same and unaddressed.

Cumulative Effects
The overall objective to provide adequate network of OHV routes and a variety of activities and settings that fall within the District's niche would not be met. There would be no management action toward meeting the identified needs of the public.

The existing project area has had timber activities occur due to storm damage, red oak borer infestation. Therefore, some potential negative effects already exist and are a temporary condition as the management activities are completed and the vegetation grows. Approximately 56% of the Three Knob Project Area's trees are 80 years old or older (see Figure 5 on page III-30 in this document). For the majority of the management areas within this project the RLRMP recommends harvest rotations of between 80 to 110 years. The only exception is for shelterwood with reserves and its recommended rotation is 120 to 140 years. The visual impacts in this area of mature trees are at a greater risk of dying from natural events similar to recent past events, such as: red oak borer infestation of 2000, the ice storm in 2009 or the exceptional 2012 drought that is currently visible as trees continue to struggle to recover or die. At some point those trees could die, and if 56% of the trees in this project area die or are overcome by insects or disease within a few years of each other, then visually, that would have a dramatic negative effect on the visual quality in this project area.

The Big Piney River Scenic corridor would remain the same/unaltered without responding to the identified needs to enhance the recreational or scenic quality.

Wild and Scenic River Section
There were no thresholds met or exceeded individually or collectively for the Big Piney Wild and Scenic River corridor when effects were calculated and disclosed for each of the other resource areas. As a result, the effects to the Big Piney Wild and Scenic River corridor are addressed in this section.

Proposed Action and Alternative 2

Direct/Indirect/Cumulative Effects
The recreational effects disclosed below are based off past vegetative management activities observed such as; commercial thinning of pine and hardwoods which have taken place within

other projects on the district. These areas (1, 2, 23, 44, 45, 46, 48, 66, 82, 85, and portions of 52, 53, and 67) would be commercially thinned. Page 2-37 of the RLRMP under Scenic sections of Wild and Scenic Rivers ,desired conditions, states "management of vegetation is permitted within the river corridor to maintain outstandingly remarkable values. Vegetation management may be used for scenic enhancement or rehabilitation to provide wildlife viewing opportunities; ". It can be expected access to the above areas would be limited during implementation, up to three years. The limited access would create a direct temporary negative effect on recreation especially in areas 1, 2, 44, 45, & 46. Recreational use would increase after operations are complete due to the area being more open and accessible (skidder trails, temporary roads). This would be an indirect positive effect as the slash decomposes and exposed areas are re-vegetated.

The above vegetative treatments would promote and enhance the recreational remarkable values for which the scenic river was designated.

Areas (23, 48, 66, 82, 85, and portions of 52, 53, and 67) would be thinned and are within the corridor. These areas are more isolated and not seen by the general public visiting because the locations are not easily accessible and treatment would be blocked by terrain or other vegetation limiting any direct negative effect on scenic quality. These areas would have similar effects as above but are located in more isolated portions of the project area.

Alternative I - No Action

Direct/Indirect/Cumulative Effects
Under this alternative the recreational effects would remain as they currently exist. No activities would be implemented. There would be no improved access, enhanced wildlife viewing opportunities, or enhanced sight distances would occur.

E. Vegetation

Existing Conditions

The Three Knob project area is primarily located within three HUC-12watershed identified as Little Creek-Illinois Bayou (111102021002), Mill Creek- Big Piney Creek (111102020804), and Spring Creek-Big Piney Creek (111102020803). The project area encompasses approximately 19,050 acres of Forest Service and privately owned lands. Private or other non-Forest Service lands comprise approximately 1,374 acres while Forest Service lands comprise approximately 17,676 acres. From October 2012 through April of 2013, Forest Service personnel conducted an inventory of current stand conditions on Forest Service lands within the Three Knob project area. Data collected included information on current stocking levels, tree species, height, and diameter, forest type, and stand age. The data was then incorporated into GIS where it was utilized to delineate stand boundaries and analyzed in order to determine different stand and forest characteristics. The characteristics obtained from analysis of the stand inventory data was also used to aid in the development and prioritization of silvicultural treatments. Forest types present on Forest Service lands include: cedar/hardwood, loblolly pine forest, shortleaf pine forest, shortleaf pine/hardwood forest, loblolly pine/hardwood forest, hardwood/pine forest at,

mixed hardwood forests, and 55 acres or less than 1% of non-forested areas. Figure 3 illustrates the forest type distribution present across the Three Knob project area. Figure 4 illustrates the age class distribution across all forest types present within the project area, while Figure 5 and Table 22 illustrate the current age class distribution present across each forest type.

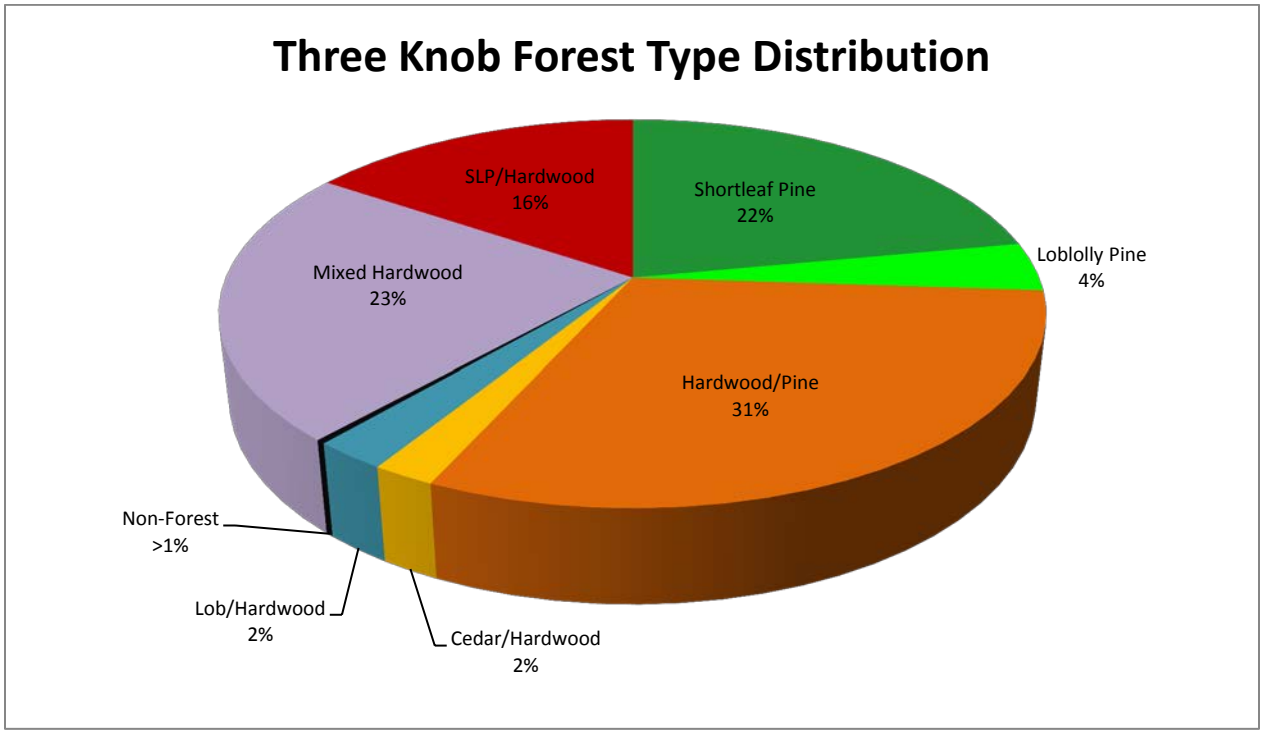


Figure 4: Forest Type Distribution

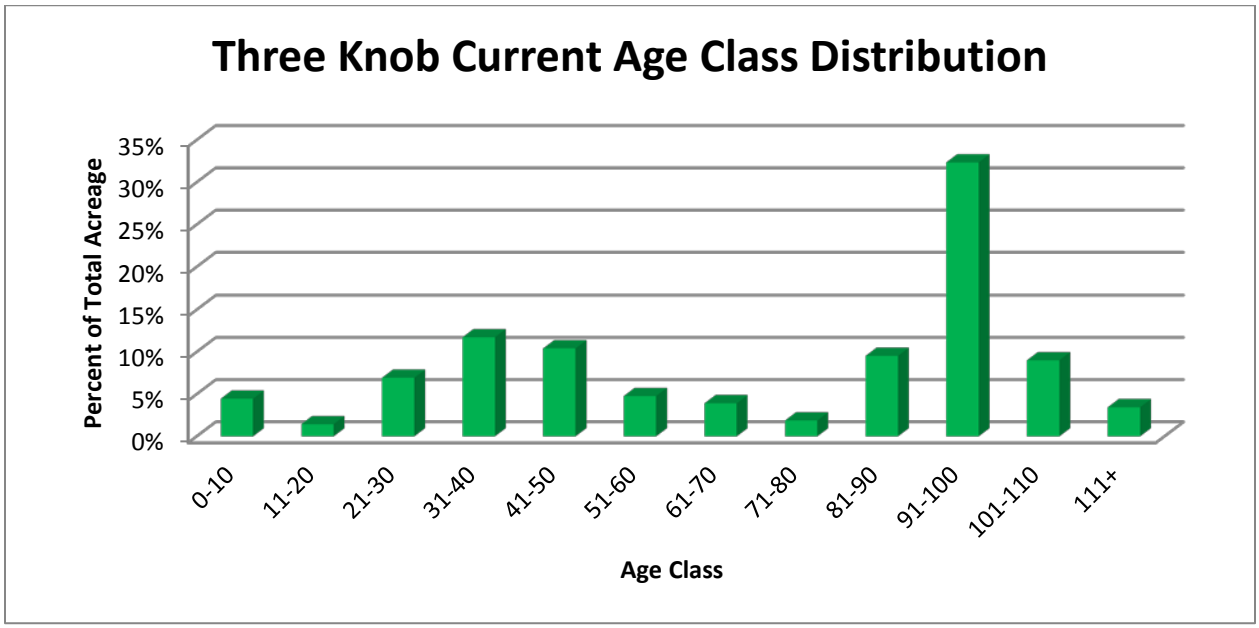


Figure 5: Current Age Class Distribution

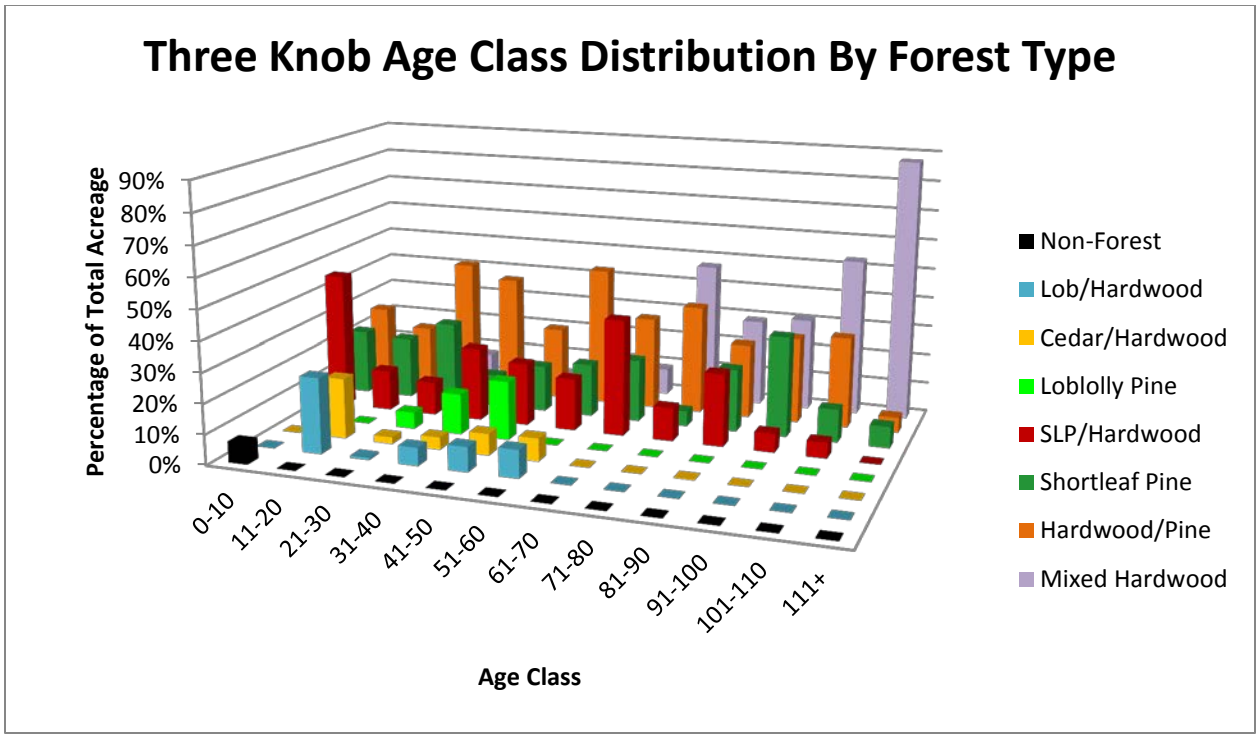


Figure 6: Age Class Distribution by Forest Type

Table 22: Current Age Class by Species

Forest Type		Age Class											
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111+
Shortleaf Pine	Acres	171	53	335	223	288	151	146	17	358	1,928	178	44
	% of Type	4%	1%	9%	6%	7%	4%	4%	0%	9%	50%	5%	1%
	% of Total	22%	21%	27%	11%	16%	18%	21%	5%	21%	34%	11%	7%
Loblolly Pine	Acres	0	0	69	284	363	0	0	0	0	0	0	0
	% of Type	0%	0%	10%	40%	51%	0%	0%	0%	0%	0%	0%	0%
	% of Total	0%	0%	6%	14%	20%	0%	0%	0%	0%	0%	0%	0%
Hardwood/Pine	Acres	204	52	551	845	448	395	215	122	423	1,653	488	32
	% of Type	4%	1%	10%	16%	8%	7%	4%	2%	8%	30%	9%	1%
	% of Total	26%	20%	45%	41%	24%	47%	31%	37%	25%	29%	31%	5%
Cedar/Hardwood	Acres	0	52	28	86	134	65	0	0	3	0	0	0
	% of Type	0%	14%	8%	23%	36%	18%	0%	0%	1%	0%	0%	0%
	% of Total	0%	20%	2%	4%	7%	8%	0%	0%	0%	0%	0%	0%
Lob/Hardwood	Acres	0	65	9	126	153	79	0	0	0	0	0	0
	% of Type	0%	15%	2%	29%	35%	18%	0%	0%	0%	0%	0%	0%
	% of Total	0%	25%	1%	6%	8%	9%	0%	0%	0%	0%	0%	0%

Table 22 (Cont'd): Current Age Class by Species

Forest Type	Age Class												
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111+	0-10
Mixed Hardwood	Acres	0	0	96	0	69	7	61	156	490	1,776	844	534
	% of Type	0%	0%	2%	0%	2%	0%	2%	4%	12%	44%	21%	13%
	% of Total	0%	0%	8%	0%	4%	1%	9%	47%	29%	31%	53%	88%
SLP/Hardwood	Acres	360	35	139	511	389	148	270	37	412	364	85	0
	% of Type	13%	1%	5%	19%	14%	5%	10%	1%	15%	13%	3%	0%
	% of Total	46%	14%	11%	25%	21%	18%	39%	11%	24%	6%	5%	0%
Non-Forest	Acres	55	0	0	0	0	0	0	0	0	0	0	0
	% of Type	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	% of Total	7%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
All Forest Types	Acres	789	258	1,227	2,077	1,843	846	692	333	1,687	5,719	1,595	610
	% of Total	4%	1%	7%	12%	10%	5%	4%	2%	10%	32%	9%	3%

Two distinct age classes are present within the project area. A 21-60 year old age class comprised mainly of pine forest types and an 81-111+ age class comprised mainly of hardwood forest types. The most predominant age class across the project area is the 91-100 year age class. At 5,719 acres, it comprises 32% of the total acreage within the project area. Approximately 9,944 acres or 56% of the stands within the project area are considered mature (older than 70 years of age). Of these 9,944 acres, approximately 3,800 acres or 38% are mature growth hardwood types; 2,717 acres or 27% are mature hardwood/pine forest types; 2,525 acres or 26% are mature growth pine types; 899 acres or 9% are mature pine/hardwood forest types. Currently, there are approximately 735 acres or approximately 4% of the forested lands that are considered to be in the early seral (0-10 year age class). Forest health and stand vigor is declining or at risk due to advanced stand age and overcrowding or densely stocked stands (Gouldin, 2011, Haavik et al, 2012). Figure 7 illustrates the mature forest type distribution.

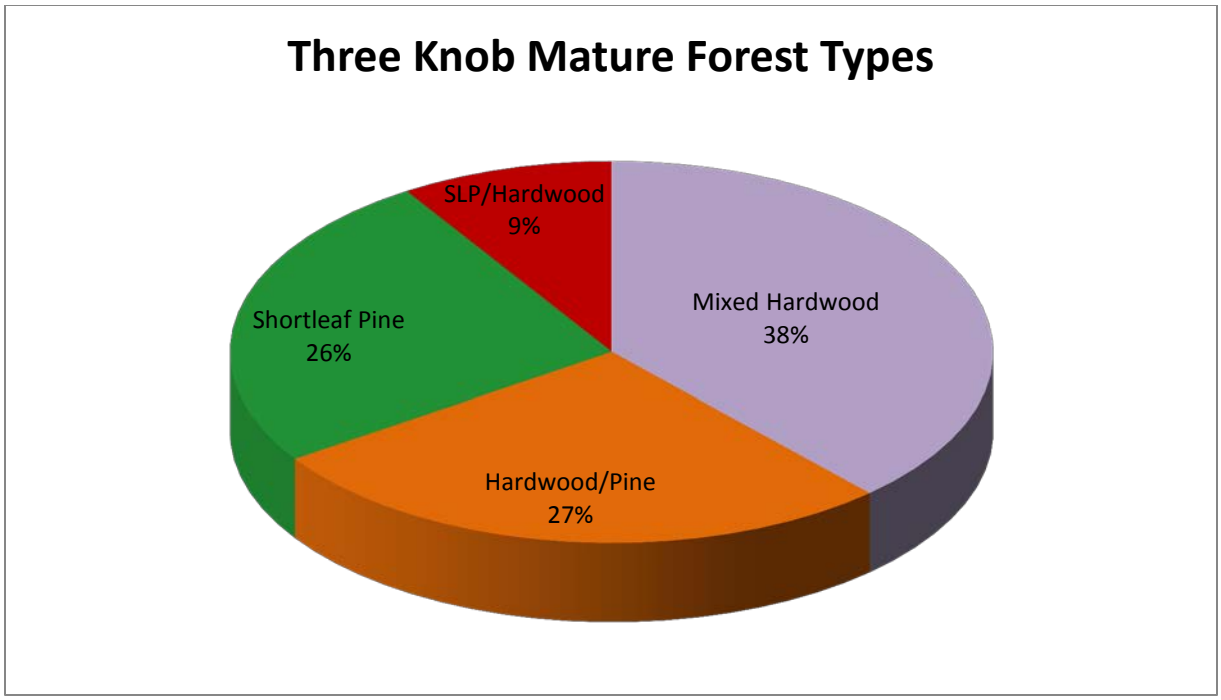


Figure 7: Mature Forest Types

Most stands proposed for silvicultural treatment have an average basal area ranging from 90 to 130 square feet per acre. The stand conditions are predominately immature poletimber, immature sawtimber, and mature sawtimber. The current high stocking levels increase competition for available sunlight and nutrients. This competition reduces the amount of nutrients available to individual trees and reduces their ability to defend against attacks by insects or disease. This creates an unhealthy forest environment and leaves portions of the forest susceptible to attacks by insects, diseases, wildfire, and weather.

Within the project area, oak-hickory stands tend to occur on north-facing slopes above 35% and along stream courses. The midstory and understory components on these stands are typically comprised of flowering dogwood, red maple, eastern hop hornbeam, and black gum. The midstory and understory species composition on north aspects less than 35% typically includes flowering dogwood, vacciniums, rusty black haw, and witch hazel.

Pine timber types are typically found on the southern aspects. Their midstory and understory associates include oaks, hickories, flowering dogwood, blackgum, and vacciniums. Species often found on ridge tops include grasses, forbs, serviceberry, 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 either 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 shrubby Lespedeza (*Lespedeza bicolor*), Chinese Lespedeza (*Lespedeza cuneata*), Royal Paulownia-(*paulownia tomentosa)*, Japanese privet (*Ligustrum japonicum*), Japanese Honeysuckle

(*Lonicera japonica)*, Nonnative Rose (*Rosa multiflora*), Mimosa (*Albizia julibrissn*), and Japanese stiltgrass (*Microstegium vimineum).*

<u>Effects of Management Activities on Early Seral Habitat</u>

Proposed Action

<u>Direct Effects</u>:
The amount of early seral habitat within the project area would increase by approximately 2,825 acres (from 4% to 20%) through regeneration harvests (2,807 acres), managing/enlarging existing wildlife openings, and construction of new wildlife openings (75 acres). (Figure 8)

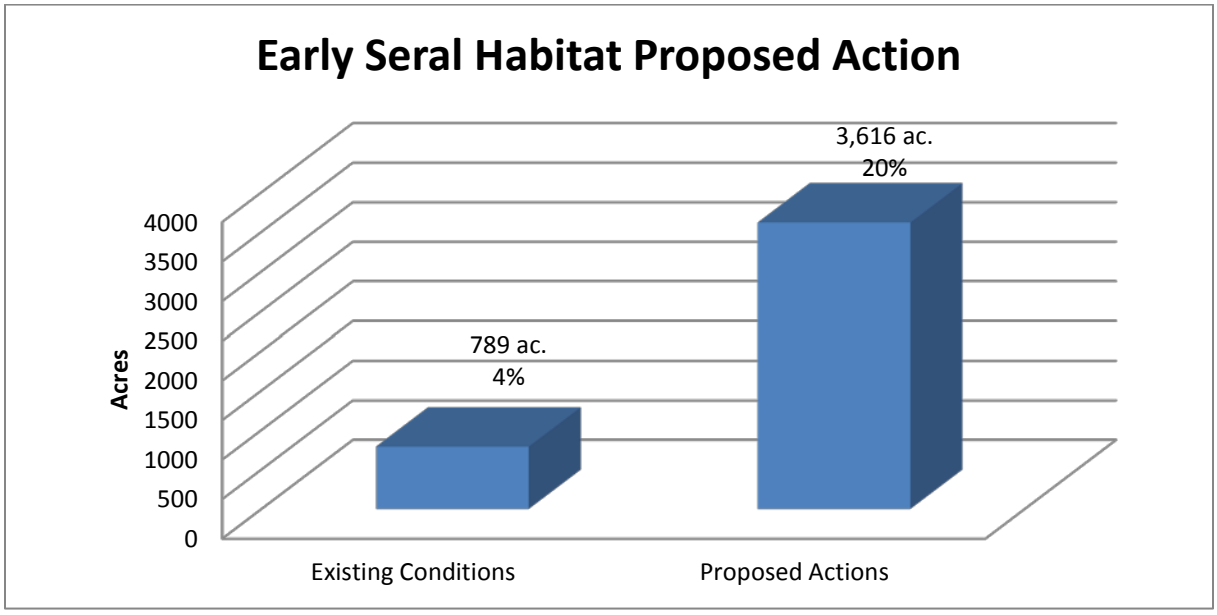


Figure 8: Comparing Current Amount of Early Seral Habitat to Proposed Action

The proposed prescribed burns and field management activities under the Proposed Action would reduce the new growth and establishment of woody vegetation and maintain existing early seral habitat within the project area.

<u>Indirect Effects</u>:
Under the Proposed Action alternative, approximately 2,825 acres of new early seral habitat would be created from the proposed actions. Over time, the 2,752 acres of proposed regeneration harvests and 10.5 acres of reforesting existing wildlife openings would continue to grow into older age classes and the amount of early seral habitat available overtime would be reduced. However, the 75 acres of wildlife opening maintenance/enlargement would continue to be maintained in the 0-10 year age class. This would serve to maintain this type of early seral habitat over time.

By reducing the stand density, the forest floor would receive the required sun light for the germination and establishment of woodland habitat that provides for many early seral wildlife species. With the reduction of the possible fuel loading, the risk for catastrophic wildfires is

reduced. Prescribed burns, repeated on 3-5 year cycles, would retain existing and newly created woodland habitat over time.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. Past land clearing (wildlife opening construction) and wildlife opening rehabilitation activities have helped create or maintain 53 acres within the project area in early seral habitat. Gas well development has resulted in the clearing of 2 acres of pine and hardwood forest types. Future gas well development is unknown at this time; however, the environmental effects of each natural gas proposal would receive its own analysis. Ongoing activities such as activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and not affect early seral habitat composition.

The proposed pine and hardwood regeneration harvests would result in a temporary increase in the amount of woodland habitat available throughout the project area. With repeated prescribed burning and thinning woodlands would be maintained over time. Wildlife openings 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 1: No Action

Direct Effects:
Alternative 1 proposes no management actions that would result in the creation of additional early seral habitat within the project area (Figure 9). No direct effects to early seral habitat would occur.

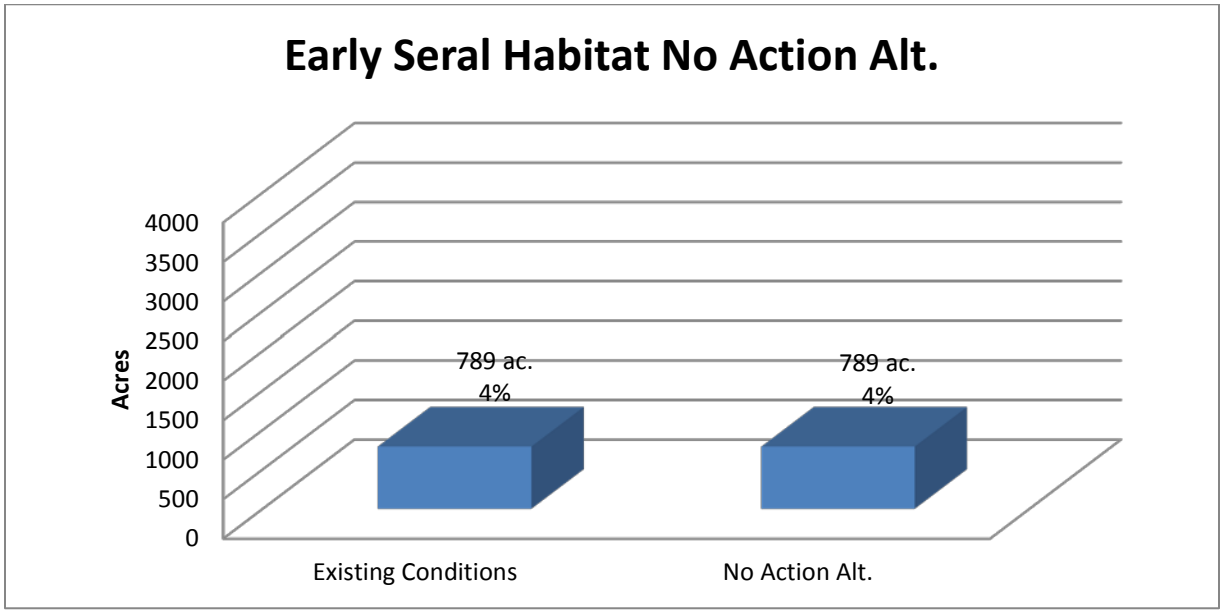


Figure 9: Comparing Current Amount of Early Seral Habitat to Alternative 1

Indirect Effects:
In the absence of fire or other vegetation management activity, trees and other woody vegetation would grow in and shade out existing early seral habitat. The absence of management activities such as thinning and regeneration harvests would put overall forest health at risk. Stands would continue to grow and increase existing stocking levels. As stocking increases, competition for resources such as light, water, and nutrients increases. The stands 0-10 age-class would disappear before this area is entered again to b evaluated for potential treatments. The increased competition for resources strains trees and leaves them susceptible to insects such as the Southern pine beetle and diseases by reducing their ability to fight off attacks. Further increases in stocking levels would lead to density dependent mortality. This is the point at which competition for resources is so great that trees begin to die.

Cumulative Effects:
Under this alternative, the proposed management activities would not occur. As discussed in the Indirect Effects section, there is a potential for trees and other woody vegetation to take over existing early seral habitat. Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. Past land clearing (wildlife opening construction) and wildlife opening rehabilitation activities have helped create or maintain 53 acres within the project area in early seral habitat. Gas well development has resulted in the clearing of 2 acres of pine and hardwood forest types. Future gas well development is unknown at this time; however, the environmental effects of each natural gas proposal would receive its own analysis. Ongoing activities such as activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and not affect early seral habitat composition.

Over time, without the implementation of the proposed vegetation management activities, the amount of trees and other woody vegetation would increase and the area of land in early seral habitat would decrease. Forest health and stand vigor would continue to decline.

Alternative 2: No Herbicide Use

For this alternative, the direct, indirect, and cumulative effects would be the same as those listed under the proposed action. The proposed vegetation management activities would still be implemented for this alternative utilizing manual methods instead of the use of herbicides.

Effects of Management on Age Class Diversity

Proposed Action

Direct Effects:
Management activities such as pine and hardwood regeneration harvests as well as wildlife opening construction/reconstruction would shift current age class distribution from older age classes into the 0-10 year age class. Table 23 illustrates the amount of acres that would move from current age classes into the 1-10 year age class for each treatment. Figure 10 shows the comparison of age class distribution from existing conditions to what it would be following implementation of the proposed actions.

Table 23: Acres Moved from Current Age Class into 1-10 Year Age Class.

Age Class	Treatment				
	WLO	Hardwood SW	Pine ST	Pine SW	Total Acres
21-30	3				3
31-40	11		118		129
41-50	11		290		301
51-60	5			36	41
61-70	5				5
71-80		49			49
81-90	21	115	208	173	517
91-100	10	461	859	144	1,474
101-110	7	147	30	32	216
111+		91			91
					2,825

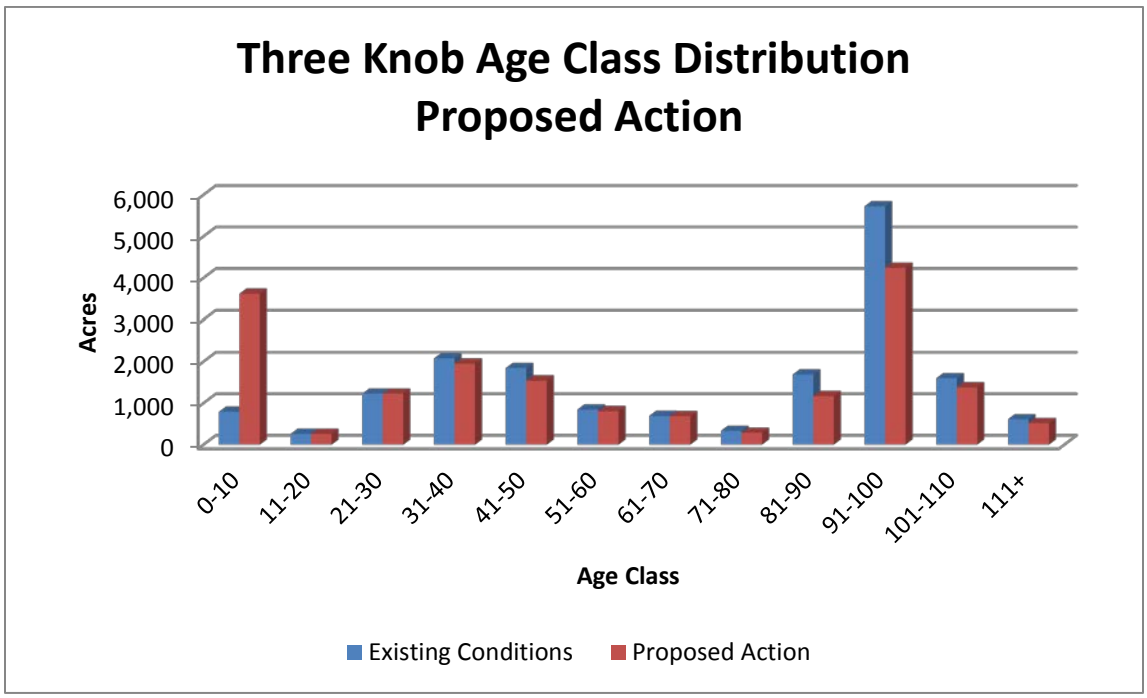


Figure 10: Age Class Distribution Proposed Action

Indirect Effects:
The proposed actions would increase age class diversity by shifting 2,825 acres across several age classes to the 0-10 year age class through regeneration harvests. Overall forest health and vigor would be increased. Younger age classes tend to exhibit more vigorous growth while

increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. Past land clearing (wildlife opening construction) and wildlife opening rehabilitation activities have helped create or maintain 53 acres within the project area in early seral habitat. Gas well development has resulted in the clearing of 2 acres of pine and hardwood forest types. Future gas well development is unknown at this time however; the environmental effects of each natural gas proposal would receive its own analysis. Ongoing activities such as activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect forest age class distribution.

The proposed pine and hardwood regeneration harvests, construction of new wildlife openings, and expansion and management of existing wildlife openings associated with the proposed actions combined with past management activities would increase age class diversity across the entire project area by shifting older age classes to the 0-10 year age class by a total of 2,825 acres over current conditions. Overall forest health and vigor would be increased. Younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition. 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 1: No Action

Direct Effects:
No activities are proposed under this alternative, therefore there would be no direct effects to age class structure within the project area.

Indirect Effects:
Younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition. In the absence of management activities or natural disturbances, 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 as depicted in Figure 11. This would reduce overall Forest health and vigor. The large amount of 90-100 year old age-class would move into the 100-110 year old age-class before next entry.

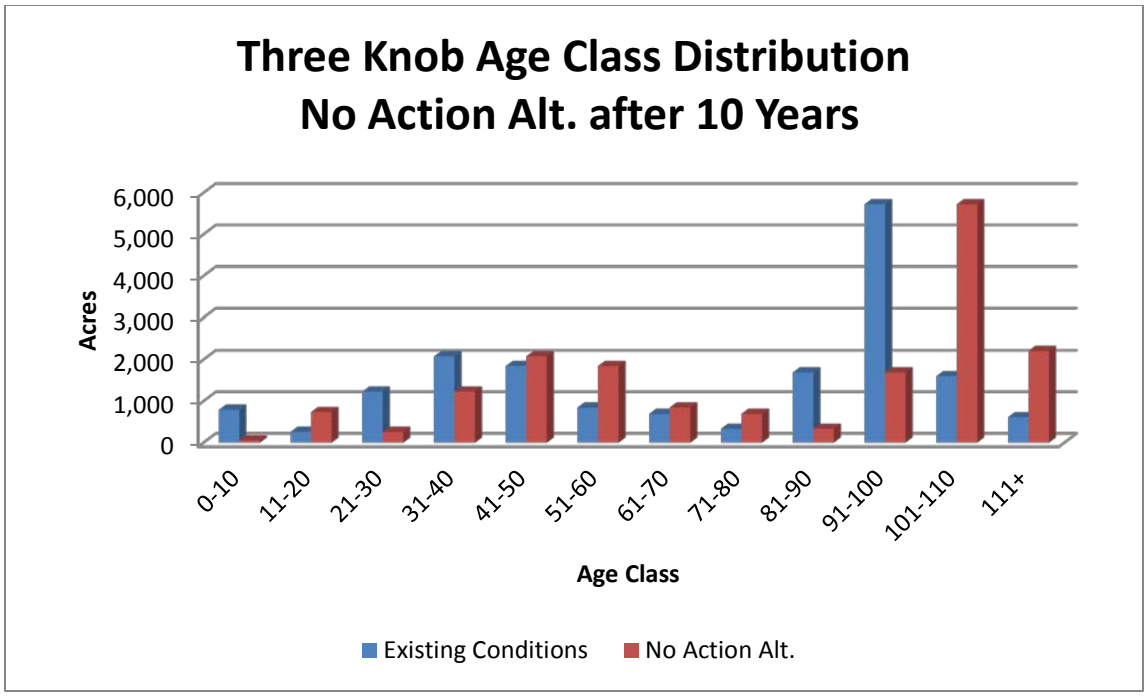


Figure 11: No Action Alternative Age Class Distribution after 10 Years

Cumulative Effects:
Under this alternative, the proposed management activities would not occur. As discussed in the indirect effects section, increased age class diversity leads to increases in the overall forest health and vigor. Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. Past land clearing (wildlife opening construction) and wildlife opening rehabilitation activities have helped create or maintain 53 acres within the project area in early seral habitat. Gas well development has resulted in the clearing of 2 acres of pine and hardwood forest types. Future gas well development is unknown at this time; however, the environmental effects of each natural gas proposal would receive its own analysis. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect forest age class distribution.

Over time, without the implementation of the proposed vegetation management activities, 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. Forest health and vigor would continue to decline.

Alternative 2: No Herbicide Use

For this alternative, the direct, indirect, and cumulative effects would be the same as those listed under the Proposed Action. The proposed vegetation management activities would still be implemented for this alternative utilizing manual methods instead of the use of herbicides.

Effects of Management Activities on Mature Growth

Proposed Action

Direct Effects:
Currently, approximately 9,944 acres or 56% of the Three Knob Project area is comprised of mature growth (older than 70 years of age) forest types. Of the 9,944 acres, approximately 3,800 acres or 38% are comprised of mature mixed hardwood forest types; approximately 2,717 acres or 27% are comprised of mature hardwood/pine forest types; approximately 2,515 acres or 25% are comprised of mature Shortleaf pine types; and approximately 899 acres or 9% are comprised of mature Shortleaf pine/hardwood forest types. Under the Proposed Action alternative, approximately 2,347 acres of mature growth forest types would be reduced through regeneration harvests, managing/enlarging existing wildlife openings, and construction of new wildlife openings.

Where the activities would be performed, approximately 1,243 acres would be reduced on mature growth pine types, approximately 826 acres would be reduced on mature growth hardwood forest types, and approximately 278 acres would be reduced on mature growth pine/hardwood forest types. This would reduce the amount of mature growth forest types across the project area to 43%.

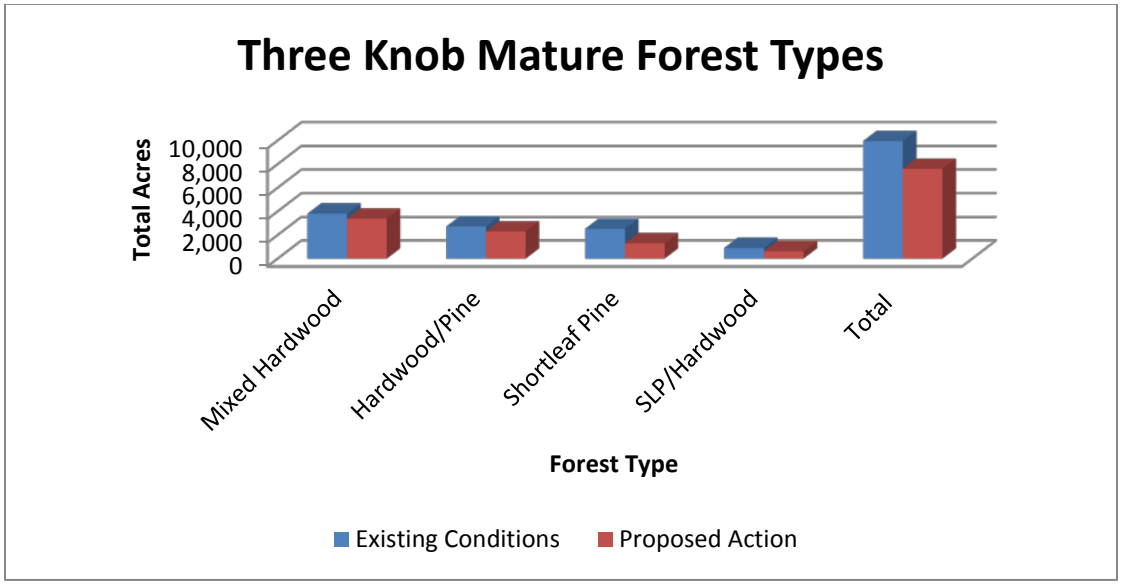


Figure 12: Direct Effects on Mature Forest Types under the Proposed Action

Note: Shortleaf Pine in the above table includes 443 acres of Loblolly Pine regeneration. RLRMP states for Loblolly Pine under desired condition; once mature, they are harvested for wood products and restored to native forest communities appropriate to site conditions. As a result, abundance of this community decreases over time.

Indirect Effects:
The mature growth would be reduced by approximately 2,347 acres or 13%. Overtime the younger age classes would continue to grow into older age classes, increasing the amount of mature growth present within the project area. By removing 13% of the current age structure

from mature growth age class to the 0-10 year early seral age class age class diversity is increased. As discussed under the Age Class Diversity section, increases to forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. None of the past management activities which occurred within the Three Knob Project area took place on mature forest types. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect mature growth composition.

Management activities proposed under the Proposed Action would reduce the amount of mature growth mixed hardwood forest types to 3,384 acres; mature growth hardwood/pine forest types to 2,301 acres; shortleaf pine forest types to 1,287 acres; and shortleaf pine/hardwood forest types to 622 acres. This would increase age class diversity across the entire project area by shifting mature age classes to the 0-10 year age class by a total of 2,347 acres over current conditions. Overall forest health and vigor would be increased. Younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition. 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 1: No Action

Direct Effects:
No activities are proposed under this alternative; therefore, there would be no direct effects to mature growth within the project area.

Indirect Effects:
Overtime, the current age classes would retain the same distribution in relation to one another, but the distribution would be increasingly skewed to the older age classes. The younger age classes would continue to grow into older age classes, increasing the amount of mature growth present within the project area. The disproportionate amount of mature and older age class structures would result in decreased forest vigor and increased susceptibility to insects, disease, and mortality.

Cumulative Effects:
Under this alternative, the proposed management activities would not occur. As discussed in the Indirect Effects section, increased age class diversity leads to increases in the overall forest health and vigor. Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening

rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. None of the past management activities which occurred within the Three Knob Project area took place on mature forest types. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect mature growth composition.

Over time, without the implementation of the proposed vegetation management activities, the current age classes would retain the same distribution in relation to one another, but the distribution would be increasingly skewed to the older age classes. The younger age classes would continue to grow into older age classes, increasing the amount of mature growth present within the project area. The disproportionate amount of mature and older age class structures would result in decreased forest vigor and increased susceptibility to insects, disease, and mortality.

Alternative 2: No Herbicide Use

For this alternative, the direct, indirect, and cumulative effects would be the same as those listed under the proposed action. The age classes that comprise the mature status are generally not in direct competition with the understory or midstory vegetation.

Effect of Management Activities on Retention and Recruitment of Hardwoods

Proposed Action:

Direct Effects:
Under the Proposed Action, approximately 2,208 acres of hardwood forest types would receive a commercial timber harvest that would reduce the overall stand density. Commercial treatments typically remove larger diameter trees present in the dominant and co-dominant canopy layer. Approximately 1,418 acres would receive a non-commercial intermediate treatment to reduce stand density; however, non-commercial treatments typically remove smaller diameter trees present in the under and mid canopy levels. Within these areas, selected hard and soft mast producing trees would be released from competition. As a result there will be an increase to the amount of available sunlight and available nutrients to the forest floor and remaining trees.

The removal of hardwoods during regeneration harvests would temporarily reduce the hard mast production. Following regeneration harvests, stands would receive site preparation treatment to control competing vegetation using either manual techniques or the application of herbicides. The stands would then be reforested, either naturally or artificially, to a minimum stocking level of 150 hardwood trees per acre within three years following harvest activities. The target stocking level is 250-350 hardwood trees per acre within three years following harvest activities (RLRMP, 2005, FW-11, p.3-2). Prescribed fire would be utilized to remove litter from the ground surface, aiding in the germination of hardwood seeds. In regards to hardwood retention, dormant season burns do not kill the rootstocks of hardwood species. Top-killing could occur, but hardwoods often re-sprout.

Both commercial and non-commercial thinning activities within the hardwoods forest types would decrease competition for light and nutrients, reduce canopy closure, and allow for crowns to expand.

Indirect Effects:
Approximately 21 acres or >1% of hardwood forest types present across the Three Knob Project area would be converted to open early seral habitat conditions through the construction of high quality wildlife openings. These areas would be maintained as wildlife openings and would result in a loss of hardwood forest types. Areas proposed for regeneration harvests would still be managed as hardwood stands and no change in species composition is expected to occur. Areas proposed for thinning, both commercial and non-commercial, would only have a reduction in stand density; no change in species composition is expected to occur. This would increase the residual trees capability to produce hard mast.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. None of the past management activities which occurred within the Three Knob Project area took place on hardwood forest types. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect species composition.

Management activities proposed under the Proposed Action would temporarily reduce the amount of hardwood trees on approximately 2,208 acres through commercial timber harvests, approximately 1,418 acres through non-commercial intermediate treatments. Areas proposed for regeneration harvests would still be managed as hardwood stands and no change in species composition is expected to occur. Areas proposed for thinning, both commercial and non-commercial, would only have a reduction in stand density; no change in species composition is expected to occur. Approximately 21 acres of hardwood forest types present across the Three Knob Project area would be converted to open early seral habitat conditions through the construction of high quality wildlife openings.

Alternative 1: No Action

Direct Effects:
No management activities would occur under this alternative. There would be no direct effects on the retention and recruitment of hardwoods.

Indirect Effects:
Mixed hardwood and hardwood pine forest types comprise approximately 6,517 acres or 66% of the mature forest types present across the Three Knob Project area. Due to the lack of management activities these stands would continue to increase in age and stand density overtime. Competing vegetation could also suppress the growth and development of hardwood seedling/saplings. Advanced age combined with increased stand density greatly increases the competition for light and nutrients. These factors combine to increase stand stress and decrease

stand vigor which leaves them vulnerable to insects, disease, and mortality. Overtime as hardwood forest types continue to age and succumb to environmental factors such as prolonged drought, wildfire, ice, and wind damage, the amount of desirable hardwood forest types across the project could decline. Additionally, with an inadequate amount of light reaching the forest floor hardwood recruitment would be very little.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. None of the past management activities which occurred within the Three Knob Project area took place on hardwood forest types. Ongoing activities such as road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect species composition.

Alternative 2: No Herbicide Use

For this alternative, the direct, indirect, and cumulative effects would be the same as those listed under the proposed Action.

Effects of Management Activities on Hard Mast Production

Proposed Action

Direct Effects:
Under the Proposed Action, approximately 2,208 acres of hardwood forest types would receive a commercial timber harvest that would reduce the overall stand density. Commercial treatments typically remove large diameter trees present in the dominant and co-dominant canopy layer. Approximately 1,418 acres would receive a non-commercial intermediate treatment to reduce stand density; however, non-commercial treatments typically remove smaller diameter trees present in the under and mid canopy levels. Within these areas, selected hard and soft mast producing trees would be released from competition. As a result, there will be an increase to the amount of available sunlight and available nutrients to remaining trees.

The removal of hardwoods and other mast producing species during regenerative harvests would temporarily reduce the hard mast production. Thinning activities both commercial and non-commercial within the hardwoods forest types would also remove mast producing trees; however, these activities would also decrease competition for light and nutrients, reduce canopy closure, and allow for crowns to expand. This would increase the residual trees capability to produce hard mast.
Indirect Effects:
Approximately 21 acres or >1% of hardwood forest types present across the Three Knob Project area would be converted to open early seral habitat conditions through the construction of high quality wildlife openings. These areas would be maintained as wildlife openings and would result mast producing trees. However, by reducing stocking levels through commercial thinning, woodland management, and TSI activities competition for available sunlight and nutrients would be reduced. Selective marking techniques would help to ensure that the best mast producers are

retained. This would, in turn, improve crown development resulting in increased mast producing capabilities of the remaining trees and the overall area. Mast production could be reduced in the future from site preparation activities and release treatments on regeneration areas.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. None of the past management activities which occurred within the Three Knob Project area took place on hardwood forest types. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction could result in the removal of a few individual mast producing trees; however, these activities are not expected to diminish the overall amount of mast available to area wildlife.

Management activities proposed under the Proposed Action would temporarily reduce the amount of mast producing trees on approximately 2,208 acres through commercial timber harvests, and approximately 1,418 acres through non-commercial intermediate treatments. Approximately 21 acres of hardwood forest types present across the Three Knob Project area would be converted to open early seral habitat conditions through the construction of high quality wildlife openings. The removal of hardwoods and other mast producing species during regenerative harvests would temporarily reduce the hard mast production. Both commercial and non-commercial thinning activities within the hardwoods forest types would also remove mast producing trees; however, these activities would also decrease competition for light and nutrients, reduce canopy closure, and allow for crowns to expand. This would increase the residual stand's capability to produce hard and soft mast.

Alternative 1: No Action

Direct Effects:
No activities are proposed under this alternative, therefore there would be no direct effects to the hard mast production.

Indirect Effects:
Mixed hardwood and hardwood pine forest types comprise approximately 6,517 acres or 66% of the mature forest types present across the Three Knob Project area. These forest types comprise a major percentage of hard and soft mast producing species. Due to the lack of management activities, these stands would continue to increase in age and stand density overtime. Advanced age combined with increased stand density greatly increased the competition for light and nutrients. These factors combine to increase stand stress and decrease stand vigor which leaves them vulnerable to insects, disease, and mortality. Overtime as hardwood forest types continue to age and succumb to environmental factors such as prolonged drought, wildfire, ice, and wind damage, the amount of quality mast producing species across the project could decline.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. None of the past

management activities which occurred within the Three Knob Project area took place on hardwood forest types. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction could result in the removal of a few individual mast producing trees; however, these activities are not expected to diminish the overall amount of mast available to area wildlife.

Due to the lack of management activities, these stands would continue to increase in age and stand density overtime. Competing vegetation could also suppress the growth and development of hardwood seedling/saplings. Advanced age combined with increased stand density greatly increased the competition for light and nutrients. These factors combine to increase stand stress and decrease stand vigor which leaves them vulnerable to insects, disease, and mortality. Overtime as hardwood forest types continue to age and succumb to environmental factors such as prolonged drought, wildfire, ice, and wind damage, the amount of quality mast producing species across the project could decline causing the wildlife dependent on this food source to search elsewhere.

Alternative 2: No Herbicide Use

For this alternative, the direct, indirect, and cumulative effects would be the same as those listed under the proposed action. Management activities would still be performed throughout the project area utilizing manual methods instead of herbicides. Generally, without the use of herbicides the treatments are less effective and require extensive manual treatments.

Effects of Regeneration Harvests on Vegetation

Proposed Action

Direct Effects:
Under the PA, approximately 2,752 acres of early seral habitat would be created through the proposed seed tree and shelterwood regeneration harvests. Seed tree regeneration harvests would retain approximately 10-20 ft^2 of residual basal area while shelterwood regeneration harvests would retain approximately 20-40 ft^2 of residual basal area. Trees that are removed during regeneration harvests include any diseased or damaged trees as well as any overmature, intermediate or suppressed trees. The residual trees that remain exhibit good health with dominant or co-dominant crowns, straight trunks, good pruning and seed producing ability. By removing overmature, diseased, and stressed trees and leaving the healthy, vigorous, seed-producing trees, the current and future health of the stand is improved. All regeneration harvests would be followed up by site preparation, release and if necessary, planting to ensure adequate reforestation within five years following harvest activities.

Indirect Effects:
As forested stands reach maturity and continue to age, competition for light and nutrients increases and growth and vigor begin to decline. Overtime, the increased competition, combined with the reduction in health and vigor leads to mortality in overmature, diseased, stressed, or suppressed trees. By removing approximately 2,309 acres of mature forest through regeneration harvests the expected losses from future mortality would be reduced or eliminated and a new early seral age class would be introduced. As discussed in previous sections, the early seral

habitat created through proposed regeneration harvests would increase the overall age class diversity across the project area. This would serve to improve the overall health and vigor of the forest because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Cumulative Effects:
Past management activities within the project area have included 8 acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. Past land clearing (wildlife opening construction) and wildlife opening rehabilitation activities have helped create or maintain 53 acres within the project area in early seral habitat. Gas well development has resulted in the clearing of 2 acres of pine and hardwood forest types. Future gas well development is unknown at this time; however, the environmental effects of each natural gas proposal would receive its own analysis. Ongoing activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees and would not affect forest age class distribution.

The proposed pine and hardwood regeneration harvests, construction of new wildlife openings, and expansion and management of existing wildlife openings associated with the proposed actions combined with past management activities would increase age class diversity across the entire project area by shifting older age classes to the 0-10 year age class by a total of 2,825 acres over current conditions. As discussed under previous sections, increases to early seral habitat and forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Alternative 1: No Action

Direct Effects:
No activities are proposed under this alternative; therefore, there would be no direct effects from regeneration harvests on vegetation.

Indirect Effects:
Under this alternative the proposed regeneration harvests would not occur. Stands would continue to mature and age resulting in increased competition for sunlight and available nutrients as well as a decline in forest growth and vigor. Overtime, the increased competition, combined with the reduction in health and vigor leads would increase natural mortality in over-mature, stressed, or suppressed trees as well increase the risk of mortality from insect or disease outbreaks.

Cumulative Effects:
Under this alternative, the proposed management activities would not occur. As discussed in the indirect effects section, there is a potential for trees and other woody vegetation to take over existing early seral habitat. Past management activities within the project area have included 8

acres of permanent land clearing (wildlife opening construction), 45 acres of wildlife opening rehabilitation, 2 acres of clearing for well pad installation, and 4.5 miles of road improvement work. Past land clearing (wildlife opening construction) and wildlife opening rehabilitation activities have helped create or maintain 53 acres within the project area in early seral habitat. Gas well development has resulted in the clearing of 2 acres of pine and hardwood forest types. Future gas well development is unknown at this time however; the environmental effects of each natural gas proposal would receive its own analysis. Ongoing activities such as activities such as trail maintenance, or road maintenance/ reconstruction would only result in the removal of a few individual trees.

Overtime, the current age classes would retain the same distribution in relation to one another, but the distribution would be increasingly skewed to the older age classes. The younger age classed would continue to grow into older age classes, increasing the amount of mature growth present within the project area. The disproportionate amount of mature and older age class structures would result in decreased forest vigor and increased susceptibility to insects, disease, and mortality. Overall, forest health and stand vigor would continue to decline.

Alternative 2: No Herbicide Use

Direct Effects:
The direct effects of Alternative 2 would be the same as those listed under the proposed action.

Indirect Effects:
Under this alternative no herbicides would be utilized to achieve management goals. The activities listed on the Herbicide Use Table (Table 10) would be accomplished using manual methods. The use of manual methods for these activities greatly reduces the effectiveness and success of site preparation and release activities. It is important to adequately reduce competing vegetation when performing regeneration harvests to ensure that conditions are adequate for successful regeneration to become established and grow. Manual methods are less effective than chemical treatments because of the propensity for the vegetation to re-sprout. Because the competing vegetation already have established root systems, they can often out compete and shade out desirable regeneration after re-sprouting. This may require follow up manual treatments and increase the overall cost to ensure adequate reforestation.

Cumulative Effects:
Past experience on the Big Piney Ranger District has shown that manual site preparation and release techniques are far less effective at adequately ensuring successful regeneration following regeneration harvests. Because follow up treatments are often required, they are less cost effective.

Effects of Commercial Thinning on Vegetation

Proposed Action

Direct Effects:

Under the Proposed Action approximately 4,442 acres of commercial thinning (2,912 acres on pine forest types, 1,483 acres on hardwood forest types, and 47 acres on cedar/hardwood forest types) would occur across the project area. Stocking levels would be reduced to approximately 60-80 ft^2 of residual basal area. Other activities such as woodland management on surrounding wildlife openings and salvage operations, and timber stand improvement thinning would involve the removal of existing vegetation to reduce stocking levels. These treatments may be manual or offered commercially. Thinning operations, whether they are commercial or non-commercial, target tree species which are directly competing with desired crop trees for removal first. Next, tree species that appears to be smaller, weaker, damaged, diseased, or poorly formed, would be removed. If the target stacking has not been met under the first two conditions, otherwise healthy appearing tree species may be removed to reduce competition for sunlight, water, and soil nutrients. The residual trees which remain are the larger and are often the healthiest and most vigorous trees in the stand, due to the position of their crowns in the canopy.

Indirect Effects:
Commercial thinning operations on 4,442 acres (2,912 acres on pine forest types; 1,483 acres on hardwood forest types; and 47 acres on cedar/hardwood forest types) would result in reduced stocking levels by removing small, weak, damaged, or diseased trees. This would reduce competition for available light and nutrients among the residual trees and improve the overall health and vigor of these areas. By maintaining a healthy and vigorously growing forest, likelihood and severity of future attacks from insects and diseases are reduced. Lower stocking levels also allow more sunlight to reach the forest floor. This would improve the number and diversity of plant species present within the forest understory as well as increase the amount of available browse for wildlife species.

Cumulative Effects:
The commercial thinning combined with prescribed burning and other vegetation management techniques such as woodland management on surrounding wildlife openings, salvage operations, timber stand improvement thinnings, seedling release, and pre-commercial thinning would increase and maintain the amount of reduced stocking levels across the project area. This would reduce competition for light and available nutrients, as well as increase the amount of sunlight reaching the forest floor thus increasing the amount and diversity of plant species on the forest floor as well as increasing browse for wildlife species. The proposed prescribed burning would help maintain the lower stocking levels over time by controlling the amount of smaller vegetation present in the forest understory.

Alternative 1: No Action

Direct Effects:
No activities are proposed under this alternative; therefore, there would be no direct effects from commercial thinning on vegetation.

Indirect Effects:
Under this alternative, proposed commercial thinnings and other vegetation management activities would not occur. The forest would continue to grow resulting in increased stocking levels, competition for sunlight and available nutrients as well as a decline in forest growth and

vigor. Overtime, the increased competition, combined with the reduction in health and vigor leads would increase natural mortality in overmature, stressed, or suppressed trees as well as increase the risk of mortality from insect or disease outbreaks. Thick forest canopies would prevent sunlight from reaching the forest floor. This would reduce the amount and diversity of forest floor species as well as reduce the amount of available browse for wildlife.

Cumulative Effects:
Under this alternative, forest health would decline due to the lack of management activities. Stocking levels would continue to increase, increasing competition and reducing vigor. The overstocked conditions would leave the forest susceptible to outbreaks from insects and disease. The lack of prescribed burning would allow fuel loading to increase. Higher fuel loadings would increase the risk and intensity of wildfires.

Alternative 2: No Herbicide Use

The direct, indirect, and cumulative effects of Alternative 2 would be the same as those listed under the Proposed Action.

Effects of Management Activities on Non-Native Invasive Species (NNIS)

Proposed Action

Direct Effects:
Under the Proposed Action, NNIS populations up to 500 acres per year would be suppressed, contained, or eradicated. Identified populations would be treated with a combination of herbicide application, prescribed burning, manual, or mechanical treatments.

Indirect Effects:
Ground disturbing activities such as timber harvest, road construction, road maintenance, fireline construction, fireline maintenance, and high quality forage area 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. Treating known NNIS populations prior to or in conjunction with other proposed management activities would help contain infestations while they are relatively small and prevent their spread into uncontaminated areas by vehicles, equipment, foot traffic, etc. This would aid in the re-establishment of native plant communities across the project area. Because some species have persistent seeds that remain viable in the soil for years, monitoring would determine the effectiveness of the treatments and if further treatments would be required. Implementation of Best Management Practices would reduce the possibility of introducing or spreading non-native invasive plants during project implementation.

Once NNIS populations are reduced or eradicated, plant diversity would be re-established from existing native seeds in the soil and from adjacent areas. Grasses or other early-seral vegetation would recover within treated areas within the first growing season (typical for recovery on most sites) while abundance and diversity of native vegetation would increase over subsequence years.

Re-establishment of native vegetative cover is key to preventing the re-infestation of NNIS populations.

Cumulative Effects:
Reduction of NNIS would allow native species that had been temporarily lost from the habitat to become re-established. Activities such as road maintenance, recreation, and camping, could transport the NNIS to uninfected parts of the project area. However, by treating existing populations of NNIS and allowing native vegetation to become re-established, future infestations and spread of NNIS would be reduced or eliminated. Treatment of NNIS in the project area could help keep NNIS off of private lands in the project area.

Alternative 1: No Action

Direct Effects:
No activities are proposed under this alternative; therefore, there would be no direct change to NNIS populations.

Indirect Effects:
Ongoing activities such as road maintenance and recreation could continue to spread the existing populations and introduce new populations of NNIS to the project area. With the absence of any management activities, the NNIS would continue to spread and dominate the native vegetation.

Cumulative Effects:
Due to the lack of management activities, NNIS populations would continue to increase and spread over the project areas. Through recreation and road maintenance, the NNIS would continue to spread, reducing the amount of native species from the project area.

Alternative 2: No Herbicide Use

Direct Effects:
Under this alternative, NNIS populations would be controlled by using combination of prescribed burning, manual, or mechanical treatment without using herbicides for control. Prescribed burning and manual methods are less effective than chemical treatments because of the propensity for the vegetation to re-sprout. These treatments alone can often increase populations. Also, some species have persistent seeds that remain viable in the soil for years. Little to no control of existing NNIS population could be expected under the No Herbicide Alternative.

Indirect Effects:
Ground disturbing activities such as timber harvest, road construction, road maintenance, fireline construction, fireline maintenance, and high quality forage 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. Without the use of herbicides, populations of NNIS could continue to increase and spread across the project area.

Cumulative Effects:
Reduction of NNIS would allow species that had been temporarily lost from the habitat to become re-established. Adversely, activities such as road maintenance, recreation, camping, could transport the NNIS to uninfected parts of the project area. Without the use of herbicides, populations of NNIS could continue to increase and spread across the project area including private lands.

F. Heritage Resources

Existing Condition

Heritage Resource surveys have been conducted on the project area. Sites have been inventoried and management recommendations made to the State Historic Preservation Officer (SHPO) and the Native American Tribes. Protective measures and design criteria would be implemented in order to prevent disturbing any of the sites. A concurrence letter was received from SHPO for the SECO Phase II Heritage Resource Report (included the Three Knob Project area) from the Department of Arkansas Heritage on September 9th, 2013.

In total, 49 previously recorded sites and 86 new sites are known within the study area. All were included in the buffer zones provided for avoidance within the Three Knob Mountain EA, including project redesign to avoid adverse effects to historical properties.

Proposed Action and Alternative 2

Direct/Indirect/Cumulative Effects
There are 16 sites recommended as eligible for the National Register of Historic Places within the project area and the immediate vicinity and will be protected from ground disturbing impacts. Fifty-seven sites are recommended as undetermined and will be protected from ground disturbing activities. Additionally, 62 sites are recommended not eligible for the National Register, and no further work is required; but project activities were designed to avoid ground disturbing activities for these sites.
Four prehistoric sites (3PP0052, 3PP0364, 3PP0978, 3PP1065), five prehistoric/historic sites (3PP0371, 3PP1000, 3PP1064, 3PP1153, 3JO0723) and seven historic sites (3PP657, 3PP881, 3PP1150, 3PP1151, 3PP1152, 3PP1191, 3JO677) were recommended eligible for the National Register of Historic Places.

The previously recorded site components include 65 that are primarily prehistoric. These include 35 rockshelters, 28 open sites (lithic scatters/camps), and two fissured outcrops with caves.

Historic farmsteads or houses are the most common historic site component, with 39 known. In addition, 25 fields, two cemetery/graves, and single occurrences of a well, a spring, a school, a dip vat, a borrow pit, a road, a rock culvert, and a rock pile are present. Works Progress Administration (CCC) and Forest Service-related site types include six CCC components.

Finally, one historic house site, adjacent to an old road along Big Piney Creek, that was possibly occupied by immigrant Native Americans, possibly affiliated with the Cherokee Indians.

The Bloyd Mountain Valleys Land Type Associations (LTAs) contain 52.2% of all sites discussed in the Three Knob Project area. Arkansas Valley Hills contain 35% of all sites. The Lower Atoka Hills and Mountains are more constricted in distribution, with 12.8% of all sites.

Among all landtypes, the south aspect slopes contain 36.9% of all sites, with more than half found on the middle slope of the south aspect. This is followed closely by the north aspect with 23.8% of all sites, with half found on the middle slope. Flat areas or benches contain 14.3% of all sites, with 80% on middle slopes. Floodplains are relatively restricted in the study area, and contain 10.7% of all sites. Toe slopes contain 9.5% of all sites. Finally upland ridge tops, relatively common in the study area, contain the fewest sites (4.8%).

Among Forest management areas, Designated Wild and Scenic River corridors contain 40.5% of all sites in the Three Knob Project study area. High Quality Forest Products contain 29.1% of all sites, followed closely by Mixed Forest with 27.8% of all sites. The Scenic Byway Corridors are relatively limited in extent, and contain 2.6% of all sites.

Unanticipated discoveries-
Heritage survey methods are designed to locate the majority of cultural sites within specific project areas. Cultural sites can be missed and discovered during project implementation. If a new site discovery is made during implementation, activities would cease until an archeologist is notified to assess the situation, and notify SHPO and Native American Tribes. Through consultation the determination of eligibility and site mitigation/protection stratigies will be implemented. Ground disturbing activities would not resume in the area of the new site discovery until the recommendation from the archeologist has been received and implemented.

Alternative 1

Direct/Indirect/Cumulative Effects
No project activities would be implemented. All current approved projects would move forward with their heritage protection measures.

G. Wildlife

Existing Condition

The analysis area used for this discussion totals 17,633 acres of National Forest lands and 1,417 acres of private lands within the Lower Big Piney and Lower Illinois Bayou watersheds. The Forest Plan's designated Management Areas (MA) within this project include Oak Woodland (MA 3.B), Mixed Forest (MA 3.C), High Quality Forest Products (MA 3.E), Designated Wild and Scenic Rivers (MA 1.C), and Scenic Byway Corridors (MA 1.H).

Currently, 56% of timber stands are above the age of 70. Permanent openings make up less than 1% of the project area, and early successional habitat (or age 20 and below) comprises

approximately 6% of the area when you include previously existing openings. Ponds of various sizes, condition, and origin are scattered throughout the project area. See the Vegetation Section of this EA for more details on timber stand structure and condition.

Existing wildlife openings in this project area support many native wildlife species including bear, white-tailed deer, turkeys, migratory birds and others. Some of the current openings are small, hard to maintain, poorly located, and/or are too close to recreational activities to prevent human intrusion. More discussion on the relocation, improvement, enlargement, or elimination of wildlife clearings will be found in the project alternatives below.

The Biological Evaluation (BE) will consider, in detail, the potential effects for Threatened, Endangered, and Sensitive (TES) plants and animals known to be in the project area, and a summary of potential effects can be found in the TES section of this EA. Site specific biological inventories and monitoring were conducted by Forest personnel, the Arkansas Game and Fish Commission, and contracted biological consultants from 2009-2013. Evaluating these species meets the legal requirements for an environmental analysis (EA); therefore, specific species that may have been mentioned in scoping comments may not be directly addressed in this EA but grouped with species of similar habitat or lifecycle.

Non-native invasive plant species have been documented in the project area. The Forest Service as an agency recognizes the Syracuse Environmental Research Associates (SERA) ecological risk assessments as the source for evaluating herbicide impacts on the forest. More discussion on herbicides will be found in the project alternatives below.

Management Indicator Species Analysis

This analysis will focus upon the Management Indicator Species (MIS) to assess the potential impacts of this project on wildlife by the proposed actions in Chapter 2 of this EA. The foundation for MIS can be found in the National Forest Management Act and Planning regulations (36 CFR 219.12). Briefly, MIS were selected because "their population changes are believed to indicate the effects of management activities" and they were used to help meet the Forests' legal requirement to "preserve and enhance the diversity of plants and animals consistent with overall multiple-use objectives." It is important to remember that MIS are a planning and monitoring tool that reflects a way to analyze a change in conditions. The list in Table 24 provides information on the current conditions for the 17 MIS chosen for the Forests. The latest data for assessing population and habitat trends for MIS was used to evaluate the Proposed Action and alternatives (Steve Duzan, personal communication, 2012).

Table 24: Management Indicator Species for the Ozark-St. Francis National Forest

Northern Bobwhite *(Colinus virginianus)* – Preferred habitat on the Forests is oak savanna and woodland, restored glades, native fields, early seral forest (0-5) and thinned and burned forest areas. This species is at historic lows on the forest. Long term Breeding Bird Surveys across this species entire range show a sustained decline. Data from the Ozark-St.Francis NFs also show a downward trend.

Table 24 (Cont'd): Management Indicator Species for the Ozark-St. Francis National Forest

White-tailed Deer (*Odocoileus virginianus*) - For the Forest, the preferred habitat for deer can be described as areas of mature hardwood, hardwood-pine and pine-hardwood stands, which provide hard and soft mast, with 0-5 year old regeneration areas, food plots, oak savannas and woodlands and permanent water sources intermixed. The regeneration areas, savanna and woodlands provide cover and along with food plots provide forage. The population appears to be stable on the Ozark NF.
Black Bear (*Ursus americanus*) - On the Forest, the preferred habitat for bear can be described, as areas that are relatively isolated from human disturbance, comprised of mature hardwood, hardwood-pine and pine-hardwood forest types that provide hard mast, with 0-5 year old regeneration areas and food plots intermixed to provide cover, forage and soft mast. The numbers of bears remain high on the Ozark NF and continue to be stable to increasing.
Eastern wild turkey (*Meleagris gallapavo*) - The preferred habitat for wild turkeys can be described as mature hardwood or hardwood-pine stands with open areas (fields, food plots or natural openings) nearby and a permanent water source readily available. Habitat is wide spread on the forests and total population fluctuates widely, but recent surveys indicate decline.
Prairie Warbler *(Dendroica discolor)* - Optimal habitat conditions include early seral habitat, regeneration areas that are in the 5-20 year old age class, pine-bluestem and oak savanna/woodland habitats. Species monitoring indicates a declining trend for this physiographic region.
Yellow-breasted Chat (*Icteria virens*) - On the Forests, the preferred habitat for the chat can be described as regeneration areas and other openings with 1-3 m (3-10 ft) tall brushy vegetation. Identified in RLRMP as MIS for the St. Francis NF. Regional and Forest data show an increasing trend.
Brown-headed Nuthatch *(Sitta pusilla)* - This species is tied to mature open pine stands or pine woodland conditions. The upland Ozarks fall outside of this species range although it is possible that historically it was more widespread where mature pine stands once occurred. This species is rare on the Forest, but available data shows an increasing trend.
Northern Parula *(Parula americana)* – Habitat is typically mature, moist forests along streams and within riparian areas. Commonly found along Ozark wooded rivers and streams. Breeding Bird Data for the region indicates a declining trend, but on the OZFNFs this species appears to be slightly increasing.
Rufous-crowned Sparrow *(Aimophila ruficeps)* – A very small population occurs on Mt. Magazine in Logan County. It is primarily a species of the desert Southwest. Habitat would include glades or thin shrub/seedling stands with sparse grasses and shrubs.
Cerulean Warbler *(Dendroica cerulean)* – The Arkansas Ozarks are on the southern edge of this species range. Primary habitat includes rich mature forest with mesic to wet conditions. Typically they have larger diameter trees with a defined shrub layer. More commonly found in bottomland hardwoods, but on the main division of the forest they are found in upland habitats. This species is declining over its range but on the Ozark NF, it appears to be fairly stable.

Table 24: Management Indicator Species for the Ozark-St. Francis National Forest

Ovenbird *(Seiurus aurocapillus)* – Typical habitat would include mid to late seral dry-oak deciduous forests with limited understory. Nesting occurs on the ground. Species well distributed in the Ozark Uplands. This species is common on the Ozark NF but has shown some decline locally and regionally.
Red-headed Woodpecker *(Melanerpes erythrocephalus)* – Preferred habitat would include open oak woodlands or pines. Requires dead trees and snags for nesting. Species is uncommon on the Forest. On the OZFNFs, this species has increased despite the overall declining trend.
Pileated woodpecker (*Dryocopus pileatus*) - The preferred habitat for the pileated woodpecker can be described as mature stands of any species or species mix with large dead snags and woody debris on the forest floor. USFWS Breeding Bird Surveys show this species is decreasing for this physiographic region and on the OZFNFs.
Scarlet Tanager *(Piranga olivacea)* – Mature deciduous forest and rich upland forest is the preferred habitat for this species. In suitable habitat this species is not uncommon on the Forests. Long term Breeding Bird Surveys indicates a decline overall for AR but is slightly increasing on Forests.
Acadian Flycatcher *(Empidonax virescens)* – Prefers moist deciduous forest near streams and bottomland hardwoods. Not uncommon and increasing on the Ozark NF in riparian areas.
Small-mouth Bass (*Micropterus dolomieui)* - Cool, clear, mid-order streams, greater than 10.5 m (35 ft), wide with abundant shade, cover and deep pools, moderate current, and gravel or rubble substrate characterize optimum riverine habitat. The largest stream populations of smallmouth bass occur in streams with gradients of 0.75-4.70 m/km, (3-15 ft/mi) that provide alternating pools and riffles, support. Standing crop is generally largest in pools deeper than 1.2 m (4 ft.). In suitable habitat this species is indicative of high water quality. The relative abundance of this species in streams on the Ozark NF is considered normal.
Largemouth Bass (*Micropterus salmoides)* – prefers larger ponds, lakes, reservoirs, slough and river backwaters. Usually found close to shore in lakes and reservoirs. This species prefers warm quiet waters with low turbidity, soft bottom and beds of aquatic plants. For lakes on the Forests, the overall relative weights, PSD, and RSD for largemouth bass stayed fairly stable from 2005 to 2010.

A more complete description of the habitat relationships for these species can be found in the Nature Serve database: http://www.natureserve.org/ , and a Land Manager's Guide to Birds of the South: http://www.srs.fs.usda.gov/pubs/2702

Two of the MIS species were eliminated from the analysis due to the following reasons: the Yellow Breasted Chat is identified in the Forest Plan as an MIS for the St. Francis NF, and the Rufous-crowned Sparrow's occurrence on the Forests is limited to an area on the Mt. Magazine Ranger District. The remaining MIS will be divided into two groups: Low Disturbance Species (LDS) and High Disturbances Species (HDS). Low disturbance species occupy habitats that require a low intensity and/or frequency of disturbances; for example, a closed canopy forest. Habitats of HDS species require high intensity and/or frequency of disturbance to maintain them. Examples of these habitats are oak woodlands and 0 to 10 year old regeneration stands. Table 25 will identify the classification of each of the Terrestrial MIS species. For the purpose of this project analysis, COMPATS (Computerized Project Analysis of Timber Sales) modeling was

done for six of these species: scarlet tanager, prairie warbler, pileated woodpecker, Northern bobwhite quail, deer, and turkey. COMPATS was developed by researchers and experts of these species to illustrate theoretical effects of forest management practices across alternatives on an individual project level. The scarlet tanager and pileated woodpecker will represent LDS species. Their responses to management activities according to the model will serve as an indicator for how other LDS such as ambystomid salamanders, ovenbirds or southern flying squirrels would respond. The prairie warbler, Northern bobwhite quail, deer, and turkey will represent the HDS species. Their model responses will serve as an indicator for how other HDS species such as bear, Eastern cottontails, or bluebirds would respond to management activities.

Table 25: Classification of MIS on the Ozark-St. Francis NFs

Common Name	Classification (LDS or HDS)
Northern Bobwhite	HDS
White-tailed Deer	HDS
Black Bear	HDS
Wild Turkey	HDS
Prairie warbler	HDS
Brown-headed Nuthatch	HDS
Red-headed Woodpecker	HDS
Cerulean Warbler	LDS
Ovenbird	LDS
Northern Parula	LDS
Pileated Woodpecker	LDS
Scarlet Tanager	LDS
Acadian Flycatcher	LDS
Smallmouth Bass	NA
Largemouth Bass	NA

Table 26 represents a model developed by researchers and experts on these species to illustrate theoretical effects by each alternative for project level comparison purposes and does not necessarily reflect exact changes in population. Number results may show minor discrepancies due to rounding.

Table 26: MIS/COMPATS Results for the Ozark-St. Francis NFs

All units given as individuals per square mile		Species					
		Scarlet Tanager	Prairie Warbler	Pileated Wood Pecker	Quail	Deer	Turkey
Baseline		26.8	13.6	28.5	26.6	11.0	9.7
Proposed Action	Implementation	26.4	65.9	22.5	102.7	25.7	18.3
	% change over baseline	-1.4	384.8	-20.9	286.1	133.1	87.9
	10 years	27.1	15.8	28.9	31.4	13.3	12.7
	% change over baseline	1.3	16.0	1.7	18.0	20.3	30.0
Alternative 1 - No Action	Implementation	26.8	13.7	28.5	26.7	11.0	11.8
	% change over baseline	0.0	1.0	0.0	0.5	0.3	21.6
	10 years	28.0	5.7	31.0	16.0	9.5	8.9
	% change over baseline	4.7	-57.7	9.1	-40.0	-13.4	-8.7
Alternative 2 - No Herbicide	Implementation	26.4	65.4	22.5	101.9	25.5	18.0
	% change over baseline	-1.4	381.4	-20.9	282.8	131.5	85.4
	10 years	27.7	14.5	29.7	27.6	13.1	12.5
	% change over baseline	3.3	6.8	4.3	3.8	18.5	28.7

Prior projects that fall into the current project area include maintenance and seeding of openings. The impacts of these projects would continue to have an influence on species and some management may continue to occur under previously approved projects.

Proposed Action (PA)

Direct/Indirect Effects

For the purpose of this analysis, the area within the project boundary (19,050 ac) was used to determine wildlife effects. All four HDS (deer, turkey, prairie warbler, and Northern bobwhite quail) carrying capacities improved with the implementation of the PA. As stands age, thinning and WSI midstory treatments increase in importance. Prairie warblers (PRWAs) represent the

species that depend on regenerating forests, i.e., early seral and more open woodland habitats. These species prefer shrubby-early successional, young forest habitat including regeneration areas. This group would benefit most from prescribed burning and thinning treatments. Prescribed burning was important across all age classes. A reason for the large response seen in both the prairie warbler and quail at project implementation is mostly due to the lack or insufficient amount of suitable habitat currently existing for these species. Turkeys and deer are both game species that rely on habitat at both ends of the age class spectrum as well as sources of water. These species would benefit from ponds, seeding, and thinning.

Under the proposed activities, heavy equipment, tree skidding, or prescribed fire may crush or burn nests, eggs, fawns, young birds on the ground. Adults are highly mobile and should not be directly impacted. Soil disturbance, sedimentation, and creation and maintenance of early successional habitat should not directly affect deer, quail, turkeys or PRWAs. Direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could be potentially harmful to avian species and mammals; however, triclopyr and imazapyr are both considered low to practically non-toxic to birds when applied according to registered label directions and slightly toxic to practically non-toxic to terrestrial mammals (See SERAs below). Glyphosate is considered no more than slightly toxic to birds and is considered to have minimal effects on mammals (SERAs). Based on these toxicity ratings, these three herbicides should not have any substantial direct effects on deer, quail, turkeys or PRWAs. Overall, any negative direct effects would be far outweighed by the beneficial indirect and cumulative effects of this alternative which include enhanced and sustained early successional habitat for nesting sites and foraging. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for these species, specifically, a mixture of early successional habitat needed for nesting and young rearing, as well as the mature forests needed for roosting, shelter, and hard mast forage production.

The PA would remove or reduce stand density on approximately 53% of the 70 and above age class stands within the project area. The COMPATS model indicated that carrying capacity for LDS (scarlet tanager and pileated woodpecker) would be decreased immediately after implementation of the action alternatives. Scarlet tanagers represent species that prefer mature forest slightly favoring hardwood over pine. Thinning in the older age classes improved carrying capacity for the tanager whereas the prescribed burning decreased their carrying capacity. Pileated woodpeckers represent species that prefer older forests with standing dead trees and woody debris on the forest floor. Species such as the Pileated initially respond negatively to any management within mature stands. Site preparation, pre-commercial thins, and releases that occur in stands 20 years old or younger would not affect either of these LDS species.

Tree felling or heavy equipment may impact nests and eggs of these birds. Old snags that Pileateds prefer for nesting are rarely felled or pushed over during management activities, but prescribed burning may remove some snags and create others. Soil disturbance, tree skidding, prescribed fire, and sedimentation should not have any other direct effects on these species; however, these activities may disturb individuals and cause them to leave the area temporarily. The creation and maintenance of early successional habitats will limit preferred habitat in the immediate and surrounding area. Although direct contact with herbicides (or feeding on insects that have been exposed to herbicides) could potentially harm woodpeckers, triclopyr and

imazapyr are both considered low to practically non-toxic to birds when applied according to registered label directions (USDA Forest Service, 1995a,b). Glyphosate is considered to be no more than slightly toxic to birds (EPA, 1993). Based on these toxicity ratings, these three herbicides should not have any substantial direct effects on this species.

The COMPATS model was run again to estimate effects 10 years from implementation. After project implementation of either action alternative, HDS showed an increase in carrying capacity over the current condition. Some HDS have very little available habitat under current conditions and show an increased potential presence and a sustained future presence under the PA. Better understory control with herbicide would help sustain early successional conditions and herbaceous growth. For all HDS, the action alternatives showed the greatest sustained benefit compared to the no action alternative.

Although LDS initially had a small decline, they still remained a major element of the system. Carrying capacity for both LDS initially decreased but in a 10-year period they recover or slightly increase. This recovery may include reasons such as canopies within thinned areas would branch out into the gaps and obtain at least partial closure, as well as the advancement of timber currently in the 41-70 and 71-100 age classes into the 71-100+ age classes. One thing to consider that is not reflected by the model is the increased amount of snags and woody debris created or caused by bug kill, the 2009 ice storm, and recent tornados. Although the project area model shows a slight decline due to project implementation, increased snag habitat may have a positive influence on population numbers while concentrated areas of decreased canopy cover may reflect a negative trend on populations.

Species diversity would be higher in the action alternatives. Increasing acreage of early successional vegetation, while maintaining mature forest and closed canopy acreage, would allow the presence and sustainability of both LDS and HDS within the project area.

Pond construction and reconstruction would improve conditions for HDS such as turkey, deer, and quail. Species such as prairie warblers that primarily utilize shrub/brush habitats and are not limited by water sources would not measurably benefit from these activities. Road and trail maintenance or decommissioning would, in the long term, benefit species that rely on low disturbance in aquatic systems. Restoring native cane along waterways will also help anchor soils and establish unique micro-habitats for insects and aquatic/semi-aquatic species.

Road closures and decommissioning would benefit the HDS and LDS by decreasing human disturbance especially for the demand species (deer and turkey) as well as herpetofauna and migratory birds. Road closures into fields and openings would decrease vehicle mortality, noise disturbance, sensitivity to exposure, and habitat degradation such as ruts and barren soils.

Field maintenance would increase the value of the fields for HDS. Increasing the size of clearings to a maximum of five acres would increase the potential of grassland species that are sensitive to habitat edges to utilize the clearings. Those areas seeded with a variety of forage would provide higher quality forage than monoculture agricultural fields. Control of NNIS would protect the quality and availability of foraging habitats.

Glades are another unique habitat that exists in small patches within the project boundary. With the exclusion of fire from the landscape, these communities are being invaded by cedar. In restoring these glades by removing cedar, the herbaceous plants characteristic of glades should flourish and support the species that rely on this unique community; however, results will be temporary without fire or repeated efforts to control cedar within the glade.

Surface rock collection within commercial timber sales and openings would reduce available potential habitat for some species such as the Eastern small-footed bat and certain herpetofauna by removing potential cover. Bluff-lines and talus slopes are off-limits for rock collection and are avoided during timber harvest. This is a non-renewable resource; therefore, the reduction of potential habitat is permanent. Site specific design criteria are included in each rock contract which limits the following: total area of collection, the percentage of rock that may be collected by size, and the distance between collection areas. Allowable rock collection is for surface rock only, and rocks anchored in soil should not be mined according to permit standards; therefore, soil disturbance from this activity should be minimal. Potential habitat from surface rock would be reduced in these site specific areas; however, the entire project area is unlikely to reflect an overall measurable change for species utilizing rocky habitats.

The proposed use of herbicides in the PA to control undesirable NNIS would improve wildlife habitats for both LDS and HDS species. Noxious weeds are displacing native plant species. Species such as *Serecea* and tree of heaven are also prone to spread into areas where disturbances occur and have no established herbaceous understory. The proposed herbicide treatments would impede the expansion of NNIS in the project area and potentially eliminate some of the seed source populations. Moreover, the use of herbicides would provide longer lasting results over manual treatments which would require multiple entries into an area to achieve the same results.

The Human Health and Ecological Risk Assessments completed by the USDA, Forest Service www.fs.fed.us/foresthealth/pesticide/risk.shtml (See individual SERA s) indicate that the proposed formulations of herbicides are either nontoxic or of low toxicity to birds, mammals, and insects. Only herbicides with aquatic labels may be used near water. Terrestrial animals may be exposed to herbicides by way of the following examples: direct spray, contact with sprayed vegetation, or ingestion of contaminated vegetation, water, or insects. Non-target species may be impacted by drift or run-off.

Toxicity is generally tested at rates above label application rates. In order to reduce potential adverse effects to non-target species, the herbicides would be applied according to label specifications, would be largely target specific by using methods such as backpack spraying, and would be applied using the guidelines in the Forest Plan.

Specific Herbicides (Does not apply to Alternative 1 or 2)

Glyphosate – is used to control post-emergent vegetation. It functions by interrupting the production of aromatic amino acids. The two main formulas of glyphosate that would be used are Rodeo and Accord whose toxicity is rated as low and have had extensive studies (SERA 2011). Glyphosate by itself is of relatively low toxicity to birds, mammals, and fish; however,

formulations that include surfactants have shown high impacts to aquatic systems affecting amphibians in particular (SERA 2011). Such formulations are not proposed for use in aquatic systems.

Triclopyr – has two different forms: a salt and an ester. It functions by mimicking a growth hormone disrupting normal plant development. Both forms readily degrade and do not persist in the environment. In general, the ester formulation is more toxic than the salt form with larger mammals being more sensitive than smaller mammals. The ester formulation would be used for basal spray application only. This method would require less of the herbicide to control the woody species than foliar spray. Triclopyr is classified as being practically non-toxic to slightly toxic to birds. Although the ester formulation poses more of a toxicity risk to fish, it will not persist in surface water and would have minimal long-term risk. The highest risk to aquatics would be a direct spill in large amounts.

Metsulfuron methyl - is used to control pre- and post-emergent annual weeds, perennial weeds, and woody plants. It functions by inhibiting an enzyme involved in making chain amino acids. There is little information on non-target wildlife; however, Metsulfuron methyl is of low toxicity to practically nontoxic for birds, mammals, fish, and bees.

Imazapyr –is used for the control of terrestrial and aquatic vegetation such as grasses, broadleaf weeds, vines, and brush. It functions by inhibiting an enzyme involved in making chain amino acids. It is hazardous to both terrestrial and aquatic macrophytes but practically non-toxic to mammals, birds, honeybees, fish, aquatic invertebrates, and algae. There is little information on the toxicity to reptiles, terrestrial and aquatic-phase amphibians, and microorganisms.

Fluroxypyr - is a plant growth hormone mimicking, post-emergent systemic herbicide which is more toxic to dicots such as broadleaf weeds and woody brush than monocots like grasses. Fluroxypyr acid and fluroxypyr-MHE appear to be relatively non-toxic to terrestrial animals. Very little information is available on the toxicity of fluroxypyr to insects, reptiles, and amphibians. Available studies indicate that fluroxypyr is relatively nontoxic to birds and up to slightly toxic to aquatic animals such as fish , most aquatic crustaceans (daphnids and shrimp), and freshwater invertebrates; however, fluroxypyr-MHE may be highly toxic to bivalves and perhaps to other molluscs. Runoff of up to about 10% of applied fluroxypyr may occur in predominantly clay soils with high rates of rainfall. Much less runoff is expected from loam soils, and virtually no runoff is expected from predominantly sand soils. Soil half-life (aerobic) ranges from 7-23 days, and water half-life (field dissipation) ranges from 13-25 days (SERA, 2009).

Cumulative Effects

The Lower Big Piney Creek watershed makes up approximately 76% of the Three Knob project area. There have been several recent activities within this watershed as shown in Table 27.

Table 27: Past and present management activities within the Project Area Watershed

Treatments (On USFS Land) within the project area	Acres/ Miles	Year Treated
Permanent land clearing	8ac	2011
Wildlife opening rehabilitation	45ac	2012

Treatments (On USFS Land) within the project area	Acres/ Miles	Year Treated
Well pad (Graves Creek)	2ac	2011
ERFO Project	4.5mi	2012
Treatments (On USFS Land) in the Lower Piney watershed		
High Mountain Project	37,826	2013-current
Future Actions	Approx. Acres or Miles	Approx. Year
None Known		

Habitat manipulations in the adjacent High Mountain Project area should increase the amount of early successional habitat across the landscape and improve overall forest health by reducing basal area and age classes. LDS species are predicted to decline in the area for the years immediately following implementation, but in the long term these species should recover to present levels or increase slightly as shown in the COMPATS exercise.

At a Forest-wide scale, the Monitoring and Evaluation Report data from 2008-2012 suggests that three HDS species are trending down: Eastern wild turkeys, Northern bobwhite quail, and prairie warblers. Management recommendations include the regeneration of early successional and woodland habitats on a regular basis across the Forests as well as implementing prescribed burns and conversions to warm season grasses in wildlife openings. The data indicates that long-term observations for the LDS pileated woodpeckers may show a downward trend as well; however, increases in snag habitat due to insect, disease, and storm damage may improve local pileated populations in the near future. Scarlet tanagers and deer reflect stable trends on the Forests; however, the scarlet tanger shows a slight decline statewide. These general trends are from the Breeding Bird survey for the Ouachita-Ozark Plateau Area, Forest Landbird Surveys, and Arkansas Game and Fish's annual harvest data. Further details on interpreting Breeding Bird data can be found at: http://www.mbr-pwrc.usgs.gov/bbs/.

Surface rock would be permanently reduced in designated collection areas for the foreseeable future, but it would not measurably reduce rock within the project area. Illegal rock collection will contribute to surface rock depletion. Available habitat for rock dwelling species could be limited within specific areas depending on the current structure of each site; however, no more than one percent of the project area would be affected by permitted rock collection, and the overall project area would continue to provide habitat of this element.

Improvements and closures to roads and trails within an area that receives a notable amount of recreational activity may encourage users to stay within designated areas thereby decreasing the overall intensity of disturbance to potential habitats.

Continued maintenance and occasional disking and re-seeding of openings may cause periods of short-term soil movement; however, the disturbance will be dispersed over space and time which will reduce potential risks of soil loss and water quality.

Forest fragmentation is a concern for some species. Although the canopy would be fragmented in terms of stratification and percent coverage, what that means in terms of habitat fragmentation

must be defined by the species being examined (Franklin et.al, 2002). Species such as elk, bear, white-tailed deer, and prairie warblers are examples of species that may benefit from a mosaic landscape to one degree or another. Prairie warblers may only use shrubby woodlands and open field edges whereas bears may use old growth, early successional shrub and forest, woodlands, and open fields. Usage of various elements of the mosaic may be seasonal or impartial to season. To such species, the landscape is an interconnected mosaic of continuous habitat. Other species such as Northern bobwhite quail and ovenbirds would be less adaptable to changes in the landscape in varying degrees. Certain species of herpetofauna such as amphibians and salamanders may become geographically isolated due to fragmentation because, for instance, the majority of southern herpetofauna do not make long-range migratory movements over land (Gibbons and Buhlmann, 2001). Amphibians and reptiles require both terrestrial and aquatic habitats and movements between them occurs regularly at several hundred meters (Bailey et. al, 2006). Gibbons and Buhlmann also stated that the presence and persistence of certain species may depend on the long term availability of specific habitats as well as acceptable travel habitat between alternate breeding sites (2001, pg.384). Streamside Management Zones (SMZs) are established according to the Forest wide Standards in the Forest Plan (FW81) adjacent to perennial streams, springs, and defined channels.

Alternative 1: (No Action)

Direct/Indirect Effects

The No Action Alternative for the project area would remain without substantial suitable habitats for early successional species such as Northern Bobwhite quail and Prairie Warblers. Habitat for deer and turkeys would decline. In the No Action alternative, effects of previous wildlife opening creation, maintenance, and seeding will continue to have a positive influence on deer and turkey for a few years into the future.

The No Action Alternative is the worst alternative for prairie warblers, quail, turkeys and deer due to the disappearance of early successional habitats. The COMPATS model does not account for the quality and climate of brood rearing habitat which is critical for the sustainability of turkey populations. Habitat for HDS species would continue to deteriorate resulting in a decline in Forest trend data. A temporary increase in the amount of early successional habitat needed by these species could result from wildfires as well as declining forest health which could promote disease and insect outbreaks; however, the periodicity and intensity of these events would be uncertain and may not produce and maintain sufficient early successional habitat within this ecosystem. The current habitat capability for quail and prairie warblers is insufficient to meet the minimum population projections in the Forest Plan.

Pileated woodpeckers, representing the snag/mature forest habitat group, show a clear preference for the No Action Alternative. Scarlet tanagers also show a preference for the No Action Alternative but on a smaller scale. COMPATS would not reflect a decline in forest health in the event of storm damage, insect infestations, or disease due, in part, to overstocked and over-mature forest stands and the suppression of wildfires.

Cumulative Effects

Some of the previously managed lands, both FS and private, have created habitat for HDS. Sustainability of current conditions would decrease with time, but some benefits would

perpetuate. Forest trends are likely to follow the current trends; i.e. prairie warblers, quail, and turkeys would continue to decline; and deer, pileated woodpeckers and scarlet tanagers would remain stable. Unknown intentions for management on private lands leave future conditions unpredictable; however, some early successional habitat is likely to remain. Timber management in the High Mountain Project area adjacent to the Three Knob project area would provide some beneficial early successional habitat, but it may not provide enough across the landscape to attract, increase, or sustain currently absent or low population HDS species.

LDS species would benefit from the No Action Alternative as long as there is not an outbreak or weather system that damages mature overstory. The No Action Alternative in Three Knob would help sustain LDS in the general area until the High Mountain project area populations rebound a few years after timber harvest.

The No Action Alternative would fail to address needed improvements and closures to roads and trails within an area that receives a notable amount of recreational activity. Over time, these current systems could begin to impact a wider area and contribute to sedimentation in water sources if allowed to decline.

Previous management and natural events on both Forest Service and private lands have created opportunities for NNIS to become established. Unless there is an effective tool available for the control of these non-natives, the established populations would continue to be a seed source for the spread of NNIS, mainly along roads and natural or man-made openings. This reduces the quality and availability of wildlife habitat.

Alternative 2: (No Herbicide)

Direct/Indirect Effects

Effects of this alternative would be similar to the Proposed Action Alternative with the exception of herbicide exposure. Human intrusion would be more intense as the work would have to be accomplished manually and more often in order to achieve similar results; however, cost and man-power availability would likely result in fewer acres treated to the desired extent.

The PA and Alternative 2 (No Herbicides) initially show similar benefits to prairie warblers, quail, deer and turkeys, but habitat conditions with Alternative 2 could not be sustained and over time would decline from a previously improved state most likely due to the reduced ability to control woody succession in woodland and grassland habitats.

Burning alone would not completely control the resurgence of woody growth due to limitations on rotations and required burning parameters. Eventually open woodlands would advance to shrubby woodlands and early forest. Although non-target species are less likely to be adversely affected in this alternative by herbicide, the diversity in structure and plant species composition within the woodland and savanna habitats would decline.

Non-native invasive species would be difficult to control without the use of herbicide, and their populations can be expected to expand over time especially in areas that do not have an established understory, where any type of ground disturbance occurs, and areas without a closed

canopy to shade the invasives out. Burning is unlikely to kill many NNIS, such as tree of heaven, and increase germination in others such as exotic lespedezas (Evans, C.W. et. al, 2006). NNIS displace native species and reduce the variety and quality of available vegetation. "Many reptiles and amphibians are specifically adapted to forage, bask, hibernate, and nest exclusively in native vegetative communities." (Bailey et. al, 2006, pg. 19). Recreational vehicles and horses may spread NNIS along trails. Without an effective means of control, habitat improvements would be counterweighed with the negative impacts from the loss of available native vegetation.

Scarlet tanagers represent a group of LDS that prefer mature canopy but derive some benefit out of thinning and WSI; however, they respond negatively to prescribed burning. Initial decline after project implementation is predicted but will rebound over time.

Pileated woodpeckers which represent the almost "no disturbance" species group shows a slight preference for Alternative 2 over the preferred action; however, COMPATS does not reflect the amount of increased disturbance required for manual control verses herbicidal control including a higher number of entries into an area with noise disturbance.

Cumulative Effects

Forest trends are likely to show a temporary increase in species such as prairie warblers, turkeys and quail and then continue to show a slow decline. Deer are likely to remain relatively stable. Pileated woodpeckers and scarlet tanagers are likely to slightly decrease initially and then recover to current levels or above.

Habitat manipulations in the adjacent High Mountain Project area should increase the amount of early successional habitat across the landscape and improve overall forest health by reducing basal area and age classes; thereby, benefiting many species of HDS. LDS are predicted to decline in the area for the years immediately following implementation, but in the long term these species should recover to present levels or increase slightly as shown in the COMPATS exercise.

Previous management and natural events on both Forest Service and private lands have created opportunities for NNIS to become established. Unless there is an effective tool available for the control of these non-natives, the established populations would continue to be a seed source for the spread of NNIS to the detriment of wildlife populations that depend on native vegetation for food and cover.

See the PA Cumulative Effects for surface rock, roads and trails.

H. Fisheries

Existing Condition

The fisheries analysis area for this project is the Lower Big Piney watershed and the Little Creek - Lower Illinois Bayou watershed. Three main tributaries are in the project area: Graves Creek, Trace Creek, and Levi Branch. These streams are typical of perennial streams within the Boston Mountain physiographic regions. Graves Creek originates in Johnson County within the project

area and flows into Big Piney Creek just south of Treat, AR where Indian Creek connects with Big Piney. Trace Creek forms the northwest boundary of the project area and flows in to Big Piney Creek northwest of Treat. Levi Branch is in the lower section of the project area west of Hwy 7 in the Three Knob Mountain area, and it flows into Big Piney Creek south of Longpool. The Big Piney watershed is primarily forested. Non-forested land is for the most part in private ownership and is typically in small farms and recreational dwellings. For more details on land use practices, see the Soil and Water section.

The Lower Big Piney Creek watershed makes up approximately 76% of the Three Knob Project area. Big Piney Creek is the main body of water into which the project area drains. The river was surveyed by the Arkansas Department of Environmental Quality (ADEQ) in 1998 to determine fish assemblages (See Table 28). A survey in 2009 was conducted by the Arkansas Game and Fish Commission documenting the abundance and size structure of sport fishes in Big Piney Creek. Common sport fishes collected were channel catfish, various bass species, and green sunfish. Additional fish that were caught in 2009 that were not documented in the 1998 fish assemblage include: Chestnut and Southern brook lampreys, longnose gar, gizzard shad, common carp, duskystripe shiner, smallmouth/bigmouth/black buffalo, golden and river redhorse, yellow bullhead, channel catfish, flathead catfish, largemouth bass, logperch, Channel darter, and freshwater drum. Results from the sport fish survey concluded that the Big Piney was slightly below average for black bass but has an excellent population of channel catfish. Tributaries to the Big Piney within the project area that have been surveyed will serve as examples for project area streams.

Trace Creek, a non-sport fishery stream in the Lower Big Piney watershed, was surveyed by the Southern Research Station's Center for Aquatic Technology Transfer (CATT) during the summer of 2010. A total of six species in three families were identified. Smaller headwater streams are typically dominated by minnow species such as creek chubs and stonerollers and have one or two darter species. Such areas have few if any bass and sunfish. This assemblage describes what was found in Trace Creek which is expected for these size watersheds. Indian Creek is larger with a more permanent flow and supports a small sport fishery with smallmouth bass *(Micropterus dolomieu)*, Long ear *(Lepomis megalotis)* and green sunfish *(Lepomis cyanellus)* being the most popular species.

The Little Creek-Lower Illinois Bayou watershed is a combination of private forested, private developed, and Forest Service forested lands. Little Creek and the Illinois Bayou run mainly through private lands south of the FS boundary; however, forks and tributaries to these streams can be found on Forest Service lands. Fish assemblages from ADEQ for the Illinois Bayou can be seen in Table 30.

Table 28: Description of the fish assemblages in the project area

Common Name	Streams					
	Big Piney Creek @ FS RD 1802		Trace Creek		Indian Creek	
	Number	Relative Abundance	Number	Relative Abundance	Number	Relative Abundance
Central Stoneroller	86	6.7	17	7.3	267	16.4
Bigeye Shiner	118	9.2	0	0	60	3.7
Redfin Darter	1	.07	15	6.4	23	1.4
Cardinal shiner	66	5.1	0	0	32	2.0
Steelcolor shiner	25	1.9	0	0	0	0
Wedgespot shiner	24	1.8	0	0	0	0
Blackspotted topminnow	38	2.9	0	0	8	0.5
Bluntnose Minnow	29	2.2	0	0	22	1.4
Creek Chub	0	0	117	50.6	54	3.3
Brook silversides	51	3.9	0	0	0	0
Northern Hog Sucker	4	0.3	0	0	10	0.6
Black redhorse	1	.07	0	0	0	0
Slender Madtom	122	9.5	20	8.6	260	16.0
Northern Studfish	0	0	0	0	1	0.1
Yellow bullhead	0	0	0	0	1	0.1
Green Sunfish	79	6.1	0	0	10	0.6
Fantail darter	45	3.5	0	0	61	3.8
Bluegill	1	.07	0	0	0	0
Longear Sunfish	388	30.3	0	0	101	6.2
Smallmouth Bass	5	0.3	0	0	12	0.7
Shadow Bass	1	.07	0	0	0	0
Spotted Bass	1	.07	0	0	0	0
Greenside Darter	103	8.0	2	0.8	215	13.2
Banded Darter	37	2.8	0	0	42	2.6
Orangethroat Darter	48	3.7	60	25.9	445	27.4
Blackside darter	3	0.2	0	0	0	0
Longnose darter	1	.07	0	0	0	0
Total number of Species	24		6		18	

Common Name	Streams					
	Big Piney Creek @ FS RD 1802		Trace Creek		Indian Creek	
	Number	Relative Abundance	Number	Relative Abundance	Number	Relative Abundance
Total number of individuals	1277		231		1624	

Proportions of the proposed actions within the Lower Illinois watershed are broken down in the Table 29.

Table 29: Treatments in the Lower Illinois Watershed

Treatments and Acres (In acres unless otherwise specified)	**PA** Project	**Illinois Watershed**
Wildlife		
Wildlife Ponds (no.)	37	Approx. 7
Non-Native Invasive Species Control	500*/yr	Approx. 120/yr*
Placement of Large Woody Debris	Yes	Yes
Forestry		
Pine Seed Tree Regeneration Harvest	1504	656
Pine Seed Tree Prep	692	86
Pine Shelterwood Harvest	385	67
Pine Commercial Thinning	2220	326
Timber Stand Improvement Thinning	2161	1215
TSI chemical	395	135
Prescribed Burning as needed	1771	0
Commercial Rock Collection	Yes	Yes
Commercial Salvage	500	Up to 500**
Road Management		
Temporary Roads (mi.)	20	Approx. 9
Road Reconstruction (mi.)	1	0
Road Maintenance (mi.)	75	37
Maintenance and Road Closure (mi.)	57	11
Road Decommissioning (mi.)	8	2
Road Closure (mi.)	4	0

* Herbicides would be used as part of these treatments
**To Be Determined in the event of a disaster

Table 30: Fish Assemblage in the Illinois Bayou Watershed

Common Name	Illinois Bayou, Hwy 27 Bridge, 2009	
	Number	Relative Abundance
Central Stoneroller	77	6.49
Bigeye shiner	111	9.36
Steelcolor shiner	5	0.42
Wedgespot shiner	29	2.45
Blackspotted topminnow	11	0.93
Bluntnose Minnow	114	9.61
Flathead catfish	2	0.17
Brook silversides	17	1.43
Northern Hog Sucker	9	0.76
Black redhorse	9	0.76
Golden redhorse	3	0.25
Slender Madtom	55	4.64
Green Sunfish	111	9.36
Bluegill	25	2.11
Longear Sunfish	338	28.5
Smallmouth Bass	41	3.46
Shadow Bass	3	0.25
Spotted Bass	37	3.12
Lamprey	5	0.42
Dusky darter	3	0.25
Fantail darter	28	2.36
Greenside Darter	89	7.5
Banded Darter	43	3.63
Johnny darter	2	0.17
Banded darter	43	3.63
Logperch	11	0.93
Total number of Species	26	
Total number of individuals	1186	

Although these fish are assembled in the same streams, they have different preferences of micro-habitats, stream flow, and tolerances. The following examples of fish preferences for fish that appear in both watersheds are descriptions from Robison and Buchanan's Fishes of Arkansas, 1988.

Central stoneroller: Central stonerollers generally inhabit and spawn in small streams with cool, clear water, and gravel, cobble or exposed bedrock substrates in slow to moderate current. The young will school in vegetated margins and warm backwaters.

Bigeye shiner: Prefer gravel and rock bottomed pools lined with water willow or clear, high-gradient streams and rivers and is intolerant of siltation and continuous high turbidity.

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.

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).

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

Smallmouth bass: The smallmouth bass is mainly an inhabitant of cool, clear mountain streams with permanent flow and rocky bottoms. 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.

Bluegill: Bluegill are found in clear, quiet, warm waters having at least some aquatic vegetation and other cover, but it is also found in streams and rivers. Some turbidity is tolerated, but not in continuous or high level conditions.

Proposed Action (PA)

Direct Effects

Timber harvesting has been shown to destabilize stream banks, alter flow regimes and nutrient cycles, and change the morphology of stream channels. Changes in the stream environment may alter fish communities found in the stream. The majority of impacts from timber harvesting are caused by road building activities. This project has one mile of road reconstruction and approximately 20 miles of temporary road use. Implementation of resource protection following guidelines outlined in the Forest's RLRMP and Arkansas's BMPs as well as project designs will help reduce sediment yield and the potential for impacts on aquatic organisms. See more information in the Water section of this EA.

Closure of four miles of system roads and decommissioning of 7.5 miles of roads would reduce erosion and sediment yield, and contribute to the protection of riparian vegetation. Another significant factor that is contributing sediment to local streams is the condition of the existing roads in the project area. Regular maintenance of roads keeps them functioning as they should instead of developing problems that cause resource damage. Maintenance of 132 miles of roads and re-closure of 57 of those miles in the project area will reduce erosion and sediment yield to these streams. Vegetative filter strips and BMP's for silvicultural activities will be implemented to reduce the impacts to soil and water resources within the project area.

User-made and poorly located roads and trails increase the risks to aquatic systems. Designated OHV routes that are exhibiting safety issues and resource damage will be removed from the designated routes list and would no longer allow OHV use on a total of six miles. Well maintained trails reduce the need for users to detour outside of the designated trail area, and re-routing and decommissioning poorly located sections of trail will reduce the impacts to our aquatic ecosystems by stabilizing soils and minimizing erosion.

Enlarging, creating and maintaining approximately 80 acres of high quality forage openings may impact sediment yield in the project area for a short period of time. The primary concern will be during the construction of the openings before the establishment of grasses. Some factors that will minimize this impact are:

- activities scattered over space and time
- duration in an un-vegetated state approximately 2 months or less
- implement largely during periods of lower rainfall amounts
- locate in areas with relatively gentle slopes and on ridge tops.
- ensure openings will be a maximum of 5 acres, and some of those acres are already established

Maintenance activities for these fields such as disking could also impact sediment yield, but these impacts should be much less than the construction. This activity is likely to occur once every 3 to 5 years. Plans include dropping and reforesting 10.5 acres of existing openings which are economically unfeasible to maintain due to factors such as location, size, or human encroachment. Improvements in the design and placement of openings will reduce soil movement into aquatic systems.

Pond construction could slightly affect sediment yield and hydrology. The highest risk to aquatic systems is during construction of the pond when there is no vegetation on the dam or spillway to stabilize and anchor the soil. These areas will be mulched with straw and seeded to speed up the re-vegetation process. These ponds, approximately a half acre each, will catch and hold water that would normally run off into streams thereby contributing to its water level and flow; however, due to the ponds' small sizes and their distribution across the project area, the decrease in run-off should not be significant enough to impact the aquatic biota in the local streams. Moreover, ponds will provide more habitat for semi-aquatic species such as frogs, salamanders, and insects.

Vegetation removed by prescribed fire could slightly increase sedimentation rates immediately after implementation but these changes would be very short in duration. Within a few weeks, the area will re-vegetate as more sunlight is available to the forest floor. In most areas the mineral soil is not bare but has some duff layer left to protect the soil. The primary concern for affecting sedimentation rates during prescribed burns is associated firelines. The State's BMP's and Forest Plan standards for the creation and maintenance of firelines, which include rehabilitation and seeding, will minimize the potential effects.

Native cane grows along stream banks and flood plains creating a unique habitat for wildlife and acting as a filter and soil stabilizer. Enhancing and planting populations of cane within the

project area will expand their beneficial contributions to aquatic system health. Woody succession within these cane brake areas may be reduced to allow for cane expansion. Implementation will occur manually and with herbicides using labels appropriate for the habitat (aquatic vs. terrestrial). Large woody debris in streams will also enhance habitat diversity and provide further shade and shelter for aquatic life.

Based upon the sediment yield model, all of these activities would produce little sediment and would be considered low risk to the aquatic biota as long as Best Management Practices are observed (See the Soil and Water Section).

Site preparation, release, and the control of woody stems and invasive species associated with several of these activities would require herbicides. Given the resource protection measures that minimize herbicide movement into sensitive surface waters, there should be no significant effect to fisheries from herbicide use. Only herbicides with aquatic labels may be used near water. Only sufficient herbicide to accomplish the day's work would be transported to the site. Also, herbicide mixing, loading, or cleaning areas in the field are not located within 300 feet of private land, open water or wells, or other sensitive areas. In the event of an accidental spill, the Emergency Spill Plan (Forest Service Handbook 2109.14 Chapter 40) would be followed. The Plan contains procedures for spill containment and cordoning-off of the spill area. The toxicity and potential risk to aquatic systems associated with herbicides are discussed in the wildlife and water sections.

Indirect Effects

This alternative would improve water quality over time. The restoration activities (thinning, woodland management, understory control and prescribed burning) will increase the herbaceous plant density on the forest floor. Many of these plant species such as warm-season grasses are deep rooted and will stabilize and filter sediment out of water run-off. Furthermore, the cane restoration will increase the stability of the stream banks and create another sediment filter as the cane expands, along with other plant species, in the riparian habitats.

Loss of large woody debris in streams can affect the habitat diversity, nutrient movements through the stream and the hydrology which affects the morphology and stream process. Habitat data on the Forests shows that the large woody debris per mile is much lower than what is recommended per mile as outlined in the Forest Plan. Placement of large woody debris would help restore stream functions and improve habitat diversity to maintain and increase species diversity.

The action alternatives have the most potential for improving or maintaining water quality by addressing road degradation issues with road and trail maintenance, closure, reconstruction and decommissioning.

Cumulative Effects

The Lower Big Piney Creek watershed makes up approximately 76% of the Three Knob Project area. There have been several recent activities within this watershed as shown in Table 31.

Table 31: Past and present management activities within the Project Area Watershed

Treatments (On USFS Land) within the project area	Acres/ Miles	Year Treated
Permanent land clearing	8ac	2011
Wildlife opening rehabilitation	45ac	2012
Well pad (Graves Creek)	2ac	2011
ERFO Project	4.5mi	2012
Treatments (On USFS Land) in the Lower Piney watershed	Acres	Year Treated
High Mountain Project	37,826	2013-current
Future Actions	Approx. Acres or Miles	Approx. Year
None Known		

The High Mountain Project EA concluded that the Proposed Action would pose a minimal risk to water quality (2012). The minimal amount of impact these projects have on water quality is typical of Forest practices on the Ozark National Forest. The aquatic resources on the Forest have remained in a high quality condition over the years. The EPA's Index of Watershed Indicators (IWI) is designed to describe broadly the condition and vulnerability (sensitivity) of aquatic systems across the U.S. For the Forest, the watersheds were ranked as either "better water quality, low vulnerability" (highest ranking) or "less serious water quality, low vulnerability" (second highest ranking) (USFS 1999). These rankings demonstrate the high quality of the watersheds and how well they compare to the rest of the nation. As shown in the Water Quality Section, the level of concern for all but the Little Creek sub-watershed is expected to remain low. The little creek sub-watershed is currently in a high risk situation and is not a reflection of an increase in risk due to the proposed actions. Strict adherence to BMPs and monitoring would be performed.

Based upon the models, all of these activities would produce little sediment and would be considered low risk to the aquatic biota as long as Best Management Practices are observed. See the Soil and Water Section.

Forest fragmentation is a concern for some species. Although the canopy would be fragmented in terms of stratification and percent coverage, what that means in terms of habitat fragmentation must be defined by the species being examined (Franklin et.al, 2002). Certain species of herpetofauna such as amphibians and salamanders may become geographically isolated due to fragmentation because, for instance, the majority of southern herpetofauna do not make long-range migratory movements overland (Gibbons and Buhlmann, 2001). Amphibians and reptiles require both terrestrial and aquatic habitats and movements between them occurs regularly at several hundred meters (Bailey et. al, 2006). Gibbons and Buhlmann also stated that the presence and persistence of certain species may depend on the long term availability of specific habitats as well as acceptable travel habitat between alternate breeding sites (2001, pg.384). Streamside Management Zones (SMZs) have been used in Forest Service Projects and would be established in Three Knob according to the Forest wide Standards in the Forest Plan adjacent to perennial streams, springs, and defined channels (FW81).

Alternative 1 (No Action)

Direct Effects
The No-Action Alternative would not have the temporary increases in sediment yield during implementation of project activities. Current trends would likely continue.

Indirect Effects
The No-Action Alternative would have higher sediment yields in the long term due to factors such as the deterioration of road and trail systems. These systems would not be repaired, maintained, or decommissioned resulting in the deterioration of the surfaces and existing sediment control structures. Activities such as thinning and understory control would not occur under this alternative. As a result, development and sustainment of cane and an herbaceous understory in woodland habitats would be impeded due to competition and reduced sunlight. This alternative would not have the improved stabilization, sediment filtering, and potential increases in soil depth that would help to buffer local streams from increase sedimentation or flash flooding associated with both natural and man-made disturbances.

This alternative would not address the low level of large woody debris and it is anticipated that habitat diversity would continue to decline.

Cumulative Effects
Past and present management activities within the watershed will, for the most part, continue. Sediment yield would remain at current levels with small fluctuations as management activities take place over time in the adjacent projects. Deterioration of roads and trails within the Three Knob Project area would eventually contribute to erosion and sedimentation.

The lack of impacts the Proposed Action and alternatives would have on water quality is typical of the Forest practice on the Ozark NF. The aquatic resources on the Forests have remained in a high quality condition over the years. The EPA's Index of Watershed Indicators (IWI) is designed to describe broadly the condition and vulnerability (sensitivity) of aquatic systems across the U.S. For the Forest, the watersheds were ranked as either "better water quality, low vulnerability" (highest ranking) or "less serious water quality, low vulnerability" (second highest ranking) (USFS 1999). These rankings demonstrate the high quality of the watersheds and how well they compare to the rest of the nation.

Alternative 2 (No Herbicide)

Direct Effects
This activity will eliminate the risk of contaminating local streams, but the project will require an increase in mechanical treatments to control woody plant species for stand regeneration, woodland restoration activities, and opening maintenance. This change would increase the intensity and number of disturbance events which will increase the potential for higher sedimentation rates; however, the difference in sediment yield between the Proposed Action and Alternative 2 is likely to be slight if any (see the Water Quality Section for further information). All other effects would be the same as the PA.

Indirect Effects
The primary difference from the Proposed Action Alternative is the extent and the time required to establish the herbaceous understory in the woodlands. Mechanical and manual treatments to control woody species are not as effective as herbicide treatments. This change will cause some areas to become too thick (more canopy closure), shade out the herbaceous plant species and decrease their beneficial effects of stabilization, sediment filtering and buffering of local streams. All other effects would be similar to the Proposed Action.

Cumulative Effects
See the Proposed Action.

I. Endangered, Threatened and Sensitive Species (TES)

Terms Used in TES Analysis:

Biological Evaluation (BE) - a document that discloses the effects of management activities on TES species and their associated habitat that occur or are likely to occur in the analysis area.

Endangered Species (E) - Any species (plant or animal) which is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.

Threatened Species (T) - Any species (plant or animal) that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and one that has been designated as a threatened by the Secretary of Interior in accordance with the Endangered Species Act of 1973.

Sensitive Species (S) - Those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Existing Conditions

A review has been completed that examines all known occurrences of Proposed, Endangered, Threatened Species as well as the Regional Forester’s Sensitive Species that are applicable to the Ozark-St. Francis National Forests.

Twenty-three (23) federally listed species have been identified by the US Fish and Wildlife Service, Conway office as occurring or having the potential to occur on the Ozark-St. Francis National Forests. Twenty (20) federally listed species were eliminated from consideration for this project on the Big Piney Ranger District of the Ozark-St. Francis National Forests because 1) they do not occur on the Forests or 2) their known distribution is well outside the counties and/or watersheds that make up the Big Piney Ranger District or 3) no potential habitat was found within the project area.

There is **no critical habitat** for any federally-listed species on the Big Piney Ranger District (BPRD) of the OSFNFs. There is no known occupied or unoccupied habitat required for recovery of any of the species discussed here in the project area or the BPRD.

Table 31 contains the TES species that were reviewed in the BE that are known to occur or which may occur in the project area or watershed. A summary of the conclusions in the BE will follow Table 31.

Table 31: Threatened, Endangered, and Sensitive Species in Three Knob Project

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Gray Bat	*Myotis grisescens*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	Endangered
Eastern Small Footed Myotis	*Myotis leibii*	Sensitive
Bachman's Sparrow	*Aimophila aestivalis/ Peucaea aestivalis*	Sensitive
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
Ozark Chinquapin	*Castanea pumila ozarkensis*	Sensitive
Southern Lady's Slipper	*Cypripedium kentuckiense*	Sensitive
Small headed pipewort	*Eriocaulon koernickianum*	Sensitive
Moore's Larkspur	*Delphinium newtonianum*	Sensitive
Ouachita false indigo	*Amorpha ouachitensis*	Sensitive
Alabama snow-wreath	*Neviusia alabamensis*	Sensitive
Ovate-leaf catchfly	*Silene ovate*	Sensitive
Ozark spiderwort	*Tradescantia ozarkana*	Sensitive
Longnose Darter	*Percina nasuta*	Sensitive
Nearctic paduniellan caddisfly	*Paduniella nearctica*	Sensitive
An isopod	*Lirceus bicuspidatus*	Sensitive

Proposed Action and All Alternatives

Direct/Indirect Effects

Neither the PA nor any of the alternatives are likely to adversely affect the federally listed **Indiana bat**, **gray bat**, or **Ozark big-eared bat**. Arkansas State Forestry Commission's Best Management Practices for Water Quality (BMP's) and all standards identified in the RLRMP and the Three Knob Project would be applied to all action alternatives. These measures should minimize or eliminate any potential effect to these species. Rock collection guidelines restrict collectors from removing rock on bluff-lines. This would protect potential day-roosting sites of gray and Ozark big-eared bats. Some trees suitable for roosting of Indiana bats would be removed; however, flight paths would be enhanced. Potential for direct exposure to herbicides should be minimal, and there is low risk for these species overall. Prescribed burning would have minimal direct effects on these species, and indirect effects would include the loss of some existing snags, the creation of new snags, and an increase in the herbaceous plant and accompanying insect component.

Following is a summary of the Regional Forester's sensitive species:

There would be **No Impact** from the Proposed Action and both alternatives to the **Alabama snow-wreath**, **Ozark spiderwort**, and **ovate-leaf catchfly**. Although they are listed as occurring in Pope and Johnson counties, they do not have a record of occurrence within the project area and none were discovered during field surveys. Special habitats, similar to the ones where known populations occur, are limited or absent from the project area.

The call of **May Impact Individuals but Not Likely to Cause a Trend to Federal Listing or a Loss of Viability** was made across all three proposed management options for the **Eastern small-footed bat**, **bald eagle**, **Ozark chinquapin**, **Southern lady's slipper**, **Moore's delphinium**, **nearctic paduniellan caddisfly**, **isopod**, and **longnose darter**. The No Action Alternative was not without impacts due to factors such as loss of viability after canopy closure, sedimentation and erosion of existing roads and trails, and declining forest health.

The following species were predicted to receive **Beneficial Impacts** from the Proposed Action and Alternative 2: **Bachman's sparrow**, **small-headed pipewort**, and **Ouachita false indigo**. Preferred habitat exists in the project area and is within the species range, but the habitat conditions are poor. The action alternatives would improve habitat conditions for these species that are currently not using the area. The No Action Alternative is predicted to affect each of these species differently. The Bachman's sparrow has been declining across its range, and without the creation and sustainment of preferred habitat it is likely to continue its decline; therefore, the call for Alternative 1 was "**Likely to Result in a Trend to Federal Listing or a Loss of Viability**." For the pipewort and false indigo, the No Action Alternative would not address the issue with NNIS and encroachment of woody species into potential habitats. These species are not currently known from this project area but potential habitat would continue to degrade; therefore, the call for this alternative is: **May Impact individuals but not likely to cause a trend to federal listing or a loss of viability**.

Cumulative Effects

Based upon the Biological Assessment for the Forest Plan, implementation of forest practices at the levels identified in the RLRMP would not result in an adverse effect for any of the Federally Threatened and Endangered Species. At the watershed project level, all cumulative effects from past, present and foreseeable future actions would result in a "may affect -not likely to adversely affect" determination for the Indiana bat, gray bat, and Ozark big-eared bat for the proposed action. The other action alternative, Alternative 2, and the No Action Alternative, Alternative1, would initially have a decreased risk relative to the Proposed Action, but in the long term, these alternatives would not be as effective in sustaining forest conditions, health, and/or water quality.

Of the sensitive species identified as occurring within the analysis area, Ozark chinquapin would likely continue to decline overall due to the effects of the chestnut blight across its known range. For more details, see the Three Knob Biological Evaluation (BE).

J. Climate Change

Existing Condition

Although it is possible to quantify a project's direct effects on carbon sequestration and Green House Gas (GHG) emissions, there is no certainty about the actual intensity of individual project's indirect effects on global climate change. Uncertainty in climate change effects is expected because it is not possible to meaningfully link individual project actions to quantitative effects on climatic patterns. Complete quantifiable information about project effects on global climate change is not currently possible and is not essential to a reasoned choice among alternatives since it would be such a minute factor in the climate change equation. However, based on climate change science, we can recognize the relative potential of some types of proposals and alternatives to affect or influence climate change and, therefore, provide qualitative analysis to help inform project decisions. Climate change in this assessment focused on using qualitative rather than quantitative analysis.

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).

According to the laws of organic chemistry, the process of photosynthesis removes carbon 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 timber stands grow overly dense and lose vigor. Wildfires can cause a quick carbon release from forests but have little effect on the long term since most carbon released in the fire would eventually be released through decay. 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. More recently changes are due to conversions from forest to urban development, dams, highways, and other infrastructure (Malmsheimer, Heffernan, Brink, et al.).

Proposed Action and Alternative 2

Direct Effects:
The proposed harvest operations associated with the Proposed Action and Alternative 2 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 would be removed is offset by storage in forest products. With the proposed action and alternative 2 some of the carbon currently sequestered in vegetation and soils would be released back to the atmosphere. In the short-term, greenhouse gas emissions and alteration to the carbon cycle would be caused by hazardous fuel reduction activities, timber removal and thinning of overstocked stands. In the long term, however, these actions would also increase the forest's ability to sequester additional carbon, improve the forest's resilience to the potential impacts of climate change and decrease the potential for uncharacteristically severe wildfires. Timber harvest would remove some of the mature stems with diminished ability to sequester additional carbon; some of the carbon sequestered in harvested stems would continue to be stored in manufactured wood products. Residual stems and regeneration in the proposed project area would continue to sequester and store carbon.

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 greenhouse gasses, and particulates into the atmosphere. However, implementing the proposed prescribed burns on a 3 to 5 year cycle would reduce fuel loading and could be expected to reduce fire intensity and severity as well. Wildfires may still occur in the proposed project area; however, because fuel loads would have been reduced, there would be a lower risk of uncharacteristically severe wildfire for the treated acres than the current condition poses. The reduced risk has a two-fold effect on greenhouse gas emissions or the carbon cycle:

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

Indirect Effects:
Indirectly, implementation of the Proposed Action 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 some carbon accumulation in the atmosphere.

Cumulative Effects:
As Green House Gas (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 similar projects. It is not expected that

the effects of this project or multiple projects can be specifically attributed the cumulative effects of global climate change. However, the cumulative effects of climate change on this project can be seen in the form of more frequent environmental events such as the red oak borer outbreak in the year 2000, the ice storm of 2009, the tornado event in 2011, and the drought of 2012. Forests with older trees are less able to withstand and recover from these events.

Alternative 1: (No Action)

Direct Effects:
No management activities would occur under this alternative; therefore, no direct effects on 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 (pulse) 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 have 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.

A possible cumulative effect with the No Action Alternative is harvest of trees that have reached or passed maturity or are too thick would not occur. The ability of those trees to sequester additional carbon from the atmosphere would continue to be less than that of younger stands of trees. No wood products such as wood flooring, furniture and lumber that would store carbon would be obtained from the proposed project area.

K. Human Health Factors

Existing Condition

Chemicals used to control plants are known as herbicides. Herbicides are being considered in the Proposed Action with the goal of incorporating herbicide treatment along with non-chemical treatments. Herbicides kill the existing plant but often allow remaining seeds to germinate.

Herbicides are known through experience with similar activities to be one of the most effective treatment methods for eradicating or controlling weed species that currently exist (For the purpose of this document weed species consists of vegetation that may be outside of management desired objective such as non-native invasive species or aggressive native species). When herbicides are used in conjunction with an integrated treatment effort it improves the effectiveness of non-chemical treatments, either concurrently or as follow-up treatments.

The primary herbicides proposed for use within the project area have metsulfuron methyl, triclopyr, imazapyr, and glyphosate as their active ingredients. Mixtures of herbicides could be used where they would provide more effective control, particularly for weeds that may be persistent. Because the herbicides proposed for use do not persist in the soil at effective levels for more than a few months (at the maximum), follow-up treatments may be needed to eliminate new sprouts that were in seed during the initial treatment. The most noticeable consequences from weed treatment would be the long-term, beneficial improvements to native ground vegetation such as grasses, forbs and shrubs.

Only herbicide formulas/products that have been registered with the Environmental Protection Agency (EPA) for rangeland, forest land, or aquatic use would be approved for application. In addition, the Forest Service has completed risk assessments that have analyzed the risk of specific herbicides on human health and safety, on wildlife/fish, and on non-target plants. Only herbicides with a completed risk assessment would be used.

No aerial application of herbicides would be used for this project. Herbicides would be applied using ground-based methods such as hand application using gloves, or spray using a backpack containing the herbicide attached to a flexible sprayer, wand or other hand application device that directs the chemical onto the target weed. Vehicles may be used with a mounted herbicide tank and boom or wand spray device to direct each respective herbicide used. Booms or wands may be articulated or fixed.

Table 32 explains terminology commonly used in evaluating health risk associated with herbicides.

Table 32: Herbicide Risk Assessment Standard Terminology

Term	Abbrev	Explanation (see risk assessments for specific definitions)
Toxic		The short-term effects of exposure to a chemical, which appear immediately upon exposure. See specific sections of the risk assessments for definition of the various “end points” of exposure, e.g. nervous system.
Sub-chronic		The effects that do not appear immediately, but that would appear over a short period of time after exposure, or if exposure continues for a period of time.
Chronic		Effects over a number of years (or over a lifetime) of repeated exposure
No Observed Adverse Effect Level	NOAEL	The amount of a substance that shows no toxic effects given short term (mg/kg body weight) or to show lack of chronic effects over long duration may be expressed as a dose over time (mg/kg/day).
No Observed Effect Concentration	NOEC	Used for plants to determine the lowest concentration at which a concentration of herbicide had no effect.
Safety Factor		Once a no observable effect level is established, safety factors are

Term	Abbrev	Explanation (see risk assessments for specific definitions)
		applied for the human risk assessments in order to set a reference dose. Safety factors depend on the information used for the no effect finding. Factors include such circumstances as uncertainties in species-to species extrapolation as well as accounting for sensitive individuals in the population. Each factor reduces the exposure dose by dividing by 10, so that a NOAEL of 5 would become an RfD of 0.05 if three safety factors were applied.
Reference Dose	RfD	The amount of a substance that would not have an adverse effect if this does were given every day over a lifespan of 70 years. It is measured in milligrams of substance per kilogram body weight of the person of concern, per day (mg/kg/day). An RfD is basically defined as a level of exposure that would not result in any adverse effects in any individual. The U.S. EPA RfDs are used because they generally provide a level of analysis, review, and resources that far exceed those that are or can be conducted in support of most Forest Service risk assessments. In addition, it is desirable for different agencies and organization within the Federal government to use concordant risk assessment values.
Hazard Quotient	HQ	The result of dividing the reference dose by the expected exposure to provide a measure of the hazard and so a relationship to the expected risk.

The information in this analysis was provided from the SERA identified in the following table:

Table 33: Herbicide Risk Assessment Information

	Herbicide Name	Date prepared	Reference	Pages
1	Glyphosate	March 1, 2003	SERA 2011	281
2	Imazapyr	December 18, 2004	SERA 2004e	149
3	Metsulfuron methyl	December 9, 2004	SERA 2004d	152
4	Triclopyr	March 15, 2003	SERA 2003b	264
5	Fluroxypyr	June 12, 2009	SERA 2009	140

Note: Tank mixes and adjuvants (such as Cide-Kick) may be added to the herbicide to improve effectiveness and control of target species. All herbicides would be applied at rates and use only application methods specified on the label. Additional spot treatments would be needed to reach the desired future condition in some areas.

These are standard risk assessment procedures, tested by several years of EPA use and scrutiny by the larger scientific community. As noted in a number of the risk assessments, the anticipated effects can be minimized or avoided by prudent industrial hygiene practices during proper handling of the herbicides. No chemical has been studied for all possible effects and the use of data from laboratory animals to estimate hazard or the lack of hazard to humans is a process that is fraught with uncertainty. Prudence dictates that normal and reasonable care should be taken in the handling of this or any other chemical. Notwithstanding these reservations, the use of herbicides does not appear to pose any risk of systemic toxic effects to workers or the general public in Forest Service Programs. Risk Assessment documents for the specific types of herbicide proposed to be used may be found at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

Glyphosate

Description
The active ingredient herbicide *gylphosate* (examples of trade name RoundUp, RoundUp Pro**,** Accord SP) would typically be applied to target vegetation with a directed ground application by back pack or vehicle mounted sprayer, at manufacture's labeled rates per acre. Mixing rates would vary depending on topography and amount of vegetation to be controlled. Repetitive treatments may occur in follow up years if overall treatment is needed. Spot applications would occur in years following the initial treatments to control future growth. Spot applications would be made at the same rate and mixture or less, but would be applied only to small areas as needed, and typically made with backpack or vehicle mounted sprayer.

Risk Summary
The risk characterization for both workers and members of the general public are reasonably consistent and unambiguous. For both groups, there is very little indication of any potential risk at the typical application rate. Even at the upper range of plausible exposures in workers, exposure is below the level of concern, even at the upper levels when broadcast spray is used. For members of the general public, none of the longer-term exposure scenarios exceed or even approach a level of concern. There is no route of exposure or exposure scenario suggesting that the general public would be at risk from longer-term exposure to *glyphosate*. Only exposure scenarios that contemplate consumption of water directly out of a pond immediately after a spill exceed the levels of concern.

The current risk assessment for *glyphosate* generally supports the conclusions reached by U.S. EPA: Based on the current data, it has been determined that typical application rate does not approach the level of exposure in the reference dose.

At the typical application rate, the exposure to hazardous levels would not be reached or exceeded under worst-case conditions (SERA 2011).

Imazapyr

Description
Imazapyr would be applied directly to target vegetation with a backpack sprayer, at manufacture's labeled rates (examples of trade name Arsenal, Chopper, Stalker) per acre. In some cases where woody growth is larger, a hack and squirt method or cut stump application may be made directly to each stem. Mixing rates would vary depending on topography and amount of vegetation to be controlled. Repetitive treatments may occur in follow up years if overall treatment is needed. Spot applications would occur in years following the initial treatments to control future growth. Spot applications would be made at the same rate and mixture or less, but would be applied only to small areas as needed. Solutions may contain nonionic surfactants or vegetable-based seed oil to increase surface contact at recommended label rates or have them added according to the manufacturer's label.

Risk Summary

Typical exposures to *imazapyr* do not lead to estimated doses that exceed a level of concern for either workers or members of the general public at either the typical or highest application rate. For workers and the general public, the upper limits of exposure when compared with reference dose are sufficiently below a level of concern that the risk characterization is relatively unambiguous. Based on the available information and under the foreseeable conditions of application, there is no route of exposure or scenario suggesting that the workers or members of the general public would be at any substantial risk from longer term exposure to *imazapyr* even at the upper range of the application rate considered in this risk assessment. The EPA has classified *imazapyr* as a Class E compound, one having evidence of non-carcinogenicity. Under typical and conservative worst-case exposure assumptions, the evidence suggests that no adverse effects would be expected from the application of *imazapyr* (SERA 2011).

Metsulfuron methyl

Description
Metsulfuron methyl is a selective herbicide that would be used to control brush and certain woody plants, annual and perennial broadleaf weeds, and annual grassy weeds. It is recommended for weed control and suppression in the establishment and maintenance of native grasses along with managing right-of-ways. Commercial products (example: Escort, Ally) contain 60 percent *metsulfuron methyl* and 40 percent inert ingredients. *Metsulfuron methyl* would be applied directly to target vegetation with a back pack or vehicle mounted sprayer, at manufacture's labeled rates per acre. (Note: One modification to this would be in applications to control multiflora rose. In that case, a handgun applicator would be used to direct the treatment to the soil within 2 feet of the stem union for each plant). Mixing rates would vary depending on topography and amount of vegetation to be controlled. Repetitive treatments may occur in follow up years if overall treatment is needed. Spot applications would occur in years following the initial treatments to control future growth. Spot applications would be made at the same rate and mixture or less, but would be applied only to small areas as needed. Solutions may contain nonionic surfactants to increase surface contact at recommended label rates or have them added according to the manufacturer's label.

Risk Summary
Typical exposures to *metsulfuron methyl* do not lead to estimated doses that exceed a level of concern. For workers, no exposure scenarios, acute or chronic, exceeds the reference dose, even at the upper ranges of estimated dose. For members of the general public, all upper limits for hazard quotients are below a level of concern. Thus, based on the available information and under the foreseeable conditions of application, there is no route of exposure or scenario suggestion that workers or members of the general public would be at any substantial risk from acute or longer term exposures to *metsulfuron methyl* (SERA 2004d).

Triclopyr

Description
The herbicide *triclopyr* [in a *triethylamine salt* formulation] (example trade name Garlon 3A**,**) would be used on woody vegetation that is less responsive to treatment by *glyphosate*. This herbicide would be applied directly to target vegetation typically with a backpack or vehicle

mounted sprayer, at manufacture's labeled rates per acre. Mixing rates would vary depending on topography and amount of vegetation to be controlled. Repetitive treatments may occur in follow up years if overall treatment is needed. Spot applications would occur in years following the initial treatments to control future growth. Spot applications would be made at the same rate and mixture or less, but would be applied only to small areas as needed. Except for aquatic treatments, solutions may contain nonionic surfactants to increase surface contact at recommended label rates or have them added according to the manufacturer's label.
In some cases where woody growth is larger, a hack and squirt method or cut stump application may be made directly to each stem. The rate of application if this method is used would be in a 1:1 ratio or undiluted. *Triclopyr* (ester) the oil based formulation (one trade name being Garlon 4) has similar application methods as the *triclopyr triethylamine* formulation described above. Additional application methods for *Triclopyr* (ester) include; broadcast foliar ground applications, which involve the use of a two- to six-nozzle boom mounted tank and sprayer on a tractor or other heavy duty vehicle.

Risk Summary
There is no indication that workers would be subject to hazardous levels of either form of *triclopyr* at the typical application rate and under typical exposure conditions. Nonetheless, at the upper range of exposures, all application methods exceed the level of concern based on the chronic reference dose (but not the acute RfD). Thus, for workers who may apply *triclopyr* (any formulation) repeatedly over a period of several weeks or longer, it is important to ensure that work practices involve reasonably protective procedures to avoid the upper extremes of potential exposure. At higher application rates, particularly rates that approach the maximum application rate of 10 lbs/acre, measures should be taken to limit exposure. These measures would need to be developed on a case-by-case basis depending on the specific application rates that are used and the type of the applications that are employed. For members of the general public, the risk characterization is relatively unambiguous at the typical application rate and under the foreseeable conditions of exposure. There is no route of exposure or exposure scenario suggestion that the general public would be at risk from longer term exposure to either form of *triclopyr*. Even at the maximum projected application rate of 10 lbs/acre, the only long-term scenario that exceeds the level of concern is the consumption of contaminated fruit. Several acute exposures also lead to exposure to levels that are above the level of concern. For instance, accidental spray over the lower legs as well as contacting contaminated vegetation both exceed the level of concern at the central estimate of exposure when the highest application rate is considered to be (10 lbs/acre). All dermal exposures exceed the level of concern. These dermal exposure assessments are extremely conservative and designed to identify which possible types of exposure would be most hazardous. For *triclopyr*, such scenarios include dermal contact and accidental spills into water (SERA 2011).

Fluroxypyr

Description
The herbicide *fluroxypyr* which includes the trade name, Vista XRT (Ultra), is a chemical which controls a wide range of broadleaf weeds and woody brush. *Fluroxypyr* is classified as a Group I Herbicide, with a mode of action where the weed cannot grow due to disruption of plant cell growth. *Fluroxypyr* belongs to the Pyridines group of chemicals. *Fluroxypyr* is registered as a

spray treatment for the control of a wide range of broadleaf weeds and woody species. Application methods for larger areas would be by hydraulic spray (typically broadcast sprays using truck/tractor mounted equipment) or pull behind trailers with tanks and boom sprayers wick type application may also be utilized. Small areas would be treated by backpack application (selective foliar application or spot treatments). Application rates would be according to the manufacturer's label. Further details of use can be found in the Direction of Use section on the Product Label. *Fluroxypyr* would be mixed with *triclopyr* (Garlon 3) to achieve the desired results in certain circumstances.

Risk Summary

General exposures to workers in terms of normal conditions, for prolonged application times even at the highest application rate, exposure levels of *fluroxypyr*-MHE, are substantially below the level of concern. Dermal exposures to *fluroxypyr* are not likely to pose a risk to workers. Damage to eyes studies concerning the irritant effects of Vista XRT formulation, the more concentrated formulation of *fluroxypyr*-MHE are not available. While somewhat speculative, the more highly concentrated Vista XRT formulation (45.52% a.e.) may pose a greater risk of eye damage to workers than a diluted formulation would pose. General public the risk characterizations for all non-accidental exposure scenarios are easily interpreted, and there is no basis for assuming plausible risks to the general public. The upper bounds of the other non-accidental acute exposure scenarios for the general public are below the level of concern by factors from about 10 to greater than 1400 (SERA, 2009). The EPA has not made a common mechanism of toxicity finding for *fluroxypyr* and any other substances, and *fluroxypyr* does not appear to produce a toxic metabolite produced by other substances. For the purposes of this tolerance action, therefore, EPA has not assumed that *fluroxypyr* has a common mechanism of toxicity with other substances. U.S. EPA/OPP, 2004e, p. 73.

Sub chronic and Chronic Toxicity

Considerable information exists on sub chronic and chronic effects due to exposure to herbicide in controlled animal studies. Sub chronic and chronic effects are those that might occur over a long period of time, after weeks or years of exposure. Sub chronic and chronic effects are reviewed in terms of potential impacts to their potential neurological or reproductive effects. These evaluations assume some lower threshold level below which these effects would not occur.

Other potential health effects evaluated include the herbicide potential to be carcinogenic, mutagenic, or teratogenic. These impacts are not threshold dependent, and so they are evaluated under the assumption that any level may cause the health effect. Hence, they rely on probability, based on exposure levels.

Considering anticipated exposure levels to workers and the public, all five herbicides express evidence of non-carcinogenicity. Also, Glyphosate, Fluroxypyr and Imazapyr show no evidence on being mutagenic or reproductive while Metsulfuron methyl and Triclopyr evidence showed no-to-slight chance of mutagenic or reproductive effects.

In summary the five herbicides considered for use in the Proposed Action are not expected to create a health concern for carcinogenic, mutagenic, teratogenic sub-chronic, chronic effects to

the workers or to the general public. Since forestry use of herbicide poses a low risk and usage is likely to occur only once or twice over 25 to 75 years cumulative effects are not likely to occur.

Proposed Action

Direct/Indirect effects
The term public includes hikers, campers, hunters, fuel-wood gatherers, and other forest users. It basically includes all people who use or work in the project area except those who apply the herbicide treatments.
Risk to the public due to herbicide use is not likely to occur because none of the herbicides are persistent in the environment or in the human body. Also, none of the herbicides proposed to be used in this project bio-accumulates in animal tissues, so there is no threat of human exposure by eating animals that have come into contact with the vegetation on which herbicides were applied.

Snags do pose a direct negative effect for forest visitors and workers in the forest. If the Proposed Action were chosen then some of the snags in the project area would be made safe within the activity areas. This would result in a safer working environment for forest workers and forest visitors.

Cumulative effects
The area would be safer for forest visitors after the project has been implemented. This includes herbicide use. As shown above effects can be minimized or avoided by prudent hygiene, proper handling and following label application rates. Generally speaking, contamination of workers, the public or the environment shows very little indication of any potential risk at the typical label recommended application rates and methods.

Alternative 1 (No Action)

Direct/Indirect effects
No herbicides would be applied in the project area. No direct or indirect consequences to human health would occur related to herbicides. No management activities would take place within the project area. Over time this would create an old forest susceptible to insects or disease outbreak (oak borer, pine beetle) if this scenario played out a forest of snags would be left.
Dead standing and dying trees (snags) pose a potential safety threat to forest visitors and workers. An increased risk to the public and forest visitors would be present if Alternative 1 is chosen.

Cumulative Effects
No herbicides would be applied in the project area.
Over time the risk of a forest visitor or worker being struck by a falling snag would increase. As more and more trees die and the number of snags increase across the project area the risk to visitors would increase as well. Also, the potential for a catastrophic fire to happen in this project area would increase as would the risk to a fire fighter or member of the public due to greater fuel loading and increased potential of a large fire.

Alternative 2

Direct/Indirect Effects

The activities listed in the Proposed Action would be implemented with no herbicide use. For activities proposed for herbicide use such as release, WSI, or pre commercial thinning, chainsaws or other power equipment would be utilized in an attempt to achieve similar results. This could increase the risk of injury to workers performing the activity.

Cumulative Effects

There would be no measurable cumulative effects from alternative two.

Chapter IV

Coordination and Consultation

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

Ozark National Forest – Big Piney Ranger District:

Terry Hope - Recreation Assistant
Jim Dixon – Integrated Resources Team Leader
Dwayne Rambo - Wildlife Biologist
Rickey Adams – Engineering Technician
Sarah Davis – Wildlife Biologist
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Anthony Harris – Timber Management Officer
Mark Morales – Fire Management Officer
Mark Hellen – District Forester
Leif Anderson – District Forester
Mike Walden – Heritage Resources Technician
Michael (Smoke) Pfeiffer – Archeologist
Chris Brightwell – Integrated Resources Crew Leader
Heath Thomas - Integrated Resources Crew Leader

Ozark National Forest – Supervisor's Office:

Rick Monk – Hydrologist
Shawn Cochran – Ecosystems Staff Officer
J. Keith Whalen – Forest Fisheries Biologist
Marvin L. Weeks – Forest Soil Scientist
Dr. David Jurney – Archeologist
Kathy King – Writer/Editor
Steve Duzan – Forest NEPA Coordinator

Arkansas Game and Fish Commission

A J Riggs – Wildlife Management Supervisor

Federal, Tribal, State, and Local Agencies:

Theo Witsell – Arkansas Natural Heritage Commission
Arkansas State Historic Preservation Office (SHPO)
US Forest Service Research
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Josh Sutterfield Historic Preservation Officer Miami Nation of Oklahoma
Historic Preservation Office Peoria Tribe of Oklahoma
Jack Shadwick Historic Preservation Officer Modoc Tribe of Oklahoma
Historic Preservation Officer Ponca Tribe of Oklahoma
Joyce Bear Historic Preservation Officer Muskogee (Creek) Nation
John Berry Tribal Historic Preservation Officer
Dr. Andrea Hunter Historic Preservation Officer Osage Nation
Sandra Massey Historic Preservation Officer Sac and Fox Nation of Oklahoma
Rhonda Dixon Historic Preservation Officer Ottawa Tribe of Oklahoma
Natalie Deere Historic Preservation Office Seminole Nation of Oklahoma
Richard Goulden Historic Preservation Officer Otoe-Missouri Tribe of Oklahoma
Chris Franks Historic Preservation Officer Seneca-Cayuga Tribe of Oklahoma
Frank Morris Repatriation Coordinator Pawnee Nation of Oklahoma
Historic Preservation Office Shawnee Tribe of Oklahoma
Historic Preservation Office Thlopthlocco Tribal Town
Josh Waffle Historic Preservation Officer Tonkawa Tribe of Oklahoma
Lisa Stopp Historic Preservation Officer United Keetoowah Band of Cherokee
Stratford Williams Historic Preservation Officer Wichita and Affiliated Tribes
Sherry Clemons Historic Preservation Officer Wyandotte Tribe of Oklahoma

Appendix A

Maps

APPENDIX B

Supporting Literature

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APPENDIX C

Public Involvement

To encourage public participation in the Three Knob Project decision process, a project initiation letter including maps were mailed to 328 neighboring landowners, the Native American Tribes, and other interested parties, explaining the project proposal on August 15th, 2013. They were asked to comment on, or involve themselves in, the proposed project, and were informed about the kinds of decisions to be made. The project was also published in the Ozark- St. Francis National Forest Schedule of Proposed Actions and on the Forest planning website. An initial scoping letter was also published in Russellville's The Courier (The Official Paper of Record for the Big Piney Ranger District) on August 16th, 2013 requesting comments, questions, and offering detailed information to those expressing an interest in the project. Twenty six letters were returned as undeliverable.

The project initiation effort resulted in six responses (3 from Native American Tribes and 3 from members of the public). All interested parties who responded to our public involvement efforts will receive a notice informing them that the Draft EA is ready for review.

Internally, the Interdisciplinary (ID) Team met to develop the Proposed Action and the Alternatives which were analyzed in the EA. The ID team developed "Key Issues" from meetings and public input. A "Key Issue" is an issue for which an alternative would be developed and considered in detail.

On May 6, 2014 four cover letters were sent to interested individuals via email informing them that the Draft EA was ready for review and comment. The cover letter included information on where the EA could be viewed and how to obtain a copy of the EA. A legal notice requesting comments was published in Russellville's The Courier on May 7, 2014 which contained the same information as the cover letters above. The Draft EA was posted to the Ozark-St. Francis National Forest website along with a copy of the legal notice inviting the public to review and comment on the Three Knob project and Draft EA.

This effort resulted in 1 response. The ID Team reviewed the response (14 different comments from the one commenter) and addressed the concerns from the commenter. The comment(s) and agency responses are included in this EA as Appendix F.

Appendix D: Scenic Integrity Objective Table by Treatment

Topic or Management Activity	Scenery Treatments by Scenic Integrity Objective (SIO)			
Management Activities	High	Moderate	Low	Unclassified
Commercial/Non-Commercial thinning	A, B, C, D, E, F, G, H, I, S, T, V, W, Y, AA	B, D, E, G, H, I, S, T, V, W, AA	B, T, V, W, AA	
Areas #	Hwd-thin 1,2,45,57,62,67,107, south tip of 33 & 35; Small north east part of 52; west tip of 42 Pine Thin 44, 46, 48, 53, 58, 59, 64, 65, 66, 69, 82, 85, 86*, 94, 106, 109*, 116*, 127, 150, & 152* Pine ST prep 72, 74, 83*, 92, 103, 104, 112*, 145*, TSI 76, 91, 135, 151 TSI Chemical 55 Release 108 and part of 111*	Hwd Thin 13, 16, 23, 30, 33*, 38, 49, 52*, 110 Pine Thin 5, 9, 12, 19, 27, 51, 70, 79, 86*, 109*, 138, 140, & 146 Cedar Thin 21 Pine ST prep 72*, 83*, 88, 112*, & 141 TSI 7, 20, 22, 25, 28, 128*, & 142 TSI Chemcial 26, 32, 37, 41, &113 Release 111*	Pine Thin 109*, & 152* Pine ST Prep 145*	Pine Thin 98, 118, 119, 121, 130, & 132 TSI 97, 99, 100, 101, 117, 126, 128*, 129, 133, 153, 155, 157, & 159 TSI Chemcial 123, 124, & 131
Overstory Removal Seed-Tree Removal/ Shelterwood Removal	B, C, D, E, F, G, H, I, O, P, Q, S, T, V, W, AA	B, D, G, H, I, O, P, Q, S, T, V, W, AA	Q, S, T, V, W,AA	
Area #s	Pine ST Removal 102	Pine ST Removal 81		
Seed-Tree	**	B, D, E, G, I, M, O, P, Q, T, V, W, AA	B, N, Q, T, V, W, AA	
Area #s	Pine ST 60, 73, 75, 78*, 84*, 93, 105, 134, 147, & 149	Pine ST 31, 71, 78*, 80, 87*, 89, 90, 136, 137, 139, & 143		Pine ST 120, 122, 125, 134*, 154, 156, 158, 160, 161
Shelterwood	**	B, D, E, G, I, M, O, P, Q, T, V, W, AA	B, N, Q, T, V, W, AA	
Area #s	Hwd SW 54, 56, 63, small part of 68* Pine SW 115*	Hwd SW 3, 4, 6, 8, 10, 11, 14, 15, 17, 18, 29, 35*, 39, 40, 42*, & 50 Pine SW 24, 34, 36, 43, 47, 68*, 115*, 144*, & 148	Pine SW 144	Pine SW 96
Create/Maintain Wildlife Habitat, Restore PETS and Native Commmunities	B, D, E, G, H, I, K (creating), M(restoring), N(maintaining), T, V, W, AA	B, D, E, G, H, I, N, T, V, W, AA	B, D, H, T, V, W, AA	
Area #s	52, 57, 63, 54, 69, 72*, 103, 114, 149	5, 13, 15, 19, 21, 51, 68, 70, 72*, 78, 88, 98, 109,		128, 129, 133 Cane 95
Prescribed Burn	D, E, F, H	D, E, H	H	
Area #s	72, 73, 74, 75, 76, 77, 78*, 82, 83*, 84*, 85, 86*,	70, 71, 72*, 78*, 79, 80, 81, 83*, 84*, 87, 88, 89, 90		

APPENDIX E

Project Designs

The following Forest / Management Area Design Criteria are taken directly from the RLRMP while the list below is not all inclusive all the designs below do directly apply to the Three Knob Project;

FW01 Water control structures necessary for the control of surface water movement from soil-disturbing activities will be constructed for temporary use roads, skid trails, and fire lines concurrent with construction operations.

FW02 Maximum even-aged or two-aged regeneration stand size will be limited to 80 acres for pine and 40 acres for hardwood. These acreage limits do not apply to areas treated as a result of natural catastrophic conditions such as fire, insect or disease attack, or windstorm. Areas managed as permanent openings (e.g., meadows, pastures, food plots, rights-of-way, and savannas) are not subject to these standards and are not included in calculations of opening size, even when within or adjacent to created openings.

FW03 Openings created by even-aged and two-aged regeneration treatments will be separated from each other by fully stocked stands of at least 10 acres in size with a minimum of 330 feet in width.

FW04 Regeneration areas will be distributed so that no more than 30 percent of 1,000 acres is in the 0 to 20 year age class.

FW18 Mature forest cover is maintained within 100 feet slope distance from the top of bluffs and 200 feet slope distance from the base to provide wildlife habitat associated with the unique landform. Within this zone, activities are limited to those needed to ensure public safety or to maintain and improve habitat for federally listed species or other species whose viability is at risk.

FW20 Herbicides and application methods are chosen to minimize risk to human and wildlife health and the environment. Diesel oil will not be used as a carrier for herbicides, except as it may be a component of a formulated product when purchased from the manufacturer. Vegetable oils will be used as a carrier for herbicides when available and compatible with the application proposed.

FW21 Herbicides are applied at the lowest rate effective in meeting project objectives and according to guidelines for protecting human and wildlife health. Application rate and work time must not exceed levels that pose an unacceptable level of risk to human or wildlife health. If the rate or exposure time being evaluated causes the Margin of Safety or the Hazard Quotient computed for a proposed treatment to fail to achieve the current Forest Service Region 8 standard for acceptability (acceptability requires a MOS > 100 or, using the SERA Risk Assessments found on the Forest Service website, a HQ of < 1.0), additional risk management must be undertaken to reduce unacceptable risks to acceptable levels or an alternative method of

treatment must be used.

FW22 Fuelwood sales will not be made for a minimum of 30 days after treatment in areas where pesticide treatments have been made. Should injection of trees be done, effected trees will not be sold as fuelwood.

FW23 Weather is monitored and the project is suspended if temperature, humidity, and/or wind do not meet the criteria shown in Table 3-2.

Table 3-2: Criteria for suspension of Herbicide Application.

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

FW25 A certified pesticide applicator supervises each Forest Service application crew and trains crew members in personal safety, proper handling in application of herbicides, and proper disposal of empty containers.

FW26 With the exception of treatment by permittees of right-of-way corridors that are continuous into or out of private lands and through Forest Service managed areas, no herbicide is broadcast within 100 feet of private land or 300 feet of a private residence unless the landowner agrees to closer treatment. Buffers are clearly marked before treatment so applicators can easily see and avoid them.

FW27 No soil-active herbicide is ground applied within 30 feet of the drip line of non-target vegetation specifically designated for retention (e.g., den trees, hardwood inclusions, adjacent untreated stands) within or next to the treated area. However, chemical side pruning is allowed in this buffer if necessary, but movement of herbicide to the root systems of non-target plants must be avoided. Buffers are clearly marked before treatment so applicators can easily see and avoid them.

FW28 No herbicide is ground broadcast within 60 feet of any known threatened, endangered, proposed, or sensitive species except for endangered bats. Selective applications may be done closer than 60 feet, but only when supported by a site-specific analysis. Selective herbicide treatments using a non-soil active herbicide may be used closer than 60 feet to protect TES plants from encroachment by invasive plants.

FW29 Application equipment, empty herbicide containers, clothes worn during treatment, and skin are not cleaned in open water or wells. Mixing and cleaning water must come from a public water supply and be transported in separate labeled containers.

FW30 Herbicide mixing, loading, or cleaning areas in the field are not located within 300 feet of

private lands, open water or wells, or other sensitive areas.

FW32 Herbicide will not be used within the appropriate SMZs or within 300 feet of any public or domestic water intake. Selective treatments may occur within SMZs only when a site-specific analysis of actions to prevent significant environmental damage such as noxious weed infestations supports a "Finding of No Significant Impact" (FONSI), and then using only herbicides labeled for both terrestrial and aquatic use within these areas.

FW33 Maintain the following average standing dead, existing, and potential hollow den and loose bark trees per acre forest wide:

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

Total 6 snags per acre

Unless necessary for insect/disease control or to provide for public safety, standing dead and den trees will not be cut during salvage operations.

Snags will be left from the largest size classes and maybe clumped.

FW35 Provide up to four permanent water sources per square mile in upland sites.

FW37 Wildlife water holes (ponds) less than one-half surface acre will be managed for native amphibian habitat and not stocked with fish.

FW39 Add large woody debris (LWD) to streams and rivers where natural levels are inadequate, except in wilderness areas.

FW42 Karst features will be recognized and documented when they are found to occur across the landscape; these features include caves, springs, sinkholes, and losing streams.

FW44 Management activities within KMZs will be planned to use practices that result in minimal surface disturbance; this will be measured as less than five percent soil disturbance over the entire KMZ within the project area.

FW50 A 1,500-ft radius protection zone will be established around any bald eagle nest or communal roost site found on the Forests. Within this protection zone, vegetation management that would affect the forest canopy, or other activities that may disturb eagles, will be prohibited during periods of eagle use.

FW51 Prescribed burn plans will identify, as smoke sensitive targets, area where active eagle

nests with eggs or chicks are present. Mitigation will be done to avoid putting heavy accumulations of smoke into those areas. Prescribed burns should not be planned closer than 1500 feet from active nest sites during nesting season.

FW55 Close or restrict access to caves where disturbance or vandalism of critical resources may occur.

FW70 Shagbark hickory, because of its high value as roost/maternity sites, should receive special attention during sale layout and cultural treatments. In areas where shagbark hickory is uncommon, retain all shagbark hickory over six inches dbh (6" dbh) except those that are immediate hazards. If multiple 6-inch or greater stems are encountered, which are competing for moisture, nutrients, and growing space, thin to retain the largest shagbark trees with potential for crown development and longevity. Where shagbark hickory is common within the treatment stand and the surrounding landscape, retain the largest individual shagbark stems in the treatment stand as part of the 20 basal area (overstory) and allow smaller stems, which might be in excess of six inches dbh (6" dbh) to be removed during regeneration treatments.

FW71 A 200-foot buffer of undisturbed forest will be maintained around gray bat maternity and hibernation colony sites, Ozark big-eared bat maternity sites, bachelor sites, or winter colony sites. Prohibited activities within this buffer include cutting of overstory vegetation; construction of roads, trails, or wildlife openings or development of pastures; and prescribed burning. Exceptions may be made where coordination with USFWS determines these activities to be compatible with recovery of these species.

FW72 Promote and implement current Best Management Practices (BMPs) for forestry as recommended by the Arkansas Forestry Commission to all management activities in order to control non-point source pollution and comply with state water quality standards.

FW73 Concurrent with temporary road construction, install silt barriers at the base of the cut and fill slopes within 50 feet of a stream course.

FW74 At stream crossings, seed and mulch cut and fill slopes within 50 feet slope distance within 5 days after construction of temporary roads.

FW75 Apply gravel at temporary road crossings for 35 feet on both sides of the stream channel, when the risk of soil erosion is present and where the crossing substrate requires hardening.

FW76 On temporary roads, apply gravel on steep grades exceeding 10 percent slope.

FW77 Reestablish native cane species along streams and rivers during native grass restoration activities

FW78 Soil disturbances within SMZs will be treated with erosion control measures within five days.

FW79 Use only native or non-persistent nonnative species when seeding temporary openings

from soil disturbing activities.

FW80 No mechanical site preparation (excluding mulching) is done on sustained slopes over 35 percent or on slopes over 20 percent when soil erosion hazard is classified as "severe."

FW81 Streamside management zones (SMZs) will be identified and designated during the appropriate stages of project planning for all defined channels, perennial streams, and springs. Minimum SMZs will be as described in
Table 3-3 based on the percent of the adjacent slope:

Table 3-3: Minimum Streamside Management Zones.

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

- Vegetation within 20 feet of the bank of a perennial stream and 5 feet of a defined channel will not be removed.
- Retain at least 50 square feet per acre of basal area within the SMZs when available.
- No mechanical site preparation is allowed within the SMZs.
- Within SMZs, only non-motorized trails are allowed. Motorized trails are prohibited except at designated crossings or where the trail location requires some encroachment for safety.
- No more than five percent of the mineral soil within the SMZs will be exposed during ground disturbing activities.
- Exceptions to SMZ standards are only allowed after site-specific determinations and with consultation/approval by the appropriate Staff Officer.

FW82 To limit soil compaction, no mechanical equipment is used on plastic soils when the water table is within 12 inches of the surface or when soil moisture exceeds the plastic limit. Soil moisture exceeds the plastic limit if the soil can be rolled to pencil size without breaking or crumbling.

FW83 Mechanical equipment for site preparation is operated so that furrows and soil indentations are aligned perpendicular to the contour.

FW85 On all soils dedicated to growing vegetation, the organic layers, topsoil, and root mat will be left intact over at least 85 percent of an activity area.

FW87 Within the SMZs, cross only at designated crossings identified during planned activities. Cross at a 90-degree angle and utilize temporary structures to maintain bank stability.

FW88 When temporary culverts or other approved structures are used, they must be removed upon completion of the activity. Streamside management zones disturbances will be restored to a stable, natural condition.

FW89 Design, locate, and construct new system roads or other improvements to avoid floodplains and riparian areas in order to minimize impacts on water quality, flood flows, and riparian habitat.

FW90 Soil and debris will not be deposited in wetlands, springs, or seeps.

FW91 Any area that meets the riparian area definition (Page 2-71) will be managed as Riparian Corridors MA (3.I). These stands will be mapped and reallocated to Riparian Corridors MA (3.I) in subsequent LRMP amendments.

FW92 Best available smoke management practices (FSM 5140, State Smoke Management Plans and State Implementation Plans) will be used to minimize the adverse effects of prescribed burning on public health and safety and to protect visibility in Class I Area (Upper Buffalo Wilderness).

FW93 Prescribed burning will be conducted in, or adjacent to, counties with forecasted high Air Quality Index (AQI) values (AQI equals orange or higher) only if meteorological conditions indicate that smoke will be carried away from the high AQI area.

FW94 Conduct all National Forest management activities in a manner that does not result in (1) a significant contribution to a violation of National Ambient Air Quality Standards or (2) a violation of applicable provisions in the State Implementation Plan.

FW101 All dispersed and developed recreation management activities will be managed according to Recreation Opportunity Spectrum (ROS) classifications found in Appendix G of RLRMP.

FW102 Rehabilitate, relocate, or close sites or trails when vegetation loss or excessive soil compaction occurs to prevent sedimentation and loss of water quality.

FW103 All areas of the Ozark-St. Francis National Forests except designated open roads and trails are closed to OHV use in order to minimize disturbance, environmental damage, and other user conflicts.

FW104 Vegetation along trails is treated to maintenance levels identified in the publication "Trails South." Priority is given to correcting unsafe conditions, preventing resource damage, and providing for intended recreation experience level.

FW105 Projects will be designed to meet the assigned scenic integrity objectives (SIO) as defined in Appendix D of the Three Knob EA.

FW106 Resource management activities will be conducted in a manner that promotes SIO. Exceptions for short periods of time (one growing season or less) may be allowed to achieve important resource management goals on a case-by-case basis under consultation with and approval of the Forest Landscape Architect or the Forest Supervisor.

FW108 Where possible, locate log decks and borrow areas out of sight of roads and trails in areas that have high or very high SIOs.

FW109 In the foreground of scenic roads and trails, prescribed burns will meet SIO criteria. (See Treatment Guide)

FW110 In very high or high SIO areas, a landscape architect will be involved in the site selection process and development of plans and specifications for projects. In medium SIO areas, project planning will be coordinated with a landscape architect. In low SIO areas, as long as the objective for the area is met, projects may proceed without the involvement of a landscape architect

FW111 Whenever proposed projects may affect a recreation trail, consult with the Forest landscape architect (or his/her designated representative) to determine how best to minimize impacts on the trail, minimize future vegetation encroachment on the trail and meet the assigned Scenic Integrity Objective. Retain sufficient overstory vegetation above and immediately adjacent to the trail to reduce opportunities for blackberry vines and other vegetation that impede non-motorized travel to flourish.

FW112 Timber harvests located near recreation trails will be conducted with mitigation measures appropriate for the trail Concern Level and the Scenic Integrity Objective of the area. Where skid trails or skidders must cross the recreation trail, the number of crossings should be minimized and crossings should be made at right angles unless doing so would result in greater damage to the trail than crossing at another angle. The affected trail tread will be restored when the timber harvest is completed.

FW113 Whenever proposed projects may affect a recreation trail, consult with the Forest landscape architect (or his/her designated representative) to determine how best to minimize impacts on the trail, minimize future vegetation encroachment on the trail and meet the assigned Scenic Integrity Objective. Retain sufficient overstory vegetation above and immediately adjacent to the trail to reduce opportunities for blackberry vines and other vegetation that impede non-motorized travel to flourish.

FW114 Close access to caves where there are sites listed on the National Register of Historic Places.

FW115 Coordinate management direction with the State Historic Preservation Office, federally recognized tribes, and other appropriate state and federal agencies pursuant to Programmatic

Agreement.

FW117 Fuels treatment is allowed through prescribed burning or mechanized means while meeting well-defined risk mitigation objectives.

FW118 Close or obliterate all temporary roads.

FW119 Temporary roads should have a grade which does not exceed 20 percent for lengths more than 200 feet.

FW120 Erosion control will be applied to all newly disturbed road cut and fill embankments before closing roads with native-bed surfaces that exceed a 10 percent grade.

FW121 All recreation trails, system roads, and associated improvements in project areas will be kept free of logs, slash, and debris. Any road, trail, ditch, or other improvement damaged by operations will be promptly repaired.

FW129 Locate, design, and maintain trails, roads, other facilities, and management activities to avoid, minimize, or mitigate potential geologic hazards.

FW150 All prescribed burning will be fully coordinated with all resources and documented in Silvicultural Prescriptions signed by a certified Silviculturist and approved by the District Ranger.

FW151 Do not burn through planted plantations less than three years old.

FW152 Except when firefighter safety and/or life and human property are compromised, fire line construction within 20 feet of a perennial stream and five feet of a defined channel will be done using hand tools.

FW153 Herbicide treatment areas will not be prescribed burned for at least 30 days after application.

FW155 In any prescribed burning, the duff layer will remain present on 80 percent of the burn area.

FW156 Appropriate erosion control strategies will be applied to fire lines in order to minimize soil erosion.

FW160 If necessary to cross a stream with a fire line, the crossing will be as close to right angles as possible and be stabilized as soon after the fire is controlled as possible.

FW161 The full range of wildland suppression tactics (from immediate suppression to monitoring) may be used consistent with Forest and resource management objectives and direction.

MA1.C-1 Any project proposals which could affect a Wild and Scenic River will be evaluated against the appropriate river's management plan to ensure that the proposal does not conflict with characteristics or classification that qualified the river for inclusion in the Wild and Scenic River System.

MA1.C-2 No management activities will be proposed that may compromise the outstandingly remarkable value(s), potential classification, or free- flowing character until designated or released from consideration.

MA1.C-25 Prescribed fire is allowed to reduce a buildup of fuels to an acceptable level and to decrease the risks and consequences of wildland fire escaping from the wild river corridor.

Through applying current research, past experience, site visits, and observations all of the above project designs have proven effective on sites similar to those that are in the project area.

APPENDIX F

30 day Comments received and agency responses for the Three Knob Project

Comment #1: Ranger Jones, there is no "timber famine" as the USFS has been so fond of predicting for many decades. There is no shortage of raw materials for paper and wood products in the United States, therefore there is no reason to have commercial timber sales in the national forests. The USFS could stop logging today and the market would never react.

Response: The Forest Service (FS) uses a variety of tools in order to meet its management objectives. The Ozark-St. Francis National Forests' Revised Plan states The Ozark-St. Francis National Forests are a model of sustainable ecosystem management, featuring healthy ecosystems that provide a balanced and sustainable flow of goods and services for a growing, diverse population(page 1-14 of Revised Land Resource Management Plan). "The Forests' will reach their desired conditions for vegetation through natural ecological processes and by using a diverse range of management tools and techniques. The Three Knob project (EA) is tiered to the Forests' Plan and Final Environmental Impact Statement (FEIS).

The Forest Service is also bound by laws such as the Multiple-Use Sustained-Yield Act. The Multiple-Use Sustained-Yield Act of 1960 made it clear that the Forest Service was responsible for managing non-timber values as well, such as recreation, range, watershed, wildlife and fishery purposes, but it wasn't until the National Forest Management Act (NFMA), that these uses were embodied by the forest planning process. Chapter 3 of the Three Knob EA complies with the Multiple Uses Sustained Yield Act and NFMA by disclosing the effects of the project actions on non-timber resources.

Comment #2: Ranger Jones, you are being paid to serve 317 million Americans, not special interest groups! With any other employer if you ignored your bosses you would be terminated. How is this situation different? Should someone be considered a public servant when they choose to ignore the wishes of the public?

Response: The Three Knob Project follows CFR 218 regulations, which include sending notification to local landowners, legal notices, and posting to our website in an attempt to involve the public.

Comment #3: Members of the public who submit comments on a draft NEPA document make the effort to read the NEPA document closely and take the time to compose comments that reflect their issues. Ranger Jones, unless you respond to these comments and allow the public to read your responses they don't know if their comments were read and "considered."

Response: The Big Piney Ranger District includes public comments received during the 30-day comment period and agency responses as an appendix in the Final Environmental Assessment. This document is made available to the public and is posted on the Ozark-St. Francis National Forests Website.

Comment #4: Ranger Jones, simply making a general statement that amenity resource values have been considered in the NEPA document is not enough. The public wants to read about how they were considered, thus they want the page numbers shown.

Response: Commenter doesn't give enough specific information on what "amenity resources" or section/page he is referring to; so a response can't be rendered.

Comment #5: Ranger Jones, as a retired USFS employee I understand that natural vegetation and the resources that depend on the health of the natural vegetation will be significantly harmed if the non-native invasive plants are not eradicated. I also know there are effective (although more costly) alternatives to killing these plants other than herbicides. If most Americans knew of the tragic results stemming from contact with some herbicides they would insist that the USFS spend the extra money on these safer alternatives.

Response: A no herbicide alternative was analyzed in the Three Knob EA the effects are disclosed in Chapter 3

Comment #6: Ranger Jones, as you will learn below even casual exposure to herbicides that contain glyphosate is shown in the lab to cause cancer in mammals. Of course now you are wondering what you can do to disprove these science conclusions. You might not even believe that glyphosate is unsafe. I suggest you search the WEB for the 2 words "glyphosate" and "cancer." When you do you will get 79,600 hits.

Response: Human Health and Ecological Risk Assessments have been prepared for glyphosate (Syracuse Environmental Research Associates, Inc., 2011). In these documents, risk analyses are used to quantitatively evaluate the probability that glyphosate and any adjuvants (agents which aid the function of the herbicide) use might impose harm on humans or other species in the environment. Measures of risk were based on typical Forest Service use of the herbicide. For glyphosate, The EPA uses 2.0 mg/kg/day as a level of exposure that would not result in any adverse effects in any individual to measure both short and long-term exposure. Typical estimates of applicator's exposure are small, ranging between 0.026 and 0.045 mg/kg/day. Most long-term estimates of exposure for the general public are much lower than for applicators. The proposed use of glyphosate would be minimal. Any invasive plant treatment utilizing glyphosate would be spot treatment of individual plants or stumps. The proposed concentration of herbicide applied is well below 2.0 mg/kg/day; potential effects are well below the exposure established by the EPA.
All herbicide application will be done in accordance with label direction (FSH 2109.14, 52.11) and the specifications in the Forest Service Manual 2150, Pesticide Use Management and Coordination (USDA Forest Service, 1994), and in the Forest Service Handbook 2109.14, Pesticide Use Management and Coordination Handbook (USDA Forest Service, 1994). Also, compliance with all federal, state, and local regulations regarding herbicide use would be followed. Herbicide application would be conducted and/or overseen by certified personnel (FSM 2154.2).

Comment #7: Ranger Jones, would you apply a chemical to your yard where children play in the grass that was banned in Denmark 10 years ago because of its lethal effects?

Response: This comment refers to the herbicide application. See response to comment #6. Comment Noted.

Comment #8: Ranger Jones, would you apply a chemical to your yard where children play in the grass that the Institute of Science in Society based in London England calls for banning in England?
Response: This comment refers to the herbicide application. See response to comment #6. Comment Noted.

Comment #9: Ranger Jones, would you apply a chemical to your yard where children play in the grass that Italy wants banned for use in the country?

Response: This comment refers to the herbicide application. See response to comment #6. Comment Noted.

Comment #10: Ranger Jones, would you apply a chemical to your yard where children play in the grass that El Salvador banned in October 2013?

Response: This comment refers to the herbicide application. See response to comment #6. Comment Noted.

Comment #11: Ranger Jones, would you apply a chemical to your yard where children play in the grass that Sri Lanka banned in March 2014?

Response: This comment refers to the herbicide application. See response to comment #6. Comment Noted.

Comment #12: Ranger Jones, you cite outdated SERA Risk Assessments as the basis for your conclusion that herbicides containing glyphosate are safe if used according to label directions. Once again, The Monsanto Corporation composed the text of the label directions and printed the label directions. Roundup was Monsanto's top selling product in 2013. That year Monsanto's earnings were 14.87 billion dollars. When the judge reads the SERA Risk Assessmentsand compares it's safety conclusions with the information authored by hundreds of independent Ph.D. chemists that describe the tragic health problems caused by these toxic herbicides in ***Opposing Views Attachment #9a** which will carry the most weight?

Response: This comment refers to the herbicide application. See response to comment #6.
Comment Noted.The commenter did bring to our attention that the SERA risk assessment for glyphosate
http://www.fs.fed.us/foresthealth/pesticide/pdfs/Glyphosate_SERA_TR-052-22-03b.pdf
used in the EA were not the latest version. References in the Final EA have been updated to reflect this oversight. Thanks for the constructive comment.

Comment #13: Ranger Jones, you received recommendations to log 7,729 acres owned by 318 million Americans from your TMA and silviculturist. Their tragic advice was supported by the members of the IDT. You witlessly choose to accept the advice of 3 to 4 of your employees with financial incentive to sell this timber sale and reject the research conclusions of hundreds of Ph.D. scientists. Here is a tiny sample of the quotations contained in **Attachments #1 and #4**.

Response: As stated in Comment #2 above, this project follows current CFR 218 regulations, which includes sending notification to local landowners, legal notices, and posting to our website in an attempt to involve the public. Chapter 3 of the Three Knob project complies with the Multiple Uses Sustained Yield Act and NFMA by disclosing the effects of the project actions on non-timber resources. This includes effects to resources such as recreation and visual quality (pg. III-19), soils (pg. III-1), water quality (pg. III-3), fish (pg. III-65), and wildlife (pg. III-52).

Comment #14: The commenter also had remarks in the comment letter that questioned the following:

- Was the Purpose and Need for the project derived from legitimate sources for a project
- The NEPA process was not followed
- The Draft EA was crafted to fool the public. The Proposed Action would have greater impacts than were disclosed and the project was only crafted to increase corporate profits

Response: The project Purpose and Need is based on recommendations of the current condition from professionals with a natural resources background who conducted field inventories within the project area. Current conditions were contrasted with the Desired Future Conditions for the project area listed in the Revised Land and Resource Management Plan (RLRMP) for the Ozark-St. Francis National Forests. The Proposed Action is based on improving current conditions in the project area and moving those conditions toward conditions described in the RLRMP (pages 1-9 of the Draft EA). Additionally, all regulatory agencies governing resources within the project were consulted concerning the Proposed Action's activities and no adverse effects were identified by those agencies.

The effects were evaluated using best available science, based on field inventories and investigation and resources in the project area. Effects were evaluated according to the NEPA process in accordance with (State: Policy/Reg./Manual directions. Both adverse and beneficial effects are disclosed in Chapter 3 of the Draft EA.

*__Opposing views attachment #9a__ an agency response to this attachment has been completed and is incorporated by reference as, #9a attachment responses. It is in the process file and is available for review by request.

APPENDIX G

Summary Table from Travel Analysis Process

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93697B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.75
93697H	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.23
93782B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.28
			TOTAL	**1.26**
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.51
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.96
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.04
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.66
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.17
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.01
1800A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close - Convert to OHV Trail	0.41
			TOTAL	**2.76**
93783V	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.13
93225Y	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.13
93225T	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.14
93783S	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.11
93782B6	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.11
93233N	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.61
93782O	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.32
93782W	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.11
93782A1	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.09
93782B1	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.18
93782C1	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.10
93782F1	1 - BASIC CUSTODIAL CARE (CLOSED)	Decommission	Decommission	0.12
1800F	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	1.53
93232F	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	1.09
93709C	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.86
93698D	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.44
93232I	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.12
93698C	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.14
93782L	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.40
93782F2	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.10
93212A	2 - HIGH CLEARANCE VEHICLES	Decommission	Decommission	0.58
			TOTAL	**7.43**
93232H	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.18

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93709B	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.07
93709A	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.05
1800E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.65
93232K	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.21
93698B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.26
93233D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.24
93698A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.91
93233A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.20
93709C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.15
93212E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admin Only	Gate - OML2 Admin Only	0.31
			TOTAL	**3.25**
93783H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.41
93698G	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.76
93231B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.22
93231E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	1.15
93231G	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.41
93231O	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.83
1800D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	2.95
1800F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.40
1802F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	1.22
1832	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	3.06
93232D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.95
93781R	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	4.09
93231B1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.04
93231A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	1.05
93231S	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.49
93233F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	1.22
93233L	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.64
93782Y4	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.06
93233E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.45
1875	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.24
1802A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	3.86
93225B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.37
93225D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.57
93226I	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.51
93233A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.47

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93709J	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	3.02
93226A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	3.04
93781E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.10
93698F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.87
93782A4	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.25
93232L	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.12
93781U	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.56
93782Z8	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.32
93233B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.64
1800A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	1.99
1801A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.74
1801A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.30
1801A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.46
93231D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.83
93225K	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.32
93212A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	1.67
93225E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.15
93697G	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.20
93781T	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.07
93781D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.31
93782Z	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	3.61
93782Z2	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.72
93782I	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.36
93782R	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.13
93698A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.89
1800A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.55
93212A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.00
93212A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.55
1375	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.68
93226A1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.12
93226C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.25
93226C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.28
93212F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Maintenance	0.10
1387	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	0.62
1386	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	1.15
1371	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	1.43
1853	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	0.32
1802	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	0.63
1802	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	1.53
1802	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Maintenance	2.65

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
1805	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Maintenance	2.24
1001	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Maintenance	3.14
1800	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Maintenance	5.73
1800	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Maintenance	0.92
SR7	5 - HIGH DEGREE OF USER COMFORT	5 - HIGH DEGREE OF USER COMFORT	Maintenance	3.95
			TOTAL	**74.94**
93231L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.48
93225V	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.30
93225W	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.19
93225A1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.19
93225S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.39
93225A3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.07
93783B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.37
93783C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.20
93783E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.54
93783F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.75
93783G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.02
93783I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.39
93783J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.18
93783K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.09
93783N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.19
93783Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.09
93783R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.22
93231O1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.25
1804A4	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.07
93781R9	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.86
93212C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17
93212I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.16
93226B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.57
93226G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.73
93231A2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.06
1375	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.61
93225A2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.13
93231J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.29
93231R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.48
93231T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.20
93233C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.10
93233G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.60

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93782Z9	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.61
93231O2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.52
93226J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93233I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.25
93212J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.15
93231I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.34
93226M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.35
93231X	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.36
93225I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.27
93225L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.12
93226F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93226Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17
93226T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.03
93709G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17
93709O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.16
93781R5	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.24
93782Z5	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.53
93782Y2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.33
93226H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.05
93782Z1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.13
93226R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.06
93231Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.07
93233H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.20
93233M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17
93225A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.18
93225A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.32
93225A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.32
93225D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.52
93225M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.31
93225M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.31
93225N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.27
93226D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.32
93226E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.29
93226P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.26
93226S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.34
93226V	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.19
93781S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.18
93781R1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.81
93781U1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.14
93781R6	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.09

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93781R7	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.14
93781W	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.15
93782Z3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.13
93782Z7	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.20
93231A4	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.12
93233O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93231H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.21
93231V	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.36
93232A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.57
93781R2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.21
93782Z4	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.56
93231N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.11
93231A1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.20
93233P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93225R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.42
93225E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.44
93781R4	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.25
93781R8	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.12
93782Z6	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.30
93783A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.32
93782D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.73
93782E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.71
93782H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.04
93782K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.36
93782M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.06
93782P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.85
93782T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17
93782U	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.31
93782V	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.14
93782B5	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.34
93782D1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.21
93782M1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.11
93782Y	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.35
93782D2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.15
93782D3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.13
93782J3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.06
93782J1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.07
93782P1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.23
93709A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.00
93709A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.46

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93709A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.02
93781B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17
93709D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.45
93783U	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.11
93782A5	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93783D	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.56
93783O	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.07
93782J2	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.16
93697C	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.36
93232B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.05
93232G	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.24
93232J	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.16
93233J	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.49
93233K	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.62
93782B7	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.20
93225O	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.31
93697E	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.76
93212G	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.30
1849	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.07
93231U	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.12
93231Z	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.13
93225G	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.15
93697A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.36
93782Y3	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93231C	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.58
93212D	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.26
93781V	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.12
93231W	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.21
93231F	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.36
93709H	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.18
93225J	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.19
93697D	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.71
93698E	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.41
93782A	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.88
93782B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.53
93782C	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.45
93782G	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.39
93782J	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.49
93782A2	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.38
93782A3	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.17

Road #	Road Status Before Harvest	Road Status After Harvest	Action	Miles
93782B2	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.13
93782C2	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93783T	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.08
93782B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	0.57
93212B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Maintenance & Close	1.02
			TOTAL	**56.95**