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Environmental Assessment

Fuels Management Project

Project Number 45613
Newton, Madison, Searcy, Conway, Van Buren, 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 project location, the purpose and need for action and proposed action. This chapter also references direction from the Revised Land Resource Management Plan (RLRMP or Forest Plan) and includes decisions to be made, other issues, concerns and opportunities.

A. Location of Project Area

The Fuels management project area is spread out across the Big Piney Ranger District at several locations. Proposed project activities are located close to the following communities: Appleton, Cleveland, Austin, Tilly, Witts Springs, Moore, Lurton, Pelsor, Fort Douglas, Haw Creek, Pilot Rock Mountain, Cowell, Deer and Red Star (See Appendix A Maps).

B. Purpose and Need

The primary developmental forces for this project are as follows:

The Big Piney Ranger District has approximately 91,000 acres in which analysis was done and decisions made to allow for prescribed burning (and other treatments) within the past 10 years. The burns have been implemented multiple times on these areas over a 10 year period, and monitoring has shown limited progression of those burn areas toward desired future conditions (DFC) as outlined in the RLRMP for the Ozark-St. Francis National Forests. Additionally, other areas have been identified which are in need of restoration (prescribed burning as well as other activities) which would reduce fuel loading, protect private property in the wildland-urban interface and increase species diversity.

Inventories and monitoring within the project area identified the following existing ecological conditions:

- shift in historic plant community composition and condition class toward fire intolerant plant species which contains less species diversity
- overstocked timber stands
- little to no herbaceous species in the understory resulting in a lack of species diversity and a deficiency of habitat for pollinators
- an increase in insect and pathogen outbreaks
- areas which burn cycles have been skipped/missed due to a variety of factors
- inventories have indicated a lack of early seral habitat across the project area

Due to the above conditions the ecosystems are considered at risk to insects, disease and catastrophic wildfire. They are declining in health and vigor. Many stands contain more trees per acre than the soil and nutrients can sustain into perpetuity. These stands of trees may grow and survive in times of abundant rainfall but will experience mortality in the form of competition for light and increased stress on individual trees during periods of drought. Red oak and white

oak borers as well as oak decline are present in many hardwood stands and currently causing mortality.

Additionally, the tree crowns in the overstocked stands are underdeveloped, reducing seed and mast production. Where insect, disease, dieback from overstocked conditions and ice damage have already caused high levels of mortality the composition of the forest is shifting to fire intolerant species as a result of so many years of fire suppression/exclusion. The need for restoration to fire adapted species and an increased diversity in plant species on a landscape scale is needed to restore the ecosystem to a more stable condition. Managing stand density, composition and structure toward the desired future conditions through thinning and the re-establishment of the natural fire regime is needed to improve overall forest health.

Early seral habitat is lacking and is needed for some species of neo-tropical birds and pollinators. Some song birds which require early seral habitat migrate into this area during the summer to forage and reproduce. Additionally, some species such as Bobwhite Quail which do not migrate require early seral habitat too. Pollinators' populations across the continent have been on the decline for the past several years partially due to lower populations of plants they utilize such as milkweeds and flowering plants.

Some areas have been heavily affected by some event (insect outbreak, ice storm, etc.), for these a regeneration type of activity may be recommended to remove diseased or damaged timber and establish new generation or age class, within the area this would increase early seral habitat.
If an area has aging timber and is experiencing measureable mortality, a regeneration type of activity could be considered to remove the over mature timber. Removing the over mature and declining trees improves the overall health and vigor of the forest.

If an area has fully mature trees and sufficient advanced regeneration (seedling trees) so the next generation of forest will grow, a regeneration type of activity may be considered.
If a high percentage of the area is made up of timber stands of older age classes (See age class distribution graph, Figure 6, in the vegetation effects section Chapter III page 55) a regeneration type of activity may be considered.

Desired Future Condition: Historically (pre-1840), much of the Ozark-St Francis National Forests consisted of fire-adapted woodland and forest ecosystems with well-developed herbaceous understories (Simon, 2002). A return to historical fire regimes (condition class) would improve forest health and increase the diversity and abundance of the herbaceous understory (early seral) habitat suitable for wildlife and some threatened, endangered and sensitive (TES) species as well as increasing habitat for pollinators.

Monitoring data collected by the Forest Service and the Nature Conservancy (TNC) in a joint monitoring project consisting of vegetation plots monitored since 2004 shows limited progress toward the DFC (Monitoring data is in the process file at the Jasper Office) in woodland ecosystem restoration areas. Several factors have affected the ability to regularly apply fire on some of these areas, other tools are needed to create disturbance if the ability to prescribed burn often enough is limited. Some areas that have had fire applied enough times and on a regular

interval have shown a dramatic change in species composition moving the area close to the DFC, but these areas are small in scale.

The White Oak Mountain Communication Site is a 19 acre administrative site which currently has trees growing adjacent to the communication towers and support wires creating a hazardous condition. These trees could be blown over and strike the guide wires supporting the towers or in some cases the trees could even strike the towers themselves. This creates a very hazardous situation. Trees need to be removed and the site maintained in a condition which would make the site safer and communications more reliable.

Purpose

Reduce fuel loading in order to protect private property in the wildland-urban interface and forest ecosystems that are at risk. This could be accomplished through prescribed burning, mechanical fuel reduction treatments, and thinning overstocked stands (commercially or otherwise).

Restore and maintain ecosystem health by continuing to move the fire regime condition class towards the desired future condition through continued treatments that create disturbance.

Restore stands devestated by insect, disease, ice storms and overstocked conditions to young vigorous stands of fire adapted species historically found in the area using a varity of treatments such as limited regeneration, thinning, mechanical fuel reduction and prescribed burning.

Improve stand health and individual tree vigor for increased resistence to insects and disease using a varity of treatments such as limited regeneration, thinning, mechanical fuel reduction and prescribed burning.

Provide early seral habitat to create the environment required maintain viable populations of early successional species.

Increase plant and wildlife diversity in the understory and at ground level by thinning (commercial, noncommercial and mechanical), prescribed burning and in some instances using herbicide application to reduce woody sprouts allowing for more herbacious plant species.

Remove trees growing on the White Oak Mountain Communications Site and set up a maintenance regime which would result in removal of the safety hazard, increased reliability of the site and increased safety of the public.

1.) Management Areas:

Contrasts between current and desired conditions illustrate the need for the proposed management activities within this project area. The RLRMP for the Ozark- St. Francis National Forests describes the DFC 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:

<u>MA 3E High Quality Forest Products;</u> 8,154 acres 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. 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 activities 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 3I Riparian Corridors; 1,084 acres of the project area. This management area is identified based on landform, vegetation, soils and hydrological characteristics of the landscape. They are managed to retain, restore and enhance the inherent ecological processes and functions of the components within the corridors. The desired condition for these areas reflects function and value. The vegetative communities, predominately forest, are productive and diverse, providing for a rich variety of organisms and habitat types. Timber and vegetation (dead and alive) have the appropriate structure needed to provide shade, food, shelter and microclimate for riparian-associated flora and fauna, especially threatened, endangered, sensitive (TES) and locally rare species. Prescribed fire may be used within the corridor to create or maintain the composition and vitality of fire-dependent vegetative communities (e.g., canebrakes). Management activities take place to provide diversity and complexity of native vegetation; rehabilitate both natural and human caused disturbances; provide for visitor safety; or accommodate appropriate recreational uses.

MA 1C Designated and MA 1. D Recommended Wild and Scenic Rivers; 3,500 acres of the project area (Big Piney Creek). These MAs are managed to enhance and protect the outstandingly remarkable values and unique qualities of each river and its surroundings. 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.

MA 1G Special Interest Areas (SIAs); 339 acres 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 1H Scenic Byway Corridors; 3,438 acres 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. An exceptional opportunity for motorized recreation, especially scenic driving, exists in this MA.

MA3.A Pine Woodland; 27,236 acres of the project area. The primary emphasis in this management area is to restore and maintain a landscape mosaic of open pine woodland that approximates historical conditions. Thinning of trees is often needed to create initial open-canopy conditions and may be achieved through manual, mechanical or chemical methods including use of commercial timber sales. Frequent prescribed fire (often applied at landscape scales) may be used to thin trees and is the predominate method used to maintain open conditions and well-developed understory communities. Regeneration of woodland occurs on a scheduled basis to diversify age class distribution to ensure a sustained supply of this habitat over time.

Generally, patches of pine woodlands are well connected in networks of ridges and other suitable sites incorporating other fire-dependent communities such as glades and barrens. Pine woodlands have open canopies (10 to 60% canopy closure), sparse midstories and well-developed understories that are typically dominated by grasses and forbs. Evidence of fire is common at all stages of the pine woodland restoration process in the form of charred bark and top-killed woody sprouts. Occasionally, freshly burned areas are encountered with large areas of blackened ground and scorched vegetation. These areas typically green-up quickly through the sprouting of fire-adapted vegetation. Fire often occurs over large areas (up to several thousand acres) in blocks surrounded, to the extent practicable, by existing permanent fire breaks such as roads and streams.

The abundance of pine woodlands within this area provides optimal habitat conditions for many species including management indicator species such as brown-headed nuthatch and northern bobwhite, rare species and species in demand for hunting such as wild turkey and whitetail deer.

MA 3. B Oak Woodland; 28,405 acres of the project area. The primary emphasis in this management area is to restore and maintain a landscape mosaic of open oak woodland that mimics historical conditions. The purpose is to provide habitat for associated plants and animals, some of which are rare and declining and to create a setting for recreation that is visually appealing, rich in wildlife and not commonly encountered elsewhere.

Lands within this management area are predominately classed as suitable for timber production. Silvicultural prescriptions applied are primarily those for oak woodland restoration with a variety of other prescriptions applied in areas not suited for woodland restoration.

Restoration and maintenance of oak woodland is accomplished through application of a variety of forest management practices. Thinning of trees is often needed to create initial open-canopy

conditions and may be achieved through manual, mechanical or chemical methods including use of commercial timber sales. Frequent prescribed fire (often applied at landscape scales) may be used to thin trees, and is the predominate method used to maintain open conditions and well-developed understory communities. Regeneration of woodland occurs on a scheduled basis to diversify age class distribution to ensure a sustained supply of this habitat over time.

Oak woodlands are primarily comprised of the Dry Oak Forest and Woodland community. They have open canopies (10 to 60% canopy closure), sparse midstories and well-developed understories that are typically dominated by grasses and forbs but may also have a significant woody component.

Evidence of fire is common at all stages of the oak woodland restoration process in the form of charred bark and top-killed woody sprouts. Occasionally, freshly burned areas are encountered with large areas of blackened ground and scorched vegetation. These areas typically green-up quickly through the sprouting of fire-adapted vegetation. Fire often occurs over large areas (up to several thousand acres) in blocks surrounded to the extent practicable by existing permanent fire breaks such as roads and streams. Some areas, especially the wettest sites, do not typically burn or burn at very low intensities with minimal effects on vegetation and litter layers.

<u>MA3.C Mixed Forest;</u> 9,676 acres 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. Thinning, prescribed fire at regular intervals and regeneration harvests are common silvicultural treatments. Stands are regularly thinned to reduce stress as trees age. Fire is common, typically as a result of prescribed burning. Evidence of fire in the form of charred bark and occasional freshly burned areas may be encountered.

While the landscape character will appear natural, the management activities are visually evident and may occasionally dominate the natural landscape. These areas will provide a variety of motorized and non-motorized recreational opportunities including hunting, fishing, hiking, bicycling, berry picking, dispersed camping, driving for pleasure and viewing scenery and wildlife.

<u>MA3.D Oak Decline Restoration Areas</u>; 13,788 acres of the project area. These areas range from low to high sites and occur on south as well as north facing aspects. These are areas where red oak and white oak trees suffered severe mortality due to general oak decline, repeated insect outbreaks (red oak borer) and disease. Fuel loadings in these areas are high and wildlife mast producing capabilities are greatly reduced from what was present 50 years ago.

The emphasis of this MA is to restore and maintain a healthy white oak group, red oak group and hickory forest that is resistant to large-scale insect and disease attacks and provides for regeneration of oak into the future. Currently, the red oak ecotype is all but gone from these acres due to recent massive outbreaks of red oak borer, other pathogens and general oak decline. Fuel loading is extremely high, creating a serious fire hazard for the next few years. The primary objective of this MA is to return mast-producing trees to the area for wildlife and to repopulate the forest stands with desirable species of commercial value to assist local economies.

Management to achieve the desired future condition of these areas is accomplished through various forest management practices including prescribed fire and manual, mechanical and chemical vegetation control.

MA 2. D Upper Buffalo Dispersed Recreation Area; 798 acres of the project area. This area is suitable for timber production. This is an area of dispersed recreational use with no developed campgrounds. This area is managed to provide the public a variety of recreational opportunities in a setting that provides quality scenery, non-motorized trails and limited facilities.

Management in this area includes prescribed fire, integrated pest management, wildlife management and commercial timber harvest. Vegetative management is used to manage for forest health and desired recreation settings. Integrated pest management is used to eradicate or suppress insects, diseases and non-desirable invasive vegetation. Prescribed fires are used to restore and maintain historic fire regimes. Wildlife viewing opportunities are maintained through openings, cultivation, mowing and burning of openings and pastoral areas.

MA 3. J Pastures and Large Wildlife Openings; 84 acres in this project area (The 84 acres are not a part of the 124 acres in the PA). The desired future condition for pastures is to provide optimal forage and cover for livestock and wildlife species. Pastures should be in a grass/forb condition with little woody encroachment. The desired condition for pastures is that soil productivity is maintained and optimum forage is provided. Where it is practical, native forage is favored over exotic improved pasture. The reduction of invasive species and those of poor forage quality is desirable.

The landscape character will range from natural appearing to pastoral/agricultural. Wildlife openings and fields will provide for non-motorized recreation opportunities. Improved pastures generally do not provide for recreation opportunities although they may provide scenic interest in the landscape. Human activities may be evident in some places. Some methods to keep pastures open include the use of a prescribed fire interval of one to three years, grazing, bush hogging and haying. These lands are classified as unsuitable for timber production.

MA 3. K Wildlife Emphasis Area; 10,580 acres of this project area. This are is suitable for timber production. This management area is established to provide optimal wildlife habitat to benefit both game and non-game wildlife species (e.g., elk, deer, turkey, quail, Neotropical migrant bird and small mammals) and to enhance consumptive and non-consumptive recreational opportunities as they relate to these and other wildlife species that benefit from a mix of early-and late-successional habitat management.

Oak and pine woodlands are prescribed on appropriate sites through thinning and prescribed fire to maintain widely spaced trees. Improved pastures and wildlife openings composed of native species and other non- invasive species are created and maintained to provide year-round forage and to reduce wildlife impacts on private lands. Improved pastures are constructed and maintained to provide year-round forage for wildlife. They will consist of cool and/or warm season grasses and a variety of forbs.

MA 1. E Experimental Forests; 243 acres in this project area. Experimental forests are

congressionally authorized and have been designated by Forest Service Chiefs over the last 90 years. The national network of experimental forests provides much of the scientific basis for the management of forest ecosystems, including public and private lands. The Southern Research Station (SRS) manages experimental forests on the Ozark NF. These lands help provide the current and future research needs of the SRS and provide scientific information to understand, manage and sustain the ecological processes, structures and benefits of loblolly pine, shortleaf pine, mixed pine-hardwood and hardwood forests in the uplands of the mid-South. They demonstrate common forestry practices for non- industrial private forest landowners. Appropriate management tools include timber harvest, prescribed fire and other research-related activities.

MA 2. A. Ozark Highlands Trail (OHT); 646 acres in this project area. The trail is a National Recreation Trail, the only one on the Forests. The corridor width is 198 feet on either side of the centerline of the trail center and was established to provide visual enhancement, protect the trail and minimize maintenance by keeping a canopy over the trail. Management practices are designed to protect the OHT experience. Motorized recreation, bicycles, horses and pack stock are not allowed on the OHT trail. This MA retains a natural, forested or pastoral appearance shaped by both natural processes and humans. Management practices are modified to recognize the nationally significant aesthetic and recreational values of these lands.

This area is classified as unsuitable for timber production, however low intensity vegetation management is appropriate to maintain the long-term goals and stewardship objectives of the OHT. Prescribed fire is an appropriate vegetative management tool available to be used in the corridor to enhance or improve trail qualities and to be used with other resource activities. Activities are planned and carried out in cooperation with appropriate OHT management partners.

Note - 12,311 acres within the project is privately owned.

2.) Areas of Concern or Special Emphasis identified by Leadership:

The National Cohesive Wildland Fire Management Strategy (The National Strategy April 2014): Represents the culmination of a collaborative effort by Federal, state, local, and tribal governments, non-governmental partners and public stakeholders. The National Strategy provides the strategic direction necessary to achieve the vision for the next century. To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and, as a Nation, live with wildland fire.

The National Strategy includes a set of guidelines intended to provide basic direction when planning activities. Broadly defined to address national challenges, these guidelines can be tailored to meet local and regional needs. Meeting the challenges requires priorities. *Safe and effective response to wildfires is the highest priority of the National Strategy*, and includes enhancing wildfire response preparedness with an emphasis on both structural protection and wildfire prevention to maximize the effectiveness of initial response. The second priority is *vegetation and fuels management*, and is perhaps the most challenging issue. General guidance in this area includes designing and prioritizing fuel treatments; strategically placing fuel

treatments; increasing use of wildland fire for meeting resource objectives; and continuing and expanding the use of all methods to improve the resiliency of our forests and rangelands. The third priority involves engaging homeowners and communities in taking proactive action prior to wildfires. The fourth priority includes emphasizing programs and activities, tailored to meet identified local needs, which seek to prevent human-caused ignitions.

Habitat loss for pollinators: Within the past five years pollinators' populations have dramatically declined for a variety of reasons, not the least of which is loss of habitat. Leadership has recommended where practicable to include management activities that enhance the types of plants that pollinators utilize. Ecosystem restoration efforts increase habitat for pollinators.

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) total 51 million acres or 26 percent of the NFS. Areas at moderate risk (Class 2) total 80.5 million acres or 41 percent. Areas currently within their historical range (Class 1) total 65 million acres or 33 percent. 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. Infestations of invasive plants have reached epidemic proportions, spreading rapidly over hundreds of millions of acres, across all landscapes and ownerships. Invasive forest diseases have been documented to wipe out entire forest species in the East. An example of this is 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. All invasive species combined cost Americans more than $137 billion a year in total economic damages and associated control costs.

Loss of Open Space: America is losing important working forests and rangelands to development across the Nation at a rate of more than three 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 off highway vehicles (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 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:

Forest products resulting from achieving 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 eliminated shade tolerant species from the understory and provided ample forage for many species of wildlife and maintained habitat for pollinators. The suppression of fire for many years has resulted in a change in Fire Regime Condition Class. Fire Regime Condition Class is a qualitative measure classified into three classes describing the relative degree of departure from historical fire regimes possibly resulting in alterations of key ecosystem components such as; species composition, structural stage, stand age, canopy closure, and fuel loadings) (Hann and Burnett 2001; Schmidt and others 2002). A map of the United States displaying this departure can be found at the following:
https://www.conservationgateway.org/ConservationPractices/FireLandscapes/LANDFIRE/PublishingImages/Forested%20Departure.jpg

Past forest management practices have created a situation where shading and buildup of duff or needle layers has reduced and in some cases eliminated grasses and forbs. This loss has caused a reduction in the number of insects (pollinators), small mammals, seed eating birds, deer and wild turkey. In addition, the build-up of leaves, pine needles and 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, gates or signs. In areas where OHVs illegally go over these mounds to access the area, 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:

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)
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)
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)
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)
Treat at least 200 acres per year for reduction or elimination of non-native, invasive species (RLRMP page 2.12)
Improve and maintain bobwhite quail habitat on 5,000 acres per year for the first decade (RLRMP page 2.13)
Improve and maintain habitat for whitetail deer on 10,000 acres per year for the first decade (RLRMP page 2.13)
Improve and maintain habitat for eastern wild turkey on 10,000 acres per year for the first decade (RLRMP page 2.13)
Improve and maintain habitat for black bear on 8,000 acres per year for the first decade (RLRMP page 2.13)
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
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)
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).
Evaluate historic sites for appropriate management. Develop site management plans for noteworthy heritage resources wherever they occur. (RLRMP page 2.21)
Decommission roads and trails unnecessary for conversion to either the road or trail system through the roads analysis process (RAP) (RLRMP page 2.24)
Identify by the first decade all system roads that should be obliterated (RLRMP page 2.24)
Within 15 years, restore 15 to 20 percent of all ecological communities into Fire Regime Condition Class 1 (RLRMP page 2.26)
Annually complete 50,000 to 100,000 acres of hazardous fuel reduction (RLRMP pg 2.26)
Provide 731 MMBF (146MCF) per decade of saw timber and pulpwood (RLRMP pg 2.28)
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)
Treat up to 300 acres per decade to meet the habitat needs of riparian area species groups. (RLRMP page 2.76)

C. The Proposed Action (PA)

The Ozark-St. Francis National Forest, Big Piney Ranger District, is proposing the following management activities across the Big Piney Ranger district (See Chapter II of this document for detailed descriptions of individual proposed activities). Proposed road activities are taken from the Travel Analysis Report for the Fuels Management Project.

The specific proposed activities include:
Prescribed Burning on 90,987 acres
Commercial thinning on 13,264 acres
All other types of thinning 779 acres
Regeneration harvest on 1,507 acres
Pine Seed Tree Removal Harvest on 117 acres
Commercial Salvage of timber on up to 500 acres
Herbicide treatment to control woody species (Woodland Restoration) on 12,927 total acres(would treat up to 2,500 acres annually)
Herbicide treatment to control NNIS on up to 2,500 acres annually
Cane Enhancement / Restoration on 1,495 acres
Glade/Woodland Restoration on 300 acres
Reconstruct pond dam (Deer Pond)
Construct/reconstruct 7 wildlife ponds
New and reconstruct wildlife openings on 124 acres
New control (dozer) line construction 37 miles for prescribed burns
Maintenance on 24 miles of existing control (dozer) line for prescribed burns
Removal of Hazards at the White Oak Communications site and management of 19 the acre site
Large woody debris placed along 100 miles of secondary streams
Reconstruction of 10 miles of existing roads
Maintenance of 248 miles of existing roads
Decommission 30 miles of existing roads
Closure of 38 miles of existing roads
Construction of 20 miles of temporary roads to access timber stands

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.

D. Objective of the Proposed Action

The purpose of this project is to implement the Revised Land Resource Management Plan for the Ozark-St. Francis National Forests and move the existing conditions of the project area toward the desired conditions as referenced in the RLRMP.

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

Vegetation management may include the use of prescribed burns, manual, chemical, and mechanical treatments of plants in the service of ecosystem management objectives. The Final Environmental Impact Statement for the forest 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 Environmental Assessment (EA) tiers to the following documents:
The Revised Land Resource Management Plan and accompanying Environmental Impact Statement for the Ozark St Francis National Forest (2005)
Biological Evaluation for the Big Piney Fuels Management Project

Heritage Resource Report for the Big Piney Fuels Management Project
Region 8 Scenery Treatment Guide (2008)
The National Cohesive Wildland Fire Management Strategy (April 2014)
Conservation and Management of Monarch Butterflies: A Strategic Framework (March 2015)

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.

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 documented wetlands within or adjacent to the project area and therefore wetlands would not be impacted. If wetlands are encountered during project implementation the implementation would cease and the Forest Hydrologist would be consulted.

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). That process lead to the identification and development of, "issues studied in detail", which are addressed in the subsequent analysis. The issues studied in detail are:

Herbicide Use

Herbicide use has been identified as an important issue with the public. For this reason a "no herbicide" use alternative has been studied and included. The environmental consequences of herbicide use are disclosed throughout Chapter 3.

H. Other Concerns and Relevant Effects

The following concerns were identified during ID Team meetings and public involvement and will be addressed in Chapter III of this EA.

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/ enlargement of

openings may cause a decrease in water quality in the watershed(s) where the Fuels Management 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 scoping comments*

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

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

Vegetation- There is a concern that a lack of early seral habitat occurs 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*

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 scoping comments*

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 Fuels Management 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 scoping comments*

Heritage Resources- There is a concern that management actions could impact both historic and prehistoric sites through project implementation and by exposing sensitive cultural sites to workers or forest visitors. There is also concern about fire control around rock shelters, caves, and sacred sites. Looting and desecration of human burials is a rampant illegal activity in the National Forest. *Source: ID Team and scoping comments*

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.

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

Chapter II

Alternatives Including the Proposed Action

The Big Piney Ranger District Interdisciplinary Team (IDT) initiated internal scoping for the Fuels Management Project on October 2012. A project initiation letter was mailed out on December 9, 2014 to 400 tribes, agencies, groups, neighboring landowners and individuals. The project initiation letter was posted on the Ozark- St. Francis National Forests planning website and included in the Schedule of Proposed Actions (SOPA). The letter requested any interested public to respond with their recommendations/concerns in order to shape the proposed action of this project.

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.
The National Cohesive Wildland Fire Management Strategy (April 2014).

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.

Prescribed Burning as needed on 90,987 acres (See Maps Appendix A)
These areas could be repeatedly burned for fuel reduction, improve wildlife habitat, and restore ecosystems. The project area is a fire adapted ecosystem in which fire was excluded for many years. Based on monitoring data, the reintroduction of fire into this system has improved conditions and would continue to move it toward the desired future conditions with this treatment.

Approximately 61 miles of (dozer) control-line construction/reconstruction may be established along the Wildland Urban Interface (WUI) adjacent to private property where landowners do not

want fire on their property. The remainder of the control lines would take advantage of existing roads or natural fuel breaks such as streams to minimize ground disturbance.

Mechanical treatments such as mulching or piling could be used (areas of heavy fuels, WUI areas, etc.) to reduce fuel loading and facilitate prescribed burning operations. Heavy equipment could be used to remove snags. After burns are completed, the control lines would be stabilized and may be seeded with legumes and annuals such as clovers, winter wheat, oats and annual rye grass or native grasses and forbs to restore vegetative cover and for erosion control.

Table 1: Prescribed Burns

RX BURN	ACRES		RX BURN	ACRES		RX BURN	ACRES
Rotary Ann -South	1,636		Shields Knob	1,781		Pedestal Rocks	2,993
Parker Ridge	4,041		Brodgen Hollow	2,088		Gee Creek	1,595
Griffin Mtn.	1,567		Roundhill	2,127		Bayou Bluff	106
Payne Ridge - North	2,250		Owens	118		Long Field Road	89
Wiley Cemetary	1,224		Ben Hur	2,402		Blue Hole	1,271
Hess Knob	5,744		Big Point	4,045		Overcup	2
County Line	1,783		Falling Water - Shotgun	2,400		Walker Mtn Com Site	3
Greenhaw	2,629		Falling Water - Raspberry	1,973		Rock Creek	1,285
Pilot Rock	3,909		Falling Water - Private Line	931		Koen	576
Cedar Mtn.	1,038		Bearcat I - Block 2	2,610		Payne Ridge - South	2,038
Willis	1,179		Rotary Ann - North Block	1,739		Bearcat I - Block 3	2,457
Tacket Mtn.	1,227		Rotary Ann - Middle Block	1,319		Bearcat I - Block 1	754
Mills	1,438		Oak Mt Woodland Demo	231		Kato Ridge	114
John Mtn.	498		Cemetery	55		Kincannon Mtn.	1,366
Hatley Mtn.	2,786		Zing	1,115		Reeves Branch	3,146
Armstead	1,679		Hideout Hollow	735		Evans Mtn.	1,426
South Fork	1,097		Daniels Mtn.	3,766		Grapevine Overlook	5
White Oak West	1,684		Slushers East	1,944		Slushers West	2,465
White Oak East	1,996						
Total	92,472						

Note: 1,485 acres of private land is included within the above prescribed burn acre calculations in order to analyze cumulative effects. These acres may or may not be burned depending on the status of agreement with the landowner(s).

Regeneration harvest on 1,507 acres

The regeneration timber harvesting method removes mature, over mature or diseased trees and establishes new pine or hardwood stands. This creates early seral habitat and balances age classes, which improves forest health. A variety of situations trigger considering an area for this type of activity.

Using the seed-tree (612 acres proposed) method of regeneration treatment typically leaves 10-50 square feet of residual trees basal area (Approximately 10-55 trees per acre) retained in the over story after harvesting is complete. Following harvests, competing vegetation would be reduced to create an adequate seedbed for regeneration to become established using fire, an herbicide application or both (See Herbicide use table). Some areas may be regenerated

naturally by utilizing the residual trees left on the area to provide the seed to regenerate the next generation forest. Within these areas, if an adequate amount of regeneration (300-500 trees per acre) is not established within 3 years of harvest, the area would then be planted with seedlings to meet target stocking levels.
NOTE: Seed-trees typically leave a residual basal area (BA) of 10-20, Shelterwood 20-40BA, and seedtree or shelterwood preparation treatments leave 40-60 BA.

A shelterwood or seed-tree preparation (895 acres proposed) treatment is included in the regeneration types of treatment for the analysis, and would leave 40-60 basal area of residual trees. These are areas that have trees which are within ten or so years of being fully mature, but they do not have advanced regeneration (seedling trees) in the understory. The preparation treatment would open up the canopy and allow enough sunlight to reach the forest floor to stimulate the natural establishment and growth of seedling trees. An understory treatment (manual or using herbicide) may be required to control woody understory species and allow the target species (shortleaf pine, oak, hickory etc.) to become established in order to effectively compete with the understory.

Regeneration areas outside burning areas rely more on manual or chemical efforts to gain advanced regeneration due to the absence of periodic prescribed burning to control brush and other competing vegetation. These areas would be planted with 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 proposal (see herbicide use table). Residual trees may be removed once adequate regeneration has been established or they may be left. These areas may be utilized for public firewood sale.

Table 2: Regeneration treatment table

Area#	Acres		Area #	Acres		Area #	Acres		Area #	Acres		Area #	Acres
***03**	89		**21**	33		***28**	43		***37**	42		***52**	40
05	34		**22**	36		***30**	46		***40**	44		**53**	39
***08**	51		**23**	26		**31**	38		**41**	8		**55**	25
***10**	257		**24**	29		**32**	23		**45**	9		**57**	18
14	23		***25**	40		**33**	35		**48**	16		***59**	43
15	13		***26**	46		***35**	42		***50**	41		***61**	40
***17**	42		***27**	41		**36**	31		**51**	38		***63**	41
***18**	44												

*****Indicates hardwood regeneration areas greater than 40 acres which is the maximum size the Forest Plan allows according to **FW02** (Page 3-1), but these areas have been impacted by both oak borer and the 2009 Ice storm and **FW02** does state, "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".

Commercial Thinning on 13,264 Acres
These areas are pine, hardwood or mixed, and they are overstocked (too many trees per acre), reducing health and vigor and creating susceptibility to catastrophic fire, insects and disease. These areas would be thinned to an average residual basal area of 60-80 square feet per acre based on the average tree diameter. This would result in improved growth and crown

development, healthier trees, development of higher quality trees and reduced fuel loading. Trees selected for removal (harvest) would primarily 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. If needed, herbicide understory treatments may be used to control woody species in the form of basal spray, stem injection or cut surface treatment on brush more than six feet tall, or a foliar spray treatment on brush less than six feet tall to control competition. The understory treatment could be accomplished manually (chainsaws and brush saws) as well. These areas may be utilized for public firewood sale.

Table 3: Commercial Thinning Table

Area#	Acres		Area#	Acres		Area #	Acres		Area #	Acres		Area #	Acres
02	62		**62**	22		**90**	28		**112**	53		**144**	46
04	63		**65**	16		**91**	42		**113**	474		**145**	76
07	143		**66**	11		**93**	111		**114**	122		**146**	55
09	107		**68**	828		**94**	81		**116**	88		**148**	13
11	174		**70**	82		**95**	41		**117**	48		**149**	44
12	73		**71**	48		**96**	49		**118**	104		**150**	66
13	315		**72**	14		**97**	197		**119**	80		**151**	385
16	82		**73**	42		**98**	29		**120**	46		**152**	458
19	114		**74**	09		**99**	233		**121**	84		**153**	22
29	41		**75**	149		**100**	402		**122**	62		**154**	261
38	114		**76**	66		**101**	134		**124**	18		**157**	45
39	26		**77**	304		**102**	51		**126**	36		**159**	50
42	375		**78**	245		**104**	19		**127**	450		**160**	34
43	19		**79**	05		**105**	76		**129**	18		**161**	149
44	11		**80**	15		**106**	266		**132**	2,187		**165**	213
46	26		**83**	386		**107**	188		**138**	15		**166**	18
47	112		**84**	79		**108**	130		**140**	78		**167**	19
54	13		**85**	46		**109**	220		**141**	16		**168**	49
56	48		**86**	19		**110**	283		**142**	223		**169**	05
58	04		**87**	12		**111**	40		**143**	63		**170**	05
60	28		**89**	11									

Thinning (non-commercial, Understory, etc.) on 779 acres

On areas with 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/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.

In Ecological Land Types (ELTs) that have aspects that are more south to west facing and on upper thirds of northern aspects or ridge tops (typically lower site index), the goal would be to restore these areas to historic open forest conditions with an understory dominated by native grasses and forbs. Thinning would permit sunlight to reach the forest floor stimulating the growth of native grasses and forbs. Ideally, the basal area of these stands needs to be 40 to 60, but the initial treatment of the areas would be to thin them to 60-70 BA. After thinning and prescribed burning one or two times, these areas would be revisited to determine if further thinning is needed to reach the desired future condition of 40-60 BA.

Table 4: Non-Commercial Thinning (PCT=Pre-commercial Thinning, SP=Site Preparation, WSI=Wildlife Stand Improvement) Table

Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres
06 PCT	19		**64 WSI**	6		***123**	191		***134**	44
20 SP	70		**67 PCT**	13		***125**	19		***135**	77
34 WSI	10		***82**	53		***128**	17		***139**	29
***49**	54		***115**	39		***130**	54		***147**	84

*****Indicates areas to be thinned utilizing public firewood permits, after firewood activities are completed these areas may have an herbicide application(s) to control woody sprouts.

Woodland Restoration utilizing Herbicide on 12,927 acres (no more than 2,500 acres annually);

Monitoring data collected by the Forest Service and The Nature Conservancy (TNC) in a joint monitoring project consisting of vegetation plots monitored since 2004 in existing woodland ecosystem restoration areas shows limited progress toward the DFC (See monitoring data contained in the process file at Jasper office). Several factors have affected the ability to regularly apply fire on some areas. Areas that have had fire applied on a regular interval have shown a dramatic change in species composition moving the area close to the DFC, but these areas are somewhat isolated and small in scale. An additional tool is needed to create disturbance at regular intervals given the limited ability to apply fire.

In order to reach the desired future condition, herbicides may be used to control woody species in these areas. This would be accomplished by a basal spray, stem injection or cut surface herbicide treatment on brush more than six feet tall, and by using a foliar spray treatment on brush less than six feet tall to control competition, or the treatment could be accomplished manually (chainsaws and brush saws only). Multiple manual and /or herbicide treatment(s) may occur to move the area(s) toward the DFC (See Herbicide use table page III-???). Used in conjunction with prescribed burning, these treatments would increase herbaceous plants as well as overall habitat diversity. The reasons for reducing the number of trees and/or understory in these areas vary with the specific aspect, site index (an indication of soil richness) and ELT.

Since the areas proposed for this type of herbicide treatment in most cases is in conjunction with other treatments and occurs within areas proposed to prescribe burn they are shown on the map(s) (Appendix A), but they do not have individual area numbers.

Cane enhancement / restoration 1,495 acres;

Riparian areas have become denser due to lack of fire; as a result, rare communities such as native cane and some grasses and forbs have been reduced. The loss of these components affects terrestrial animals, and the aquatic biota that depends on these components to stabilize stream morphology and control sedimentation rates. Historically, these areas would be more closed canopy forest habitats and would maintain a higher basal area in mature stands compared with more open forest habitats. These areas should have between 80-100% canopy closures. To promote the growth of native cane and the other components along streams and riparian areas some non-commercial thinning of the midstory and understory would be done to restore and promote a more diverse riparian community. This would be done manually (chainsaws or brush saws) or an herbicide application could be used. Cane could also be planted in strategic locations to promote the further expansion of this community within riparian habitats. These areas would be available for public firewood sale.

Glade Restoration on 300 Acres

Glades have been identified within this project area which needs to be restored due to encroachment by Eastern red cedar and other hardwood species not historically found on glades. Tree cover would be reduced to less than 40 trees per acre using manual treatments with chainsaws and/or herbicide treatments. Multiple herbicide and manual treatments may be needed to control re-sprouting of woody species. Depending on the specific glade, mechanical equipment (masticator, mulcher) may be used to accomplish reducing the number of trees per acre. Access to these areas by motorized vehicles would be restricted.

Table 5: Showing areas for glade restoration

Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres		Area#	Acres
01	78		**133**	25		**155**	15		**158**	13		**163**	16
92	04		**136**	54		**156**	15		**162**	10		**164**	36
103	10		**137**	24									

Pine Seed Tree Removal Harvest on 117 Acres

Area number 69 (71 acres) and number 131 (46 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 that original harvest, these areas were either regenerated naturally or 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 fully stocked the pine seed-tree 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. Releasing (thinning) 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). This will increase the growth and development of the young seedlings. Following the release treatment, a pre-commercial thinning treatment would occur in three to seven years using the same methods as outlined above.

Commercial Salvage of Timber on up to 500 Acres

Across the project area numerous events have occurred 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 the utilization of damaged timber resources and

reforestation efforts. If it is 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 124 acres (See Appendix A maps for areas).

New construction and enlargement of openings up to five acres per opening are proposed primarily in the Lonesome Hollow portion of the project area south of Deer. New construction of openings could include short (less than ¼ mile) sections of road which would be gated for access as part of this proposal. 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. Opening reconstruction would involve removing tree and brush islands from within the clearings and put into the same management as the openings.

Construction/Reconstruction of 7 Wildlife Ponds

The construction of wildlife ponds (< ½ acre) 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. The newly constructued and existing ponds may need maintenance or repair periodically including spillway and dam reshaping, woody sprout removal from dam using manual and herbicide treatments, sediment removal by draining the pond or adding woody structure in the pond itself.

Reconstruction of the dam on the Deer Pond

The dam on the pond across from the Deer Work Center has been leaking for several years and from recent inspections getting progressivily worse. This approximately three acre pond has hosted the annual Arkansas Game and Fish Commission's Kids Fishing Derby for the community of Deer since the early 1980s. Reconstructing this dam would require draining down the pond, possibly entirely, then using heavy equipment (dozers, excavtors, etc.) to reconstruct the dam to its current size.

Management of White Oak Communication Site 19 acres

Past inspections have concluded serious safety concerns at this 19 acre site. The greatest concern is trees that are growing within two trees length of communation towers or the guide wires supporting the towers. The proposal for this site is to remove all the trees from the site, construct control (dozer) line around the site using roads and road templates so the area can be prescribed burned. Mulching, brush-hogging, or mowing could be used to control vegetation. Herbicide application(s) would also be used to control persistant woody species. This would keep the site

in a herbacious condition and lessen the danger of a tree being blown over or falling and damaging a communication facility.

Placement of Large Woody Debris in up to 100 miles of Secondary Streams
In order to improve overall stream habitat, up to 10 trees per mile greater than 12 inches in diameter at breast height (DBH) would be felled into streams within the project areas. These streams include perennial, intermittent and larger ephemeral streams. Trees would not be felled into streams as large as Big Piney Creek or any of the streams designated as Wild and Scenic Rivers. Woody debris could be placed in the existing watershed reservoirs to increase underwater structure and fish habitat.

Non-Native Invasive Species (NNIS) Control on Approximately 2,500 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 2,500 acres annually. These non-indigenous plant species degrade the diversity of wildlife habitat in forest openings, primarily along roads, but would be treated wherever they occur. Control of existing infestations would aid the reestablishment of native vegetation.

Table 6 identifies the NNIS known to occur in the project area.

Table 6: NNIS Species Table

Non-Native Invasive Species to be Treated
Privet -*ligustrum spp.*
Paulownia- *paulownia tomentosa*
Tree of Heaven- *Ailanthus altissima*
Exotic Lespedezas- *cuneata* and *bicolor*
Japanese Honeysuckle- *Lonicera japonica*
Nonnative Rose- *Rosa multiflora*
Mimosa- *Albizia julibrissin*
Japanese stiltgrass- *Microstegium vimineum*
Kudzu- *Pueraria lobata*

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**.**

Proposed actions for the road system in this project are recommendations taken from the Fuels Management Travel Management Process Report (TAP). The table showing recommendations for specific roads from the TAP is included in this document as appendix G. Below is a summary of these recommendations.
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 TAP in the process file contains additional information about each individual road.

Maintenance on 248 miles of existing roads
These roads would have routine maintenance (blading, cleaning lead-offs, filling potholes etc.) performed to them in association with proposed activities.

Reconstruction of 10 Miles of Road
Ten miles of road would be reconstructed to facilitate access and hauling of timber from stands proposed for commercial harvest. Reconstruction could include shifting the road template or increasing road condition class. Timber values to pay for reconstruction may or may not cover the whole cost.

Decommission 30 Miles Existing Roads
Decommissioning of 30 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 38 Miles of Existing Open Roads
Thirty eight miles would be permanently closed; 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. And require maintenance at a time when maintenance dollars are limited. 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 TAP table is attached as Appendix G. The entire TAP 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 silviculture actions. These roads would be closed once the activity has been completed.

Table 7 shows the number of acres, herbicides used and method of application for the treatments proposed in the PA:

Table 7: Herbicide Use Table

Treatment	Glyphosate	Metsulfuron methyl	Triclopyr (ester)	Triclopyr (amine)	Imazapyr	Triclopyr & Fluroxypyr	Acres
Wildlife Opening Management	Foliar	Foliar	Basal Spray	Foliar	Foliar	Foliar	124
NNIS Control	Foliar	Foliar		Foliar &/or stem injection	Foliar and/or Stem Injection		Up to 2,500 Annually
Woodland Restoration	Cut surface	Foliar		Foliar &/or stem injection	Foliar &/or stem injection		Up to 2,500*** Annually
Regeneration Harvest Site Prep / Release	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		1,507*
Non-Commercial Thinning/Firewood areas			Basal Spray	Foliar &/or cut surface	Foliar &/or Stem Injection		780**
Pine Seed tree Removal(release)	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		117
Glade Restoration	Cut surface	Foliar	Basal Spray	Foliar &/or Stem Injection	Foliar &/or Stem Injection		300
Cane enhancement / understory treatment	Cut surface		Basal Spray	Stem Injection	Stem Injection		1,495
White Oak Communications Site	Foliar			Foliar &/or Stem Injection	Foliar &/or Stem Injection		19
Total							9,341

*** - Includes 34 acres of pine seed tree, 578 acres of hardwood seed tree, 747 acres of hardwood shelter-wood and 148 acres of shelter-wood preparation treatments .**

**** - Includes 662 acres of firewood permit areas and 48 acres of wildlife stand improvement and pre-commercial thinning and 70 acres of site preparation for planting.**

***** - Total proposed acres of Woodland Restoration for this project is 12,927.**

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 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 17,268 acres plus up to 2,500 acres annually for NNIS treatment, as outlined in Table 7, would not occur. These activities would be accomplished manually and 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 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.
Due to the project area(s) being located across the district each area may have different past, present and reasonably foreseeable future projects. For the purpose of the analysis each specialist will disclose what was used to define the past, present and reasonably foreseeable future actions in the "existing conditions" portion of their section. Their analysis boundary for past, present and reasonably foreseeable actions will be located in the process file at the Jasper office and available upon request.

Comparison of Alternatives

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

Table 8: Comparison of Alternatives

Treatments and Acres	PA	Alternative 1	Alternative 2
Wildlife			
Create and improve wildlife openings	124 ac*	27ac**	124ac
Non-Native Invasive Species Control	2,500*yr	0	0
Wildlife Ponds (including reconstruction)	7*	0	7
Native Cane Restoration	1,495* acres	0	1,495 ac
Placement of Large Woody Debris (miles)	100	0	100

Treatments and Acres	PA	Alternative 1	Alternative 2
Woodland Restoration Herbicide Treatments	12,927* acres	0	0
Wildlife Stand Improvement	16*ac	0	16
Forestry			
Regeneration Treatment	1,507*	0	1,507
Pine Seed Tree Removal	117*ac	0	117
Commercial Thinning (acres)	13,264*	0	13,264
Firewood permit areas	662*ac	0	662
Commercial Salvage of Damaged Timber	500 acres	0	500
Pre-commercial Thinning	32*ac	0	32
Site Preparation for Planting	70*ac	0	70
Prescribe Burning Activities			
Prescribed Burning as needed (acres)	92,472	0	92,472
RX Burn Control (Dozer) line construction/reconstruction (miles)	61	0	61
Road Management			
Temporary Roads (mi.)	20	0	20
Road Reconstruction (mi.)	10	0	10
Road Maintenance (mi.)	248	0	248
Road Decommissioning of (mi.)	31	0	31
Road Closure of (mi.)	38	0	38
Management of White Oak Mtn. Communications Site	19*ac	0	19

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 9: Comparison of Treatments to Alternatives

Treatments	Proposed Action	Alternative 1	Alternative 2
*Soil Productivity Reduction%	12	0	12
**Sediment Created (tons)	994	608	994
***Herbicide Use (acres)	17,268	0	0
**** Early Successional Habitat%	11	0	11

*** 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 21,771 tons.**
***** This is the total potential acres on which herbicide used over the life of the project excluding NNIS treatment.**
****** Includes regeneration treatments and wildlife openings. The percentage of early successional was calculated using acres from nine compartments in the Hurricane watershed and one in Piney which have wildlife openings and regeneration treatments proposed.**

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 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 RLRMP.

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. 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 Fuels Management Project are as follows:

Area 13 – 100 foot buffer between pasture and treatment area
Area 22 – 100 foot possible buffer for chemical treatment area
Area 23 – 100 foot possible buffer for chemical treatment area
Area 28 – 100 foot buffer at upper edge of area
Area 29 – 100 foot buffer at upper edge of area
Area 42 – 100 foot buffer at upper north boundary along Hwy 7

Additional design criteria from other resource specialists are as follows:

Area 66 - A proposed commercial thin of approximately 11 acres would be dropped because it's inside an Inventoried Roadless Area (IRA) which is more restrictive.
Area 19 - Is inside a Scenic portion of wild and scenic river designation would be dropped because the thin proposed would not enhance the qualities for which the river was designated.
Area 83 - Approximately 98 acres of this area is in IRA proposed to commercial thin would be dropped.

Applies to all glades proposed for restoration activities – any mechanical treatments (Heavy Equipment) would be done in the driest time of the year, generally, July-August.

Area 100 – A small less than 5 acre upland bog exists in and around area 100. Upland Bogs are home to sensitive plant species and have soils and hydrology that are prone to damage. To protect the soils and hydrology a 150 foot buffer has been installed. Vegetation management which enhances the bog's qualities or addresses public safety would be allowed. Mechanized equipment would not be allowed in the bog or its buffer. An illegal trail would be decommissioned by felling Shortleaf Pine. Currently the bog does not have a problem with NNIS, but if one develops than special measures need to be taken. Herbicide would be applied at label rates, carry an aquatic label, be non-soil active, and would be only applied by FS personnel, trained in sensitive plant species identification.

Northern Long-eared Bat Mitigations

Location: Fuels EA Maps 3 and 6, Slusher West and Daniels Mtn. Rx Burns

Northern long-eared bat hibernaculum (known location) – Identify Wolf Creek Cave as a smoke sensitive target in burn plans (as specified in FW52).

Northern long-eared bat maternity roost (known locations) mitigations – Lonesome Hollow area numbers 21 & 22 in the Slusher West Rx burn. Ketcherside Mtn. in the Daniel's Mtn. Rx Burn area (just north of the Greenhaw Rx burn boundary on the west side of Richland Creek

Wilderness along FS 1200 & 1203). Although prescribed burning is not prohibited at any time during the year under this final 4(d) rule, it is recommended that when using prescribed burning as a management tool, fire frequency, timing, location, and intensity all need to be considered to lower the risk of incidental take of bats; therefore, a low intensity backing fire is recommended in these known maternity roost sites. These Rx burns should be conducted, if possible, either January through March or late summer/fall avoiding the pup season May 15 through July 31.

The Lonesome Hollow units 21 & 22 are also scheduled for regeneration harvests. The final 4(d) rule prohibits the cutting or destruction of known occupied maternity roost trees as well as any other tree within a 150 ft. radius during the pup season, May 15 through July 31; therefore, these units must be harvested outside of the May 15-July 31st window.

Hazardous tree removal is not prohibited, but is recommended that removal occur, whenever possible, during the winter.

Indiana Bat Mitigations

Location: Fuels EA Maps 3 & 5, Slusher Rx Burns

The northern portion of the Lonesome Hollow project area is within a secondary conservation zone for the Indiana bat. Silvicultural areas include Areas 3-20 and Areas 26-30, and the Rx burn units include Slusher East and Slusher West. The following Forest-wide Standards are from the Revised Land and Resource Management Plan for the Ozark-St. Francis National Forests Arkansas.

FW48 - Optimal over-story density within the secondary zone around Indiana bat hibernacula is a range of 50 to 70 percent canopy closure. Use timber harvest, non-commercial thinning, and prescribed fire as needed to regulate and maintain this optimal density.

During normal order of entry for compartments within Indiana bat secondary conservation zones, do landscape scale analysis of existing forest stand conditions. This analysis should be used to determine commercial and non- commercial treatments needed to shift percent canopy closure toward the optimal over-story density. The long-term goal of treatments is to adjust canopy closure so that 80 to 90 percent of the primary conservation zone is within the 50 to 70 percent canopy closure range. This will not be fully accomplished during this planning period. Annually report canopy cover adjustments accomplished with commercial and non-commercial treatments within Indiana bat conservation zones to the Arkansas Field Office, USFWS.

When designating trees to be cut to regulate over-story density, two approaches are recommended for equating canopy density to target leave basal area. A simple rule of thumb is to use site index minus 10 as the target basal area. Another option is the use of canopy density/basal area conversion charts defined by tree diameter classes.
FW66 – Tree Cutting and prescribed fires are prohibited in primary and <u>secondary</u> Indiana bat zones between May 1 and November 30. Adjustments to these dates may be made on a project-specific basis through coordination with the Arkansas Field Office, USFWS. Site-specific inventories are good for two calendar years for the date of survey completion.

FW67 – Tree cutting and salvage operations can occur between December 1 and March 15 without a site-specific inventory. Additional coordination with the USFWS is not required.

FW68 – In the secondary zone buffer around the Indiana bat hibernacula, a minimum of 60 percent of all forested acreage is maintained in nine inch or greater size classes. Of this total, about 40 percent will be trees in a mature condition. The 0-10 age class does not exceed 10 percent of forested acreage of the secondary buffer at any time.

FW69 – In the secondary zone buffer around Indiana bat hibernacula, live trees or snags, buildings, and other structures known to have been used as roosts by Indiana bats are protected from cutting and/or modification until they are no longer suitable as roost trees, unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it occurs only after consultation with the USFWS.

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 (over-story) and allow smaller stems, which might be in excess of six inches dbh (6” dbh) to be removed during regeneration treatments.

Koen Experimental Forest Mitigations

Location: Fuels EA Map 1, Koen Rx burn

Alabama Snow wreath, a Regional Forester’s sensitive species, is located within a glade/woodland restoration area and the Koen Rx burn. It is recommended that only a patchwork, low intensity fire should be allowed through the population or not at all.

During restoration efforts, herbicide may not be used within 60 feet of any known TES species except for endangered bats. According to FW28, selective applications may be done closer than 60 feet only when supported by site-specific analysis with a non-soil active herbicide to protect TES from encroachment by invasive plants.

Where Karst features (which includes caves, sinkholes, springs, and losing streams) are identified, the boundaries will be delineated according to significance (species dependency) or potential risks. For karst features that of are significance or where potential risks to water resources are great, a buffer of 100 feet will be applied. For karst features of less significance and risk to water resources, a 50 feet buffer will be applied. Activities that are prohibited within these areas include use of motorized wheeled or tracked equipment (except on existing roads and trails), mechanical site-prep, recreation site construction, tractor constructed fire lines for prescribed fire, herbicide application, construction of new roads, skid trails, and log landings, and slash disposal (see FW43).

Bald Eagle Mitigations

Location: Fuels EA Map 10, Willis Eastside Burn Block C.

A communal roost and an active nest have been documented in the southeast corner of the district near Lower Brock Creek Lake. The following Forest wide standards were developed to mitigate potential adverse effects:

FW50 - A 1,500-foot 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, areas 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 1,500 feet from active nest sites during nesting season.

In addition, rake fuels from around known nest trees in order to prevent the loss of the tree since eagles are known to re-use nests.

Cavity Nesters:

Location: Fuels EA Maps 3 and 5

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

6 snags per acre 2 of which are greater than 12” dbh
9 snags per acre in Primary and Secondary Indiana bat zones
Within RX Burns known cavity nest trees may be raked around to protect them from fire unless doing so would compromise safety of the public or workers implementing the burn
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 may be clumped.

The following protection measures only apply to historical properties that are unevaluated, eligible or listed in the National Register of Historic Places.

Heritage Protection Measure 1: Site Avoidance During Project Implementation

Avoidance of historic properties will require the protection from effects resulting from the undertaking. Mitigation measures include establishing clearly defined site boundaries and buffers around archeological sites where activities that might result in an adverse effect and routing proposed activities away from historic properties. Buffers will be of sufficient size to ensure that site integrity is not compromised.

Heritage Protection Measure 2: Site Protection During Prescribed Burns

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

Burn Unit Interior. Combustible elements at historic properties in burn unit interiors will be protected from damage during burns by removing excessive fuels from the feature vicinity and, where applicable, by burning out around the feature prior to igniting the main burn and creating a fuel-free zone. Historic properties containing above ground, non-combustible cultural features and exposed artifacts will be protected by removing fuel concentrations dense enough to significantly alter the characteristics of those cultural resources. For sites that have been previously burned or that do not contain combustible elements or other above-ground features and exposed artifacts, no additional measures are proposed. Past research indicates that prescribed burning will not be sufficiently intense to cause adverse effects to these features.

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

Heritage Protection Measure 3: Other Protection Measures

If it is not feasible or desirable to avoid an historic property that may be harmed by a project activity (HP1), then the following steps will be taken:

In consultation with the Arkansas SHPO, the site(s) will be evaluated against NRHP significance criteria (36 CFR 60.4) to determine eligibility for the NRHP. The evaluation may require subsurface site testing;

In consultation with the Arkansas SHPO, relevant federally-recognized Tribes, and if required with the ACHP, mitigation measures will be developed to minimize the adverse effects on the site, so that a finding of No Adverse Effect results;

The agreed-upon mitigation measures will be implemented prior to initiation of activities having the potential to affect the site.

Heritage Protection Measure 4: Discovery of Cultural Resources during Project Implementation

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

Chapter III

Environmental Effects

A. SOILS

Existing Condition

The analysis area for soils will be the activity areas within Compartments 212, 225, 226, 231, 232, 233, 697, 698, 709, 710, 781, 782, and 783 for soils
The parent geology within the 2015 Fuels Reduction Project Area consists primarily of Pennsylvanian Age sandstone, shale, and limestone rocks of the Boyd and Atoka formations.

Landscape morphology is primarily composed mostly of moderately dissected uplands with broad rounded ridges, steep side slopes, bluff, and bench topography that formed in sandstone, shale, and limestone.

The upland soils are shallow to deep, moderately well to well drained and mostly developed in residuum and colluvium of sandstone, shale, and limestone.

The terrace and floodplain soils are deep, well to poorly drained and developed in silty, sandy, and loamy alluvium.

Soil Resources

Soils are mostly forested and stable. Soils are covered with pine and hardwood litter, sandstone and shale gravel, and vegetation except for the soils in stream channels, roadbeds, and road cut banks.

Table 10. Dominant Soil Map Unit Characteristics for Silvicultural Treatments

	Hazard of Off-Road and Off-Trail Erosion			**Soil Rutting Hazard**			**Fire Damage to Soil**		
	Slight	Mod	Severe	Slight	Mod	Severe	Low	Mod	High
Acres	12,616	3,567	525	10,283	5,843	582	9451	5,005	2,252
% of Area	76	21	3	62	35	3	57	30	13
	Hazard of Erosion on Roads and Trails								
	Slight	Mod	Severe						
Acres	10,175	1,231	5,302						
% of Area	61	7	32						

Ratings in the column "hazard of off-road or off-trail erosion" are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas

where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column soil rutting hazard are based on depth to water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope. Ruts form because of the operation of forest equipment. The hazard is described as slight, moderate, or severe. A rating of slight indicates that the soil is subject to little or no rutting, moderate indicates that rutting is likely, and severe indicates that ruts form readily.

Soils are rated as having a low, moderate, or high potential for damage to soil by fire. The ratings indicate an evaluation of the potential impact of prescribed fires that are intense enough to remove the duff layer and consume organic matter in the surface layer (NRCS). The ratings are based on the texture of the soil surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope.

Ratings in the column "hazard of erosion on roads and trails" are based on the soil erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance; and that simple erosion control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

The Proposed Action

Direct/Indirect Effects

Timber Harvest
Approximately 11 percent (2,023 acres) of the harvested area would sustain a temporary reduction in soil productivity due to harvesting operations.

Site Preparation and Pre-commercial Thinning
Site prep, release, and precommercial thinning would have little impact on soils because hand tools and chemicals would be used. Treatment of invasive species with hand tools and chemicals is also expected to have little or no impact on soils. Prescribed Burning was included in the analysis.

Road Construction/Reconstruction
An additional 34 acres (<1% of the harvest area) would sustain a temporary reduction in soil productivity due to temporary road construction. Soil productivity would be lost on approximately 5 acres due to road reconstruction. Decommissioning 20 miles of temporary

roads constructed for this project and 30 miles of existing roads would return 85 acres of soil to productivity.

Fireline Construction
Approximately 18 acres (<1% of the burned area) would sustain a temporary reduction in soil productivity due to fireline construction

Total expected temporary reduction of soil productivity would be 2,029 acres (12% of the harvested area), including skidding , temporary road construction, system road reconstruction, road decommissioning and fireline construction. Temporary roads, primary skid trails and log landings would be disked, seeded and closed following harvesting to speed the recovery of the soil productivity. Firelines would be bladed and seeded when prescribed burning is completed to speed recovery of soil productivity and to prevent erosion. Less than 15% of an activity area can sustain a reduction in soil productivity, according to the LRMP standard. If more than 15% of the activity area sustains a reduction in soil productivity mitigation measures must be installed. The use of herbicides for TSI activities and treatment of invasive species would not cause any soil disturbance and would help to maintain soil organic matter by leaving vegetation in place. The documentation for the amount of temporary reduction in soil productivity can be found in the analysis file at the District Office in Jasper.

Proper placement of the skid trails and landings, following best management practices and avoiding any seeps in addition to discing, seeding, fertilization and mulching (as needed) of skid trails and log landings will protect and revegetate these areas which might contain exposed soils, therefore preventing erosion and loss of site productivity. Follow up release, precommerical thinning and non-commercial thinning treatments would result in these stands being completely checked for any potential erosion. That way any potential erosion problems would be caught early and treated prior to development of potential serious problems.

Wildlife and Aquatic Habitat Management
Wildlife opening construction/enlargement would cause some soil disturbance and a temporary increase in erosion, which would last for a few weeks. Disking, seeding, and fertilizing would quickly reduce the impacts on soil productivity and erosion.

Wildlife pond construction would cause a temporary increase in erosion which would last for a few weeks and would convert the soil use from growing terrestrial plants to growing aquatic plants and a small amount of soil would be devoted to the dam and to growing grasses. A temporary reduction in soil productivity would be expected in the area of the pond due to the removal of top soil. Soil productivity in the pond area would be expected to return to normal as aquatic plants and organisms decay and are added to the soil at the bottom of the pond. Nitrogen added in rainfall would also be expected to help return productivity to the soils in the pond.

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

Wildlife stand improvement and riparian stand improvement thinning would have little impact

on the soils because trees would be cut and left on site. Riparian stand improvement is expected to improve soil productivity by adding organic matter to the soil, and slowing water velocity during flood events due to trees left on the floodplain which would result in productive sediments being deposited on the floodplain.

Site prep, release, and precommercial thinning would have little impact on soils because hand tools would be used. Treatment of invasive species with hand tools and chemicals is also expected to have little or no impact on soils. Burning was included in the impacts.

Prescribed Burning Effects on Soils

Fire affects soil through transfer of heat into the duff layer and underlying soil. These effects vary considerably depending upon fire intensity, duration, and soil conditions. Prescribed fire has the potential to affect soil physical, chemical, and biological properties. Prescribed burns are generally planned to burn at low to moderate intensities, limiting adverse impacts. These fires are often designed to reduce fuel loadings that reduce the likelihood of detrimental impacts from subsequent wildfires (RLRMP 2005).

The most important soil physical characteristic affected by fire is soil structure because the organic matter component can be lost at relatively low temperatures. Organic matter helps to hold soil particles together and along with biofilms created by soil organisms, aggregates are formed which make up soil structure. The magnitude of change in soil physical properties depends on the temperature threshold of soil properties and the severity of the fire (DeBano and Neary 2003). When the litter and duff are completely consumed by a high severity fire the soil is bare and subject to raindrop splash and erosion. Moderate burns cause minor erosion because they expose soil on less than 20 percent of the area and recovery usually takes one year. Light burns cause no erosion because they expose almost no soil (Dissmeyer and Stump 1978). Prescribed underburns are usually light to moderate, so their effect on erosion is generally negligible (RLRMP 2005). Low-intensity burns have little, if any adverse effect on soil erosion even on relatively steep slopes (Brender and Cooper 1968, Cushwa and others 1971, Goebel and others 1967 cited in Stanturf and others 2002). The remaining duff, root mat, surface gravel and stones protect the soil from erosion after the burn.

Soil organic matter plays a key role in nutrient cycling, cation exchange, and water retention in soils. When organic matter is combusted, the stored nutrients are either volatilized or are changed into highly available forms that can be readily taken up by microbial organisms and vegetation (Knoepp, DeBano, and Neary 2005). The magnitude of nutrient losses during burning is positively and linearly correlated with fuel consumption (Hough 1981, Raison et al, 1985a; Schoch and Binkley, 1986 cited in Carter and Foster 2003). Liechty and others (2004) concluded that shortleaf pine-bluestem restoration, which includes harvesting, midstory reductions, and prescribed fire, can alter nutrient availability within surface soils. They found that pH, Ca, total N, C, and C:N ratios were increased by approximately 20 years of restoration activities.

Low-severity prescribed fire has a minimal effect on soil biota because maximum temperatures are generally nonlethal, except for the upper litter layer, and consumption of forest floor habitat is limited (Busse and DeBano 2005).

During best management practice reviews on the Forest from 2006 – 2011 we looked at 29 prescribed burned areas. On all of the burned areas we observed an adequate duff layer and surface root mat, substantial re-vegetation of the areas after the burns, and no erosion was observed within the burned areas. The districts did a good job of using existing roads, trails, and streams as fire lines where it was possible.

Soils are rated as having a low, moderate, or high potential for damage to soil by fire. The ratings indicate an evaluation of the potential impact of prescribed fires that are intense enough to remove the duff layer and consume organic matter in the surface layer (NRCS). The ratings are based on the texture of the soil surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope. Most of the burn units have mostly low to moderate potential for damage to the soil by fire (see Table 11. below).

Table 11. Potential for Damage to Soil by Fire.

Burn Unit	Burn Acres	Percent of Burn Unit rated Low Potential for Damage to Soil by Fire.	Percent of Burn Unit rated Moderate Potential for Damage to Soil by Fire.	Percent of Burn Unit rated High Potential for Damage to Soil by Fire.
Armstead	1,679	34	56	9
Bayou Bluff	106	32	68	0
Bearcat 1	5,821	60	15	25
Ben Hur	2,402	59	38	3
Big Point	4,045	59	24	17
Blue Hole	1,271	91	9	0
Brogden Hollow	2,088	23	77	0
Cedar Mtn.	1,038	31	66	3
Cemetary	55	100	0	0
County Line	1,783	53	11	36
Daniels Mountain	3,747	43	8	49
Evans Mt.	1,426	44	48	8
Falling Water Raspberry	1,973	26	74	0
Falling Water Private Line	931	49	42	9
Falling Water Shotgun	2,400	54	37	9
Gee Creek	1,595	76	24	0
Grape Vine Overlook	5	34	33	33
Greenhaw	2,629	52	10	38
Griffin Mtn.	1,567	60	40	0
Hess Knob	5,744	70	30	0
Hideout Hollow	735	72	10	18
John Mtn.	498	70	26	4
Kato Ridge	114	19	81	0
Kincannon Mtn.	1,366	47	33	20
Koen	576	61	23	16
Long Field Road	89	30	70	0
Mills	1,438	12	73	15
Oak Mtn. Woodland Demo	231	17	83	0
Overcup	2	100	0	0
Owens	118	20	80	0
Parker Ridge	4,041	46	8	46
Payne Ridge	4,288	28	72	0

Burn Unit	Burn Acres	Percent of Burn Unit rated Low Potential for Damage to Soil by Fire.	Percent of Burn Unit rated Moderate Potential for Damage to Soil by Fire.	Percent of Burn Unit rated High Potential for Damage to Soil by Fire.
Pilot Rock	3,909	60	40	0
Reeves Branch	3,146	39	28	33
Rock Creek	1,285	67	23	10
Rotary Ann Middle Block	1,319	32	68	0
Rotary Ann North Block	1,579	27	73	0
Rotary Ann South Block	1,636	32	68	0
Round Hill	2,127	68	11	21
Slushers East	1,944	48	3	49
Slushers West	2,465	52	7	41
South Fork	1,097	40	41	19
Tacket Mtn.	1,227	64	28	8
Walker Mtn. Com Site	3	50	50	0
White Oak East	1,996	29	71	0
White Oak West	1,684	29	71	0
Wiley Cemetary	1,224	55	43	2
Willis	990	86	11	3
Zing	1,115	66	27	7

The prescribed burns that are proposed would be low to moderate intensity which would expose soil on 20% or less of the burn area and duff layer would be present on 80% of the burn area (RLRMP FW155).

Herbicides

The herbicides that are to be used are not expected to have any negative impacts on the soils. Herbicides will not cause soil disturbance and roots of treated vegetation will remain in place to protect the soil. A brief summary of each of the herbicides characteristics relating to soils is given below.

Glyphosate is readily absorbed by foliage. It had practically no leaching characteristics because it binds tightly to the soil. In soil, it is highly susceptible to degradation by microorganisms, being converted to natural products such as carbon dioxide and water. Persistence in soils is about two months or less. “Glyphosate does not pose a clear hazard to soil miroorganisms” (Durkin 2011). “Most studies suggest that effects on terrestrial invertebrates will be minimal and secondary to changes in vegetation” (Durkin 2011). “Glyphosate applications may cause changes in microbial populations due to changes in terrestrial vegetation” (Durkin 2011).

Triclopyr is absorbed by plant roots, but it is not considered effective as a soil-applied herbicide. Triclopyr is adsorbed primarily to organic matter particles in soil. The organic matter content is the primary factor in the degree of soil adsorption. Long-term forest and pasture field studies found very little indication that triclopyr will leach substantially either horizontally or vertically in loamy soils (SERA, Inc. 1996c cited in USFS PNW Region 1996). Microorganisms degrade triclopyr readily. It degrades more rapidly under warm, moist conditions which favor microbial activity. The average half life for triclopyr in soil is 30 days (Tu et. al. 2001). Triclopyr did not affect the growth of soil microorganisms up to 500 parts per million (Forest Service 1984). Triclopyr can be slightly toxic to bacteria, actinomycetes and fungi (Sapundzhieva, 1987 cited in Brown et. al. 1990). The warm temperatures at the time of application and the high density of plant roots are expected to rapidly degrade triclopyr. "…There is little indication that concentrations of triclopyr in soil are likely to adversely affect soil invertebrates" (Durkin 2011). "The potential for substantial effects on soil mircroorganisms appears to be low" (Durkin 2011).

Imazapyr is relatively non-toxic to soil microorganisms, aquatic invertebrates, and fish. Effects on bacteria appear to be highly species specific with variations in sensitivity of up to a factor of 100. Imazapyr appears to have the potential to shift bacterial soil populations that contain sensitive species of bacteria. "There does not appear to be any basis for asserting that imazapyr is likely to adversely effect microorganisms in soil. If imazapyr were extremely toxic to terrestrial microorganisms that are important for the maintenance of soil suitable for plant growth, it seems reasonable to assume that secondary signs of injury to microbial populations would have been reported" (Durkin 2011). Degradation halftime in soils ranges from 25 to 180 days.

Fluroxypyr when applied is rapidly absorbed by plant foliage. If fluroxypyr were highly toxic to soil microorganisms it might be revealed in degredation studies indicating a rapid decline in degredation rates. No such pattern is reported in available literature (Durkin 2009). Degredation half-lives for fluroxypyr range from 41 to 53 days depending on soil type. Studies indicate that fluroxypyr is mobile in soils, but the mobility strongly deceases with increased residence time in the soil.

Metsulfuron methyl when applied to plant foliage is rapidly absorbed and can be taken up through the roots. There is no clear basis for suggesting that effects on terrestrial or aquatic animals are likely or would be substantial (Klotzbach and Durkin 2005). Metsulfuron methyl is fairly mobile in the soil and is broken down by soil microbes, half-life in the South is typically 1 to 6 weeks. Laboratory and field studies on the effects of metsulfuron methyl to soil microorganisms suggest that transient effects on soil bacteria are plausible. "At surface application rates of 0.05-0.075kg/ha, transient decreases in soil bacteria were apparent for 3 days, but reversed completely after 9 days" (Ismail et al. 1996). Based on laboratory studies it appears there is a low order of toxicity to fish and animals.

Cumulative Effects

Most of the impacts to the soils would occur where skid trails and temporary roads are located. Skid trails and temporary roads would be disked, fertilized, and seeded where needed to prevent erosion and to help restore soil productivity to previous levels. Future activities in the project area are expected to use the same locations for skid trails and temporary roads so the impacts are

not expected to be cumulative.

Seed tree removal harvest is proposed for the 34 acres of Pine Seedtree harvest. Approximately three acres of soil in this unit would be expected to sustain a temporary loss in soil productivity due to the initial seedtree preparation harvest. An additional one acre of soil is estimated to sustain a temporary loss in soil productiviity due to the removal of the seedtrees in the future. The potential existing and estimated additional temporary loss in soil productivity equals four acres which is 12 percent of the seedtree harvest and seed tree removal area. The actual amount of the temporary loss of soil productivity is expected to be less because the same skid trails that would be used in the initial harvest would be used again and erosion control measures would speed the recovery of the soil during the interval between the first and second harvest.

Hardwood Shelterwood removal harvest would be proposed for the 747 acres of Hardwood Shelterwood preparation harvest. Approximately 67 acres of soil in this unit would be expected to sustain a temporary loss in soil productivity due to the initial shelterwood preparation harvest. An additional 30 acres of soil would be estimated to sustain a temporary loss in soil productiviity due to the removal of the shelterwoods in the future. The potential existing and estimated additional temporary loss in soil productivity equals 97 acres which is 13 percent of the shelterwood harvest and shelterwood removal area. The actual amount of the temporary loss of soil productivity would be expected to be less because the same skid trails that would be used in the initial harvest would be used again and erosion control measures would speed the recovery of the soil during the interval between the first and second harvest.

Seed tree removal harvest would be proposed for the 578 acres of Hardwood Seedtree harvest. Approximately 52 acres of soil in this unit would be expected to sustain a temporary loss in soil productivity due to the initial seedtree preparation harvest. An additional 23 acres of soil would be estimated to sustain a temporary loss in soil productiviity due to the removal of the seedtrees in the future. The potential existing and estimated additional temporary loss in soil productivity would equal 75 acres which is 13 percent of the seedtree harvest and seed tree removal area. The actual amount of the temporary loss of soil productivity would be expected to be less because the same skid trails that would be used in the initial harvest would be used again and erosion control measures would speed the recovery of the soil during the interval between the first and second harvest.

Cumulative Effects for soils due to the above harvests would be expected to be within the RFLRP Standard FW85: On all soils dedicated to growing vegetation, the organic layers, topsoils, and root mat would be left intact over at least 85 percent of the activity area.

Alternative 1: No Action

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

The direct, indirect, and cumulative effects would be the same as those for the Proposed Action. 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. The project areas covered by this analysis fall within parts of 32 different sub-watersheds. The proposed project areas and activities will be discussed as a whole and will be analyzed at the sub-watershed or 6th level Hydrologic Unit Code (HUC) level, which provides for a logical aerial extent for analyzing cumulative effects on water resources.

There are approximately 265 miles of streams within the proposed project areas. The primary streams found in the project areas include Sulphur Creek, Little Sulphur Creek, Payne Creek, Nowlin Creek, Rock Creek, Slusher Creek, Hurricane Creek, Cub Creek, Buck Branch, Falls Branch, Dry Creek, Bobtail Creek, Falling Water Creek, Bailey Cole Creek, Reeves Branch, Illinois Bayou, Brushy Fork, Bradley Creek, Brock Creek and Anderson Creek plus multiple unnamed tributaries to these streams. Falling Water Creek, Illinois Bayou, Hurricane Creek and Big Piney Creek are designated Extraordinary Resource Waters (ERW) that either border or flow through parts of the proposed project areas. 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.

This portion of the Forest is located primarily in the Boston Mountain eco-region with deeply dissected drainages into the Bloyd Formation (McFarland, 2004). The proposed areas in the southeastern part of the district 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 are 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 boundary of the analysis area, the Forest Service administers approximately 57% of the land. This leaves a sizable portion of the land within the watersheds as privately owned. Land use within these sub-watersheds is approximately 86% forested. The balance of the land uses is 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 NF, 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; U.S. Department of Agriculture – Soil Conservation Service, 1989).

Within the analysis area, roads exist both within the forest boundary and outside the forest boundary. There are approximately 794 miles of roads within the proposed project areas. These roads vary from paved roads to dirt roads designated for administrative use and/or high clearance vehicles only.

According to the National Wetland Inventory Database, several Freshwater Forested/Shrub Wetlands exist in association with streams within and bordering proposed project areas. These wetlands are generally less than four acres in size. Small, unmapped wetlands may also 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. Appropriate measures will be taken to protect any mapped or unmapped wetlands located within the proposed project areas.

A total of 2,865 acres of floodplains are identified on the forest within the project areas. These features were found to occur in most of the project areas with a higher concentration in the Arkansas River Valley eco-region. 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 (2014), 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 that could cause effects are those of prescribed burning, dozer line construction, vegetation management, silvicultural site preparation and road construction.

The effects of prescribed fire on water yield and timing, erosion, and nutrient cycling depend on fire severity, fuel characteristics, soil moisture, and recurrence interval, and primarily the amount of ground cover removal. Less intense fires result in effects of less magnitude than moderate to severe fire intensity (Marion, 2004). Controlled burns designed to meet fuel reduction, wildlife, recreation, watershed, or ecological objectives are typically planned to be less intense than a wildfire. There is little evidence that water yield increases 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 3 years (Van Lear et al., 1985).

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 seedtree harvest produced 2 ¼ times this amount of sediment during the first year after harvest with 31.3 lbs/acre. Three years after the treatment, the erosion rates were similar to the undisturbed state. This is roughly equivalent to a 5-gallon bucket of soil/acre. Another study by Lawson and Hileman (1982) investigated the effects of seedtree removal and site preparation burning. The results indicated that there were no substantial differences in stream turbidity between seedtree removal sites and undisturbed control sites. Thus, seedtree silvicultural practices in Arkansas would result in the production of sediment, but at levels below those found on typically managed 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 application, 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 to ten percent of their use in agriculture settings and at application rates of less than 2 kilograms per hectare (Neary and Michael, 1996). Additionally, many chemicals used in forestry applications break down usually within several weeks under normal conditions. 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 waterbodies, 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 Forest, it has been determined that the selection of the proposed action could potentially result in low levels of herbicide residues entering waterbodies within the project area (SO unpublished reports). However, the levels found in the past and those anticipated for the future, are expected to be very small, and not in excess of the levels of concern established by the EPA. The Ozark-St. Francis National Forests utilize standards for herbicide application that require buffers between treated vegetation and waterbodies, as well as standards to ensure that drift and direct application to waterbodies 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 would not be 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.

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 Edwards (1991). In this study best management practices were used that include 100 foot wide perennial buffers, logging slash removed from streams, sale units were monitored by a responsible party, operations ceased during wet weather, roads laid out by 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 necessary to determine that no adverse effects to the water resources are the result of Forest Service activities; this includes monitoring for adequate BMP compliance. Under high-risk concerns, projects should seek a no net increase of sediment levels through restoration opportunities throughout the watershed.

The water resource cumulative effects analysis was completed based on the activities described in this document. The results of this analysis are displayed in table 12 below.

Table 12. Watershed Analysis Results

	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
Terrapin Branch-Buffalo River	170	Low	173	Low	171	Low	173	Low
Hoskin Creek-Buffalo River	276	Low	290	Low	288	Low	290	Low
Cave Creek	247	Low	251	Low	251	Low	251	Low
Headwaters Richland Creek	155	Low	160	Low	156	Low	160	Low
Falling Water Creek	185	Low	170	Low	185	Low	170	Low
Outlet Richland Creek	197	Low	193	Low	201	Low	193	Low
Brushy Fork	252	Low	264	Low	257	Low	264	Low
Hurricane Creek-Upper Big Piney Creek	146	Low	143	Low	146	Low	143	Low
Cow Creek-Big Piney Creek	134	Low	143	Low	134	Low	143	Low
Haw Creek-Big Piney Creek	145	Low	155	Low	145	Low	155	Low
Middle Little Piney Creek	349	Low	356	Low	353	Low	356	Low
Spring Creek-Big Piney Creek	184	Low	188	Low	184	Low	188	Low
East Fork Illinois Bayou	213	Low	216	Low	215	Low	216	Low
Middle Fork Illinois Bayou	247	Low	245	Low	248	Low	245	Low
Upper North Fork Illinois Bayou	203	Low	208	Low	203	Low	208	Low
Mill Creek-Illinois Bayou	423	Low	434	Low	427	Low	434	Low
Brock Creek	360	Low	354	Low	364	Low	354	Low
Trimble Creek-West Fork Point Remove Creek	818	High	844	High	838	High	844	High

	Percent increase of sediment above undisturbed conditions							
	Current		Future					
			Proposed Action		No Action		No Herbicide	
Upper Clear Creek	758	High	780	High	767	High	780	High
Rock Creek-West Fork Point Remove Creek	514	Moderate	559	Moderate	525	Moderate	559	Moderate

The concern level for the proposed action and each alternative is estimated to remain low for all but three of the watersheds. In those three watersheds, the risk levels do not change from the current condition. Those watersheds are all in the southeast portion of the forest and are all within the larger West Fork Point Remove watershed. In some watersheds, the activities proposed by the Forest Service for the proposed action would result in an increase in sediment yield compared to current conditions and alternative 1. In other watersheds, the proposed activities would result in a decrease in sediment yield due to road and trail maintenance and closures. 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 are not decommissioned 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 reconstruction would not receive the necessary upgrades to minimize effects on resources. Unpaved roads paralleling and crossing streams would continue to pose specific risks to water quality as they often maintain linkages with the stream channel.

C. Air Quality

Existing Condition

The Fuels management project area is spread out across the Big Piney Ranger District at several locations totaling 121,060 acres (includes private property). Proposed project activities are located close to the following communities: Appleton, Cleveland, Austin, Tilly, Witts Springs, Moore, Lurton, Pelsor, Fort Douglas, Haw Creek, Pilot Rock Mountain, Cowell, Deer and Red Star. Analysis of this project will be confined to Project Areas identified on the maps (See Appendix A).

The purpose of this project proposal is to continue the use of prescribed burning and use other management activities with the goal of restoring these areas to the desired future conditions (DFC) as outlined in the RLRMP for the Ozark-St. Francis National Forests. Additionally, other areas were identified which are in need of restoration (prescribed burning and other activities) which would reduce fuel loading, protect private property in the wildland-urban interface and increase species diversity.

Inventories and monitoring within the project area identified a number of existing ecological conditions, such as: overstocked timber stands, lack of early seral habitat, limited herbaceous species in the understory resulting in a lack of species diversity, an increase in potential for insect outbreaks, and a lack of habitat for pollinators.

Due to the above conditions these ecosystems are considered at risk to insects, disease and catastrophic wildfire. They are declining in health and vigor. Many stands contain more trees per acre than the soil and nutrients can sustain into perpetuity. These stands of trees may grow and survive, however in time; insect, disease, dieback from overstocked conditions has and will continue to have a negative impact on the resiliency and quality of the forest. The need for restoration to fire adapted species and an increased diversity in plant species on a landscape scale is needed to restore the ecosystem to a more stable condition. Managing stand density, composition and structure toward the desired future conditions through thinning and the re-establishment of the natural fire regime would improve overall forest health.

Current Management Direction

The framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act (CAA), as amended in 1977 and 1990 (*42 U.S.C. sec. 7401 et seq.*). The CAA designed to "protect and enhance" the quality of the nation's air resources. The CAA encourages reasonable Federal, State and local government actions for pollution prevention. State Implement Plans (SIPs) are developed by each state to implement the provisions of the CAA. The SIPs describe the State's actions to achieve and maintain National Ambient Air Quality Standards (NAAQS). An ambient air quality standard is a legal limit (threshold) on concentrations of a regulated atmospheric pollutant. Its establishment is based on the toxicological principle that pollutant exposures below threshold values are relatively safe and, some level of atmospheric pollutant is acceptable, thus legally permissible.

Arkansas and the Federal Government have established air quality standards for six principal pollutants (or criteria air pollutants) as indicators of air quality. The criteria pollutants are carbon monoxide (CO), lead (Pb), sulfur dioxide (SO2), particulate matter smaller than 10 microns (PM10), and particulate matter smaller than 2.5 microns (PM2.5), ozone (O3), and nitrogen dioxide (NO2). Air quality in the project area is classified as in attainment for all criteria

pollutants. A "nonattainment" designation means that violations of standards have been documented in the region. The only nonattainment areas in Arkansas is Crittenden County (West Memphis area), for 8-hour ozone - moderate class.

Table 13.National Ambient Air Quality Standards (revised June 2010).

Pollutant	Primary Standards		Secondary Standards	
	Averaging Times	Level	Averaging Times	Level
Carbon Monoxide	8 hour	10 mg/m3 (9 ppm)	None	
	1 hour	40 mg/m3 (35 ppm)		
Nitrogen Dioxide	Annual	100 µg/m3 (0.053 ppm)	Same as Primary	
	1 hour	188.7 µg/m3 (0.1 ppm)	Annual average	100 µg/m3 (0.053 ppm)
Sulfur Dioxide	Annual	80 µg/m3 (0.03 ppm)	3 hour	0.5 ppm
	24 hour	365 µg/m3 (0.14 ppm)		
	1 hour	75 ppb	None	
Particulate Matter (PM_{10})	24 hour	150 µg/m3	Same as Primary	
Particulate Matter ($PM_{2.5}$)	Annual	15.0 µg/m3	Same as Primary	
	24 hour	35 µg/m3	Same as Primary	
Ozone	8 hour	0.075 ppm	Same as Primary	
	1 hour	0.12 ppm 1	Same as Primary	
Lead	Rolaverage ing 3-month	0.15 µg/m3	Same as Primary	

1EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard.
http://epa.gov/air/criteria.html

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.

Air pollution can impact both human health as well as the environment. In recent years air quality standards have refined the particular matter size to 2.5 microns ($PM_{2.5}$). The reason for refining particulate matter is $PM_{2.5}$ happens to be 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; etc.

In 1999, EPA promulgated the Regional Haze Rule (40 CFR 51.308-309), which calls for states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment. Class I areas include wilderness or National Parks greater than 5000 acres which existed on August 7, 1977. The Regional Haze Rule requires states to demonstrate "reasonable progress" toward improving visibility in each Class I area over a sixty year period (to 2064), during which visibility should be returned to natural conditions.

The Regional Haze Rule also requires states to address visibility impairment in mandatory class I areas due to emissions from fire activities. The Preamble to the Rule emphasizes the "implementation of smoke management programs to minimize effects of all fire activities on visibility." The Rule requires states to address visibility effects from all fire sources contributing to visibility impairment in mandatory class I areas (Dzomba 2005). Areas within and around the project area are designated as Class II air sheds except for the County line burn which is next to the Upper Buffalo Wilderness that is designated as Class I air shed. The Class II designation allows for moderate degradation of air quality within certain limits above the baseline air quality. A Class I designation provides the most protection to pristine land, limiting the increment above baseline pollution levels. The standards are much stricter for Class I than Class II areas.

The Interim Air Quality Policy on Wildland and Prescribed Fires (U.S. EPA 1998)
The Interim Policy suggests that air quality and visibility impact evaluations of fire activities on Federal lands should consider several different items during planning (EPA 1998). In a project level NEPA document, it is appropriate to consider and address to the extent practical, a description of applicable regulations, plans, or policies, identification of sensitive areas (receptors), and the potential for smoke intrusions in those sensitive areas. Other important disclosure items include applicable smoke management techniques, participation in a basic smoke management program, and potential for emission reductions. Typically ambient air quality, visibility monitoring, and cumulative impacts of fires on regional and sub regional air quality are not explained to the same level of detail. Ambient air quality and visibility monitoring (for Class I areas) are typically done collaboratively with the states. Impacts to regional and sub regional air are addressed operationally through a coordinated smoke management program. The EPA urges states to develop, implement and certify smoke management programs that meet the recommended requirements of the Interim Policy. If a "certified" program is in place and smoke exceeds the particulate standard, it may not be considered a violation by EPA (Dzomba 2005).

Forest Plan Direction

Table 14 below displays the Ozark/St. Francis Plan Standards and Guidelines for air quality (RLRMP; USDA Forest Service 2005).

Table 14. Ozark/St. Francis National Forest Revised Land and Resource Management Plan Priorities and Standards for air quality.

Management Direction/Priorities	Standard –Guidelines-Objectives
Prevent exceeding the regulatory particulate matter (PM2.5) standards through monitoring prescribed burning. Plan for resource management emissions to fall within the current state implementation plan (SIP). SIP inventories establish levels of air pollution that meet the long-term federal air quality attainment goals of the permitting Air Pollution Control District. Meet federal and state standards concerning air and water quality (e.g., National Ambient Air Quality Standard [NAAQS], Environmental Protection Agency [EPA], and state water quality standards). Minimize air pollution impacts to the Air Quality Related Values (AQRV) of the Class I Area, Upper Buffalo Wilderness, through a cooperative working relationship with agencies managing air quality. Ensure that smoke is not adversely affecting Indiana bats by not permitting active combustion and smoldering phase smoke from prescribed burns to enter hibernacula. Develop monitoring plans to evaluate residual smoldering phase and drift smoke entry into primary and secondary zones. Consider all weather perimeters, intra-cave airflow dynamics, burn duration, elevation, and topography in developing burn prescriptions.	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. OBJ.18 Protect and improve the Air Quality Related Values of the Class I Area (Upper Buffalo Wilderness). Performance Indicator: Number of AQRV monitoring sites, number of PSD (air quality-Prevention of Significant Deterioration) permits reviewed, and number of regional air quality planning committees participated in.

For the purpose of this analysis the main air pollutants of concern on the Ozark-St. Francis National Forests is fine particulate matter. When prescribed burn activities are implemented fine particulate matter is the greatest pollutant released into the air. At elevated ambient concentrations, can cause respiratory distress in sensitive populations 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 PM2.5 and the other five pollutants identified above. PM 2.5 is both a primary and secondary NAAQS. For additional information on the pollutants see **http://epa.gov/air/criteria.html** a copy of this paper is located in the project process file at the Jasper office.

State air quality agencies monitor for 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 the pollutant. There is both a 24-hour and an annual NAAQS for PM2.5. Areas that exceed the NAAQS are designated as nonattainment, 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 15. Air Quality Index (AQI) values for 24-hour and 1-hour PM 2.5 average concentrations (µg/m3), and cautionary statements regarding human health.

$PM_{2.5}$ 24-hr Avg. Concentration (µg/m^3)	$PM_{2.5}$ 1-hr Avg. Concentration (µg/m^3) *	Index Values	Level of Health Concern	Cautionary Statements
0.0 – 12.0	0 – 38	0-50	Good	None
12.1 – 35.4	39 – 88	51 – 100**	Moderate	Unusually sensitive individuals should consider limiting prolonged or heavy exertion.
35.5 – 55.4	89 – 138	101 - 150	Unhealthy for Sensitive Groups	People with respiratory or heart disease, the elderly, and children should limit prolonged exertion.
55.5 – 150.4	139 – 350	151 – 200	Unhealthy	People with respiratory or heart disease, the elderly and children should avoid prolonged exertion, everyone else should limit prolonged exertion.
150.5 – 250.4	351 - 526	201 – 300	Very Unhealthy	People with respiratory or heart disease, the elderly and children should avoid any outdoor activity, everyone else should avoid prolonged exertion.
250.5 +	>526	301 - 500	Hazardous	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.

* The 1-hour PM2.5 AQI values are taken from "Wildfire Smoke: A Guide for Public Health Officials", July 2008 revision. http://www.arb.ca.gov/smp/progdev/pubeduc/wfgv8.pdf

** An AQI of 100 for PM2.5 corresponds to a PM2.5 level of 35.4 micrograms per cubic meter (24-hr avg.).

The use of prescribed fire emits PM2.5, along with other pollutants. When prescribed burning it is important for 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 within or near the Ozark-St. Francis. As the graph below shows, there does appear to be a correlation between prescribed fire emissions and measured fine particulate matter concentrations near or in the Forest.

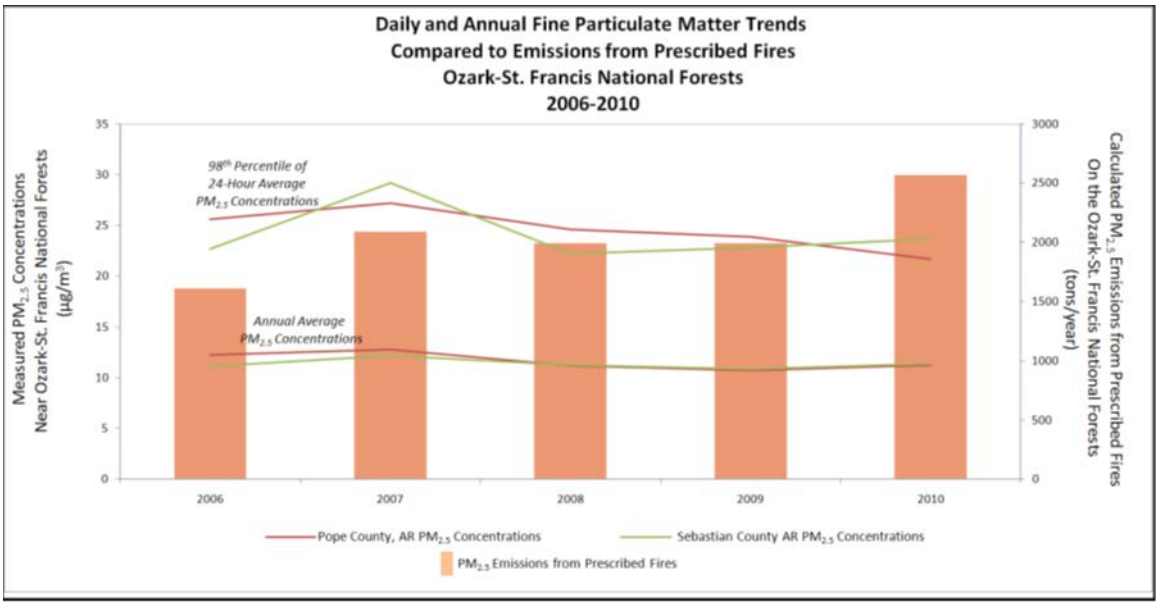

Figure 1. Graph-daily annual fine particulate matter trends relative to prescribed fires

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. This would indicate while prescribed fire is contributing to nearby concentrations of PM2.5, the area is still meeting the NAAQS for this pollutant.

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 on the graph below, 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.

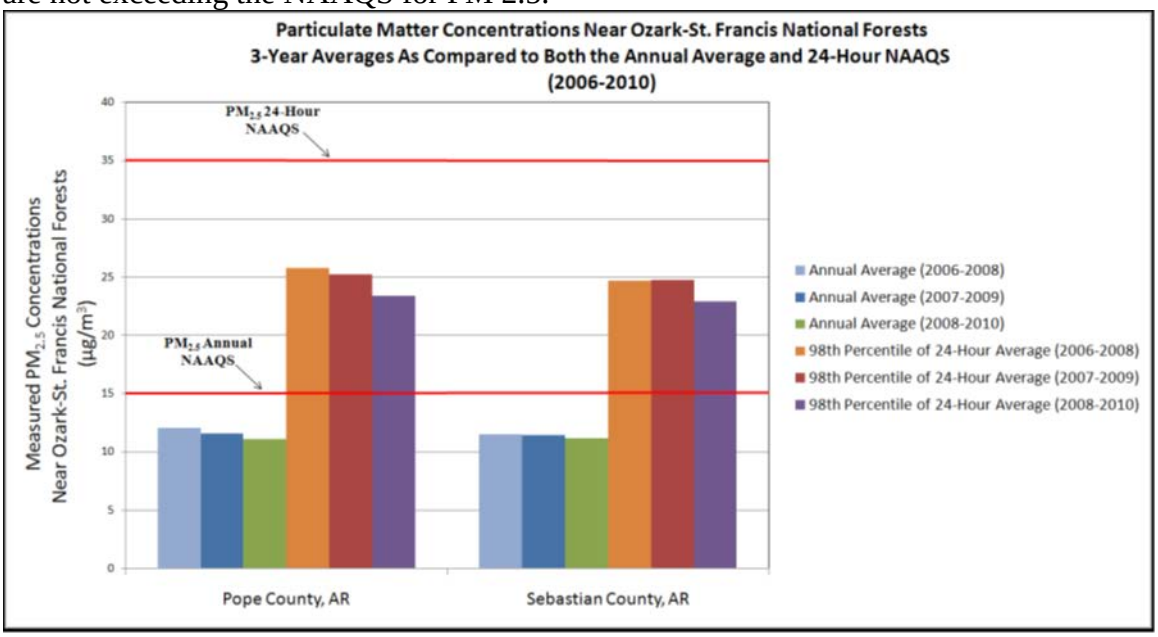

Figure 2. Graph showing three-year average particulate matter concentrations

Visibility at Class I areas

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.

Local visibility is affected by several variables including the amount, size, and type of air borne particulates. Visibility data from the Class I Area, Upper Buffalo Wilderness, near Red Star, Arkansas, air quality monitoring station has remained relatively constant for the past three years, with the average annual visual range approximately 50 km (Air Specialist Report). Between 2001 and 2004 the visual range has been as good as 140 km and as low as 27 km. On the worst days, the primary pollutants affecting visibility are sulfates, organic carbon, and nitrates (Air Specialist Report). These visibility ranges reflect the emissions that are coming from industrial sources, such as coal fired power plants, pulp mills, etc.

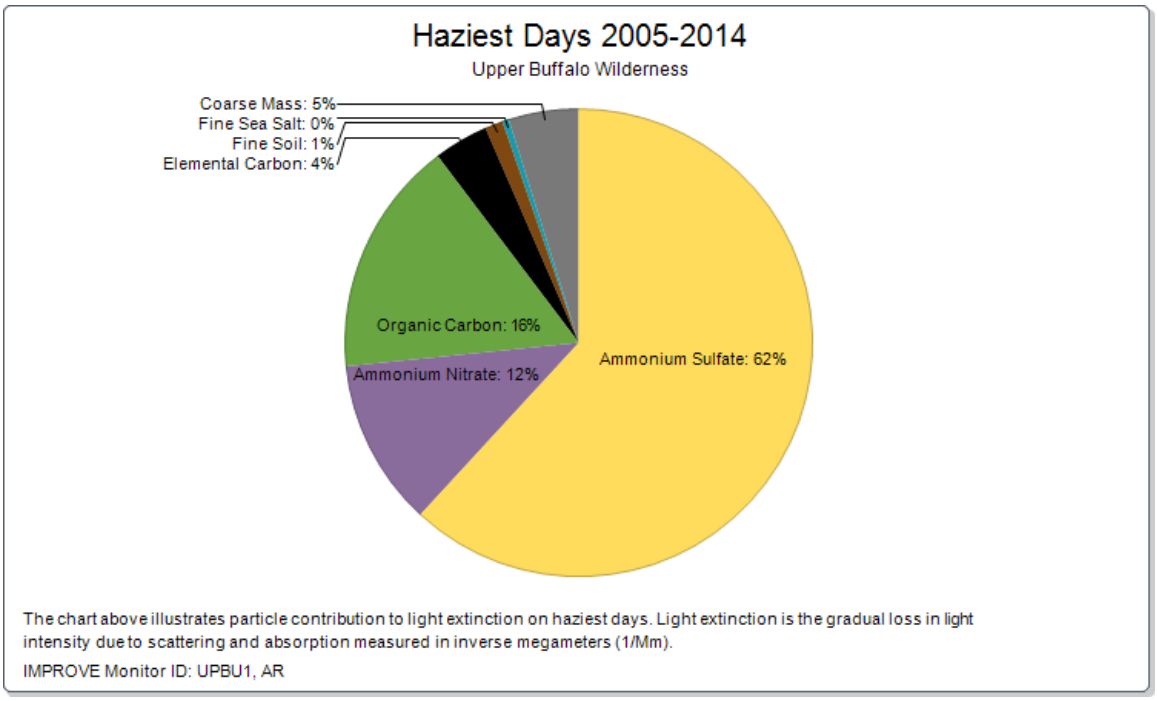

Figure 3. Average component contribution to visibility reduction Upper Buffalo Wilderness Area, AR for the 20% worst days (2005-2014). Data source: http://vista.cira.colostate.edu/web/DataWizard/

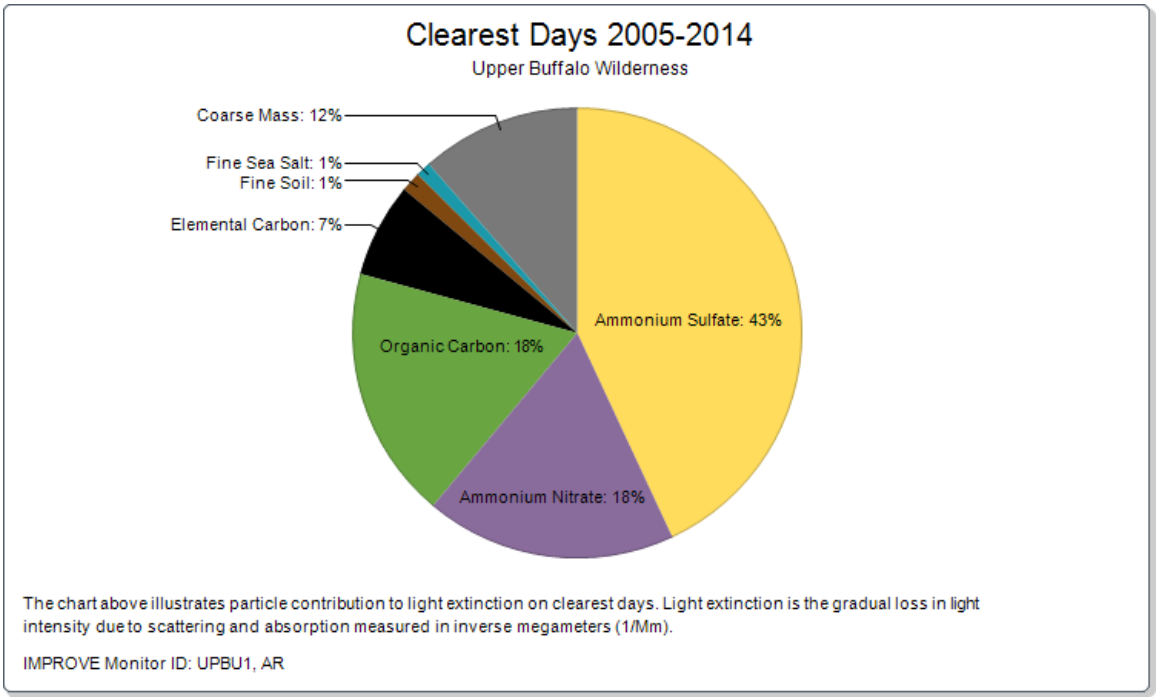

Figure 4. Average component contribution to visibility reduction Upper Buffalo Wilderness Area, AR for the 20% best days (2005-2014). Data source: http://vista.cira.colostate.edu/web/DataWizard/

Sources of Air Pollution

The largest source of sulfates (CO), nitrogen oxides (NOx) and reactive organic gases (ROG) in the Big Piney RD are on-road motor vehicles. Particulates (PM-10 and PM-2.5) are emitted into the air by sources such as factories, power plants, construction activities, automobiles, fires, and agricultural activities. Most of the haze or smog that is visible within the project area moves into these higher elevations from valleys below. Emissions for the major pollutants for Region 8 are listed below in Table 16.

Table 16. Sources of Regional Haze Pollutants

Regional Haze Pollutant	*Anthropogenic Sources of Pollutant*	*Natural Sources of Pollutant*
Sulfates	Coal-Fired Power Plants, Diesel Engines, Industrial Boilers	Volcanoes
Organic Carbon	Incineration, Household Heating	Fire, Vegetation
Nitrates	Cars & Trucks, Off-Road Vehicles, Industrial Boilers, Agriculture	Soils, Lightning, Fire
Fine Soil	Off-Road Vehicles, Agriculture	Wind-Blown Dust
Elemental Carbon	Soot, Diesel Engines	Fire
Fine Particulate Matter	Combustion Processes, Roads	Fire
Coarse Particulate Matter	Construction, Roads, Woodstoves Fireplaces	Wind-Blown Dust, Fire

Smoke

Unlike most industrial and urban sources, wildfire smoke is usually transitory in nature, lasting only a few days or weeks at a single location. However, in overall pollution loading, it can represent a substantial part of the uncontrolled pollution occurring in some air districts. At this time the Forest Service has not been identified by the state of Arkansas as a source of $PM_{2.5}$.

Within the Big Piney Ranger District a majority of the pollution is derived from the nearby urban areas. Wildland fire is one of the few exceptions. Since 1970, approximately 15,000 acres have burned in wildfires and approximately 132,220 acres have been treated with prescribed fire.

An average of the seven counties that lie within the project area gets 48.1 inches of rain per year. The US average is 35. Snowfall is 5.7 inches with the US city average of 25 inches of snow per year. The number of days with any measurable precipitation is 86.1.

On average, there are 217.7 sunny days per year within the project area. The July high is around 90.9 degrees. The January low is 26.3 degrees.

Southwesterly winds typically blow across Arkansas, but winds can blow from north to south. Industry and power generation from as far away as Dallas, Fort Worth, Houston Texas and Oklahoma City, or as nearby as Fort Smith AR and Tulsa contribute plume blight and haze. There are few local offsite sources (facilities) capable of impacting air quality over the project area, such as charcoal plant, in Tulsa, Oklahoma.

Short-term impacts that might occur on the day of the burn are predicted using smoke dispersion models. Impacts were predicted using the simple screening model, VSMOKE (Lavdas, 1996). As a screening model, VSMOKE provides conservative estimates of downwind impacts from smoke; if concentrations are estimated to be significant, more refined modeling is performed. In this analysis, a more refined analysis was not necessary.

Short-term impacts can be predicted using a smoke dispersion model run in the planning mode. This means that the meteorological parameters used are estimates of expected conditions and not actual forecasts. Dispersion modeling conducted at this stage of planning is done to identify potential air quality problems, and to make recommendations for burn planning where air quality issues may arise. It is important to remember that modeling results are predictions based on assumptions. As the assumptions get closer to actual conditions, modeling results become more reliable.

As noted above, the VSMOKE model has been and will continue to be used to predict smoke impacts from the proposed burn units. VSMOKE uses the Fire Emissions Production Simulator (FEPS) model to convert total emissions (from CONSUME) into hourly emissions and heat release rates. The smoke dispersion model then estimates dispersion of the emissions for any selected hour of the day. Ground-level concentrations of fine particulate at several distances downwind from the burn unit are then produced, and a graphic depiction of fine particulate concentrations can be displayed using ArcMap. More details are available in the VSMOKE modeling report contained in the project process file at the office in Jasper.

Proposed Action and Alternative 2

Direct Effects

Under the proposed action burning could be implemented multiple times over a 10 year period, on 90,987 acres for multiple purposes. This would continue moving the landscape toward Fire Regime Condition Class 1 (Fire Regime Condition Class is a qualitative measure classified into three classes describing the relative degree of departure from historical fire regimes possibly resulting in alterations of key ecosystem components such as; species composition, structural stage, stand age, canopy closure, and fuel loadings) (Hann and Burnett 2001; Schmidt and others 2002). Most (not all) of the project area has been previously burned under other Decisions. For the proposed action (PA) and Alternative 2 the prescribed burn acres would remain the same. The majority of the PA would have no effect on the Class I air shed (Upper Buffalo Wilderness

Area) due to the distance from the proposed prescribed burns. The Class 1 air shed is in the northwest portion of the district close to the community of Red Star. All of the proposed prescribed burns are southeast and east of the Class 1 air shed. Regionally, wind blows from the west, southwest or northwest. One burn, the County line burn, is located west of the Class 1 air shed. It does have the potential to temporarily put smoke over the Class 1 air shed. In the past when this burn has been implemented the NAAQS have **not** been exceeded. A webcam is located on the Upper Buffalo lookout tower which monitors visibility across the Class 1 air shed.

Community protection and firefighter safety would be enhanced by decreasing fuel loading by an estimated 1.5 tons per acre. Each prescribed burn has its own specific prescribed burn plan which is reviewed and signed by district specialists and the District Ranger. The burn plan contains the "how to" conduct the burn and is written to be within parameters of the Arkansas State Smoke Management Guidelines. The burn plan would be prepared to minimize effects in smoke-sensitive areas. Burning would only occur when conditions are right for adequate smoke dispersal. The guidelines require calculating the amount of available fuel (dead and down leaves, twigs, limbs which equates to tons per acre) within the burn area on the forest floor. This amount of fuel could be consumed by the burn which in turn results in a predicted amount of particulate matter released in the smoke (http://forestry.arkansas.gov/SiteCollectionDocuments/Web2013ArkVSMG.pdf). By performing these calculations the burn plan ensures no exceedances or NAAQS would occur as long as the burn is implemented according to the prescribed burn plan. Emissions from prescribed burns would release PM-10 and PM 2.5 particulate matter. PM-2.5 is particularly important because this size of particle when ingested remains in the body (see above under existing conditions). None of the prescribed burns implemented on the Big Piney Ranger District have resulted in an exceedance of NAAQS. Prescribed burn personnel can be temporarily exposed to higher levels of the PM2.5 when required to patrol control lines along the downwind side of the burn. The prescribe burn boss mitigates exposure of personnel by limiting time spent in thick smoke.

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 measureable 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 could have different effects on the air quality. During the growing season mixing heights are generally lower, and the smoke dispersion rate is less. This would result in less acres being ignited during a burn period. As stated above the burn would be implemented according to the prescribed burn plan which is written and adheres to the State Smoke Management Guidelines.

Indirect Effects

The public could be exposed to low concentrations of drift smoke. There is potential for roadways to be temporarily impacted by smoke. Monitoring of smoke along roads and highways is standard on every prescribe burn implemented. If smoke starts becoming thick enough to

impede traffic the prescribed burn plan has provisions to 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 would be no long-term effects on air quality within the analysis area. Dust and emissions generated by logging activities would have a temporary localized effect on air quality. Since this type of activity has occurred over many areas within the project area, and the air is of good quality. It could be expected any air degradation would be localized and short term.

For the proposed action and alternative 2 the potential does exist for smoke to cause temporary local negative effects on adjacent private homes and farms, and rural communities. Air quality effects could include temporary decreased visibility on roads, discomfort for local residents with respiratory problems, and 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. This would ensure that local effects to air quality would not exceed any NAQQS.

Proposed burn areas included 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 not expected to exceed any air quality thresholds.

Cumulative Effects

For prescribed burning when the forecast predicts a good day to burn chances are several other burns will be planned on the same day across the state. The Arkansas State Management Guidelines addresses this by breaking down the air across the state into six mile by six mile areas (air shed). Depending on the category of burn day (gives indication of lift and smoke dispersion) a set tons per acre of emissions can be released within a given air shed. This ensures the air over the state does not become overloaded from too many prescribed burns occurring within a given air shed. It allows the smoke to disperse and dissipate before causing visibility issues (http://forestry.arkansas.gov/SiteCollectionDocuments/Web2013ArkVSMG.pdf).

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. 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 remain in attainment of the NAAQS if the proposed action or alternative 2 are implemented.

Alternative 1 (No Action)

Direct Effects

The No Action Alternative would not include prescribed burning and therefore has no potential for negative effects to the air quality. Wildfires could have a negative effect on the air quality since there are no parameters for when they start or burn. Typically, wildfires occur during periods of extreme drought and red flag conditions resulting in the greatest impact to air quality since they will expand rapidly and consume the greatest amount of fuel. This results in greater

releases of PM-10 and PM 2.5 particulate matter. Prescribed burning would lessen some of these effects by burning areas under specific conditions which would minimize air quality issues.

Indirect Effects
With wildfires the public could be exposed to high concentrations of drift smoke. There is potential for roadways to be impacted by smoke more than with the proposed action, which could temporarily decrease visibility. Potential would exist for a more serious (stand replacement) 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 people living in the communities close by.

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 for a serious wildfire to occur in this area would increase.

Fuel loading on 90,987 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.

With similar projects, as described here, proposed on a yearly basis throughout the Forest, the sources of 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 remain in attainment of the NAAQS if alternative one is implemented.

D. Recreation/ Visual Quality

Existing Conditions
The Fuels management project area is spread out across the Big Piney Ranger District at several locations totaling 121,060 acres (includes private property). Proposed project activities are located close to the following communities: Appleton, Cleveland, Austin, Tilly, Witts Springs, Moore, Lurton, Pelsor, Fort Douglas, Haw Creek, Pilot Rock Mountain, Cowell, Deer and Red Star. Recreation and Visual Analysis of this project will be confined within the Project Areas identified on the maps. See Appendix A.

The proposed action lies within management areas as defined in the Forest Plan, which guides management direction toward multiple uses, among which are wildlife, range, timber, aesthetics and recreation found in chapter 1 of this analysis.

The primary reason for this project is use prescribed burning along with other activities in order to restore areas to the desired future conditions (DFC) as outlined in the RLRMP for the Ozark-St. Francis National Forests. Additionally, other areas were identified which are in need of restoration (prescribed burning as well as other activities) which would reduce fuel loading, protect private property in the wildland-urban interface and increase species diversity. Inventories and monitoring within the project area identified a number of existing ecological conditions, such as: overstocked timber stands, an increase in insect outbreaks, lack of early seral habitat, limited herbaceous species in the understory resulting in a lack of species diversity and a deficiency of habitat for pollinators.

Due to the above conditions the ecosystems are considered at risk to insects, disease and catastrophic wildfire. They are declining in health and vigor. Many stands contain more trees per acre than the soil and nutrients can sustain into perpetuity. These stands of trees may grow and survive, however in time; insect, disease, dieback from overstocked conditions has and will continue to have a negative impact on the scenic integrity and recreational opportunities. The need for restoration to fire adapted species and an increased diversity in plant species on a landscape scale is needed to restore the ecosystem to a more stable condition. Managing stand density, composition and structure toward the desired future conditions through thinning and the re-establishment of the natural fire regime is needed to improve overall forest health.

The project area receives moderate to heavy pressure of various types of recreational use depending on what portion of the Big Piney Ranger District you are located. The southern and eastern portions have greater developed use; motorized and horseback riding on trails and developed camping areas, while the northern portion of the district is more dispersed and backcountry use, with limited development. Uses include: dispersed camping, hunting, pleasure driving, hiking, rock climbing, horseback riding, OHV use (dirt bikes and ATVs) and paddling on the major streams and waterways. The area's users are mainly visitors within a day's drive; however visitors from adjacent states also frequently visit the Big Piney Ranger District.

Even though the previous LRMP and the RLRMP restricted OHV use from general forest and closed roads, evidence of unauthorized 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 the 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 routes are shown on the 2012 Travel Management Map. The Fuels EA has a high level of OHV opportunity and use is similar to its historic level based on continual observation and maintenance needs from OHV impacts on designated trails and unauthorized paths.

General dispersed recreation abounds within and adjacent to the project areas. The project areas include the following special designations:

OHT Corridor 687 acres
Wild & Scenic River Corridors 2,524 acres includes portions of Upper Buffalo, Richland, Hurricane & Big Piney Creek Wild and Scenic River
Stack Rock Special Interest Area 339 acres

Inventoried Roadless Areas (IRA) 10,954 acres (Gee Creek, East Fork, & Pedestal Rocks)
Scenic Byway Corridors 3,438 acres Highway 7 and 123 are within a portion of the project
Developed Recreation Areas 39 acres (Richland, Rotary Ann, Brock Creek & Haw Creek)
Big Piney Creek Wildlife Management Area (WMA), Ozark National Forest WMA, and Bearcat Hollow WMA are Arkansas Game and Fish Commission Designations

Hunting for game species is a popular dispersed recreational activity across the district and within the project areas. Evidence of dispersed camping can be found mostly from hunters, hikers or visitors seeking solitude with some sites inside or just outside the project areas. These sites receive moderate use with the peak use in spring and fall. Along major drainages such as Big Piney, Hurricane, Richland, North Fork of Illinois Bayou and Haw Creek dispersed camping extends throughout the summer months. Another activity is recreational driving along forest roads in passenger vehicles and ATVs, viewing wildlife.

Equestrian use and ATVs have a historical foundation across the district with a higher concentration on the southern portion of the project 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 for the Ozark – St. Francis National Forest in 1986. However, during each Environmental Assessment, ROS for each project 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 four of the five ROS classifications with the following acres:

Rural approximately 268 acres associated with residential development along Highway 16 at community of Deer and Scenic State Highway 7.
Urban approximately 97 acres associated with residential development in the Lurton area along Scenic State Highway 7.

Roaded Natural approximately 70,432 acres associated with the majority of the area along the main forest roads, the major drainages and ridges in the project.
Semi-primitive motorized approximately 50,263 acres associated with areas that are more difficult to access inside of the Roaded Natural designation.

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. Over half of the project area is designated within a class where vegetation management is acceptable. Rural and Urban classification allows for greatest flexibility of management due to the landscape has already been dominated by man, altering the natural appearing environment.

Visual

The Visual portion, Scenic Integrity Objectives, (SIO) analyzes the proposed activities through the lens of one who has come to the Forest to explore scenic views, wildlife, riverscapes, cultural enclaves, and/or the overall ecosystem. The Forest Plan mapping of SIO's was based on foreground and middle ground views from existing roads without consideration of topography, vegetation or the amount and types of traffic the roads receive. The Forest Plan mapped many areas as "seen or unseen" but did not include factors such as, terrain, viewer positions, vegetative screening, frequency or type of traffic etc. that are considered at the project level. For that reason, areas may be identified as a SIO High that is located in "unseen" areas; these areas would receive standard project designs to achieve better visual composition. A map showing SIOs is contained in the process file at the Jasper office.
The purpose of the SIO is to provide a site specific analysis providing both broad scale and detailed assessments of the proposed actions, as the Forest Service strives to protect and maintain the view of the landscape.

The majority of the project is predominately mature trees providing a canopy that limits viewing opportunities. Several environmental events have happened within the last ten years across the project areas which has shaped the visual landscape; red oak borer infestation, tornados, ice damage and a few small landslides. This resulted in a shift from a more uniform canopy to a broken, more open canopy in numerous areas with stressed and dying trees, creating the appearance of a damaged forest. The broken canopy in a portion of the project area has allowed more light to reach the forest floor producing an increase in woody 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 in order 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 is usually 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 have been incorporated in this EA in Chapter II.

The management area combined with the scenic class number identifies the Scenic Integrity Objectives for the Fuels 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 37% is in the foreground and middle ground with designation of 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 40% is located between the High and Low or Unseen scenic classes within the middle and back ground portion of the project.

*__Low__ or __Unseen__ – (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 23% of 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.

Table 17. Shows SIOs by Management Area with the Objectives of High, Moderate, and Low scenic classes (RLRMP Appendix D). The table below shows the distribution of the SIO by Management Areas within the project.

Table 17: Scenic Integrity Opportunity Table

Management		Inventoried Scenic Class				
Areas		1	2	3	4	5-6
	Acres	Scenic Integrity Objectives				
1.C Designated Wild and Scenic Rivers	2,367	High	High	High	High	High
1.D Recommended Wild and Scenic Rivers	1,133	High	High	High	High	High
1.E Experimental Forests	243	High	Moderate	Low	Low	Low
1.G. Special Interest Areas	339	High	High	High	Low	Low
1.H. Scenic Byway Corridors	3,438	High	High	High	High	High
2.A. Ozark Highland Trail	646	High	High	High	High	High
2.C Developed Recreation Areas	39	High	High	Moderate	Moderate	Moderate

2.D. Upper buffalo Dispersed Rec Area	798	High	High	Moderate	Moderate	Moderate
3. A. Pine Woodland	27,236	High	Moderate	Low	Low	Low
3.B Oak Woodland	28,405	High	Moderate	Low	Low	Low
3.C Mixed Forest	9676	High	High	Moderate	Low	Low
3. D. Oak Decline Restoration Areas	13,788	High	Moderate	Low	Low	Low
3.E. High Quality Forest Products	8,154	High	Moderate	Low	Low	Low
3.I Riparian Corridors	1,084	High	High	Moderate	Low	Low
3.J. Pastures and Large Wildlife Openings	84	High	High	Moderate	Moderate	Moderate
3. K. Wildlife Emphasis Area	10,580	High	Moderate	Moderate	Moderate	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.

Designated Wild and Scenic Rivers and Recommended Wild and Scenic Rivers

Portions of the designated rivers fall within the project area being analyzed for the Fuels EA. The rivers on the Ozark National Forest were designated in April 1992 to enhance and protect the outstandingly remarkable values and unique qualities of each river and its surroundings.
Hurricane Creek is designated as Scenic and Wild with three outstanding remarkable values. Those values are Botanical, Wilderness, and Scenic. The stream is clear and exhibits interesting ripple-pool patterns meandering through richly diverse vegetation with dominant over-story of pockets of American Beech. Proposed activities are in the scenic portion of the designation.
Big Piney Creek is designated as Scenic with five outstandingly remarkable values. Those values are Recreational, Fish and Wildlife, Scenic, Botanical, and Geologic. Proposed activities fall within three of these five values; Recreational, Fish and Wildlife, and Scenic.
Richland Creek is designated as Scenic and Wild with four outstandingly remarkable values. Those values are Recreational, Geological, Wilderness and Botanical. The portion within a proposed treatment is classified as Scenic.

Definitions of outstandingly remarkable values for wild and scenic rivers:

Recreational - outstandingly remarkable values are associated with the primary forms of recreational use found along the river such as: canoeing, kayaking, horseback riding, camping picnicking swimming, and fishing. Richland and Big Piney have several public access points along their length which contribute to the recreational use.
Fish and Wildlife - Big Piney is considered by the Arkansas Game and Fish Commission to be an outstanding sport fishing stream. Smallmouth and Spotted Bass are the most sought after species.
Scenic - values include highly varied and dissected terrain, uneven sharp ridges and cliffs with significant relief. Large unusual rock outcrops or formations and slopes greater than 35 percent. Streams have distinct deep clear pools with reflective qualities, waterfalls and rapids. Bluff lines are evident along much of the stream.
Botanical - some plant species considered by the Arkansas Natural Heritage Commission to be sensitive are located within the corridor. Example of plants: Bristle-Fern and Alabama Snow Wreath.
Geologic - The Mississippian and lower most Pennsylvanian rock exposed near Limestone are very important to understanding the history of the southern margin of the Ozark platform. Exposed fossiliferous limestones and shales seem to represent some of the youngest Mississippian age rocks in North American as well as the southernmost exposure of Morrowan type rock are located in this area. These exposures create a structural window important in developing an understanding of the upper Mississippian and the basal Morrowan sequence. Many of these features are exposed along Big Piney, and are of unique scenic and geologic value. The exposed bedrock of Richland Creek displays geological formations which are very important to understanding the stratigraphic synthesis of North Arkansas.

The North Fork of the Illinois Bayou has been recommended to be part of the Wild and Scenic River System. The river is classified as scenic with a ¼ mile buffer and managed under the same conditions as the scenic section of the designated rivers listed above.

Lands within the corridors are classified as unsuitable for timber production, although management of vegetation is permitted within the river corridors to maintain outstandingly remarkable values. Prescribed fire, commercial, and non-commercial felling of trees 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.

Experimental Forest
The Henry Koen Experimental Forest was designated in 1950 and managed by the Southern Research Station (SRS). These lands help provide the current and future research needs of the SRS and provide scientific information to understand, manage, and sustain the ecological processes, structures, and benefits of the different forest types. Active management due to research activities is obvious. The Henry Koen is predominately mature forest with a shift in historic plant community composition toward fire intolerant plant species limiting species diversity. The Experimental Forest includes a karst glade/woodland complex, encroachment of Eastern red cedar and other hardwood species not historically found on glades.

Scenic Byway Corridors

Scenic byway corridors are managed to offer visitors the opportunity to enjoy viewing outstanding natural and cultural landscapes along well-maintained roads. The visible area during dormant seasons (up to ½ mile from either side of the road) define the byway corridors, unless other criteria are established in the specific scenic byway management plan. The Byway designation's goal is to protect and showcase the unique and scenic natural and cultural resources while increasing tourism. Sight-seeing is limited along the highways, byways and gravel roads because the terrain and vegetation offer little opportunity of vistas with a few exceptions. The Scenic byways provide brief glimpses of National Forest lands across privately owned pastures.

Ozark Highland Trail and miscellaneous trails

The Ozark Highlands Trail (OHT) Corridor transects the Big Piney with approximately 60 miles of the trail that equals 2,245 acres including the corridor. There is about 646 acres or 13.5 miles within the project area carring this designation. The trail is a designated National Recreation Trail. The corridor width is 198 feet on either side of the centerline of the trail and was established to provide visual enhancement, protect the trail, and minimize maintenance by keeping a canopy over the trail. The vegetative cover is primarily mid to late successional forest that has multiple canopy layers with occasional large areas of early successional habitat which provides a variety of habitat niches.

Management practices are modified to recognize the nationally significant aesthetic and recreational values of these lands. This area is classified as unsuitable for timber production, however low intensity vegetation management is appropriate to maintain the long-term goals of the trail. Vegetative management tools such as prescribed fire, thinning, and treatment of NNIS with chemical or manual methods is an appropriate use in the corridor to enhance or improve trail qualities.

Approximately 50 miles of the district's 307 miles of other trails are within or adjacent to the project area. These trails are managed to offer visitors the opportunity to enjoy viewing of natural and cultural landscapes. The management area in which the trails fall dictates how the area would be managed. In most instances the vegetation is suitable for timber production. Vegetative management tools could range from low intensity such as prescribed burning to high intensity including regeneration of the trees resulting in removal of most of the over story and could also include treatment of NNIS with chemical or manual methods along the trails. The vegetative cover ranges from early successional to late successional habitat which provides a variety of habitat niches, but most of the vegetative cover is mid to late successional forest.

Developed Recreation Area

Zing Trailhead, Haw Creek and Brock Creek Campground, Rotary Ann Roadside Rest Area and Overlook are developed recreation areas within the project area and are managed to provide the public with a variety of recreational opportunities in visually appealing and environmentally healthy settings. Facilities are provided to enhance the quality of the recreational experience and to mitigate potential user damage to the environment. The landscape character is natural emphasizing open forest settings, highlighting large diameter trees. Due to the high level of recreational use and the management for aesthetics and safety, vegetation is greatly influenced by humans. Vegetative management for forest health is appropriate to maintain the long-term

goals of a diverse and vigorous forest emphasizing recreation, scenery, and visitor safety. Integrated pest management is used to eradicate or suppress insects, diseases, and non-desirable invasive vegetation.

Upper buffalo Dispersed Recreation Area
This is an area of dispersed recreational use with no developed campgrounds and no motorized use. This area is managed to provide the public a variety of recreational opportunities in a setting that provides quality scenery, non-motorized trails and limited facilities. This area is suitable for timber production. The area is managed under a mixed forest vegetation management emphasis, characterized by a predominance of early, mid and late successional pine and hardwood forests, which creates a landscapes that appears intact with some deviations.

Wilderness
No proposed activities are located inside Wilderness boundaries. Wilderness was designated with the emphasis to allow ecological and biological processes to progress naturally with little to no human influence or intervention, except for the minimum impacts made by those who seek the wilderness as a special place, offering opportunities to experience solitude and risk in as primitive surrounding as possible. There is no buffer of undeveloped wildland to provide an informal extension of wilderness. Also, no internal buffer zones that take away from wilderness values. Because wilderness does not exist in a vacuum, consideration of activities on both sides of wilderness boundaries during planning and the blending of diverse resources is expected. (Per FSM2300 2320.3 (5))

Inventoried Roadless Area (IRA)
The Roadless Rule was adopted in January 2001 to protect the social and ecological values and characteristics of inventoried roadless areas from road construction and reconstruction and certain timber harvest activities. Inventoried roadless areas provide relatively undisturbed blocks of important habitat for a variety of terrestrial and aquatic wildlife and plants; contribute to healthy watersheds and clean drinking water; and provide extensive opportunities for outdoor recreation and tourism. Court rulings have repealed and reinstated the 2001 Roadless rule over the years. On October 21, 2011, the Tenth Circuit Court of Appeals reversed the Wyoming district court's August 2008 decision and lifted the nationwide injunction. The Tenth Circuit's decision made it clear that the Roadless Rule was legally adopted. Then on September 30, 2012 the Supreme Court refused to hear an appeal on the October 21, 2011 ruling. Currently the 2001 Roadless Rule is in effect nationwide except in Idaho. Even though our RLRMP does not include a management area for IRAs the Rule is being followed. The Final Environmental Impact Statement volume 2, November 2000 page 21 for the roadless rule shows the IRA in two different categories; one that allows road construction/reconstruction, and the other does not allow road construction and reconstruction.

The Roadless Rule limits timber removal and road activities but not all. Generally, small diameter material and removal of timber is acceptable if needed for habitat improvement, to maintain or restore the desirable characteristics of ecosystem composition and structure. The cutting, sale, or removal of timber is incidental to the implementation of a management activity and not otherwise prohibited under the land and resource management plan.

White Oak Communication Administrative Site
White Oak Communications Site is approximately 19 acres in size and designated as low power non-broadcast radio service. White Oak Mountain was first developed as a fire detection lookout in the 1930s. In the 1950s the Forest Service removed the lookout and developed the site for administrative radio communications. Currently, there are seven sites under special use permits. Forest Service authority to authorize and manage communications uses on National Forest System lands derives from the Federal Land Policy and Management Act of 1976 (43.U.S.C. 1761-1771); Title 36 Code of Federal Regulations, part 251, subpart B (36CFR 251, subpart B); Forest Service Manual (FSM) 2700; and Forest Service Handbook (FSH) 2709.11 Chapter 90.

The White Oak Communication Site located on top of White Oak Mountain is covered in planted pines with openings established for the buildings and towers associated with the different communication sites. The trees have grown large enough to become a threat to the existing buildings, towers, and supporting guy wires potentially damaging one or more of communication facilities.

Wildlife Habitat Improvements
Permanent openings make up less than 1% of the project area, and early successional habitat (or age 10 and below) comprises approximately 4% of the area when you include previously existing openings. Some of the current openings are small (less than five acres) and difficult to manage.

Ponds of various sizes, condition, and origin are scattered throughout the project area. Existing ponds may need maintenance or repair periodically including spillway and dam reshaping, woody sprout removal from dam using manual and herbicide treatments, sediment removal by draining the pond or adding woody structure in the pond itself. The dam on the pond across from the Deer Work Center has been leaking for several years and from recent inspections getting progressivily worse. This approximately three acre pond has hosted the annual Arkansas Game and Fish Commission's Kids Fishing Derby for the community of Deer since the early 1980s. Reconstructing this dam would require draining down the pond, possibly entirely, then using heavy equipment (dozers, excavtors, etc.) to reconstruct the dam to its current size.

Inventories by personell have indicated a lack of large woody debris in secondary streams for aquatic habitat. Ideally healthy stream habitat needs up to 10 trees per mile greater than 12 inches in diameter at breast height (DBH). The streams include perennial, intermittent and larger ephemeral streams.

Special Use Permits
There are a number of existing access roads used as driveways and linear utility corridors throughout the project area. Also, there are two gas well permits within the proposed treatment areas of the Fuels EA.

Proposed Action

<u>Direct/Indirect Effects</u>
Recreation/Visuals
The proposed vegetation management activities would occur across several management areas. Treatments proposed are Commercial Thinning, All Other Thinning, Prescribed Burns, Cane Restoration within riparian's areas, chemical treatments for Non-Native Invasive Species, Glade

Woodland Restoration, Pine Seed Tree Removal Harvest, and Regeneration Harvest for hardwood and pine. These activities would have a direct temporary negative effect on the recreational setting, but the activities would not exceed the current Recreation Opportunity Spectrum (ROS) classifications (see definitions above). Approximately 60% of the area is in Roaded Natural, this allows for vegetation management and evidences of utilization by man to be present. The other 40% of the area is classified as Semi Primitive Motorized. Both of these classifications expect forest visitors to see active forest management while traveling Forest Service roads, hunting or while cross country hiking. Direct effects are temporary and limited recreational use is expected during and for a short time (3 to 5 years) after implementation of treatments. The areas where activities take place would experience a temporary reduction in recreational use until the limbs and debris from treatments has decomposed. Vegetative treatments have been implemented in these areas in the past with similar effects on recreational use. Recreation conditions in the area where activities would occur is expected to improve overall. An example is thinning would produce more space for residual trees to grow, reduce unsightly brushy conditions, create increased sight distances for wildlife viewing opportunities, improve forest health by reducing competition for sunlight, and in time generally enhance the visitors' recreational experience in the long term. Increased viewing opportunities would occur where vegetative management treatments are implemented, and be visible to visitors along roads, portions of OHV routes, and cross country riding or hiking.

Only 12% of all the vegetation treatments proposed would break the continuity of the canopy creating a noticeable deviation in the above managed areas. These impacts associated with the proposed regeneration areas would still, meet the ROS and SIO of the RLRMP standards. Recreation use would be directly affected during implementation and for a period of (10 years). This would be followed by limited or restricted use due to the amount of dead tree tops and debris as well as the unwelcoming appearance of the area. The regeneration areas would lengthen sight distance to any visible features such as boulders, views etc. The prescribe burn areas proposed would affect the largest number of acres within the project area. The negative effects associated with the black/charred appearance of the ground would have the shortest recovery period (one growing season), and the least negative effects of all activities within the proposed action. Distance views are likely to be opened up, increasing visual and physical depth into the forest with the expectation of seeing a greater variety of wildlife creating a positive experience to visitors. Prescribed burns would create contrast, providing a mosaic pattern, with different colors and increasing the number of hues by encouraging wildflower growth. This would also provide an overall positive visual effect and increase the visitor's recreational experience.
Additional vegetative treatments such as thinning, chemical applications, and cane restoration etc. impacts would meet RLRMP standards for Recreation and Visuals. All chemical treatments proposed are within areas receiving other treatments and would not likely be noticeable to the average visitor. Along with burning some chemical treatments are the only activity proposed to treat woody understory and to release seedlings and saplings. A few of the areas are easily accessible, so negative effects to the recreational user and visuals would be minimal. Three areas receiving chemical treatments were deemed needing mitigation measures, see Site Specific Design Criteria in Chapter II, page II-15 of this document for areas # 22, 23 and 42.

Designated and Recommended Wild and Scenic Rivers (W&S)

Portions of prescribed burn areas fall within the Scenic corridors or use the rivers as part of the control lines. Prescribed burns would have a minimal effect on recreational use. The effects would be limited to the day of implementation or at most a few weeks following the burn dependent upon fire activities. Overall effects of prescribed burns on recreation and visuals would be positive, see impacts identified above. Additional activities proposed within the designated river corridors are cane restoration, treatment of NNIS and non- commercial thinning (thinning for reason other than timber production). These would be limited in size and space resulting in minimal effects to the visual and recreational experience of forest visitors. The following areas would be dropped: Area #66 a proposed commercial thin of approximately 11 acres would be dropped because it's inside an Inventoried Roadless Area (IRA) which is more restrictive. A portion of Area #19 inside a Scenic portion of a wild and scenic river designation would be dropped because the thin proposed would not enhance the qualities for which the river was designated.

Cane planting/thinning within the Big Piney wild and scenic corridor south of Ft Douglas includes native cane re-establishment within the corridor. Cane planting and thinning treatments are isolated and restricted to riparian areas identified as suitable for re-establishment. Recreational and visual impacts are negligible due to the limited extent of the treatments and locations (isolation) of these treatments. They are unlikely to be seen by most of the public.

Experimental Forest

The proposed actions have identified 243 acres within the Henry Koen Experimental Forest for a prescribe burn in this proposal. Additionally, within the burn area a Glade Restoration and a Commercial thin (see Appendix A. Maps) are proposed. Both treatments areas would have trees removed with, skid trails, temporary road construction, etc. This would have a direct temporary negative effect on the recreational setting and visuals, but the activities would not exceed the current ROS and SIO of the RLRMP standards. As the debris decay or consume during prescribed burns visual and recreation setting would improve after green up or once the vegetation recovers approximately one growing season. Prescribed burning effects would be the same as described above. These proposed actions would move the area toward the desired future conditions of a restored landscape.

Glade restoration would increase sunlight, reduce unsightly brushy conditions, and create increased sight distances for wildlife and wildflower viewing opportunities. Glade habitat would be improved by reducing competition for nutrients and allowing for more herbaceous growth, flowering plants, increased habitat for insects, pollinators, animals, birds etc. This would enhance the visitors' recreational and visual experience.

Special Interest Area (SIA)

This SIA is within Bearcat I, Block 3, a prescribed burn which has been implemented more than once, and this burn is included in this proposed action to be burned again at 2-5 year intervals. Increased sight distance is noticeable allowing for greater views. The reduction in under growth gives a temporary appearance of a park like setting providing greater visual opportunities of the area and wildlife. This increases recreational and visual satisfaction for visitors.

Scenic Byway Corridors

Sight-seeing is limited along the highways, byways and gravel roads because the terrain and the vegetation offer little opportunity of vistas with few exceptions. Areas that have been previously prescribed burned also allow a greater sight distance for viewing of the interior of the forest for approximately three growing seasons.

The Scenic byways provide brief glimpses through privately held pastures of National Forest lands visible in the distance. The rare straight stretch of roadway along these corridors reduce the expectation of large views, which minimizes visual impacts of proposed activities. Impacts associated with prescribed burning are expected to have minor effects limited to the day of the burn due to smoke could occasionally limit distance views (Rotary Ann overlook is within the Scenic byway corridor). A few of the proposed areas actually lie within the Scenic Byway corridors and commercial thinning in Area numbers 13, 29, and 42 would be visible along State Highway 7. However, with mitigation measures such as buffer strips which would limit visibility or thinning more heavily to enhance and expand the views, this would soften the impacts to passing motorist. Mitigation measures are listed in Site Specific Design Criteria in Chapter 2 of this document.

Ozark Highland Trail and other miscellaneous trails

The Ozark Highland Trail (OHT) and miscellaneous other trails lie within or are used as the control lines on several prescribed burns in the project area. Visitors on the respective sections of the OHT would have a temporary negative effect on the day of the burn (both recreationally and visually) and possibly for an additional few days, until the trail has been cleared of hazards. The prescribe burn areas proposed would create a negative effect associated with the black/charred appearance of the ground, however, it would be for a short time frame (one growing season). The prescribed burns would reduce the dead and down woody debris and reduce the understory vegetation. The Forest would be more open, this would increase visuals and reduce vegetation along the trail. The expectation would be to view a greater variety of herbaceous plants, and wildlife creating a positive experience to visitors. Huckleberry, blackberry, and raspberry populations would increase as a result of burning. Prescribed burns would create contrast, with different colors and increasing the number of hues by encouraging wildflower growth. Providing an overall positive affect on the aesthetic and the visitor's recreational experience.

Developed Recreation Area

The Fuels EA proposed action would have a temporary negative effect on recreational use at Haw Creek Falls, Brock Creek and Zing Trailhead on the day the respective prescribed burns are implemented by limiting or restricting the use of the recreation areas for that day and potentially a day or two following. Burns adjacent to Rotary Ann would have minor negative impacts on the day of the burn because smoke could occasionally limit distance views. Impacts would be similar to the effects mentioned above under the Ozark Highland Trail section. Affected areas associated with the campgrounds would be limited due to location of the campgrounds. Haw Creek Campground is located within a riparian corridor that has a more mesic (richer/wetter) habitat, which would not burn as hot or consume as much dead fuel. This would reduce the amount of charred/black appearance, creating a mosaic pattern. Brock Creek is xeric (dryer) site, with limited ground cover reducing the dead fuel loading. This would lessen the intensity of the burn creating a similar appearence as Haw Creek.

Upper buffalo Dispersed Recreation Area
Prescribed burning is proposed along the western portion of the dispersed recreation area on 798 acres that would impact portions of two mountain biking trails. Impacts would be temporary and similar to those described under the Ozark Highland Trail section discussed above.

Wilderness
No proposed activities are inside Wilderness. Also, no internal buffer zones that degrade wilderness values. Because wilderness does not exist in a vacuum, consideration of activities on both sides of wilderness boundaries were analyzed during the Fuels EA. Prescribed burns near Richland Creek and Upper Buffalo Wildernesses would have little to no effect on recreational use and limited impacts on visuals. Prescribed burn effects would be limited to the day of implementation. Increased vehicle and aircraft traffic potentially increase noise in the area that could affect opportunities for solitude. Smoke could temporary limit visual sight distance. East Fork Wilderness has a proposed treatment associated with the main access point along State Highway 27, improving the overlook at the parking area. The parking area is expected to increase visitor's line of sight and have a positive effect on user experience.

Hurricane Creek Wilderness has more proposed activities adjacent to it than any other Wilderness areas. Regeneration treatments and several thinning areas are proposed in the vicinity. The most popular access route to Hurricane Creek Wilderness from the east (Highway 7) would not be impacted by these proposed treatments. The closest treatment of any type would be hardwood thinning near Millsap Knob at the Northeast side-of the wilderness, along the county road, this is a secondary road with limited use. A view-shed analysis was generated from multiple points within the Hurricane wilderness. Due to the position of the treatment areas, terrain, slope and aspect, negative effects to visuals were negligible. Visitors may hear some of the activities during the implementation while activities are ongoing that could potentially affect solitude resulting in a temporary negative experience to the recreational user.

Inventoried Roadless Area (IRA)
The Fuels EA includes portions of three IRAs within its analysis, they are the East Fork, Pedestal Rock and Gee Creek designations. Two (Pedestal Rock and East Fork) of the three IRAs have two different levels of management activities which are acceptable. One level allows for Road construction and reconstruction, and the other level does not. Also, depending on the purpose of vegetative treatments and intensity some activities are acceptable in IRA. Most of the proposed activities within IRAs would have little or no effect on the over-story canopy or Forest Service roads. Treatments such as pre-commercial thinning, manual or chemical treatment of NNIS, and prescribed burning would have limited effect on the recreational use or visual appearance. These would still meet the ROS and SIO of the RLRMP standards and are acceptable inside of IRAs. There are some proposed treatments that were identified for silvicultural reasons that exceed or do not meet the standards, and would be dropped from the proposal. Area #66 approximately 11 acres of commercial thinning and Area #83 approximately 98 acres of commercial thinning would be dropped. The recreational and visual effects associated with IRAs is expected to be negligible with only minor intensity treatments of the vegetation such as, Non-commercial thins, herbicide treatments and prescribed burns.

There is an administrative site within but not part of an IRA called the White Oak communication site. This 19 acre administrative site is surrounded by the East Fork IRA near the southern edge with an existing open access road to the south.

White Oak Communication Administrative Site is 19 acres in size and lies within the East Fork IRA. Site inspections have identified a safety issue of trees being within two tree lengths of the towers, guy wires and buildings. The Proposed Action recommends to remove all trees in the 19 acres. This would ensure a safe buffer around the towers, guy wires and buildings. The administrative site lies within the IRA category that allows for road construction and reconstruction. The tree removal would be acceptable based on the FSM1900 Planning Chapter 1920 1925.04a 2. The Chief reserves the authority to approve or disapprove proposed timber harvest in inventoried roadless areas, except for the following:
c. The cutting, sale, or removal of timber is needed and appropriate for personal or administrative use as provided for in part 223 of Title 36 of the Code of Federal Regulations, 36 (CFR part 223). Under this CFR 223.2 Disposal of timber for administrative use. "Trees, portions of trees, or other forest products in any amount on National Forest System lands may be disposed of for administrative use, by sale or without charge, as may be most advantageous to the United States, subject to the maximum cut fixed in accordance with established policies for management of the National Forests. Such administrative use shall be limited to the following conditions and purposes:
(a) For construction, maintenance or repair of roads, bridges, trails, telephone lines, fences, recreation areas or other improvement of value for the protection or the administration of Federal lands.

The communication site is an administrative site with little or no recreational use. Therefore, would not have a measurable effect (either positive or negative) on recreation. The visual quality impacts would be similar to that of a regeneration area since all trees would be removed to reduce the threat of any tree falling on or into guy wires, towers or buildings. The residual debris would have a negative effect on the visual quality. Since this is an administrative site, the area receives limited visitors to the area, therefore there would be no effect to visual quality. Prescribed burning would be used to assist in maintaining the clearing to discourage trees and other woody growth, keeping a grassy appearance.

Additional administrative sites such as Walker Mountain Communication Site, Over-cup access/trailhead parking area to East Fork Wilderness proposed treatments include prescribed burning and potentially chemical or limited tree removal to improve sight distances resulting in an overall positive recreational and visual experience with minor temporary negative effects.

Wildlife Habitat Improvement
New construction of openings could include short (less than ¼ mile) sections of road which would be gated for access as part of this proposal. 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. The construction of wildlife ponds (< ½ acre) 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 areaespecially during periods of drought. Pond locations would be identified during implementation when test pits can be dug to determine suitable sites. The Deer pond dam improvement would have a negetative effect on fishing while its being repaired. Lowering/draining the water would limit or stop fishing opportunities. Depending on timing of the repairs and rainfall dam improvements may require the Kids Fishing Derby to be relocated or suspended until the pond is fixed and has adequate water level and time to restock the pond. The maintenance would have a negetative effect on the recreational use (limiting or stopping fishing) and the visuals associated with the repairs. If the repairs extend to the time for the Kids Fishing Derby it would either be suspended or relocated to another pond for that year. The recreational use and visual quality impacts associated with the ponds and openings would be similar to that of a regeneration area just on a smaller scale. However in a few years the increase in diversity and constrast in vegetation would improve the overall quality of the habitat providing more opportunity for viewing wildlife increasing recreational experience. The large woody debris placement would be negligible and not expected to have any impact to the average visitor to the national forest. However, for a small portion of visitors that participate in floating these small secondary streams during times of high flow this could have a temporary negative effect. The debris added to the stream could become an obstruction to the floater limiting their use of the stream until it decays or breaks up into smaller pieces.

Special Use Permits

There are a number of access roads and utility corridors, in addition two gas well permits fall within the proposed treatment areas of the Fuels EA. There would be no negative effects associated with Special Uses in the project area for any treatments. Proposed treatments are expected to control NNIS, increase sight distances and generally reduce the amount of brush giving a more open appearance in and around the permitted area. However, the Special Use Permit holder could be temporarily affected during implementation of treatments by increased traffic on their access roads resulting a potential negative experience.

Cumulative Effects

The project area has some overlap with previous decisions which are being implemented. These proposals would increase the overall managed recreational experience by temporarily opening more roads, (life of timber sales and other vegetative treatment contracts) 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. The potential negative effects from the Proposed Action 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 RLRMP under Recreation Opportunity Spectrum and the Scenic Integrity Objectives. Since 88 % of the proposed treatment areas are light intensity management, designed to reduce under growth, and promote the health of the area by reducing competition, these activities generally have a positive effect on the recreational user and enhances the visual quality.

Alternative 1 No Action

Direct/Indirect

Under this alternative the recreational effects would remain as they currently exist. No additional activities would be implemented. There would be no improved access (brush/understory), no enhanced wildlife viewing opportunities, or no increased sight distances would occur. In the short term there would be no noticeable effects, however, over time, ten years or more and with lack of management declining health and vigor would continue to put the ecosystems at risk of insects, disease and catastrophic wildfire. The long term effects would have a negative impact on the scenic integrity and recreational opportunities.

Cumulative Effects
No additional activities would be implemented. The continuation of previous decisions would continue to be implemented for the life of the decision. Management activities would decrease and halt resulting in the continual decline of diversity in the forest as the vertical and horizontal contrast disappears. The overall recreational experience and visual opportunity would decline.

Alternative 2

Direct/Indirect and Cumulative Effects
This alternative has the same vegetative treatments as the Proposed Action. The difference is manual methods would replace the proposed chemical methods. The effects between the Proposed Action and Alternative 2 are negligible for recreation and visuals, so they were analyzed together.

E. Vegetation

Background

The primary reason for initiating the Fuels Management Project is to prevent catastrophic wildfires, reduce forest health threats, increase forest community diversity, and restore ecosystems to a disturbance resilient state. “Altered fire regimes and past land management activities have led to a significant increase in fuel loads and tree densities, a shift in species composition, and a decline in forest health” (Andre 2009). The Ozark-St. Francis National Forests uses an ecosystem management strategy that shifts the emphasis from managing for outputs of ecosystems to maintaining the structure and function of ecosystems through time and for the benefit of present and future generations (RLRMP1-12). This is accomplished through prescribed burning, timber management, and other management activities to move towards the desired conditions as outlined by the Forest Plan.

The Fuels Management Project is located inside the Boston Mountains Ecoregion, an area that is a fire-dependent ecosystem. The forest covering the Boston Mountains was first explored and utilized by Native Americans approximately 10,000 years ago. It is believed that these people used fire on the forested landscape to make travel easier, improve habitat conditions for game and berry production, drive big game animals for hunting, and eventually to clear land to cultivate crops. Accounts of early travelers through northern Arkansas frequently describe wildfires and large burned over areas as being common. (Guyette 2003). Historically, natural and anthropogenic caused fires helped to maintain a greater diversity of forested conditions that included open woodland and savannah community types with sparse mid-stories and a lush

understory dominated by forbs and grasses. (Wright and Bailey 1982, Frost 1998) These conditions were perpetuated by frequent low to moderate intensity fires that quickly carried through the understory of light fuels, keeping the fuel load from accumulating.

Before European settlement, the historic fire regime bolstered forest health and diversity by having frequent landscape scale fires. Areas of frequent low to moderate intensity fires prevented the forest canopy from closing by causing sporadic mortality and relegated the midstory. These gaps allowed sunlight to filter through the canopy onto the forest floor sufficiently enough to support grasses and forbs. The openness of the overstory canopy reduced tree stress by freeing up water, nutrients, and space to expand crowns. Trees under these environmental conditions grow vigorously and are more resilient to insects and diseases. The mean fire return interval for the period of 1680-1820 ranged from 4.6 to 16 years, for the period of 1821-1880 ranged from 2 to 3.1 years, and for the period of 1881-1920 ranged from 1.4 to 5 years. From 1921-2000 mean fire return interval for these study sites ranged from 62-80 years (Guyette and Spetich 2003, Engbring et al. 2008). During European settlement of the Ozarks, fire was adopted as a tool for managing vegetative conditions. "Homesteaders used fire to clear land, to kill insects, and to open the woods for grazing and hunting (Bass 1981)." This practice continued up until the creation of the Ozark National Forest.

Exclusion and suppression of all fires began during the early 1900's and has resulted in changes to the vegetation composition, plant diversity, stand density, and structure of forest communities. This period of fire exclusion has allowed shade tolerant and fire intolerant species to proliferate in the mid and understory through the process of mesophication (See Figure 5 below). Red maple has become nearly ubiquitous across sites of widely varying light, moisture, and nutrient availability. This distribution is in stark contrast to the limited distribution of red maple reported in pre-European settlement forests, where it occurred mainly in poorly drained areas (Abrams 1998)." In the sub-canopy of mature pine-oak forest in Arkansas, red maple density increased by more than 300% between 1950's and early 1990's (Nowacki, 2008, Abrams 1998). The mature overstory is mostly closed now from lack of fire, causing stress from competition for sunlight, water, nutrients, and growing space. These conditions favor shade tolerant and fire intolerant species to become established and thrive, and outcompete pine, hickory, and oak seedlings and saplings. "Oak and pine are aggressively replaced by mesophytic and later-successional hardwood species, such as red maple, sugar maple, beech, blackgum, and black cherry. Forest microenvironments, in turn, become shadier, cooler, and moister. The leaf litter of these replacement species is less flammable and more rapidly mineralized than that of oaks and pine. Reinforcing the lack of fire and the mesophication of eastern forests" (Nowacki 2008). The dramatic density increase of shade tolerant and fire intolerant species has altered the fuel loading, prescribed burning effects, and recruitment of desirable saplings.

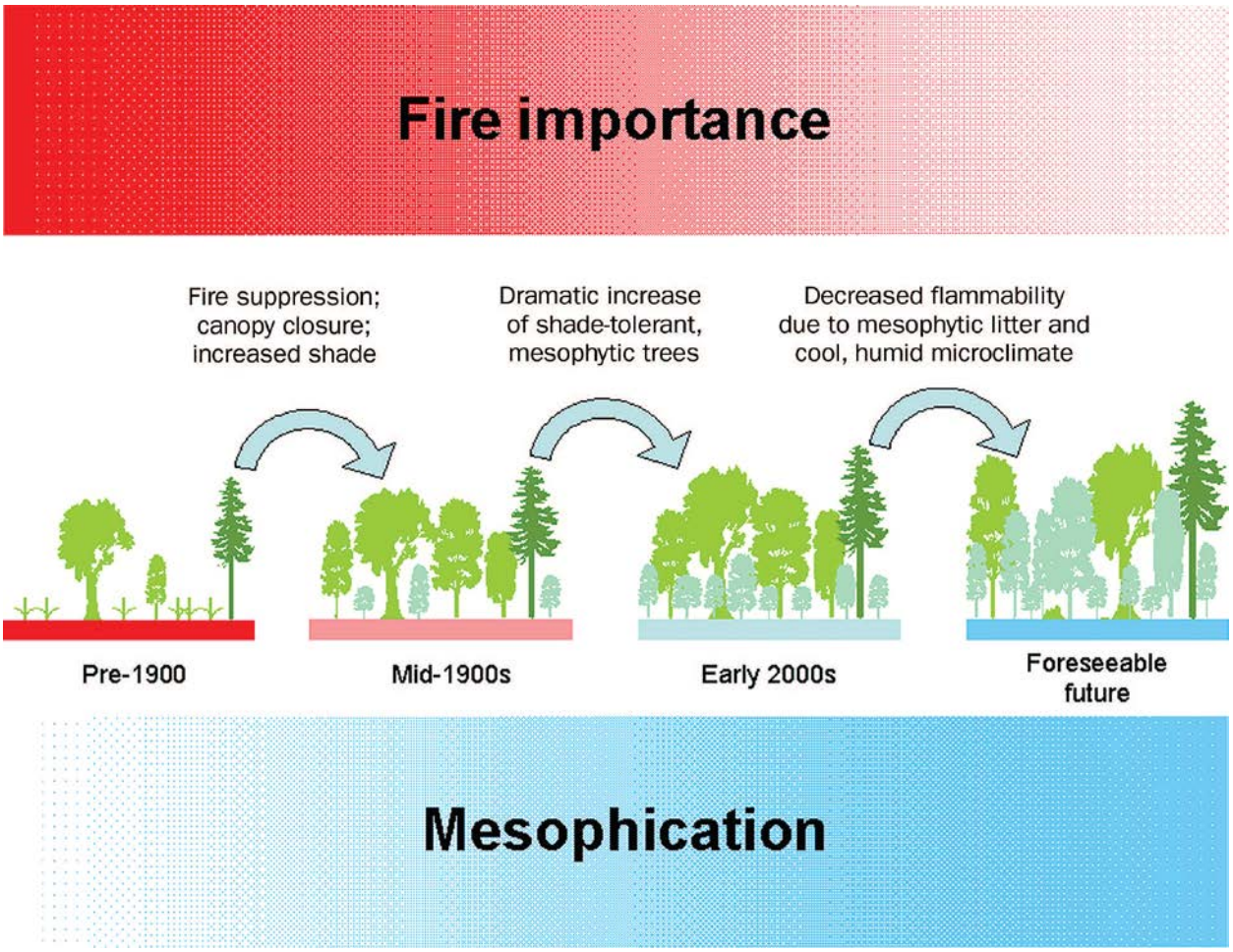

Figure 5. Temporal changes in fire importance (fire frequency and severity) and mesophication (development of cool, moist understory conditions) for oak-pine ecosystems in the eastern United States. Olive green trees represent oaks, dark green trees represent pines, and aquamarine trees represent mesophytic species (e.g., red maple). (Nowacki 2008)

The Ozark Interior Highlands, and specifically the Boston Mountain Ecoregion is generally characterized as hilly to mountainous topography on Paleozoic substrates dominated by upland hardwoods and upland pine-hardwood forests. (Foti 1998) The vast majority of this area was commercially logged during the period of European settlement 1890's to early 1900's, and deforestation on a landscape scale occurred when railroads entered the region. By the 1930's, almost all the virgin timber had been cut. Majority of Hardwood stands are now 90+ years old, and many of the abandoned farm fields and pastures were planted by the Forest Service in the 1960's with shortleaf pine.

Shortleaf pine and most oak species have evolved and adapted strategic biological characteristics to enable them to be fire tolerant and disturbance dependent. Oak and shortleaf pine seedlings initially focus energy into growing roots which makes stump sprouting possible in response to being top-killed by fire or browsed by wildlife. Fire intolerant tree species put growth into the above ground stem in an effort to outcompete disturbance dependent species for light and position dominance- thus shading out competition. Frequent disturbance events encourages

advanced regeneration (vigorous seedlings) of oaks and pine "banked" in the mid and understory that are able to respond to gaps in the canopy and grow into the overstory. (Loftis 2004, Johnson 2002) Shortleaf pine and oak regeneration needs adequate light filtering down through the overstory canopy to maintain vigorous growth. The lack of frequent fire and other disturbances since the current forest was established has allowed species such as red maple to become widely established outside of its environmental niche along waterways and mesic slope positions. Red maple and other shade tolerant and fire intolerant species have created a dense midstory and understory that creates dark shady conditions that prohibit desirable species from becoming established or vigorous enough to respond to a gap in the canopy. (Abrams 2008)

Existing Conditions

On the Ozark National Forest, northern red oak, southern red oak, white oak and hickories usually dominate the overstory canopy in the uplands, but shortleaf pine grows on the drier south and west facing slopes. The northern most half of the Big Piney Ranger District is primarily covered by the oak-hickory community type and the southern half is dominated by shortleaf pine-oak community types. Approximately 75% of the Big Piney Ranger District's forest is over 70 years old, creating conditions favorable for the development of oak decline events due to advanced age, overstocked stands, poor site quality, and other environmental factors. Within these community types there is a range of conditions from open savanna woodlands to closed canopy forest with multiple dense vertical strata. "Within Ozark National Forest approximately 68,000 acres are susceptible to ***high levels (greater than 25%) of overall*** tree mortality." assuming no active management during a 15-year time frame. (Wargo 1983)" The majority of these acres have been in the closed canopy and densely stocked conditions for many years now. Mortality in the oak forest community creates a serious and persistent problem that should be addressed in the near future. (Rossen 2014)

Several areas within this project area have received various forest management practices including prescribed fire in the recent past and are trending to the desired future conditions. However, due to the constraints of weather conditions required to conduct prescribed burns safely and achieve the desired results, there are very few days that are conducive for burning. That coupled with limited qualified personnel it becomes difficult to conduct landscape size burns in an efficient manner. There has also been in increase in rural development on private lands making smoke management and fire control line placement more critical. This created the need for a surrogate for prescribed burning for areas not in prescribed burn blocks or in areas where the vegetative conditions make it hazardous. Management activities simulate disturbance events that historically maintained ecosystems, created diversity in terms of vertical and horizontal structure heterogeneity across landscapes. Using manual (chainsaws), mechanical (masticator heads on heavy equipment), and chemical (herbicides) methods makes it possible to move towards the range of desired future conditions in areas where large prescribed burns are not feasible due to smoke issues, private land inholdings, or where the fuel arrangement and loading make it unsafe.

Wildfires have been excluded from the Big Piney Ranger District due to an aggressive fire suppression program. This long period of fire exclusion has allowed shade tolerant and fire intolerant species to proliferate in the mid and understory. Fire intolerant species such as red maple (*Acer rubrum*) often dominate the sapling and midstory layer creating dense shade

conditions. In contrast, oaks (*Quercus* spp.) are disturbance dependent species (Abrams 1996). The mature overstory canopy is mostly closed now from the period of fire exclusion causing stress from competition for sunlight, water, nutrients, and growing space. These conditions favor shade tolerant and fire intolerant species (mesophication) to become established and thrive under the main canopy, and outcompete oak, hickory, and pine seedlings and saplings. (Chapman et al.) The landscape is currently lacking adequate amounts of advanced regeneration of desirable species to become the next cohort when a disturbance occurs, thus diminishing resiliency. The understory is predominately comprised of woody stemmed plants that restrict the presence of native grasses and forbs to scattered sparse clumps.

Current heavy buildup of fuels, combined with an increasing human population establishing their presence in the wildlands are resulting in significant threats and increased potential for wildfires that can destroy homes, adversely impact forest resources, and pose more dangerous situations for firefighters and the public. Existing ecological conditions in the project areas include dense, overstocked stands, a shift from historic plant community composition toward fire intolerant plant species in former woodlands, and a lack of herbaceous species diversity. This has led to dangerous amounts of ladder fuels, and increased fuel loading. Models such as LANDFIRE indicate that this landscape is in condition class II and III, meaning it has departed from the reference condition for vegetation, fuels, and disturbance regimes. (See Chapter 1 page 10 of this document for detailed explanation of condition class).

With the implementation of prescribed burns and silvicultural treatments, particularly in areas such as the Woodland Ecosystem Project and Collaborative Forest Landscape Restoration Program, progress has been made to restoring historical vegetative conditions. A shift in species composition and structure has been identified through monitoring plots established by The Nature Conservancy in several prescribed burn blocks. (Zollner 2010) “Restoring fire to oak-dominated ecosystems in the eastern United Sates has the potential to increased groundcover plant diversity, both in terms of increased species richness and, more importantly, increased abundance of regional endemics indicative of rare habitats. Prescribed burning alone, however, most likely will not greatly increase diversity in the short term.” (Brewer 2016). Before prescribed burning efforts, some areas had a blanket of poison ivy and now those areas have much higher plant diversity that includes more grasses, forbs, sedges, and native flowers.

Oak decline is a complex interaction of predisposing forest/tree conditions (advanced age, overstocked, or physical damage), environmental stressors (drought), insect outbreaks, and diseases that in combination reduces forest health on a landscape scale and results in tree mortality. Many of these conditions are currently present across the landscape. Several past salvage operations have occurred in response to red oak borer outbreaks and ice storms in easily accessible stands and along roads in an effort improve forest health by harvesting heavily damaged, dying, and dead trees. These events can and do occur periodically and usually require intervention due to historical factors influencing the landscape that have led to the current conditions found across the district. Control efforts focus on reducing or preventing the predisposing stress factors that can be managed. Thinning can reduce competition for moisture and nutrients and promote better physiological condition of the remaining trees. Silvicultural practices designed remove weak and dying trees, and to encourage species best adapted to the site can help reduce the effects of environmental and biological forest threats. (Wargo 1983)

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. "Nonnative invasive species pose a serious risk to North American forest ecosystems, threatening to change existing ecological trajectories, suppress rare and endangered native species, reduce productivity, and biodiversity, and damage wildlife habitat (Chornesky et al. 2005)". "A concerted, long-term, integrated effort is necessary if we are to sustain environmental quality (Moser et al. 2009)". Several nonnative 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 julibrissin*), Tree of Heaven (*Ailanthus altissima*), and Japanese stiltgrass (*Microstegium vimineum)*.

Glades are natural openings in a woodland landscape with usually less than 30% tree canopy on exposed slopes or ridges with unique plant assemblages. Glades typically have bedrock outcroppings and thin rocky soil. "Historically, periodic fire kept woody encroachment under control; however, with fire suppression glades and the surrounding woodland communities were engulfed by eastern red cedar and other woody vegetation. Many large "cedar thickets" seen on Ozark hillsides today are actually degraded glade and woodland communities where on small, isolated openings native grasses and wildflowers can still be found. (NRCS MO)" Many herbaceous and woody plant species have become naturalized to glades with the altered environment that is present due to lack of fire and encroachment of dense tree canopies. The remnant populations of unique plant communities endemic to these glades are disappearing due to the lack of frequent fire maintaining the ecosystem. Eastern red cedar and hardwoods not usually found on glades have colonized these areas and altered the species composition and vegetative structure, reducing plant and animal diversity and ecological goods and services provided by these unique communities.

Scope of analysis will use the spatial boundaries of the project areas to evaluate direct and indirect consequences of management activities because this is the area that would be directly impacted by the proposed action and the alternatives. The temporal boundary used to assess the direct, indirect, and cumulative effects is 10 years because it is anticipated that it will take this long to completely implement the activities and the effects to vegetation would be diminishing. For cumulative impacts the spatial boundary used is the Big Piney Ranger District, the Koen Experimental Forest and adjoining Buffalo National River Park Service land that has planned restoration activities.

In the Hurricane Creek Watershed there has been a series of events like the red oak borer epidemic, ice storms, late frosts, drought, coupled with an overabundance of mature trees, has culminated into an outbreak of oak decline. Some stands have had salvage activities that removed dead or likely to die trees over the last 10 years. The salvage operations did not regenerate any areas, they reduced the basal area similar to commercial thinning levels. For this reason nine compartments in Hurricane watershed plus one compartment in the Big Piney watershed will be used as the spatial boundary because this is the extent where the effects information would be measurable and meaningful. The temporal boundary for the cumulative

effects used is three years prior and ten years into the future because that is the timeframe in which activities should be completed and the effects on vegetation should diminish.

Removal of hazardous vegetation at the 19 acre White Oak Communications Site would improve reliability of communications and safety for equipment and people. It is an administrative site that would be maintained in an herbaceous state for the foreseeable future using a combination or individual treatments such as herbicides, mechanical, manual, or prescribed burning, therefore will not be considered further in the effects analysis.

The creation of 37 miles of new fire control line, 24 miles of existing fire control line maintenance, reconstruction of 10 miles of road, maintenance on 248 miles of road, decommissioning of 30 miles of road, closure of 38 miles of road would have negligible effects on vegetation because they already exist or would only require the removal of non-overstory vegetation. Construction of 20 miles of temporary roads to access timber stands would remove individual trees and would not affect age class distribution or stand structure and therefore it will not be included in any further vegetation analysis.

Placement of large woody debris along 100 miles of secondary streams at a rate of up to 10 per mile would result in negligible effects to vegetation over the project area since the gap in the canopy would be temporary as the space is occupied by adjacent tree crowns. Similar effects could be expected with the construction/reconstruction of 7 wildlife ponds and the reconstruction of the Deer Pond dam, so they will be excluded from further analysis.

Proposed Action (PA)

Effects of Prescribed Burning on Vegetation

Direct Effects
This alternative involves prescribed burning on approximately 90,987 acres of Forest Service land. When an area is prescribed burned during specific environmental conditions the desired effects can be attained. Reducing small (.1 to 2 inch basal diameter) stem density, favor fire tolerant seedlings and saplings, reduce the litter layer, ladder fuels, slash, down timber, and standing snags would be expected. "Oaks have many disturbance-type adaptations that confer protection from fire, such as root-centered growth, thick bark, vigorous sprouting ability, and well-protected buds (Fan and Dey 2009)". Occasionally mature trees could receive damage to roots or the lower bole. "Prescribed fire is useful for sustaining oak forests, but it must be used judiciously to minimize timber damage and decreases in value" (Dey 2012).

Indirect Effects
Prescribed burning would reduce accumulations of hazardous fuels, encourage advanced oak regeneration, encourage natural regeneration of pine, reduce shade tolerant and fire intolerant species, and maintain stands to more sustainable levels of tree stocking. "Fire still has a role to play in preparing sites for oak seedling establishment and in controlling competing vegetation as oak regeneration develops the ability to maintain its dominance in young stands"(Dey 2014). Understory vegetation diversity would be increased which would increase wildlife foraging and habitat opportunities. Nutrient cycling would increase, freeing up elements for plants to uptake. A surge in the herbaceous layer would occur due to increased sunlight caused by the reduction of the midstory. Many woody species would resprout with multiple vigorous new shoots, while others would not.

Forested areas and woodlands that have been thinned to the desired basal area allow greater amounts of sunlight to reach the forest floor, stimulating herbaceous and woody plant growth. These plants become fine fuels which burn faster and flashier, but have less flame duration, which limits damage to the residual stand, and increases the number of days conducive for prescribe burning

Prescribed fire can damage fire adapted tree species causing open scars, scorched leaves or needles, and damage shallow roots. However, prescribed burns are planned and carried out only under ideal environmental conditions and using various ignition patterns that regulates fire intensity, length of burn time, flame height, rate of spread, and target fuels to be consumed (leaf litter, 1 and 100 hour fuels, small diameter live stems). Occasionally, there could be a large amount of fuels near the base of a mature tree that when burned could cause severe damage and result in mortality. "Burned areas can also create favorable conditions for NNIS to become established and spread by creating by removing leaf litter buildup. Reintroducing fire to oak ecosystems may increase susceptibility to nonnative plant invasion which may impede the restorative effects of burning" (Rebbeck 2012).

Cumulative Effects

Prescribe burning if implemented enough times and on a large enough scale could move the landscape toward Condition Class one (See page I-10, C. Other Developmental Forces in this document) where currently the Condition Class is at two or three. To make a moderate shift in the condition class it would take repeated prescribed burns and possibly a combination of other silvicultural treatments. Some predict that repeated burning alone will not be an effective tool to reduce the abundance of red maple due to the ability of this species to sprout prolifically following topkill of the main stem (Clark and Schweitzer 2013). Prescribe burning an area once does have environmentally beneficial effects, it reduces and removes fuel, creates space for herbaceous plants to grow, recycles nutrients back into the soil, and top kills some of the smaller woody stems (less than 3" diameter). Effects from a one-time prescribed burn however, only have a temporary effect. A single prescribed fire can significantly modify the height structure of the woody understory in upland oak forests for up to 3 years, but it does little to alter the species composition of the advance regeneration (Dey and Hartman 2005). If an area is not burned, woody plants re-sprout and the midstory reestablishes, shading out the herbaceous layer. The process of mesophication continues, favoring shade tolerant species such as red maple. "Overall, repeated burning in the dormant season reduces understory structure and favors oak regeneration" (Dey 2014). Returning fire periodically coupled with thinning of stands to reduce overstory density and managing the growth of understory shrubs and saplings while the herbaceous layer develops is the best way to restore degraded woodlands (Peterson and Reich 2001).

Effects of Proposed Action Activities on Age Class Distribution

Age class distribution would only be impacted by the PA and Alternatives in the Hurricane (9 Compartments) and Piney watersheds (1 Compartment), since all of the proposed regeneration areas and wildlife openings are located in these compartments. Outside of the Hurricane and Big piney watershed, thinning is the only treatment proposed and those do not affect the overall age class distribution. For these reasons the direct, indirect, and cumulative effects for the PA and Alternatives on age class distribution will be confined to Forest Service land that lies in those 10 compartments in the Hurricane and Piney watersheds. This area was severely damaged by the 2009 ice storm, and red oak borer epidemic in the early 2000's. Some hardwood regeneration areas would exceed the normal 40 acre limit due to the devastating affects created by the events mentioned above. (RLRMP FW02)

Direct Effects

The proposed activities of 1,507 acres of pine and hardwood regeneration harvests and 124 acres of wildlife opening construction/reconstruction would shift current age class distribution (Figure 6) from older age classes into the 0-10 year age class. This would be below 30% of 1,000 acres in the 0-20 age class threshold set by the forest plan (RLRMP FW04). There are no planned forest type conversions that would change the forest type classification of an area.

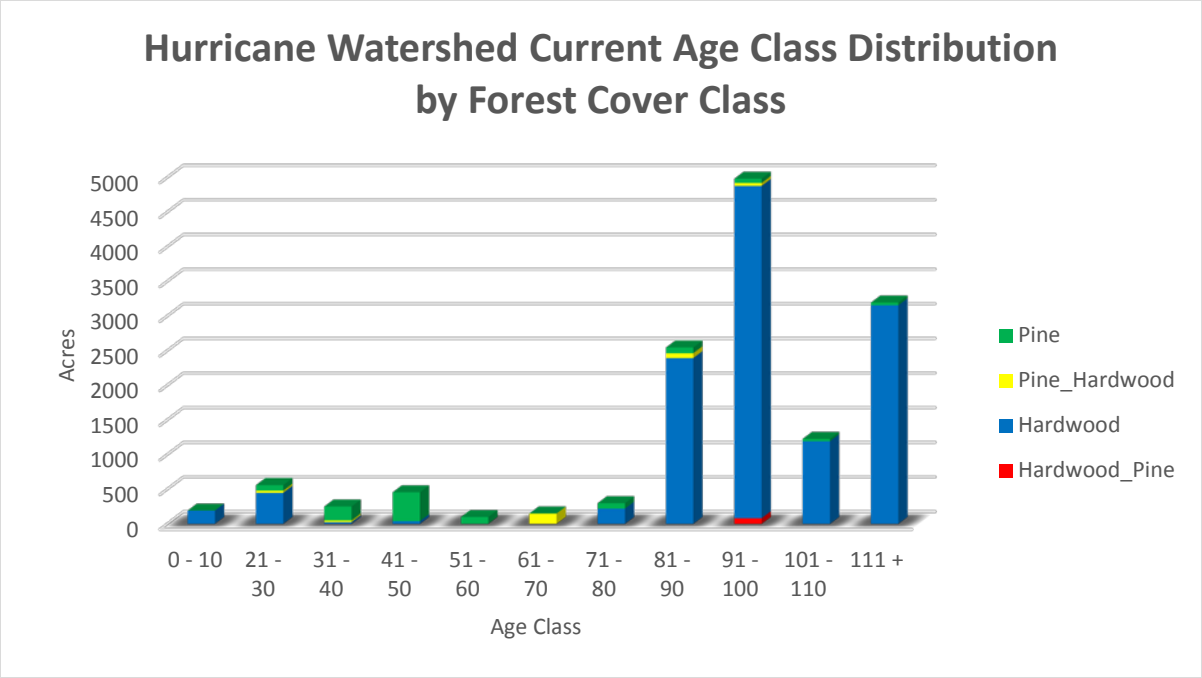

Figure 6: Current Age Class Distribution for Hurricane watershed and one watershed in upper Piney Creek.

Potentially 500 acres of additional commercial timber harvest could occur if there is a significant natural disturbance. Depending on the severity and extent of the disturbance event there could be an additional 500 acres of salvage harvests that all or part could be added to the 0-10 year age class. Additional herbicide treatments may be used to reduce vegetative competition to facilitate reforestation and release activities if the need for planting desirable species exist or to encourage the growth of existing seedlings and saplings.

Indirect Effects

The proposed actions would increase age class diversity by shifting a total of 1,631 acres across several age classes to the 0-10 year age class through regeneration harvests and wildlife openings. The wildlife openings encourage a diversity of herbaceous species by being maintained in an early seral state. Overall forest health and vigor would be increased. Younger age classes tend to exhibit more vigorous growth while increased age class diversity helps limit most disease or insect attacks that occur because of the differences in stand structure, age, and composition across the landscape. Additional acres could be added to the 0-10 age class by a severe natural disturbance, which up to 500 acres of commercial timber could be harvested through salvage operations to remove dead, dying, or damaged trees in an effort to remove potential host trees for insect and diseases.

Cumulative Effects

There are no known activities occurring on private land within this particular focus area that would add to the effects of the proposed action.

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 this particular project area by shifting older age classes to the 0-10 year age class by a total of 1,631 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 the spread of diseases or insect outbreaks that occur, because of the differences in stand structure, vigor, and composition. Forest pests usually attack older, stressed trees, and are less damaging to trees that are growing vigorously. Young stands growing vigorously would result in increased resistance to forest pests such as Southern pine beetle and widespread oak decline.

If a severe large scale disturbance occurs up to 500 acres could be harvested during salvage operations to maintain forest health by removing potential host trees for insects and disease.

Effects of Proposed Action on Vegetation

Direct Effects

Under the Proposed Action approximately 13,264 acres of commercial thinning would occur across the project area. Stocking levels would be reduced to approximately 60-80 ft^2 of residual basal area. Thinning operations, whether they are commercial or non-commercial, focuses on trees that are suppressed/low vigor, have physical damage, are diseased, or are poorly formed to be removed first. Next, trees which are directly competing with desired trees would be removed. If the target stocking level has not been met under the first two conditions, otherwise healthy appearing trees may be removed based on spacing to reduce competition for sunlight, water, nutrients, and growing space. The residual trees remaining are the larger and often the healthiest and most vigorous trees in the stand due to the position of their crowns in the canopy.

Other non-commercial activities such as woodland restoration, wildlife opening buffers, native cane enhancement/restoration, firewood cutting areas, and timber stand improvement would involve the treatment of existing vegetation to reduce stocking levels. These treatments would use methods such as manual, mechanical, or herbicide application to modify species composition, reduce density, adjust vertical and horizontal structure, reduce ladder fuels, and fuel arrangement. Temporary increases in fuel loading due to activities would occur.

Potentially 500 acres of additional commercial timber harvest could occur if there is a significant natural disturbance. Depending on the severity and extent of the disturbance event there could be an additional 500 acres of salvage harvests that all or part could be added to the commercial thinning harvest total.

Indirect Effects

Commercial thinning operations on 13,264 acres 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 and allow fire adapted species such as oak to become established. "The decrease in oak regeneration potential must be reversed through active management using combinations of fire, thinning, and timber harvesting" (Dey 2005). This would increase the diversity of plant species present within the forest understory as well as increase the amount of available forage for wildlife species. Salvage operations if needed would help to maintain forest health by removing dead, dying, or damaged trees that encourage possible insect or disease outbreaks. Temporary increases in fuel loading would be expected from thinning activities, however once the small trees and limbs decay or consumed by prescribed fire, hazardous ladder fuels would be reduced.

Thinned areas within prescribed burn blocks would see a shift in species composition towards fire tolerant species of grasses, trees, and shrubs. It would result in a robust herbaceous layer with a scattering of tree seedlings and saplings, and occasional patches of shrubs that would be maintained with a combination of treatments including herbicide. Herbicides are efficient and are directly applied to target vegetation at the lowest effective rate determined by the label and past experience with the range of conditions encountered. The treated midstory trees would not sprout and would stay standing for some time and would eventually fall over and/or be consumed over multiple prescribed burns.

The proposed action has some commercial and non-commercial vegetation management that would occur outside of prescribed burn units. These areas with vegetative treatments would reduce vegetation initially, but over time if no other control measures are used it could respond by growing back densely. The vegetation in the mid and understories in these areas would have a flush of new growth with the increased amount of sunlight and other resources becoming available. Due to the propensity of many tree and shrub species to grow multiple stump sprouts after being cut the midstory would be reoccupied in several years. Overtime, the overstory trees would expand their crowns to utilize sunlight and would reduce the amount of light filtering beneath the overstory and would start to shade out some species and favor more shade-tolerant vegetation in the mid and understory.

Cumulative Effects

The commercial thinning combined with prescribed burning and other vegetation management techniques such as woodland restoration, wildlife openings, salvage operations, timber stand improvement thinning, seedling release, and pre-commercial thinning would increase and maintain the desired stocking levels across the project area. This would enhance forest health by reducing competition for light and available nutrients, as well as increase the amount of sunlight reaching the forest floor thus, increasing diversity of plant species as well as increasing browse for wildlife species. The proposed prescribed burning and herbicide treatments would help achieve and maintain the lower stocking levels of mid/understory vegetation over time or during periods when prescribed burns could not be implemented. The project area would enhance restoration efforts across the district to improve forest health, increase biodiversity, create a mosaic pattern of forested conditions on the landscape, improve resiliency to disturbances, prevent large scale insect and disease outbreaks, and prevent large catastrophic wildfires.

Fuel loading would increase temporarily with both commercial and non-commercial treatment types, however the smaller vegetative debris would decompose overtime. The larger stems and

limbs would take longer to decompose or become available fuel, but they would be on the ground which would reduce the opportunity to act as ladder fuels during severe wildfires.

Effects of Proposed Action on Nonnative Invasive Species (NNIS)

Direct Effects

Under the Proposed Action, up to 2,500 acres per year of NNIS populations could be treated. Invasive populations usually occur in patches, therefore the actual area having herbicides applied would be substantially smaller. Identified populations would be treated with a combination of herbicide application, prescribed burning, manual, or mechanical treatments. The most effective and efficient method of NNIS treatment is using herbicides. "Most nonnative invasive plants in the South are perennials with extensive roots, tubers, or rhizomes. This means that effective herbicide applications offer the best means of containment or eradication, because herbicides can kill roots without baring soil-bared soil is susceptible to reinvasion and erosion. (Miller 2010)" "Decades of research has found that herbicides tested and registered with the U.S. Environmental Protection Agency (EPA) are safe to humans and other animals when stored, transported, and applied according to strict label directions"(Miller 2010). See Chapter II and Wildlife and Soil sections for detailed information on herbicides.

Indirect Effects

Ground disturbing activities such as timber harvesting, 20 miles temporary road construction, 248 miles road maintenance, 10 miles road reconstruction, 37 miles (bulldoze) fire control line construction, 24 miles fire control line maintenance, and construction of 124 acres wildlife openings could increase the population and spread of nonnative invasive species by destroying individual stems which could result in prolific sprouting. These activities could also provide favorable conditions for NNIS populations to spread and seeds to germinate. Mechanical equipment could dislodge seeds and transport them to unaffected areas. Chemically 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 NNIS 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 nonnative invasive plants during project implementation.

Once NNIS populations are reduced or eradicated, plant diversity could 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 subsequent years. Re-establishment of native vegetative cover is key to preventing the re-infestation of NNIS populations.

Cumulative Effects

Reduction of NNIS allows native species that had been temporarily displaced from the area to become re-established. Activities such as road maintenance, fire control line construction, and

recreational vehicles, could transport NNIS seeds to uninfected parts of the project area or district. However, by treating existing populations of NNIS and allowing native vegetation to become re-established, future infestations and spread of NNIS could be reduced or eliminated. Treatment of NNIS in the project area could help keep NNIS from spreading onto private lands in the project area.

Herbicides have been used successfully on the district in the past to control NNIS mainly along roads and wildlife openings in the past. Some of these areas could be treated again within the project area. NNIS, depending on the species, may need multiple treatments in consecutive years for plants that sprout from the seed-bank or from stumps. Treating NNIS with herbicides that are mixed to a dilution that is the most effective and uses the lowest concentrations possible, while staying below the label's maximum suggested rate, is the most efficient management tool. The herbicides proposed for use break down readily in the environment and have short half-lives. Herbicides are not expected to persist or accumulate in the environment when applied on a yearly basis. Cumulatively, these treatments would shift the species composition and structure to native plant populations.

The maximum possible acres of NNIS to be treated per year under other active EA decisions is 2,500. Those acres plus the 2,500 acres proposed annually would be 5,000 acres.

Effects of Proposed Action on Glade Restoration

Direct Effects

There are 12 separate areas that total 300 acres where glade restoration would occur. The first step begins with the removal of undesirable vegetation, primarily eastern red cedar, non-glade related hardwoods (red maple, black gum, flowering dogwood, etc.), and nonnative invasive plant species. This would be accomplished using manual treatments with chainsaws and/or herbicide, or some instances a mechanical masticator. Using prescribed fire alone may not be sufficient to accomplish restoration of groundcover plant species diversity and composition indicative of fire-maintained ecosystems. (Brewer 2016) Multiple herbicide and manual treatments may be needed to control re-sprouting of woody species and nonnative invasive plants, along with repeated prescribed fire to achieve desired conditions (Comer 2011, Miller 2010). Tree cover would be reduced to 10 - 40 ft^2 of residual basal per acre, allowing sunlight to reach the ground. The cedar may be sold commercially if a demand exists. Otherwise the resulting slash would be piled or scattered such that it would be consumed by prescribed burns. The glades would have prescribed fire used to reduce fuel loading and leaf litter, promote native grasses and forbs, and control eastern red cedar encroachment. Prescribed burning and thinning would restore vegetative structure and enhance species diversity.

Indirect Effects

Indirect effects on the glades would be a shift in species composition to fire tolerant plants in the herbaceous layer, reduced competition from shade tolerant and fire intolerant plants. The glades would visually appear open, so that a person could see across the glade with few to no trees obstructing the view.

The increased amount of sunlight reaching the ground would allow the sparse herbaceous layer to respond and be restored to the historical native plant communities common to glades. Also, many species of native plants are likely waiting in the seedbed for conducive environmental conditions to sprout, as seen from other glade restoration efforts in Arkansas and Missouri. An increase in herbaceous plant diversity and abundance is likely to occur. Several nonnative invasive plant species that are already present could proliferate under these same conditions if not monitored and controlled with multiple treatments over the life of the project with manual methods and/or herbicides.

These treatments could temporarily increase the fuel loading for several years until decomposition and prescribed fire reduce or consume the fuels. Prescribed burns would encourage fire tolerant species that historically were found in abundance in glades to spread and have a greater density. Burning would also reduce the density and the extent of fire intolerant and shade tolerant species that have become well established under the current conditions. The slash from the overstory trees removed would need to be placed away from the stems of remaining trees so that the heat produced would not damage the remaining trees or harm shallow root systems.

Cumulative Effects

The health and resiliency of glade ecosystems would be restored and provide greater plant diversity. Species composition would shift towards historical native glade plant species presence and abundance that are endemic to glade/woodland complexes through the use of fire, herbicide, manual, and mechanical means. Changes in vegetative structure and arrangement would provide conditions necessary for endemic glade plants and wildflowers that can only be found in these unique and disappearing communities to proliferate. Restoring these rare and disappearing ecosystems would create a mosaic patchwork of community types and increase forest health. Using management techniques to reduce the amount of eastern red cedar and by altering the spatial arrangement of it would prevent a wildfire or prescribed burn from consuming all the vegetation.

Glade/woodland complex restoration could provide connectivity between glade/woodland ecosystem complexes on a landscape level. In conjunction with the glade restoration activities on the Koen Experimental Forest a 248 acre prescribed burn is proposed, along with the Park Service-Buffalo National River conducting 314 acres of prescribed burning and glade/woodland complex restoration work on adjacent land to the Koen. The proposed prescribed burn would be in cooperation with the Park Service and would be completed at the same time, allowing the use of natural firebreaks (Buffalo River) and roads.

Alternative 1 (No Action)

Under this alternative natural processes would continue and provide a basis for comparison for the action alternatives. The only trees that would be cut are those posing a threat to the public and agency employees, or approved in other decisions. Hazard trees are usually limited to those trees near state, county, Forest Service roads, designated trails, fire control lines, and recreation areas. Commercial timber harvesting, non-commercial treatments, and herbicide use for

controlling woody species and NNIS would continue on areas of the project that have already been approved in previous decisions.

Effects of Alternative 1 on Prescribed Burning

Direct Effects
This alternative would not implement prescribed burning on approximately 90,987 acres, resulting in no direct effects of prescribed burning to vegetation.

Indirect Effects
Fuel loading would not decrease, increasing possible extreme wildfire behavior and risk involved with wildfire suppression. This could lead to more acres being consumed by fire and greater tree mortality. Species composition would continue to deviate from historical communities and mesophication would continue. Fire Regime Condition Class would remain the same or become further skewed away from the historic condition. This could eventually lead to lower hard mast production as oaks and hickory are replaced by fire intolerant and shade tolerant species. Glades would not be restored and the unique remnant populations of glade species would continue to diminish in size and numbers. Easter red cedar and other non-glade species would continue to encroach and shade out the herbaceous layer. "Hands-off management will result in declines in species richness for landscapes once dominated by fire-adapted ecosystems due to the homogenization process" (Nelson 2012).

Cumulative Effects
Fuel loading and the amount of ladder fuels would continue to increase and escalate the potential for a catastrophic wildfires. Forest health and resiliency would continue to decline. Species composition would shift through the process of mesophication and plant diversity would continue to decline.

Private lands would likely continue with current levels of management using prescribed burns. Most private land prescribed burns are relatively small and constrained by size of property, available personnel and equipment resources. Restoration work is a long term commitment to enhance the natural community ecosystems and to maintain them. Government agencies are most likely to be able to continue this work for several decades that it may take to reestablish some of the ecosystems. Private landowners tend not to be able to make this long-term commitment. Changes in ownership or the ability of the landowners to continue doing the work due to age or financial constraints can change how their land is managed.

Effects of Alternative 1 on Age Class Distribution

Direct Effects
No activities are proposed under this alternative, therefore no direct effects to age class distribution within the project area would occur.

Indirect Effects
The current acres in the 0-10 age class would continue to age and develop into a mid-seral stage, no longer providing the open habitat dominated by grasses, forbs, shrubs, tree seedlings and

saplings. 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. The large amount of 90-100 year old age-class would move into the 100-110 year old age-class before the next entry cycle. This would continue to reduce overall Forest health and vigor

In the absence of fire and regeneration harvests, overall forest health would be at greater risk due to competition for resources which stresses trees and makes them more susceptible to insects such as the Southern pine beetle and complexes like oak decline. Natural environmental or biological disturbances may occur, and if severe enough could convert an older age class stand to the 0-10 year age class. The dead, dying, or damaged trees would invite insects or diseases to become established and could spread to surrounding stands, further reducing forest health. Stand stocking levels would continue to increase leading to density dependent mortality, which is the point in stand development that competition for resources is so great that trees begin to die. With no regeneration harvest more stands would enter the mature age class (70+ years old) adding to the existing heavily skewed mature age class. Mast production would continue to decline as trees compete for resources and space. Increased age class structure and diversity helps limit most disease or insect outbreaks that occur because of the differences in stand structure, species composition, and ages that occur in a mosaic landscape pattern of seral variation. With the increase of stress and advanced age more trees would succumb, and they could become receptive hosts for insects or disease that can turn into an epidemic and affect healthy trees eventually.

Cumulative Effects

Under this alternative, the proposed management activities would not occur. As discussed in the indirect effects section, decreased age class diversity leads to loss of overall forest health and resiliency. 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. Natural disturbances could occur that changes acres to the younger age class, however the damaged timber would be left in place and serve as a vector for insects and disease to become established and spread. The disproportionate amount of mature and older age class would result in decreased forest vigor and increased susceptibility to insects, disease, and mortality.

Effects of Alternative 1 on Vegetation

Direct Effects

No activities are proposed under this alternative, resulting in no effects to vegetation. Forest structure and species composition would remain in the current existing conditions.

Indirect Effects
Under this alternative, no vegetation management activities would occur. The forest would continue to grow resulting in increased stocking levels, competition for sunlight and available nutrients. Forest health would continue to decline along with growth and vigor. The overstory canopy would close and the midstory dominated by shade tolerant and fire intolerant species would drastically increase, reducing the amount light being transmitted to the forest floor. This allows shade tolerant species such as red maple, blackgum, and dogwood to proliferate which further increases shading to the forest floor and prevents grasses and forbs from being able to survive. A dense midstory also hampers the ability of shade intolerant desirable species such as oaks, shortleaf, pine, and hickory from establishing advanced regeneration. The species that are present in the pool of advanced regeneration is what will be free to grow when gaps form in the mature overstory canopy through natural disturbances or tree mortality, and will constitute the species composition in the future. Overtime, the increased competition, combined with the reduction in health and vigor would cause an increase of mortality in over mature, stressed, or suppressed trees and increase the risk of insect or disease outbreaks. Mast/seed production would remain about the same or decrease due to narrowing crowns and low live crown ratios caused by overstocked conditions and competition for growing space. The seeds of most desirable tree species such as oaks and shortleaf pine are disturbance dependent and most likely would not have a conducive environment to become established or maintain vigor, reducing the ability to capture growing space when a mature tree dies or a natural disturbance creates a gap in the canopy.

Cumulative Effects
Under this alternative, forest health would continue to decline. The already overstocked conditions would continue to become even denser, increasing competition and reducing vigor. The overstocked conditions of mature trees would leave the forest susceptible to outbreaks from insects and disease, and oak decline. The lack of prescribed burning would allow fuel loading to increase. Higher fuel loadings would increase the severity and intensity of wildfires. Natural disturbances such as oak decline, insects and disease outbreaks could be more severe and widespread due to the existing conditions that have developed without the historical frequent low intensity disturbances such as fire. The process of mesophication would continue and be expressed by denser mid and understories comprised of shade tolerant and fire intolerant species, which further reduces ecosystem functions, resilience, and does not move towards the range of desired future conditions as outline in the RLRMP.

Effects of Alternative 1 on Nonnative Invasive Species (NNIS)

Direct Effects
Under the no action alternative there would be no management of NNIS, therefore no direct impact to current NNIS populations.

Indirect Effects
By not managing NNIS they would continue grow, expand, and displace native plant populations. Once, established, NNIS threaten the sustainability of native forest composition, structure, function, and resource productivity (Webster and others 2006).Ongoing activities such as road maintenance and recreation vehicles would continue to spread existing populations and

introduce populations of NNIS to new areas. With the absence of any management activities, the NNIS would continue to spread and displace native vegetation. NNIS can alter environmental conditions and prevent native plants from establishing, degrading ecosystem functions and services.

Cumulative Effects
Overtime, current populations would increase in size, density, and number of established populations that could alter ecosystem goods and services. Tree-of-heaven for example, is known to colonize a site and in a matter of years can become a pure stand by outcompeting native vegetation for resources and shading out seedlings of desirable species, perpetuating its survival and dominance into the future. NNIS are a severe threat to forest health and quality habitat. NNIS seeds could get disseminated to private lands where financial and physical ability to manage them is not possible. NNIS are persistent and if left untreated could eventually alter species composition, change forest type, stand structure, alter fire regime condition class, and increase departure from historical vegetative conditions to a point that it would be very difficult to restore.

Effects of Alternative 1 on Glade Restoration

Direct Effects
Under Alternative 1 glades would remain in the present degraded condition.

Indirect Effects
Without fire, glades can be invaded by woody plants, most notably eastern red cedar. NNIS species would continue to invade and outcompete endemic glade plants. Species composition would likely remain similar, but the endemic glade species would continue to struggle to stay present on the sites. The opportunity for a catastrophic wildfire would continue to increase.

Cumulative Effects
Cedar encroachment could deteriorate the conditions many glade dependent species require. Eastern red cedar would continue to invade and dominate glades resulting in dense shade. Eastern red cedar cast needles that form a dense mat and releases chemical compounds that prevents some species from growing, leading to less species diversity and lower prevalence of endemic glade plants and animals. These unique glade plant assemblages could disappear.

Alternative 2 (No Herbicide)

Effects of Prescribed Burning on Vegetation

Direct Effects, Indirect Effects, and Cumulative Effects
For this alternative, the direct, indirect, and cumulative effects would be similar as those listed under the Proposed Action with a few exceptions. The proposed vegetation management activities could still be implemented for this alternative utilizing only manual or mechanical methods instead of the use of herbicides. However, the capacity and cost of using manual treatments to reduce the mid and understory woody vegetation would likely result in the

reduction of acres treated and would take longer to achieve desired conditions. The effects of manual methods only last a couple of years compared to using herbicides that treat the roots of undesirable vegetation and prevent sprouting. Manual reduction of the midstory would allow woody tree species to resprout with multiple vigorous new shoots, and would likely create a dense midstory again in between burning cycles. If an area is not burned on its regular cycle for whatever reason, additional manual treatments may be needed. Using manual methods for noncommercial treatments would also create a continuous layer of available fuels on the ground and around the bases of remaining trees, which could increase fire behavior and fire damage to remaining trees. Whereas treating them with herbicide leaves the stems standing, becoming available fuel over a longer time frame.

Effects of Alternative 2 on Age Class Distribution

Direct Effects, Indirect Effects, and Cumulative Effects
For this alternative, the direct, indirect, and cumulative effects would be similar as those listed under the Proposed Action. The proposed vegetation management activities would be implemented for this alternative utilizing only manual or mechanical methods instead of the use of herbicides. In regenerated stands, using only manual, mechanical, and prescribed fire would be less effective at controlling vegetative competition, hindering the existing or planted seedlings of desirable species to become established or to grow freely.

Usually after a regeneration type harvest a site preparation and release treatment are necessary to reduce competition from the flush of vegetation that occurs so that the desirable seedlings are assured dominance in the future stand. Using methods other than herbicide to achieve the same vegetative conditions is possible for regenerated stands and wildlife openings, however the duration of desired effects would be shortened due to the aggressive stump sprouting by many undesirable species such as red maple, and proliferation of blackberry and green briars. Manual treatments may require several follow up treatments and increase the overall cost to ensure desired stocking levels of oak and pine.

Past experience on the Big Piney Ranger District has shown that manual site preparation techniques for regenerated stands are far less effective at ensuring successful regeneration of desirable species following regeneration harvests. Several follow up manual treatments are often required, making it less economical and efficient compared to using herbicides.

Potentially 500 acres of salvage may need additional manual or prescribed burn treatments to reduce vegetative competition to facilitate reforestation and release activities if the need for planting desirable species exist or to encourage the growth of existing seedlings and saplings.

Effects of Alternative 2 on Vegetation

Direct Effects, Indirect Effects, and Cumulative Effects
For this alternative, the direct, indirect, and cumulative effects would be similar as those listed under the Proposed Action with a few exceptions. Other non-commercial activities such as woodland restoration, wildlife opening buffers, native cane enhancement/restoration, firewood

cutting areas, and timber stand improvement would involve the treatment of existing vegetation to reduce stocking levels. These treatments would use manual or mechanical methods to modify species composition, reduce density, adjust vertical and horizontal structure, reduce ladder fuels, and fuel arrangement. Without the efficiency and effectiveness of herbicides it would be likely that fewer acres would be treated. Temporary increases in fuel loading due to activities would occur.

Thinned areas within prescribed burn blocks would see an eventual shift in species composition towards fire tolerant species of grasses, trees, and shrubs. Fire and manual methods alone are not as effective and can take longer to reach desired conditions compared to using chemicals to control stump sprouting. These treatments eventually could result in a robust herbaceous layer with a scattering of tree seedlings and saplings, and occasional patches of shrubs that could be maintained with a combination manual and prescribed burn treatments.

Alternative 2 has commercial and non-commercial vegetation management that would occur outside of prescribed burn units. These areas with vegetative treatments would reduce vegetation initially, but over time if no other control measures are used it could respond by growing back densely. The vegetation in the mid and understories in these areas would have a flush of new growth with the increased amount of sunlight and other resources becoming available. Due to the propensity of many tree and shrub species to grow multiple stump sprouts after being cut the midstory would be reoccupied in several years. Overtime, the overstory trees would expand their crowns to utilize sunlight and would reduce the amount of light filtering beneath the overstory and would start to shade out some species and favor more shade-tolerant vegetation in the mid and understory.

The commercial thinning combined with prescribed burning and other vegetation management techniques such as woodland restoration, wildlife openings, salvage operations, timber stand improvement thinning, seedling release, and pre-commercial thinning would decrease and maintain the desired stocking levels across the project area. This would enhance forest health by reducing competition for light and available nutrients, as well as increase the amount of sunlight reaching the forest floor thus, increasing diversity of plant species as well as increasing browse for wildlife species. The proposed prescribed burning would help achieve and maintain the lower stocking levels of mid/understory vegetation over time. However, if the opportunity to conduct a prescribed burn does not occur due to weather or other reasons, and herbicide is not an option, the woody vegetation would likely stump sprout and form a dense midstory again. The project area would enhance restoration efforts across the district to improve forest health, increase biodiversity, create a mosaic pattern of forested conditions on the landscape, improve resiliency to disturbances, prevent large scale insect and disease outbreaks, and prevent large catastrophic wildfires.

Effects of Alternative 2 on Nonnative Invasive Species (NNIS)

Direct Effects

Under Alternative 2, up to 2,500 acres per year of NNIS populations could be treated. Invasive populations usually occur in patches, therefore the actual area having manual or mechanical treatments applied would be substantially smaller. Identified populations would be treated with a

combination of prescribed burning, manual, or mechanical treatments. It is well documented that the most effective and efficient method of NNIS control is using herbicides. "Most nonnative invasive plants in the South are perennials with extensive roots, tubers, or rhizomes. This means that effective herbicide applications offer the best means of containment or eradication, because herbicides can kill roots without baring soil-bared soil is susceptible to reinvasion and erosion" (Miller 2010). Without the effectiveness and efficiency of using herbicides to control NNIS it is likely that far fewer acres would be treated, and there could be a greater need to re-treat the same areas for consecutive years.

Indirect Effects

Ground disturbing activities such as timber harvesting, 20 miles temporary road construction, 248 miles road maintenance, 10 miles road reconstruction, 37 miles (bulldoze) fire control line construction, 24 miles fire control line maintenance, and construction of 124 acres wildlife openings could increase the population and spread of nonnative invasive species by destroying individual stems which could result in prolific sprouting. These activities could also provide favorable conditions like bare soil and more sunlight for NNIS populations to spread and seeds to germinate. Mechanical equipment could 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 NNIS 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.

Cumulative Effects

Under this alternative, NNIS populations would try to be controlled using a combination of prescribed burning, manual, or mechanical treatments only. Prescribed burning and manual methods are less effective than chemical treatments because of the propensity of most NNIS species to re-sprout. These treatments alone are far less effective and efficient, which would likely result in fewer acres treated due to time constraints and tight budgets. Most of the NNIS species present in the project area have persistent seeds that remain viable in the soil for years. Little to no control of existing NNIS populations could be expected under alternative 2.

Ground disturbing activities such as timber harvesting, road construction & maintenance, fire line construction & maintenance, creation of wildlife openings could increase NNIS populations by destroying individual stems above ground which could result in prolific sprouting. It could also provide a receptive seedbed for the highly mobile seeds. Equipment such as vehicles, logging equipment, ATV/UTV's often dislodge seeds and transport them to unaffected areas. Implementation of Best Management Practices would reduce the possibility of introducing or spreading nonnative invasive plants during project implementation. Without the use of herbicides, populations of NNIS would continue to increase and spread across the project and surrounding area. The maximum possible acres of NNIS to be treated per year under other active EA decisions on the district is 2,500. Those acres plus the 2,500 acres proposed annually would be 5,000 acres total.

Effects of Alternative 2 on Glade Restoration

Direct Effects

There are 12 separate areas that total 300 acres where glade restoration would occur. The first step begins with the removal of undesirable vegetation, primarily eastern red cedar, non-glade related hardwoods (red maple, black gum, flowering dogwood, etc.), and nonnative invasive plant species. This would be attempted using manual treatments with chainsaws and/or mechanical methods. Using prescribed fire alone may not be sufficient to accomplish restoration of groundcover plant species diversity and composition indicative of fire-maintained ecosystems. (Brewer 2016) Multiple manual treatments would be needed to control the sprouts of woody species and nonnative invasive plants, along with repeated prescribed fire to achieve desired conditions. Tree cover would be reduced to 10 - 40 ft^2 of residual basal per acre, allowing sunlight to reach the ground. The cedar may be sold commercially if a market exists. Otherwise the resulting slash would be piled or scattered such that it would be consumed by prescribed burns. The glades would have prescribed fire used to reduce fuel loading and leaf litter, promote native grasses and forbs, and control eastern red cedar encroachment. Prescribed burning and thinning would restore vegetative structure and enhance species diversity.

Indirect Effects

Indirect effects on the glades with repeated prescribed burns would see a shift in species composition to fire tolerant plants in the herbaceous layer, reduced competition from shade tolerant and fire intolerant plants. The glades would visually appear open, so that a person could see across the glade with few to no trees obstructing the view. The increased amount of sunlight reaching the ground would allow the sparse herbaceous layer to respond and be restored to the historical native plant communities' common to glades. Also, many species of native plants are likely waiting in the seedbed for conducive environmental conditions to sprout, as seen from other glade restoration efforts in Arkansas and Missouri. An increase in herbaceous plant diversity and abundance is likely to occur. Several nonnative invasive plant species that are already present could proliferate under these same conditions if not monitored and controlled with multiple treatments over the life of the project.

These treatments could temporarily increase the fuel loading for several years until decomposition and prescribed fire reduce or consume the fuels. Prescribed burns would encourage fire tolerant species that historically were found in abundance in glades to spread and have a greater density. Burning would also reduce the density and the extent of fire intolerant and shade tolerant species that have become well established under the current conditions. The slash from the overstory trees removed would need to be placed away from the stems of remaining trees so that the heat produced would not damage the remaining trees or harm shallow root systems. If prescribed burns are not able to be accomplished on a regular schedule the restoration efforts would regress.

Cumulative Effects

The health and resiliency of glade ecosystems would be restored and provide greater plant diversity. Species composition would shift towards historical native glade plant species presence and abundance that are endemic to glade/woodland complexes through the use of fire, manual, and mechanical means. Changes in vegetative structure and arrangement would provide

conditions necessary for endemic glade plants and wildflowers that can only be found in these unique and disappearing communities to proliferate. Restoring these rare and disappearing ecosystems would create a mosaic patchwork of community types and increase forest health. Management of eastern red cedar and altering the spatial arrangement of it could prevent a wildfire from consuming all the vegetation. Without the use of herbicides to control undesirable vegetation and NNIS, restoration would be much more difficult and would require a longer timeframe to achieve the desired results.

Glade/woodland complex restoration could provide connectivity between glade/woodland ecosystem complexes on a landscape level. In conjunction with the glade restoration activities on the Koen Experimental Forest a 248 acre prescribed burn is proposed, along with the Park Service-Buffalo National River conducting 314 acres of prescribed burning and glade/woodland complex restoration work on adjacent land to the Koen. The proposed prescribed burn would be in cooperation with the Park Service and would be completed at the same time, allowing the use of natural firebreaks (Buffalo River) and roads.

F. Wildlife

Existing Condition

The Big Piney Ranger District (BPRD), including private land and the Koen Experimental Forest (Koen), is almost 608,000 acres. The effects analysis area used for this discussion is the project area which totals 108,749 acres of National Forest lands and 12,311 acres of private lands on the BPRD/Koen. There are 16 designated Management Areas (MA) within this project including Experimental Forests and Special Interest Areas, Mixed Forest and Woodlands, Scenic Rivers and Riparian Corridors, Openings and Wildlife Emphasis Areas, various types of Recreation and Scenic Corridors, High Quality Forest Products, and Oak Decline Restoration Areas.

Available stand data within the project area currently has 74% of Forest Service timber stands above the age of 80, 14% in the 41-80 year age range, and 12% of stands less than 40 years old. Permanent openings make up less than 1% of the project area, and early successional habitat (or age 20 and below) comprises approximately 4% 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. An area of the Forest the BPRD is collectively calling “Lonesome Hollow” (Maps 3,4,&5) adjacent to the Hurricane Creek Wilderness area has had heavy timber damage from ice, insects, and tornados. A portion of this area is within a secondary buffer zone for the protection and management of Indiana bat habitat in which the desired condition is to have 40% mature canopy. However, many locations in “Lonesome Hollow” have very little over-story canopy as a result of the aforementioned damaging agents.

Forest composition within the project area is dominated by stands of oak/hickory hardwood across 60% of the project area. Pine stands are next with 16% followed by Pine/Hardwood-11%; Hardwood/Pine-9%; Cedar/Hardwood-1%; Other Hardwoods such as walnut, sycamore, or birch-1%; Grasslands <1%; Hardwood shrub and Pine shrub <1%; and other (may include lakes, cemeteries, riparian corridors) <1%.

Existing wildlife openings in the project area support many native wildlife and plant species including warm season grasses and forbs, small mammals including bats, game animals (bear, white-tailed deer, elk, turkeys), migratory birds, and others. Some of the current openings are small (less than five acres) and difficult to manage.

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 these 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 2008-2015. Evaluating these species meets the legal requirements for an environmental analysis (EA); therefore, specific species may not be directly addressed in this EA but grouped with species of similar habitat or lifecycle.

Non-native invasive plant species, e.g., *Lespedeza cuneata, Ailanthus altissima,* and *Microstegium vimineum,* have been documented in the project area and the proposal is to treat them with herbicides. 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 Forests. More discussion on herbicides will be found in the project alternatives below.

Prescribed burning has occurred on approximately 79,000 acres of the project area with various cycles of rotation. About 12,000 acres of the project area is a proposal to add new acres to the Rx burn rotation. Rx burning would occur on nearly 18% of the Big Piney RD and Koen Experimental Forest combined. An average rotation of approximately three years between burns is the expectation. Burns on the southeast side of the district in the pine, pine-hardwood stands have trended more toward the 2-3 year cycle while burns on the north side of the district in hardwood, hardwood-pine usually lean toward the 3-5 year cycle. The most burning that this district has been able to achieve in one year has been approximately 33,000 acres due to conditions such as weather and air quality restrictions; however, under good conditions we could meet or potentially exceed this estimate in a given year.

Roads within the project area total 816.65 miles, and some of these roads will be used as control lines for the prescribed burns. Other non-road control lines include trails, creeks, dozer lines, and hand lines totaling approximately 66 miles. The project also contains 10,954 acres of Inventoried Roadless Area.

An existing communications site on White Oak Mountain hosts multiple buildings and towers on 19 acres. Hazards to the facilities need to be removed and the grounds managed to prevent future hazards such as tree limbs threatening buildings or guy-wires.

Deer Pond is an almost 3-acre pond located in the community of Deer, AR. The pond is used by the community as well as for the Kid's Fishing Derby which is sponsored annually by the BPRD. Currently, the dam structure is leaking and the pond has some silt build-up. The drainage structure needs some modification to address erosion.

Several glade habitats are in decline in the project area mainly around the southeast corner of the BPRD and on the Koen due to woody encroachment of *Juniperus* species. Although these habitats are small, the largest being about 80 acres, they provide support for different species such as pipewort, various wildflowers, butterflies, birds and reptiles. Thin soils and bedrock outcrops generally inhibit woody growth, but the eastern red cedar can survive and encroach into these glades shading out other glade species. Regular exposure to fire helps keep cedar from encroaching.

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 actions proposed 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 18 below, compiled from the RLRMP, provides information on the current conditions for the 17 MIS chosen for the Forests. The latest available data for assessing population and habitat trends for MIS was used to evaluate the Proposed Action and Alternatives.

Table 18: 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.
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.
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. Identified in RLRMP as MIS for the St. Francis NF.

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

Three of the MIS species were eliminated from the analysis due to the following reasons: the yellow-breasted chat and Acadian flycatcher are 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 19 from the RLRMP will identify the classification of each of the Terrestrial MIS species.

Table 19: Classification of MIS on the Ozark-St. Francis NFs

Common Name (WL)=Watch List	Classification (LDS or HDS)	Habitat
Northern Bobwhite	HDS Early Seral	Early seral oak savanna and woodland, restored glades, native fields, thinned and burned forest, ground nester
Prairie warbler (WL)	HDS Early Seral	Early seral habitat (5-20yr), regeneration areas, and savanna/woodland habitats, nests in shrub
White-tailed Deer	HDS Game Species	Mature forest with hard and soft mast, early regeneration, and woodlands with water sources
Black Bear	HDS Game Species	Isolated mature forest with hard and soft mast, early regen & openings with mast, forage and cover.
Wild Turkey	HDS Game Species	Mature hardwood or hardwood-pine stands with open areas and a permanent water source, ground nester.
Brown-headed Nuthatch	HDS Pine Woodlands	Mature open pine stands or pine woodlands, cavity nester
Red-headed Woodpecker (WL)	HDS Oak Woodlands	Open oak woodlands or pines, dead trees and snags for cavity nesting
Cerulean Warbler (WL)	LDS Mature/Over-Mature Complex Canopy	Rich mature forest with mesic conditions, larger diameter trees with a defined shrub layer and canopy gaps, tree nester
Ovenbird	LDS Dry Oak/Dry Mesic Oak Ground nester	Mid to late seral dry-oak deciduous forests with limited understory, nests on the ground

Northern Parula	LDS Riparian Forest	Mature, moist forests along streams and within riparian areas, tree nester
Pileated Woodpecker	LDS Snag and Older Forest	Mature stands of any species mix with large dead snags and woody debris on the forest floor, cavity nester
Scarlet Tanager	LDS Mature Upland Forest	Mature deciduous forest and rich upland forest, tree nester

The above LDS, such as the scarlet tanager and pileated woodpecker, will represent other LDS species. Their responses to management activities will serve as an indicator for how other LDS such as ambystomid salamanders or southern flying squirrels would respond as a trend. The above HDS, such as the prairie warbler or white-tailed deer, will represent other HDS species. Their responses will serve as an indicator for how other HDS species such as Eastern cottontails or bluebirds may respond to management activities.

Proposed Action (PA)

Direct/Indirect Effects

For the purpose of this analysis, the area within the project boundary (121,060 ac) was used to determine wildlife effects. Prairie warblers and northern bobwhite quail represent the species that depend on regenerating forests, i.e., early seral and more open woodland habitats. Prairie warblers represent the group of species that prefer shrubby-early successional, young forest habitat including regeneration areas, a habitat type that is under-represented in the project area as well as district-wide (2%). Prairie warbler monitoring trend data shows a steady decline locally and nationwide and is on the Watch List for species of high conservation concern in Temperate Forests (North American Bird Conservation Initiative, 2016, pg. 2). As stands age, thinning and wildlife stand improvement (WSI) mid-story treatments (which alter stand structure but not necessarily overall stand age) increase in importance. The North American Bird Conservation Initiative report, *The State of North America's Birds 2016*, indicates that in temperate forests, diversity is the key. "In the East, there is more forest today than there was 100 years ago, yet forest stands lack the diversity of young and old trees that makes for prime bird habitat" (pg.5). Northern bobwhite is another HDS that uses similar woodland habitat as the prairie warbler but takes a step further toward the early seral side of the spectrum by utilizing large glades, native grasslands, and pastures. According to the Forest Plan, desired future conditions for early successional habitat within the community types the prairie warbler utilizes should be at least 6-8% in regenerating forest (ages 0-10), and together with young forest (age 11-40) the age classes should represent 25-35% of the community type but only equals approximately 10.5% in the project area and 6.3% on the rest of the district. The data reflects a higher percentage of early seral stands within the project area because it includes the "Wildlife Emphasis Management Area" and "Pastures and Large Wildlife Openings Management Area" where large openings and woodlands have been developed. Private land vegetation conditions could add a small amount to these percentages. Direct effects of implementing project activities such as thinning, glade and woodland restoration, and opening enlargement would be an increase in early seral/early successional habitat for HDS and movement toward the desired future condition some of which will be sustained by cyclical burning.

Other HDS such as deer, turkey, and black bear were chosen as MIS because they are popular game animals and have a need for a diverse mix of habitat, especially turkeys. These HDS will benefit from a mosaic landscape because they rely on permanent water sources, soft mast which is usually found more abundantly in young forests, and hard mast which is usually found in mature forests. Oak and hickory are not only long-lived species, but they produce hard mast as forage for many species of wildlife. Deciduous stands on the district predominantly have oak and hickory as the major component of the over-story and mid-story and make up about 60% of the project area and 66% on the rest of the district. Optimum mast production for shorter lived oak species may be between ages 40 and 75 and between 50 and 200 years for longer living species although they will continue to produce at decreasing rates past these ages. Optimum hickory mast production may start as early as 40 years old in some species and continue until the ages between 125-200 years. Only about 7% of the project area hardwood/hardwood pine stands between the ages of 41-100 have silvicultural activities proposed, mostly thinnings and regeneration harvests. Conifers are often used by turkeys for roosting and cover; several species of migratory birds, such as finches, chickadees, and nuthatches, use conifers for forage and nesting. The local conifer component is dominated by shortleaf pine which will generally begin producing seed as early as age 20 but will produce more abundantly as the tree grows in diameter and height usually up to age 70 and live over 200 years. Pine and pine/hardwood of all ages makes up about 16 and 20% of the project area, and pine-pine/hardwood combined makes up about 25% of the rest of the district outside the project area. Approximately 35% of pine/pine hardwood stands within the project area that are in the 41-100 age categories will have silvicultural treatments, mostly thinning, associated with the proposed action.

HDS groups would benefit most from opening creation/enlargement, glade and woodland restoration, regeneration harvest treatments, prescribed burning, and thinning. Proposed actions to create, enlarge, and maintain openings would increase the value of the habitat for HDS. Increasing the size of clearings to a maximum of five acres in areas outside of the Wildlife Emphasis Area would increase the potential utilization for grassland species that are sensitive to habitat edges. Feathering of the edges with woodland habitat before transitioning back to mature forest would also provide both early seral vegetation and cover softening habitat transitions. It would also make maintenance more efficient. The 16 ac White Oak Communications Site is in need of maintenance in the form of hazard tree removal. Removal of trees that pose a threat to structures or hamper the ease of maintenance would be removed and may create small canopy gaps with early seral ground vegetation that could be beneficial to Scarlet tanagers, deer, and turkeys. Periods of disturbance for maintenance should be brief. Large openings that were created in the Bearcat Hollow project area (see Map 6) are planted in both warm season and cool season grasses. Warm season grasses need to be maintained by either mowing or burning in order to reduce thatch build-up, suppress shrub and tree growth, and (in the case of burning) stimulate re-growth. Those areas seeded with a variety of forage would provide higher quality forage than monoculture agricultural fields. Control of non-native invasive species (NNIS) would protect the quality and availability of foraging habitats. Application of herbicides would be restricted to the herbicides analyzed for the project and Forest Plan Forest-Wide Standards FW19-FW32.

Glades are another early successional, open canopy habitat that exists in small patches within the project boundary. Unique species such as collared lizards are known to be on restored glades north of the Buffalo River on National Park Service land which is near the Koen Experimental Forest glade restoration proposal. Another distinct species, small-headed pipewort, is found in glades located in the southeast portion of the BPRD. With the exclusion of fire from the landscape, these glade communities are being invaded by cedar. In restoring these glades by removing cedar, the herbaceous plants characteristic of glades should flourish and support pollinators and other species that rely on this unique community, and the results will be enhanced with fire and herbicides to control cedar encroachment and NNIS within the glades. Karst features are known to occur in or near some of these glades. Karst management standards are addressed in the Forest Plan Forest-Wide Standards FW42-FW46 and include restrictions on herbicide use, slash disposal and mechanical entry.

Regeneration harvest treatment areas are located in the Lonesome Hollow project area polygon adjacent to the north, east, and west boundaries of the Hurricane Wilderness Area. Natural events (e.g., ice storm, insects, and tornados) have killed, broken, or injured many trees leaving the landscape in varying states of structure, basal area, and re-growth. Although this has provided a location of early successional conditions as well as snags and cavity trees for species such as the brown-headed nuthatch or red-headed woodpecker, the health and future condition of the stand must also be considered. Trees weakened from damage are prone to insect and disease which could spread to healthy stands. Furthermore, approximately 5,300 acres of the Lonesome Hollow project area polygon lies within an Indiana bat secondary conservation zone buffer.

Within this zone, the recommended over-story density is 50 to 70 percent canopy closure (FW48). Regeneration harvests and thinning treatments will help to ensure future development of the desired canopy conditions. To maintain diversity of habitat, larger snags and den trees should be retained to provide habitat for the cavity dependent species as recommended by Forest Plan Forest-Wide Standard FW33. Retention of large cavity trees would assist species that do not utilize early successional habitat until areas transition to mature forest. Methods of management within the Lonesome Hollow project area polygon will be more diversified than other project area polygons including prescribed burning without silvicultural treatments, prescribed burning with silvicultural treatments, silvicultural treatments without prescribed burning, and improvements to a large water source, Deer Pond. Direct effects under the proposed activities with the use of heavy equipment and tree skidding may include crushed or burned nests, eggs, and mortality of young or slow moving individuals. Highly mobile adults should not be directly impacted. Prescribed burning over a portion of the Lonesome Hollow project area polygon will be beneficial for HDS wildlife in creating a mosaic of landscape progression and structure, as well as hard and soft mast.

Over the whole project, prescribed burning would indirectly impact wildlife by creating and/or maintaining early successional habitat. However, species living in leaf litter such as salamanders would be isolated in the project to areas that do not burn completely down to mineral soil such as around moist soils or riparian zones, northern slopes, or rupicolous environments until another litter layer forms. Highly mobile adults should not be directly impacted. Prescribed burning will occur on approximately 18% of the district and cooperative private lands leaving about 82% of unburned habitat for leaf-litter species assuming zero wildfire acres. Direct effects of burning

may result in the destruction of wildlife nests and mortality of young or slow-moving adults, and indirectly to the loss of habitat by losing leaf litter and the transition to more xeric conditions; however, benefits of periodically burning may outweigh occasional mortality due mostly to the lack or insufficient amount of suitable habitat currently existing for high disturbance, early successional species. "One-third (1/3) of all grassland bird species are on the Watch List due to steeply declining populations and threats to habitat. Birds that breed in the Great Plains of Canada and the U.S. and winter in Mexico's Chihuahuan grasslands are experiencing exceptionally steep declines, a nearly 70% loss since 1970. Other temperate grassland birds have declined by 33% in that time." (North American Bird Conservation Initiative, 2016). "Species dependent on either young forests (such as golden-winged warbler and eastern towhee) or mature deciduous forest (such as wood thrush and cerulean warbler) are showing the steepest declines."(North American Bird Conservation Initiative, 2014). Semi-aquatic or semi-terrestrial herpetofauna would benefit more from cane enhancement and pond rehabilitation. These activities are expected to reduce sedimentation of the aquatic environment once established, and cane enhancement along river banks will provide cover and foraging habitat for terrestrial and shallow aquatic species. Native materials will be transplanted, when needed, to help the spread of cane into areas where a source is not readily available. Sedimentation from soil disturbance should be localized and short term, and erosion control measures will be applied within five days, if needed, as required by Forest Plan Forest-Wide Standard FW78. Overall, the proposed management activities under this alternative would ensure more quality long-term habitat for HDS species, specifically, a mixture of available water sources; early successional habitat needed for soft mast forage, nesting, and young rearing; as well as the mature forests needed for roosting, shelter, and hard mast forage production. Decommissioning and closure of roads across the project should improve connectivity of habitat and reduce disturbance from human presence. Temporary roads will impact species during construction and implementation of harvest activities, but should not have long-term effects because these roads will be rehabilitated, seeded, and closed after project activities are completed. Herbicide use would also create or maintain woodlands by controlling woody vegetation in the understory shrub layer, and it will also help maintain native plant biodiversity by controlling NNIS.

Direct contact with herbicides (or feeding on insects and vegetation that have been exposed to herbicides) could be potentially harmful to individuals of a species; however, triclopyr, metsulfuron-methyl and imazapyr are 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 Specific Herbicides section below). Glyphosate is considered no more than slightly toxic to birds and is considered to have minimal effects on mammals (SERA). Fluroxypyr, considered practically non-toxic to birds and terrestrial mammals, will be used mainly in openings to control broadleaf weeds and woody stems. Adherence to Forest Plan standards and guidelines will reduce the risk of exposure to non-target species. These include only using herbicides labeled for aquatic use within riparian areas and stream-side management zones. Application methods will be as target specific as possible, verses widely broadcasting, using the lowest effective rate. Exposure to herbicides would be largely through contact with or ingestion of treated vegetation, gleaning of insects on treated vegetation, and ingestion of insects that have been exposed to herbicides. Based on toxicity ratings and adherence to plan mitigations, these herbicides should not have any substantial direct effects especially when applied in a target specific manner. Wildlife openings are at risk of becoming a mono-culture of

non-native vegetation like *Serecia lespedeza* if established plants are left untreated. Grassy openings supporting native grasses and forbs with associated insects are important in the diet of species such as the wild turkey, white-tailed deer, and migratory birds. Overall, negative direct effects to individuals would be outweighed by the beneficial indirect and cumulative effects of this alternative which include enhanced and sustained early successional habitat for nesting sites and foraging.

Low Disturbance Species (LDS) are represented by canopy nesters such as the cerulean warbler and northern parula that prefer rich forest and riparian areas; mature forest nesters such as the canopy nesting scarlet tanager and ground nesting ovenbird; and old growth forest cavity nesters like the pileated woodpecker that prefer trees with cavities, snags and fallen trees on the forest floor. These species are more sensitive to small changes in their habitat. Most of the represented LDS species prefer deciduous forest, but the pileated woodpecker will use mature stands of any mix as long as the dead and down component is represented. Site preparation, pre-commercial thins, and releases that occur in stands 20 years old or younger are not likely to affect most LDS species because these areas are not their preferred habitat.

Pine and mixed pine/hardwood stands, which may include loblolly pine, above the age of 80 comprise about 12% of the project area and 12% on the remaining district. Hardwood and mixed hardwood/pine stands above the age of 80 make up about 62% of the project area and 66% on the remaining district. The PA would remove or reduce stand density through thinning operations on approximately 20% of the project area stands above the age of 80. Carrying capacity for LDS within the project area is expected to decrease at least temporarily immediately after implementation of the action alternatives. Pileated woodpeckers represent species that prefer older forests of both hardwood and pine 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. Retention of snags, as directed in Forest Plan Forest-Wide Standard FW33, would be important for low disturbance, cavity nesting species. Removing debris and duff from around known cavity trees prior to prescribed burning would reduce the loss of such trees and potential nests and residents. Scarlet tanagers represent species that prefer mature forest slightly favoring hardwood over pine. Thinning mature hardwoods should only temporarily affect species like the scarlet tanager because the remaining trees would respond with canopy spreading or growth of mid-story trees into canopy gaps.

Regularly burned areas may not retain the forest floor debris and cover favored by LDS like the ovenbird. Species that prefer mature forest with an open understory like the ovenbird may be able to utilize prescribed burn areas during the years following a burn when the understory would be open but have some vegetative cover, especially in burn units that have a longer burn rotation. Some research has indicated that short-rotation burns negatively affect ground nesting birds such as ovenbirds and hooded warblers due to consumption of leaf litter, low shrubs and saplings, but increased habitat for American robins and eastern wood-pewees after repeated burning (Artman et al., 2001). Furthermore, Pittman and Krementz (2016) suggest that burning large burn blocks, i.e. landscape-scale burns, primarily in hardwood dominant stands on a short-rotation decreases nest success for wild turkeys, not because of destroying nests with fire but reducing concealment. Pine woodlands that have been developed through prior burns have established a well-developed herbaceous layer that can revegetate quickly and provide cover. Of

the estimated 18% of the district that will be burned with prescribed fire, approximately 28% of the burn areas are in pine dominated stands, the largest group being located in the southeast corner of the district where burn rotations are typically shorter, and 72% of prescribed burns are in hardwood dominated stands. Initial decline of LDS and other ground nesting species is predicted after an Rx burn year, but utilization of the area during non-burn years is expected for those areas with longer burn rotations. Similar to the aforementioned herpetofauna, Blake (2005) observed ovenbirds and worm-eating warblers using areas within burn units that "because of microclimate or topographic conditions, often did not burn as well as other areas" (pg. 528).

Direct effects of harvesting and burning on LDS may include the loss of nest sites, eggs, young or slow moving (or unaware) adults. Highly mobile adults will usually leave the area if disturbed. Soil disturbance, tree skidding, 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. Old snags that pileated woodpeckers prefer for nesting are occasionally felled or pushed over during management activities, and prescribed burning may remove some snags and create other snags or cavity trees. Indirect effects of management would be the loss of preferred habitat to forest management, isolated available habitat, and reduced nest success.

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 which support pollinators and other native fauna. 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 or small tank 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. 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. Glyphosate is readily absorbed by foliage and binds tightly to the soil. In soil, it is highly susceptible to degradation by microorganisms, being converted to natural products such as carbon dioxide and water. The average half-life ranges from 1-5 months depending on conditions.

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. Microorganisms degrade triclopyr readily. It degrades more rapidly under warm, moist conditions which favor microbial activity. The average half-life for triclopyr in soil is 30-90 days.

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 to practically nontoxic for birds, mammals, fish, and bees. Metsulfuron-methyl is stable to photolysis, but will break down in ultraviolet light. Half-life estimates for metsulfuron-methyl in soil are wide ranging from 14 - 180 days, with an overall average of reported values of 30 days.

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. Degradation halftime in soils ranges from 25 to 180 days.

Fluroxypyr- 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).

<u>Cumulative Effects</u>

Because the Fuels Management Project is spread widely across the district in nearly every watershed on the district, the cumulative effects boundary will be the district boundary, including the Koen Experimental Forest. As shown in Table 27, there are several past and present management activities.

Table 27: Past and present management activities

Past Treatments (On USFS Land)	Estimated Amount
Wildlife Emphasis Management Area Large Opening Creation and maintenance	700ac
Hay and Range Pastures	438ac
District Wildlife Openings maintained	519ac
Herbicide application: NNIS, Silviculture & WSI	2500ac (+/-) yr.
Multiple Utility companies' herbicide use	2421 ac
Rx burning	79000 @ max 33000/yr.
WSI manual thinning	2500(+/-)ac/yr.
Timber Harvests	Max 5000ac/yr.
Other Potential Future Actions	**Approx. Acres or Miles**
Large Openings Creation	60ac
Roberts Gap Timber, Wildlife, Recreation Management Proposal	Potential 27,670 ac project boundary

Timber management and wildlife stand improvement (WSI) on the district is occurring through previously approved projects and each is usually less than 5,000 acres per year which is almost 2% of the district. Commercial thinning is the method most frequently used for timber harvest, but seed tree regeneration harvests are mixed in as well. WSI is usually an understory removal or mid and upper story removal to reduce basal area. These and future timber management activities will continue to create early seral vegetation and early successional habitat for HDS species for the next several years, and combined with this project's proposed activities will move the district closer to the desired future condition for early successional communities and creating habitat diversity across the landscape. Cumulative impacts are likely to be more subtle with current proposed actions because the project is largely a continuation of the same management activity, i.e. Rx burns, or management of an area already impacted by a natural event that changed the structure or age class of the canopy. Future proposals for management are being discussed and researched which would distribute mainly timber and wildlife activities more evenly across the district.

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. The soil in these areas are more mesic and less likely to burn uniformly in the event of an Rx burn or wildfire; therefore, these areas will provide some connectivity across the landscape. Project activities such as decommissioning and closing roads, building small ponds, and restoring or enhancing cane habitat will improve overall connectivity of habitats.

Species diversity is expected to 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.

Hard mast production potential on the district will remain high even after project implementation. At least 45% of district stands outside of the project area are within the optimum mast production years between 40 and 100 years with another 2% poised to age into optimal production. Sustained availability of soft mast is expected with continuation of Rx burning, commercial and non-commercial thinning, wildlife opening and glade maintenance or restoration, and around developed ponds.

At a forest-wide scale, the Monitoring and Evaluation data through 2014 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. Observations on the district indicate that sustained burning in the pine woodland ecosystem in the southeast corner of the district has increased sightings of bobwhite quail. The proposed activity includes burning in an area where warm season grasses have been recently planted. Continuation of this activity will help meet the management recommendations of the evaluated monitoring data and should increase available habitat for HDS species.

Increased sightings of wild turkeys foraging in recently burned areas indicates that this species benefits from burning in terms of food resources although large-scale burning may decrease brood success due to lack of cover in areas where herbaceous vegetation is not well established. Burning in blocks across the district on a cyclical basis should help mitigate these negative impacts but a steady declining trend indicates the need for continued research and monitoring to determine the best management strategy for creating and maintaining high disturbance habitat for

this species. Feral hogs are detrimental to turkey nests and young. They have also been observed killing fawns. Although eradication efforts are being made to control hogs, observations of resource damage due to hogs are increasing and are likely contributing to the declining trend in turkey and other species.

Another outside factor contributing to the decline of our native animals is the Pseudogymnoascus destructans fungus, or Pd, that causes white-nose syndrome in bats. During hibernation, the fungus grows on the bats ultimately causing the depletion of body fat reserves that sustain bats during the winter. The Forest Plan has designated buffer zones around cave hibernacula which limits timber management and prescribed burning. Known maternity roosts for northern long-eared bats are buffered too, and restrictions for timber management are seasonal corresponding with rearing young. Canopy loss has occurred from natural events, i.e. ice storm and tornado, near known caves and maternity roosts. Regeneration harvests may remove further canopy in order to restore a healthy stand. Loss of maternity/summer roosting would be temporary and should result in diverse roost selection in the future.

Other HDS species are stable to increasing on the Forests. These include white-tailed deer, black bear, brown-headed nuthatch and red-headed woodpecker. This trend is in agreement with each species' trend across its range with the exception of the red-headed woodpecker which is declining throughout much of its range. Recommended management is to continue current management practices. Project activities that would continue this trend include woodland restoration, Rx burning, and opening maintenance. 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 therefore productivity, and water quality. 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.

Although many of the impacts from proposed project activities will be beneficial to the popular game species deer and elk, a decline is possible due to the recent discovery of Chronic Wasting Disease (CWD) in Arkansas. This disease affects members of the Cervidae family including white-tailed deer and elk. The ramifications of this disease on local herds is largely unknown, but looking at other states with long-confirmed cases indicate that a population decline does not lead to elimination. The Arkansas Game and Fish Commission has implemented a CWD management zone strategy to slow the spread of the disease which includes the district counties of Madison, Johnson, Newton, Pope, and Searcy as well as a few others not included inside district boundaries. Restrictions are focused on hunting, supplemental feeding, rehabilitating, and transporting live deer and elk or their carcasses. Project activities do not fall within these restriction categories, and the nature of this disease is not known to be affected by habitat availability or change.

LDS species are generally showing a declining trend across their range; however, several LDS show a stable to increasing trend locally on the Ozark-St. Francis National Forests. 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/. Those

species showing an increasing trend include scarlet tanagers and northern parulas representing mature upland canopy nesters and riparian forests respectively. With project implementation, there may be a temporary decline for these species, but restricting management in stream-side zones and the expansion of the canopy in thinned areas should allow the species to recover in the years following management. Cerulean warblers, standing for species preferring complex canopies in mature and over-mature forests, are in the middle reflecting a steady trend on the Forests. Habitat of this type is available outside the project area, and stands within the project area are advancing toward potential habitat; therefore, the project is not expected to change the Forests' steady trend but will not improve the declining trend across the species range. Finally, data indicates that long-term observations for pileated woodpeckers and ovenbirds, although common on the district, show a downward trend. Increases in snag habitat due to insect, disease, and storm damage may improve local pileated populations in the near future; therefore, project activities would need to adhere to the plan standards and attach project mitigation measures for the retention of snags and cavity trees. Project areas where the proposed activities are the continuation of Rx burning or maintenance of existing features will not have much of a direct effect on the LDS species because the alteration of preferred habitat has already occurred; however, cumulatively the continuation of these management practices contributes to the unavailability of the area to support LDS species and therefore continues the current trend. Increasing Rx burn acres, openings, and canopy reduction are activities that could further the declining trend on the Forests. The district overall is heavier in the older age classes, and in order to provide habitat for HDS species a decline in LDS is expected until desired future conditions are achieved. The State of the Birds assessment did not list the ovenbird or pileated woodpecker in the species of concern category, and the district has available potential habitat outside of the project area in management such as Roadless and Special Interest areas, four wilderness areas, and buffer zones that are expected to remain low management areas.

Herbicides have been used on the district to control NNIS or woody stems within openings, in site prep areas, in timber or wildlife stand improvement areas, and along roads. The proposed herbicides are the same herbicides that have been included in past and continuing projects. Some of these areas will be treated again within the project area. NNIS, depending on the species, may need multiple treatment years for stems that sprout up from the seed-bank or root stock. Utility companies are also using herbicides to treat utility corridors on Forest Service and private lands within district boundaries. The utilities are required to remain within their permitted corridor or site and use only the herbicides approved in their permit which are the same as the proposed herbicides for this project. Cumulative adverse water quality impacts from herbicide applications could result if multiple applications (either spatially or temporally) were to produce elevated herbicide concentrations; therefore, all application rates and frequencies must follow label specifications for all herbicides. The herbicides proposed for use break down readily in the environment and have short half-lives. Herbicides are not expected to persist and accumulate in the environment when applied on a yearly basis or by label standards. Herbicides used for WSI or site-prep to treat understory vegetation between burn rotations would advance the area toward the desired future condition more rapidly by combining techniques to control woody stems. Cumulatively, these treatments would shift the composition of the understory from woody stems to herbaceous in a shorter time frame.

Alternative 1: (No Action)

Direct/Indirect/Cumulative Effects

The No Action Alternative for the project area would remain relatively the same as described in the existing conditions section. There would be no direct effects when no action is taken; however, there would be indirect effects with inaction. Existing suitable habitats for early seral species such as northern bobwhite quail and prairie warblers will continue to decline without some type of disturbance or management. The current habitat capability for quail and prairie warblers is insufficient to meet the minimum population projections in the Forest Plan. The periodicity and intensity of events such as wildfires or tornados to create early successional habitat would be uncertain and may not produce and maintain a sufficient amount of this habitat within the ecosystem for HDS species, and allowing wildfires to act traditionally in shaping the landscape would be a threat to human habitation and development.

Species that prefer a mix of mature forest, woodland, and open habitats may need to compete for early successional habitat as the forest matures, likely reducing the carrying capacity. Turkey brood habitat may benefit from the No Action Alternative in relation to burning and reduced cover; however, foraging habitat may be reduced long-term. Private land, existing openings and roadsides may be utilized more as these species search for needs provided by open woodlands and grasslands. Human interaction near roadways and homesteads may cause stress to individual animals, habituation, or nuisance/hazards.

Choosing the No Action Alternative would not benefit species like the brown-headed nuthatch which represents open pine-woodland species. Prior burning has advanced some stands, especially on the southeast side of the district, toward the desired future condition in pine woodlands. Bird surveys including the Christmas bird count, Pope County migratory bird count, and Region 8 Bird counts have documented brown-headed nuthatches on this district. Other species that have been observed by district personnel in these woodland areas are bobwhite quail and red-headed woodpeckers, the latter preferring seed tree cuts and woodlands with large snags as part of the canopy (L. Anderson, personal communication, 2016). Benefits from prior burning will remain for the short-term, but without periodic burns in the future the woodlands will have successional progression from shrub understory habitat to mature forest losing the woodland and early seral habitat that supports species such as the above HDS.

Currently, over half of the district's stands are 80 years and older with more stands poised to age into this group within a few years. With age classes leaning heavily toward the mature and over-mature, hard mast production may start a slow decline as well as patchy availability of soft mast. Furthermore, an increase in overstocked and over-mature stands may cause a decline in forest health due to insects and disease. Pileated woodpeckers, representing the snag/mature forest habitat group, would show more of a preference for the No Action Alternative than other LDS species. Scarlet tanagers representing upland mature forest canopy dwelling species may also show a slight preference for the No Action Alternative, but these species can adapt, with time, to some forest management and could eventually show decline if canopies are affected by insects, disease, and damage. Salamanders and other leaf litter or semi-terrestrial species are likely to prefer the No Action Alternative so that isolation of habitat within the burn areas would not be a threat. These and other LDS would be sensitive to the opening enlargement/ creation and the construction and maintenance of prescribed burn control lines in the action alternatives, but they

would lose the benefit of reduced disturbance by road closure and decommissioning in the no action alternative.

In the No Action Alternative, effects of previous wildlife opening creation, maintenance, and seeding will continue to have a positive influence on deer, turkeys, and grassland birds for a few years into the future. Existing openings may be managed through brushing as man power allows; however, warm season grasses may eventually decline or disappear without the beneficial effects of fire to decrease thatch and stimulate growth. Establishment of NNIS within openings would decrease benefits to wildlife by replacing native flora and associated insects used for forage, and warm season grass that provides unique winter habitat may not be able to compete with NNIS and die out. Glades will not function as typical glade habitat without the control of cedar encroachment. Duff layers may be thicker than usual, and species richness and composition may be limited as species needing full sunlight are shaded out.

Man-made structures such as the White Oak Communication site and Deer Pond would still be functional in the foreseeable future but with limited capabilities. Long-term complications with Deer Pond may be reduced capacity for holding water and aquatic species and a higher risk of erosion and sedimentation downstream. Several private ponds are in the area, so the No Action Alternative would not limit species that require permanent water sources across the landscape. The com-site would have reduced effectiveness and reliability without needed maintenance and removal of trees that may impact the structure or transmissions.

Alternative 2: (No Herbicide)

Direct/Indirect/Cumulative Effects

Effects of this alternative would be similar to the Proposed Action Alternative with the elimination of risk from direct exposure to herbicide. 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. LDS such as the pileated woodpecker and HDS species like the black bear would react negatively to an increase in human and mechanical disturbance, but affecting less acreage would reduce the negative impact to their overall available habitat.

The PA and Alternative 2 (No Herbicides) would initially have similar benefits to prairie warblers, quail, deer and turkeys by providing early seral habitat, but these conditions could not be sustained. With Alternative 2, early seral habitat 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; however, non-target species are less likely to be adversely affected in this alternative by herbicide. Eventually, open woodlands would advance to shrubby woodlands and early forest. As quail drops out, ovenbird utilization and turkey nest success may increase for a time with understory structure and cover. Advancement of vegetation from herbaceous to woody would decrease support or carrying capacity of pollinator and early seral species.

Non-native invasive species would be difficult to control without the use of herbicide. Implementation of ground disturbing activities and reduction of the canopy provide perfect conditions for NNIS to get established. NNIS flourish where there is not an established understory, where any type of ground disturbance occurs, and in areas without a closed canopy to shade the NNIS out. Burning is unlikely to kill many NNIS, such as tree of heaven, and is likely to increase germination in others such as exotic lespedezas (Miller, James et al, 2010) (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 may not be worth the negative impacts from the loss of native vegetation.

G. 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. Some 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 21 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 21.

Table 21: Threatened, Endangered, and Sensitive Species in Fuels Management Project

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Gray Bat	*Myotis grisescens*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Ozark Big-eared Bat	*Corynorhinus townsendii ingens*	Endangered
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened
Rabbitsfoot Mussel	*Quadrula cylindrica cylindrica*	Threatened
Yellow-cheek darter	*Etheostoma moorei*	Endangered
Speckled Pocketbook	*Lampsilis streckeri*	Endangered
Eastern Small Footed Myotis	*Myotis leibii*	Sensitive
Bachman's Sparrow	*Aimophila aestivalis/ Peucaea aestivalis*	Sensitive
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
Ouachita leadplant	*Amorpha ouachitensis*	Sensitive
Bush's poppy mallow	*Callirhoe bushii*	Sensitive
Ozark Chinquapin	*Castanea pumila ozarkensis*	Sensitive
Southern Lady's Slipper	*Cypripedium kentuckiense*	Sensitive
Moore's larkspur	*Delphinium newtonianum*	Sensitive
Glade larkspur	*Delphinium treleasei*	Sensitive
French's shooting star	*Dodecatheon frenchii*	Sensitive
Small headed pipewort	*Eriocaulon koernickianum*	Sensitive
Butternut	*Juglans cinerea*	Sensitive
Alabama snow-wreath	*Neviusia alabamensis*	Sensitive
Ovate-leaf catchfly	*Silene ovate*	Sensitive
Royal catchfly	*Silene regia*	Sensitive
Ozark spiderwort	*Tradescantia ozarkana*	Sensitive
Ozark least trillium	*Trillium pusillum var. ozarkanum*	Sensitive
Longnose Darter	*Percina nasuta*	Sensitive
Nearctic paduniellan caddisfly	*Paduniella nearctica*	Sensitive
An isopod	*Lirceus bicuspidatus*	Sensitive
Ozark shiner	*Notropis ozarcanus*	Sensitive

Proposed Action Summary of Effects on Terrestrial T&E

Gray bats :
Positive-Known hibernacula will not be impacted; Cane restoration stabilizes stream banks and reduces sedimentation and canopy clutter; Prescribed fire will reduce fuel loads and reduce the chances of large-scale wildfires that may impact hibernacula and stream health.

Negative-Athough mitigated through Best Management Practices and Forest-wide Standards, temporary roads and timber removal potentially increase sedimentation of streams; bachelors using temporary roosting may be exposed to smoke and heat during burning; potential exposure to herbicide by contact with sprayed vegetation or ingestion of insects that have been in contact with herbicide.

Indiana bats:
Positive-Known hibernacula will not be impacted; Cane restoration stabilizes stream banks and reduces sedimentation and canopy clutter; Prescribed fire will reduce fuel loads and reduce the chances of large-scale wildfires that may impact hibernacula and stream health. Timber managmement could beneficially impact Indiana bats by reducing clutter, increasing insect abundance, and restoring future canopy cover in storm and insect damaged areas. Openings, ponds and woodland edges may create an additional foraging area with nearby cover for protection.

Negative-Athough mitigated through Best Management Practices and Forest-wide Standards, temporary roads and timber removal potentially increase sedimentation of streams; canopy closure may be reduced temporarily below what is desired by the species and will limit the local availability of roost trees; roosting after emergence may expose bats to smoke and heat during burning; potential exposure to herbicide by contact with sprayed vegetation or ingestion of insects that have been in contact with herbicide.

Northern long-eared bats:
Positive- Known hibernacula will not be impacted; Cane restoration stabilizes stream banks and reduces sedimentation and canopy clutter; Prescribed fire will reduce fuel loads and reduce the chances of large-scale wildfires that may impact hibernacula and stream health. Timber managmement could beneficially impact northern long-eared bats by reducing clutter, increasing insect abundance, and restoring future canopy cover in storm and insect damaged areas.

Negative-Athough mitigated through Best Management Practices and Forest-wide Standards, temporary roads and timber removal potentially increase sedimentation of streams; canopy closure may be reduced temporarily below what is desired by the species and locally limit roost tree availability temporarily; roosting after emergence may expose bats to smoke and heat during burning; potential exposure to herbicide by contact with sprayed vegetation or ingestion of insects that have been in contact with herbicide.

Ozark big-eared bats:
Positive- Known hibernacula (not on this district) will not be impacted. Potential habitat will be diversified with openings, watersources, and woodlands. Burning will keep areas of woodlands less cluttered.

Negative- Herbicide drift may impact native plants and associated insects which may be transferred upon ingestion by the Ozark big-eared bat.

Proposed Action Summary of Effects on Aquatic T&E
Dozer or plowed lines for prescribed burning and timber harvesting have the most potential to affect aquatic systems unless Best Management Practices for Forestry are utilized correctly. Cane restoration and enhancement will likely improve streams above current conditions by providing bank stabilization where there may be areas prone to erosion from high water and water velocities and also filters nutrients and toxins. One function of large woody debris (LWD) is to alter stream flows and create variability in stream habitats and therefore has the potential to disturb a mussel bed; however, LWD will not be placed in the South Fork of the Little Red River in streams on the Koen where known populations of T&E aquatic species occur. Closing, maintaining, and decommissioning roads will help maintain water quality. Herbicides are transported in quantities that are needed for the day in order to keep potential spills to a minimum. Only herbicides with aquatic labels may be used near water. Water sample monitoring has continued to test high quality.

Effects Determinations for T&E Terrestrial Species:

Three possible types of effects to Threatened and Endangered Species are as follows:
1. No Effects – "no effect"
2. Beneficial, insignificant, or discountable effects – "not likely to adversely affect"
3. Adverse effects – "likely to adversely affect"

This project is **likely to adversely affect the northern long-eared bat; however, there are no effects beyond those previously disclosed in the programmatic biological opinion on implementing the final 4(d) rule dated January 5, 2016, signed by Lynn Lewis**. Any taking that may occur incidental to this project is not prohibited under the final 4(d) rule (50 CFR §17.40(o)). This project is consistent with the Forest Plan, the description of the Proposed Action in the programmatic biological opinion, and activities that do not require special exemption from taking prohibitions applicable to the northern long-eared bat; therefore, the programmatic biological opinion satisfies the Forest Service's responsibilities under ESA section 7(a)(2) relative to the northern long-eared bat for this project.

This project **May Affect, Not Likely to Adversely Affect** the gray bat, Ozark big-eared bat and Indiana bat. Consultation on these bats in regards to forest management practices was conducted during the Forest Plan revision, and the proposed project follows the practices outlined in the management plan.

Effects Determinations for Aquatic Species:

Several of these activities have potential to impact water quality and these species. The Best Management Practices along with the Forest-wide Standards in the 2005 RLRMP should preserve the water quality and these species and are supported by Arkansas Department of Environmental Quality (ADEQ) water quality findings for streams in the Boston Mountains. For these reasons, yellow cheek darter, speckled pocket, and rabbits foot determination is **May Affect, Not Likely to Adversely Affect.**

Effects Determinations for Regional Forester's Sensitive Species:

Three possible types of effects to Sensitive Species are as follows:

1. No effects – "no impacts"
2. Beneficial effects – "beneficial impacts"
3. Adverse effects –
    a. "may impact individuals but not likely to cause a trend to federal listing or a loss of viability"
    b. "likely to result in a trend to federal listing or loss of viability"

Table 22 Showing Terrestrial Determinations from BE.

Terrestrial Species	No Impact	Beneficial impacts	May Impact, not likely to cause a trend to federal listing or loss of viability	Likely to result in a trend to federal listing or a loss of viability
Bachman's Sparrow		PA, Alt. 2		Alt. 1
Eastern small-footed bat	Alt. 1		PA, Alt. 2	
Bald Eagle			PA, Alt.1, Alt.2	
Ouachita leadplant	Alt. 1	PA, Alt. 2		
Bush's poppy mallow	Alt. 1	PA, Alt. 2		
Ozark chinquapin			PA, Alt.1, Alt.2	
Southern lady's slipper	Alt. 1		PA, Alt.2	
Moore's larkspur	Alt. 1		PA, Alt.2	
Glade larkspur	Alt. 1	PA, Alt. 2		
French's shooting star	Alt. 1		PA, Alt.2	
Small-headed pipewort			PA	Alt. 1, Alt. 2
Butternut			PA, Alt.2	Alt. 1
Alabama snow-wreath	Alt. 1		PA, Alt.2	

Table 22 (Continued)

Terrestrial Species	No Impact	Beneficial impacts	May Impact, not likely to cause a trend to federal listing or loss of viability	Likely to result in a trend to federal listing or a loss of viability
Ovate-leaf catchfly	Alt. 1		PA, Alt.2	
Royal catchfly	Alt. 1	PA, Alt. 2		
Ozark spiderwort	Alt. 1		PA, Alt.2	
Ozark least trillium	Alt. 1	PA, Alt. 2		

Definitions: PA = Proposed Action; Alt. 1 = Alternative 1 (No Action); Alt. 2 = Alternative 2 (No Herbicide)

The Bachman's sparrow, butternut and small-headed pipewort have been declining across their range. Bachman's sparrow is globally, nationally, and statewide listed as "vulnerable" mostly due to habitat availability. Butternut is listed "vulnerable/apparently secure" nationally and "vulnerable" statewide mostly due to butternut canker disease and shade intolerance. Small-headed pipewort is imperiled globally, nationally, and statewide mostly due to habitat degradation and destruction (NatureServe, 2015). Without the creation or sustainment of preferred habitat conditions, they are likely to continue their decline; therefore, the call for Alternative 1 (No Action) was "**Likely to Result in a Trend to Federal Listing or a Loss of Viability**." The same determination was made for the small-headed pipewort under Alternative 2 because of the potential for non-native invasive species to get established by taking advantage of open, disturbed ground without the avenue to control with herbicide.

The following species were predicted to receive **Beneficial Impacts** from the Proposed Action and Alternative 2: Bachman's sparrow, Ouachita leadplant, Bush's poppy mallow, glade larkspur, royal catchfly, and Ozark least trillium. Preferred habitat exists in the project area and is within the species range, but the habitat conditions are poor and the species are not currently known to occupy these habitats in the project area or only use the areas that have been treated in a similar fashion to the proposed action. The Proposed Action and Alternative 2 would improve habitat conditions for these species that are currently not using the area but could foreseeably move into the area if preferred habitat conditions are met or restored.

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 bald eagle and Ozark chinquapin. 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 Proposed Action was the only alternative with this determination for the small-headed pipewort because some individuals may be impacted as activities are implemented, but it is unlikely that the population as a whole would be impacted enough to cause a decline and should even benefit from some disturbance. Two of the management options, the Proposed Action and Alternative 2, had this determination for the following species: eastern small-footed bat, southern lady's slipper, Moore's larkspur, French's shooting star, butternut, Alabama snow-wreath, Ovate-leaf catchfly, and Ozark spiderwort. Individuals of these species may be impacted by activities such as timber harvest, prescribed burning, or

thinning of the canopy but due to conditions such as distribution, local abundance, or specific habitat properties it is unlikely that the loss of individuals will negatively impact the species as a whole.

There would be **No Impact** from Alternative 1 to the Ouachita leadplant, Bush's poppy mallow, glade larkspur, royal catchfly, and Ozark least trillium because these species are not known to be on the district but are found elsewhere in Arkansas. Although they are listed as occurring in counties that make up the BPRD, they do not have a record of occurrence within the project area and none were discovered during field surveys; therefore, a no action would not impact any individuals or populations. For the eastern small-footed bat, southern lady's slipper, Alabama snow-wreath and Ozark spiderwort, some thinning and the control of NNIS may be beneficial, it is unlikely that a no action of the project would endanger the viability of the scattered populations. Monitoring and survey data suggests that occurrences have remained regular; therefore, there would be "no impact" from Alternative 1. Ovate-leaf catchfly and French's shooting star are found in specific habitats and are intolerant of significant disturbance; therefore, Alternative 1 would have "no impact" on these species. Moore's larkspur is locally abundant and ebbs and flows with changes across the habitat. The seedbed is well distributed to take advantage of available habitat; therefore, Alternative 1 should have "no impact" on this species.

Table 23 Showing Aquatic Determinations from BE

Aquatic Species	No Impact	Beneficial impacts	May Impact, not likely to cause a trend to federal listing or loss of viability	Likely to result in a trend to federal listing or a loss of viability
Ozark shiner			PA, Alt. 1, Alt. 2	
Longnose darter			PA, Alt. 1, Alt. 2	
Nearctic paduniellan caddisfly			PA, Alt. 1, Alt. 2	
An isopod			PA, Alt. 1, Alt. 2	

Definitions*:* PA = Proposed Action; Alt. 1 = Alternative 1 (No Action); Alt. 2 = Alternative 2 (No Herbicide)

All management alternatives were given the "May Impact Individuals but not likely to cause a trend to federal listing or a loss of viability" determination for aquatic species within the influence of the project area. Alternative 1 would not address sedimentation from erosion nor met recommended levels of large woody debris in streams. The proposed action and alternative 2 may impact individuals through temporary sedimentation or herbicide exposure. Some project activities may temporarily impact individuals but in the long-term improve overall water quality.

H. Fisheries

Existing Condition

The analysis area for fisheries effects is comprised of all streams and waterbodies within the following 12th Level Hydrologic Units (HUC): 110100050201 (Terrpin Branch-Buffalo River),

110100050207 (Hoskin Creek-Buffalo River), 110100050305 (Cave Creek), 110100050306 (Headwaters Richland Creek), 110100050307 (Falling Water Creek), 110100050308 (Outlet Richland Creek), 110100140201 (Brushy Fork), 111102020604 (Hurricane Creek-Upper Big Piney Creek), 111102020605 (Cow Creek-Big Piney Creek), 111102020606 (Haw Creek-Big Piney Creek), 111102020704 (Middle Little Piney Creek), 111102020803 (Spring Creek-Big Piney Creek), 111102020901 (East Fork-Illinois Bay), 111102020902 (Middle Fork- Illinois Bayou), 1111020203903 (Upper North Fork-Illinois Bayou), 111102020905 (Mill Creek-Illinois Bayou), 111102030101 (Brock Creek), 111102030102, (Trimble Creek -West Fork Point Remove),111102030103 (Upper Clear Creek), and 111102030105 (Rock Creek-West Fork Point Remove). Brock Creek, Trimble Creek, Upper Clear Creek, and Rock Creek watersheds are within the Arkansas River Valley ecoregion. The remaining 17 watersheds are primarily in the Boston Mountain Ecoregion.

The Boston Mountains are highly dissected with ravine depths ranging from 500 to 1200 ft. (Robison and Buchanan 92) and are underlain by Pennsylvanian sandstone, shale, and siltstone (AFGC 2015). To the north of these ecoregions, the Ozark Highland in contrast has limestone and dolomite that dominates Ozark Highlands. Several of the streams that is encompassed by watersheds in this analysis such as Richland Creek, and Buffalo River flow into the Ozark Highlands. Many characteristics of the watersheds that straddle these two ecoregions in this analysis are similar to the Boston Mountains but the geology does transition into the Ozark Highlands. Water quality in streams reflects geology, soils and land use and is typically exceptional; mineral, nutrient and solid concentrations as well as turbidity all tend to be very low. During the summer, many streams do not flow (AFGC 2015).

Center of Aquatic Technology Transfer (CATT) with the Southern Research Station, US Forest Service, conducted stream habitat and fish surveys between 2006 and 2010. These data were used to characterize streams within these watersheds.

All watersheds except an unnamed creek in the Upper North Fork HUC showed a lack of overall large woody debris in sizes category over 16.4 feet long. The unnamed creek had 25 pieces over 16.4/ mile and 21.7 pieces of these pieces were over 21.7 DBH. For the rest of the streams, the larger categories were less than 2.5 pieces per mile. See table 3.

These streams can support ~~a~~ diverse fish assemblages and other forms of aquatic life. See Table 2 for a description of fish species and families by stream. Fish communities were characterized using the IBI (Index of Biotic Integrity) developed by Arkansas Department of Environmental Quality for assessing fish communities. This IBI uses data from reference streams and compares these data to the fish data collected in the stream of interest with a drainage over 6,500 acres. Reference streams are considered to be the ecologically highest functioning streams in an ecoregion and have fish assemblages that characterize healthy streams. Some of the metrics used, but not limited to, are diversity, percentage (%) of key species, percentage (%) of Sensitive Species, and percentage (%) of Primary Feeders. The streams were then categorized in terms similar to the reference stream. The four categories are Excellent (Mostly Similar), Good (Generally Similar), Fair (Somewhat Similar) and Poor (not similar). The species that are associated with each metric and the ranking is found in the project analysis file.

Most of the 32 streams ranked out as fair with 2 ranking excellent, 7 ranking as good, and 2 as poor. (See Table 3). The composition of fish assemblages varies from the headwaters to the lower reaches of a stream as habitat changes (Paller 1994 and Karr et.al 1987). Karr et.al (1987) found that IBIs do correlate to water quality and habitat changes caused by both anthropogenic and natural factors. Also IBIs can be affected by temporal and spatial factors such as sampling later in the year when young offspring are present. Lammert and Alan (1999) found that there were some variation and effectiveness of IBIs at a larger scale and suggested that it would be better to use IBIs at the sub-catchment level to reduce some of the natural variability. For this reason, it is important to keep fish samples for a similar drainage size within an ecoregion. Many of the fish samples conducted by the CATT team were high in the watershed where they could wade the stream.

Location of these fish samples likely affected the overall IBI rankings of these streams due to natural variation. As discussed above, most streams in this area have excellent water quality but are higher gradient and becomes intermittent to dry making conditions extremely harsh especially in the higher watersheds. These conditions will affect several parameters in an IBI such as families and feeding guilds. The habitat surveys would support this conclusion. Streams that ranked fair or poor tended to be narrow, shallow, higher gradients and/or have some cascade habitat. In addition, stream IBI rankings tended to increase within a watershed from poor/fair to good as the drainage increases (See Table 3).

Smallmouth bass was selected as a MIS due to popularity as a sport fish and as an indicator of high quality stream habitat. It is more intolerant to habitat alteration than any of the other black basses, and is especially intolerant of high turbidity and siltation. Few individuals were documented in the CATT surveys within this project due to sample location. Further downstream in the large watersheds, smallmouth bass are common (Rambo 1998).

Largemouth bass was also selected as a MIS due to popularity as a sport fish. Within the analysis area, potential habitat that sustains a sport fish for this species is primarily limited to the four lakes in the southeastern corner of the project area: Poe Creek, Lower Brock, Driver's Creek and Upper Brock lakes. There are no proposed actions to enhance the fisheries in these lakes; for this reason, this species will not be discussed further.

Proposed Action (PA)

<u>Direct/Indirect Effects</u>

Most of the activities identified in the Proposed Action have the potential to negatively and positively affect the aquatic biota within the project area. One of the focuses of the proposed action is to improve forest health through prescribed burning and mechanical and chemical vegetation manipulation. Prescribed burning can affect flow peaks, nutrient, and sedimentation rates. The potential effects depend on severity of the burns, soil type, slope, remaining soil cover and timing of precipitation (Southern Forest Assessment). Few effects from prescribed burning have been noted on these stream characteristics and their aquatic biota when the intensity is controlled (Southern Forest Assessment, Caldwell et al 2013, Richter 1982), but associated activities such as plowed lines/dozer lines account for most of the impacts to the aquatic system. Forest-Wide Standard 152 (FW152) under Part 3 Design Criteria in the 2005 Ozark-St. Francis

Revised Land and Resource Management Plan (RLRMP) states that no dozer line will be constructed within 20 feet of a perennial stream and 5 feet from a defined channel. Also, FW72 states that we will promote and implement current Best Management Practices for forestry as recommend by the Arkansas Forestry Commission (AFC). On Page 37 Section 10.30 Prescribed Fire in the AFC Best Management Practices for Water quality Protection, this document gives protection to slopes greater than 5 percent and approaches to streams by the installation of water bars. Dozers also are limited on what slopes they can operate so extreme slopes would have hand constructed lines. All these standards will reduce the potential effects from dozerline.

The potential negative impacts to water quality and the aquatic biota increase with the severity of the burns especially in the riparian zones. Most prescribed burns would have an objective of moderate to low severity which would minimize the potential effects on the aquatic biota. Under typical prescribed burning conditions, riparian areas do not burn much or very little due to the mesic conditions. Furthermore, riparian areas are burned using backing fires to minimize the effects to riparian vegetation. Data from vegetation monitoring conducted in partnership with The Nature Conservancy (TNC) suggest that burns on the Big Piney Ranger District has not affected the riparian vegetation over the last decade (Personal communication Doug Zollner, TNC Staff).

Forest practices that cut and/or remove timber can directly impact stream characteristics such as bank stability, stream width and depth, sinuosity of the stream, and substrate type. These changes affect nutrient cycles, hydrologic regimes, water temperatures, and sedimentation rates of local streams and ultimately the aquatic biota found in them. The extent of these impacts depend upon the amount of the watershed effected, the severity of disturbance, the location of the activities, topography, and soil type and condition (Forestry Impacts on Water Quality). Best Management Practices (BMPs) standards and guides were developed to minimize potential impacts to water quality and the aquatic biota. These standards limit the amount of regeneration cuts (considered to be the more severe cutting methods), slopes that commercial harvest can occur, grades of skid trails, and types of forestry practices allowed in riparian zones. In addition, they give specification on construction and maintenance of temporary roads, when mechanical equipment can operate to prevent compaction, and stabilization requirements. These standards plus more can be found in Part 3-Design Criteria of the 2005 Revised Land and Resource Management Plan and The Arkansas Forestry Commissions Best Management Practices for Water Quality Protection.

Studies have varied on the effectiveness of the BMPs depending on regional location but they generally agree that these practices reduce the potential of the effects to the aquatic biota (Aust and Blinn 2004, and McCord et al. 2007). Williams et al. (2002) looked at the effects of timber harvest on the aquatic biota in the Ouachita Mountains. The study area has many of the same standards as the Ozark-St. Francis National Forests and they found that basin and time of sampling had more to do with explaining the variability of the macroinvertebrate and fish assemblages than the presences or absence of timber harvest. These findings suggest that the methods of implementation of timber harvest in these drainages maintained the integrity of these streams. The authors were quick to point out that potential effects could have been missed because of the scale of the study and timing of the sampling.

Arkansas Department of Environmental Quality, Integrated Water Quality Report 2016, states the Boston Mountains primary land use is silviculture and is located on the Ozark National Forest. The water quality in this region is exceptionally high and current water quality samples continue to support this conclusion. The Arkansas 2015 Wildlife Plan also describes the Boston Mountain Ecoregion as having high water quality.

Herbicides have the potential to affect water quality and the aquatic biota. The potential risk depends on type of herbicide, the amount used, location of use, the application methods and envirnoment conditions in the treatment area. In the Proposed Action, the following herbicides may be used: glyphosate, imazapyr, metsulfuron methyl, Fluroxypyr and triclopyr. These herbicides are considered relatively low to higher toxicity to aquatic biota. See SERAs cited in the Terrestrial Section. Some formulations of glyphosate, Fluroxypyr, and triclopyr, especially the ester formulations, have the highest risk for aquatic. The Glyhposate Formulations with Aquatic labels are considered low risk to aquatic fish and inverterbrates and would be the only herbicide used in riparian areas or adjacent to aquatic envirnoments. All applications would follow the label instructions, and the standards outlined in the Ozark-St. Francis NFs Revised Land Management Plan of 2005. These project standards are designed to miminize the potential effects on non-target plants and animals including aquatic biota.

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

Spills during transportation from the mixing site to the treatment area are potential risks. Following is a description of typical use but the actual rates, diluents, amounts, and mixing of herbicides would depend on the label for specific situations. Contractors and Forest Service Personnel carry enough herbicide to mix a 250- to 350-gallon tank for foliar spray. The following amounts of the proposed herbicides are what would be used for these tanks indvidually not for a mixed tank: 12.5 and 17.5 gallons of Gylphosate, 17.5 to 24.5 gallons of triclyopr (amine formualtion), or 17 to 24 dry ounces of metsulfuron methyl, respectively. Imazapyr is sometimes used with triclopyr at a rate of 18 fluid ounce per 100 gallons of solution which would be 0.35 to 0.5 gallon per tank. The US Forest Service has not used Fluroxypyr prior to this EA, but at a maximum based upon the label for spot spray you would use no more than 22 to 26.5 gallons in a 250-to 300-gallon tank. Triclopyr ester formulation is typically used in a basal spray treatment with 2.5 gallons in a 15-gallon drum with a diluent of vegetable oil. Fifty (50) % Triclopyr ester formulations would be used for hack and squirt which you apply approximately 1 ml per 1-inch cut for every 2 inches in DBH for each individual stem. A contractor would have less than 5 gallons of these herbicides used for hack and squirt at any given time for a day's work. More herbicide may be transported at one time than amounts described above but typically only the amount needed for one day is transported. These amounts are small and would become diluted quickly. This situation would limit the extent of the effects to the aquatic biota

especially in the large perennial streams. In addition, a spill plan has been developed to describe the procedures that an individual should follow and the appropriate individuals to contact in case of a spill. This plan is designed to help get additional resource to the site as quickly as possible to minimize the area affected. Forest Service personnel have spill kits for immediate action to inhibit the movement and bind some of the herbicide before it escapes and until other resources get to the site.

The normal applications of herbicide for forest vegetation management are foliar spray hack and squirt, and cut surface methods. These hand application methods are more controlled and are better for directing the herbicide toward intended target plants. As a result, potential drift and movement off site would decline and have the lowest risk for affecting aquatic biota. Broadcast spray is typically limited to road sides and fields for non-native invasive species (NNIS) and undesirable species control.

The weather such as temperature, humidity, and wind plays a significant role on potential risks to movement of herbicides. RLRMP Standard FW23 on page 3-4 gives the criteria for herbicide application to minimize these risks.

One of the purposes for the riparian thinnings and planting giant cane is to reestablish canebrakes that were common in Arkansas and Southeastern United States but has been lost in 98% of its historical range. Canebrakes can benefit water quality by providing streambank stabilization, sediment retention, and bioaccumulation of nutrients and toxins. Schoonover and Williard (2005) found that within 3.3 meters from an agricultural field sediment mass was reduced by 94% and by 10 meters 100% in a canebrake. With reestablishment of this community, riparian zones should become more effective in buffering streams from changes caused by land use in the project area.

Most of these streams do not meet the RLRMP standards for large woody debris (LWD). Large woody debris is an important component that affects the morphology and habitat diversity in a stream. With the increase in habitat diversity, the ability to maintain species richness and diversity of the aquatic biota including maintaining smallmouth bass populations. The Proposed Action is to add 10 pieces of large wood debris per mile. This addition of wood could move these streams toward forest plan standards while the disturbance to the riparian vegetation would be minimal.

Road systems are a primary source of sediment. Some temporary roads would need to be constructed to remove timber. All these roads would be constructed in accordance with the forest plan standards and the Arkansas Forestry BMPs to help minimize the impacts from these roads during timber removal operations. The Proposed Action would reduce the number of open roads through decommissioning and closing roads along with maintaining or repairing structures that help disperse runoff and sediment on open roads. Over time, these actions would reduce sedimentation inputs from the road system in the project area.

Cumulative Effects

The Forest hydrologist ran an effects analysis for sediment yeild that included both public and private, existing road network, and expected current and future activities. The analysis compared

estimated sediment yeilds from an undisturbed forested watershed to the yeild prediction for the activities in those watersheds. The results were shown as a percent over the undisturbed watershed's sediment yeild. These results ~~are~~ were then compared to risk indicator values that were determined using an empirically determined relationship between sediment values and the condition of the fisheries from select loctions aross the analysis area. The results were low for all watersheds except the following three: Trimble Creek-West Fork Point Remove, Upper Clear Clear, and Rock Creek. These watersheds ranked out as high, high, and moderate, respectively.

Private land outside of the proclamation boundary for the National Forests encompasses the majority of these watersheds. The fuels EA and other activities on Forest Service land would contribute some sedimentation but are not the primary factor for these higher risks (See Forest Hydrologist Water Section of the Fuels EA).

As discussed in the direct/indirect section, these watersheds are considered to have excellent water quality in recent reports from Arkansas Game and Fish Commission (2015) and Arkansas Department of Environmental Quality (2016). The proposed actions have occurred across most of these watersheds over the last decade and many of them have occurred over several decades. For this reason, the Proposed Action's cumulative effects should not affect the aquatic biota or small bass negatively. Several actions like large woody debris, cane restoration, and road decommissioning could improve the likelihood of maintaining resilient and diverse aquatic communities in these watersheds.

There are some other potential factors such as changes in land-use on private land in-holdings, and gas exploration and extraction that could affect the aquatic biota and small mouth bass.

Alternative 1 (No Action)

Direct/Indirect Effects

Streams are dynamic systems and in a continuous state of change. Natural sedimentation would continue to occur from bank erosion, existing roads and trails, as well as heavy rain events. Potential negative effects from roads that would have been decommissioned would still occur and may continue to degrade through lack of maintenance. Many of these streams would continue to fall below Forest Plan Standards for large woody debris and, as a result, habitat diversity would not improve in these streams. Cane and the protection this community provides from alteration of stream morphology would continue to decline in the project. In addition, sedimentation rates and nutrients/toxicant inputs caused by man-made or natural disturbance would still occur.

Cumulative Effects

Overall smallmouth bass and the aquatic biota probably would not be affected based upon current conditions staying the same across most of the project except in three watersheds. It is likely that the three watersheds identified at high risk would continue to be at high risk for water quality decline because of land use outside of the forest proclamation boundary.

Alternative 2 (No Herbicide)

Direct/Indirect and Cumulative Effects

This alternative would eliminate any potential risk associated with herbicide contamination. It is likely that manual control of woody plant species sprouting would increase with this alternative. The potential use of large equipment to drum chop or mulch the regeneration areas to adequately prepare the areas for planting would increase. This action could increase the compaction of the area affecting surface run off and increase sedimentation. As mentioned in the Proposed Action, the BMPs would minimize these risks and the direct, indirect and cumulative effects would be the same as the Proposed Action. For further discussion, see the Proposed Action.

I. Climate Change

Existing Condition

Although it is possible to quantify a project's direct effects on carbon sequestration and greenhouse gas (GHG) emissions, there is no certainty about the actual intensity of individual project 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. 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 effects 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 carbon dioxide (CO_2) from the atmosphere in the process of photosynthesis and releasing carbon into the atmosphere through live plant respiration, decomposition of dead organic matter, and burning of biomass (Krankina and Harmon, 2006).

Through the process of photosynthesis, carbon is removed from the atmospheric pool. About half the carbon absorbed through photosynthesis is later released by plants through respiration as they use their own energy to grow. The rest is either stored in the plant, transferred to the soil where it may persist for a very long time in the form of organic matter, or transported through the food chain to support other forms of terrestrial life. When plants die and decompose, or when biomass or its ancient remains in the form of fossil fuels are burned, the original captured and stored carbon is released back to the atmosphere as CO_2 and other carbon-based gases. In addition, when forests or other terrestrial ecosystems are disturbed through harvesting, conversion, or natural events such as fires, some of the carbon stored in the soils and organic matter, such as stumps, snags, and slash, is oxidized and released back to the atmospheric pool as CO_2. The amount released varies, depending on subsequent land use and probably rarely is more than 50% of the original soil store (Salwasser, 2006). As forests become older, the amount of carbon released through respiration and decay can exceed that taken up in photosynthesis, and the total accumulated carbon levels off. This situation becomes more likely as timber stands grow overly dense and lose vigor. Wildfires are the greatest cause of carbon release from

forests. At the global scale, if more carbon is released than is captured and stored through photosynthesis or oceanic processes, the concentration of 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, et al., 2008).

A study by North, Hurteau and Innes (2009) states that untreated forests may release many times as much carbon if they burn in a high-intensity wildfire compared to prescribe burning of the same area. In a comparison of a modern fire-suppressed forest with that of the same forest with an active fire regime in 1865, they found that total live-tree carbon was substantially lower under fire-suppressed conditions. The potential for higher GHG emissions is not only due to the higher pulse of CO_2 generated during a wildfire but also because tree mortality rates from prescribed burning are typically lower than from wildfire (Wiedinmyer and Hurteau, 2010). Although not occurring during the fire, trees killed in a wildfire produce longer term CO_2 emissions from decay. While prescribed burning does not eliminate the occurrence of wildfire, there is evidence that treating fuels limits the severity of wildfire when it does occur because of lower fuel availability.

Proposed Action

Direct Effects:
The proposed harvest operations associated with the Proposed Action would result in a release of carbon and reduce carbon storage in the forest both by removing organic matter (trees) and by increasing heterotrophic soil respiration. However, much of the carbon that is removed is offset by storage in forest products. Forest management that includes harvesting provides increased climate change mitigation benefits over time because CO_2 emissions from decay of wood products are delayed (Malmsheimer, et al., 2008). 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 would reduce fuel loading and could be expected to reduce fire intensity and severity as well.

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

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

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, et al., 2008). In the absence of prescribed fire, fuel loadings would continue to increase and accumulate on the forest floor. In the event of a wildfire, fuel loading would be higher, increasing the risks of catastrophic damage to natural resources. This would result in a large release (pulse) of GHG 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 forest's 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.

Alternative 2

Direct Effects
The effects would be similar to those described above in the proposed action.

Indirect Effects
The effects would be similar to those described above in the proposed action.

Cumulative Effects
The effects would be similar to those described above in the proposed action.

J. Human Health Factors

Effects of Herbicide use

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 NNIS 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.

The following table explains terminology commonly used in evaluating health risk associated with herbicides.

Table 24 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 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 25 Herbicide Risk Assessment Information:

	Herbicide Name	**Date prepared**	**Reference**	**Pages**
1	Glyphosate & Glyphosate Appendices	March 25, 2011 November 29, 2010	SERA 2003a SERA	281 123
2	Imazapyr	December 16, 2011	SERA 2004e	215
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 2003a).

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 1999b).

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 2003b).

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.

Effects of Prescribed Burning.

The health and safety effects of prescribed burning on the personnel implementing the burning operations and the public are disclosed in Chapter III in the Air section of this EA. Prior to implementing any prescribed burn a Prescribed Burn Plan which addresses all aspects of carrying out the burn including safety of the public is written and approved by the line officer.
Effects on White Oak Mountain Communication Site.

Existing Condition
The White Oak Mountain Communication Site is a 19 acre administrative site which currently has trees growing adjacent to the communication towers and support wires creating a hazardous condition. These trees could be blown over and strike the guide wires supporting the towers or in some cases the trees could even strike the towers themselves. This creates a very hazardous situation. Trees need to be removed and the site maintained in a condition which would make the site safer and communications more reliable.

Proposed Action

The proposal for this site is to remove all the trees from the site, construct control (dozer) line around the site using roads and road templates so the area can be prescribed burned. Mulching, brush-hogging, or mowing could be used to control vegetation. Herbicide application(s) would also be used to control persistant woody species. This would keep the site in a herbacious condition and lessen the danger of a tree being blown over or falling and damaging a communication facility.

Direct/Indirect effects
The direct effect of implementing the PA, would create a safer and manageable communication site for all the facilities (towers and buildings) on this site by removing the hazardous trees and controlling the vegetation with various methods. The indirect effect would be greatly decreasing the likelihood of an interruption in communications for the public (Verizon customers), State Police, Arkansas Game and Fish, Corps of Engineers, Fish and Wildlife Service, Arkansas Forestry Commission, Southwest Power Administration, Entergy, and the Forest Service using this site.

Cumulative effects
The facilities on this site would provide continued service for all the agencies listed above well into the future.

Alternative 1 (No Action)

Direct/Indirect effects
The hazardous conditions on this site will remain and the benefits as outlined in the PA will not be realized.

Cumulative effects
The hazardous condition will continue to escalate.

Alternative 2 No Herbicide Use

Direct/Indirect/Cumulative Effects
The effects for this Alternative would be the same as the PA, except no herbicides will be used to manage the vegetation.

K. 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.

In total, 553 previously recorded sites and 77 new sites are known within the study area. All were included in the analysis, providing for avoidance within the Big Piney Fuels EA, including project redesign to avoid adverse effects to historical properties.

The following protection measeures only apply to historical properties that are unevaluated, eligible or listed in the National Register of Historic Places.

Heritage Protection Measure 1: Site Avoidance During Project Implementation

Avoidance of historic properties will require the protection from effects resulting from the undertaking. Mitigation measures include establishing clearly defined site boundaries and buffers around archeological sites where activities that might result in an adverse effect and routing proposed activities away from historic properties. Buffers will be of sufficient size to ensure that site integrity is not compromised.

Heritage Protection Measure 2: Site Protection During Prescribed Burns

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

(2) Burn Unit Interior. Combustible elements at historic properties in burn unit interiors will be protected from damage during burns by removing excessive fuels from the feature vicinity and, where applicable, by burning out around the feature prior to igniting the main burn and creating a fuel-free zone. Historic properties containing above ground, non-combustible cultural features and exposed artifacts will be protected by removing fuel concentrations dense enough to significantly alter the characteristics of those cultural resources. For sites that have been previously burned or that do not contain combustible elements or other above-ground features and exposed artifacts, no additional measures

are proposed. Past research indicates that prescribed burning will not be sufficiently intense to cause adverse effects to these features.

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

Heritage Protection Measure 3: Other Protection Measures

(1) If it is not feasible or desirable to avoid an historic property that may be harmed by a project activity (HP1), then the following steps will be taken:

(2) In consultation with the Arkansas SHPO, the site(s) will be evaluated against NRHP significance criteria (36 CFR 60.4) to determine eligibility for the NRHP. The evaluation may require subsurface site testing;

(3) In consultation with the Arkansas SHPO, relevant federally-recognized Tribes, and if required with the ACHP, mitigation measures will be developed to minimize the adverse effects on the site, so that a finding of No Adverse Effect results;

The agreed-upon mitigation measures will be implemented prior to initiation of activities having the potential to affect the site.

Heritage Protection Measure 4: Discovery of Cultural Resources during Project Implementation

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

Proposed Action

<u>Direct/Indirect/Cumulative Effects</u>

There are 111 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. 116 are recommended as undetermined and will be protected from ground disturbing activities. Additionally, 403 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.

Table 26 – Showing status of known Heritage Sites

Site Type	Eligible	Unevaluated	Not Eligible	Total
Historic	53	23	339	415
Prehistoric	52	67	50	169
Multicomponent	6	8	14	28
Private		18		18
Total	111	116	403	630

The previously recorded site components include 169 that are primarily prehistoric. These include 84 rockshelters and 67 open sites (lithic scatters/camps).

Historic farmsteads or houses are the most common Historic site component, with 241 known. In addition, 37 rock fences, 32 fields, 19 rock piles, 17 distilleries, 12 cemeteries, 9 wells/springs, 9 roads, 8 lookout towers, 6 sawmills, 4 ore pits, 3 stock pens, 3 potato hotdeds, 2 livestock dipping vats, 2 historic trails, 2 schools and single occurrences of a historic trash pile, grist mill, plane crash, shale quary, rock dam, tree nursery and CCC camp are present.

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 I

<u>Direct/Indirect/Cumulative Effects</u>

No project activities would be implimented. All current approved projects would move forward with their heritage protection measures.

Alternative II

Direct/Indirect/Cumulative Effects
Same as the Proposed Action

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
- Kenney Smedley – Engineering Technician
- Mike Mulford – NEPA Coordinator
- Anthony Harris – Timber Management Officer
- Michael Haisten – Fire Management Officer
- Mark Hellen – Forester
- William Hunter – Forester
- Leif Anderson – Forester
- Mike Walden – Heritage Resources Technician
- Robert Foxworth – Archeologist
- Chris Brightwell – Assistant Fire Management Officer

Ozark National Forest – Supervisor's Office:
- Rick Monk – Hydrologist
- Greg Vickers – Silviculturalist
- Mathew Anderson – Fisheries Biologist
- Marvin L. Weeks – Soil Scientist
- Dr. David Jurney – Archeologist
- Kathy King – Writer/Editor
- Steve Duzan – 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)
- Martin Spetich - US Forest Service Research
- US Fish and Wildlife Service
- Karen Kaniatobe THPO Absentee Shawnee Tribe of Oklahoma
- Augustine Ashberry Alabama-Quassarte Tribal Town Historic Preservation Office
- Darin Cisco Apache Tribe of Oklahoma Tribal Historic Preservation Office

Robert Cast THPO Caddo Nation of Oklahoma
Richard Allen, PhD Historic Preservation Officer Cherokee Nation of Oklahoma
Gordon Yellowman Cheyenne-Arapaho Tribes of Oklahoma
Virginia Nail Tribal Historic Preservation Office Chickasaw Nation of Oklahoma
Brian Jones Cultural Coordinator Fort Sill Apache Tribe of Oklahoma
Terry Cole THPO Choctaw Nation of Oklahoma
Joyce Miller Cultural Specialist Iowa Tribe of Oklahoma
Jeremy Finch THPO/NAGPRA Citizen Potawatomi Nation
Betty Durkee Kaw Tribe of Oklahoma
Phyllis Wahahrockah-Tasi Comanche Indian Nation
Henry Harjo Environmental Director Kialegee Tribal Town
Tamara Francis Historic Preservation Officer Delaware Nation
Historic Preservation Office Kickapoo Tribe of Oklahoma
Robin Dushane Historic Preservation Officer Eastern Shawnee Tribe
Dewey Tsonetokoy, Sr. NAGPRA/Historic Preservation Office Kiowa Tribe of Oklahoma
Michael Darrow Historian Fort Sill Apache Tribe of Oklahoma
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

See Individual Maps on Website

http://www.fs.usda.gov/detail/osfnf/landmanagement/planning/?cid=stelprdb5212180

Appendix B

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APPENDIX C

Public Involvement

To encourage public participation in the **Fuels Management Project** decision process, a project initiation letter including maps were mailed or emailed to 328 neighboring landowners, the Native American Tribes, and other interested parties, explaining the project proposal on December 10, 2014. 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 ?????? requesting comments, questions, and offering detailed information to those expressing an interest in the project. ???????? letters were returned as undeliverable.
On December 11, 2014 met with four members of public to discuss project.
On March 11, 2015 field visit with partners look at restoration areas.
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 several times 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 Assessment Table

Detailed Assessment Table - VSA (A) – Deer and Slusher Creek

ASSESSMENT VALUES	ANALYSIS
Existing Visual Condition (EVC)	
Scale of Existing Views	Hwy 16 and Parker Ridge Rd have medium scaled views of privately owned land and public forest, RD1202/Hurricane Trail has small scale, limited internal views
Influence of Visual Landscape Design	Only evidence of human landscape design is within the privately owned acreage
Influence of Site Disturbance	Only perception of site disturbance from this drive path is the road maintenance itself
Influence of Vegetative Color & Texture	Visual condition ranges from fields to forest and bluff with varied vegetative color and texture
Visual Absorption Capability (VAC)	
Slope	Hwy 16 and Parker Ridge Rd provides Low VAC due to the relatively flat nature of the path, RD1208 presents downward slopes along the north side for the first half and then sharply upward near a possible chemical treatment providing High Visual Absorption
Aspect	Most views are internalized within the drive path on RD1208 providing High VAC for anything 50-100 feet away from the road and very Low VAC for treatments within 50 feet of the roadway
Surface Variation	Surfaces range from thick Foreground vegetation to Foreground bluffs and forest.
Rock/Soil/Vegetative Variety	The Variety of visual content would provide a higher VAC
Biophysical Relationship (BR)	
Slope	This VSA has a Low Biophysical Relationship due to internalized views and minimization of relationship due to slope
Aspect	The inward Aspect, VSA looking internally with limited openness and exposure, causes only slight relationship to the surrounding areas
Topographic Variety	The Topographic Variety of ridges, valleys, water and bluff often minimizes Visual Impact

Vertical Relief	Vertical Relief often hides what lies behind with Hwy 16 and Parker Ridge Rd/RD1202 having an extended BR and RD1208 having a very restricted BR due to steep slopes
Vegetative Variety	Hwy 16 and Parker Ridge Rd/RD 1202 has a wide variety of vegetation ranging from field to rough forest, RD 1208 Vegetation is primarily the forest with Pine and Hardwood
Adjacent Scenery	Hwy 16 and Parker Ridge /RD 1202 are primarily developed on the west side of the road which affects the PTAs and RD1208 has High relational quality on the south side of RD1208 as it is the northern boundary of the Hurricane Creek Wilderness
Viewing Condition (VC)	
Viewing Distance	Hwy 16 and Parker Ridge Rd/RD1202 have Medium scale exterior views – 1+ miles toward east and west, RD1208 has small scale internal views
Viewing Frequency	Views are limited and opportunities to stop are few
Viewing Duration	Hwy 16 and Parker Ridge Rd/RD1202 have long, yet unappealing viewing duration due to either developed private properties or close in vegetation preventing viewing opportunities, RD1208 transitions from Parker Ridge Rd and becomes more solitary with brief exposure seen while driving, very few opportunities to stop
Viewing Angle	Hwy 16 and Parker Ridge Rd/RD1202 have outward views of development at a flat angle that transition to RD1208 which has inward views of forest and Hurricane Creek Wilderness with a fairly steep viewing angle.
Viewer Expectations	Parker Ridge Rd provides low expectations of views due to developed nature of surroundings, Viewers have higher expectations for RD1208 as it borders the Wilderness
Visual Recovery	Visual recovery will be fully achieved due to the minimalized actions proposed
Rehabilitation/Enhancement	The proposed actions are following a course of action that will enhance and encourage regeneration that will bring the surrounding areas into a closer visual relationship to the Hurricane Creek Wilderness
Visual Impact (VI)	

Silvicultural Methods	Maintain current standards of silviculture for this area using the Shelterwood Method of regeneration
Wildlife Habitat Management	n/a
Road Management	All other roads leading off the drive path are either Basic Custodial Care (Closed) or Closed
Recreation Management	Proposed Actions will have low impact on Recreation during implementation with no continuous future impact

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 G

Summary Table From Travel Analysis Report

	Road Status Before Harvest	Road Status After Harvest	Action	Miles
92631G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Change Jurisdiction from FS to Private	0.16
1331A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.21
92746B	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES	Close	0.80
1253A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.68
1352	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	2.61
1365	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.49
92095A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.27
92120B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	2.00
92121E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.73
92132A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.89
92132C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.05
92142E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.63
92269J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.25
92631B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.37
92729B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.00
92729C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.19
92729D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.07
93004I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.17
93005K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.14
93014C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.33
93014D	1 - BASIC CUSTODIAL CARE (CLOSED)	- BASIC CUSTODIAL CARE (CLOSED)	Close	0.26
93014E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.20
93014E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.92
93014F	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.16
93014G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.69
93014G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.19
93014G	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.49
93014I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.23
93014J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.09
93014T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.28
93014W	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.04
93015D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.50
93015E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.14
93015J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.18
93015K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.39
93018E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.18
93018P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.36
93019D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.58
93019D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.60
93019Z	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.53
93019Z	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.17
93020K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.08
93020L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.29
93021Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.14
93022F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.84
93022N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.21
93022S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.25
93023B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.28
93023G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.17

93023I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.26
93023J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.11
93023J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.39
93023Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.23
93023R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.57
93024K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.32
93024O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.24
93025D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.22
93025J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.45
93025J	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.09
93025L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.19
93027C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.38
93027D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.61
93027N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.23
93027Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.15
93028E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.39
93030H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.17
93078C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.91
93078H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.14
93078I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.12
93083A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.35
93086B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	1.16
93086H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.75
93086N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.37
93086O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.28
93702C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.31
93702D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.10
93702E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Close	0.13
			TOTAL	37.93
1209	DECOMMISSIONED	D - DECOMMISSION	Decommission	2.31
1811	DECOMMISSIONED	D - DECOMMISSION	Decommission	1.61
92087I	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.20
92087K	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.27
92087M	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	1.07
92088E	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.31
92088F	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.55
92088H	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.22
92089D	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.51
92089F	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.49
92092C	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	1.07
92120G	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	1.24
92120H	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.54
92121C	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.79
92127C	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.23
92127D	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.21
92127E	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.50
92127F	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.60
92127I	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.15
92132D	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.75
92133C	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.24
92631A	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.76

92631C	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.74
92631E	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.18
92631K	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.27
92725A	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.44
92725B	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.28
92725C	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.64
92725E	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.57
92729A	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.58
92730A	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.30
92746C	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.55
92749F	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.89
93006E	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.16
93014B	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.95
93015F	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.41
93015G	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.56
93015H	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.22
93018I	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.14
93018M	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.08
93018N	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.21
93018O	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.31
93018R	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.06
93018X	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.07
93018Y	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.05
93018Z	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.07
93019F	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.60
93019U	2 - HIGH CLEARANCE VEHICLES	D - DECOMMISSION	Decommission	0.09
93021K1	2 - HIGH CLEARANCE VEHICLES	D - DECOMMISSION	Decommission	0.44
93022A7	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.52
93022J	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.30
93022K	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.38
93022L	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.31
93022X	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.08
93084A	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.63
93084B	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.17
93084C	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.31
93191N	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.81
93687M	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.15
93688A	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.33
93688A1	DECOMMISSIONED	D - DECOMMISSION	Decommission	0.18
93688F	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.18
93688M	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.11
93702A	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.30
93702F	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.19
93702I	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.62
93714C	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Decommission	0.63
			TOTAL	30.70
92133A	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES	OML1 to OML2	0.38
92135C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	1.21
92135G	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	0.45

93024C	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	0.47
93024C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	0.32
93024C	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	0.58
92133A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	0.73
92135F	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	OML2 Admin Only	0.23
			TOTAL	3.99
1372	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	OML2 to OML1	2.54
1203	3 - SUITABLE FOR PASSENGER CARS	2 - HIGH CLEARANCE VEHICLES	OML3 to OML2 Per TAP	3.77
1209	3 - SUITABLE FOR PASSENGER CARS	2 - HIGH CLEARANCE VEHICLES	OML3 to OML2 Per TAP	3.53
			TOTAL	7.30
1812A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	2.90
92104A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Open - OML 2	0.17
92104A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Open - OML 2	1.96
92122E	1 - BASIC CUSTODIAL CARE (CLOSED)	2 - HIGH CLEARANCE VEHICLES	Open - OML 2	0.30
92131C1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	0.21
92131C1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	0.84
93006C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Open - OML 2	0.94
93015F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	0.10
93015L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	0.69
93018B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Open - OML 2	0.19
93020A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	1.68
93021Z	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	0.92
93022A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	2.35
93022A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Open - OML 2	1.84
93022P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML 2	0.39
			TOTAL	15.48
92746C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Open - OML2 - Admin	0.10
93020D	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Open - OML2 - Reconstruction	1.34
1331A	3 - SUITABLE FOR PASSENGER CARS	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.59
1363	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.26
1363	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.03
93014P	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.12
93018L	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.21
93018U	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.06
93019H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	1.20
93019N	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.31
93019V	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	1.12

93019V	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.06
93019V1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.12
93020S	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.31
93021B1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.09
93021C1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.45
93022V	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.10
93023M	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.67
93023U	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.22
93025V	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.16
93026A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.52
93026A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.45
93026K	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.06
93026T	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.09
93028A1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.09
93028A2	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.12
93028D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.22
93031D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.07
93031D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.18
93031E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.67
93203C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.22
93688B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.96
93693B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.48
93694C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.29
93694D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.22
93702B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.15
93702J	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES - Admnistrative Use Only	Pre-Haul Maintenance	0.41
1002	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	4.46
1200A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	2.13
1200A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.39
1202	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	6.11
1208	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	3.29
1208A	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	3.50
1209D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.97
1214	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.88
1221	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.55

1230	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.45
1242	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	2.12
1247	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.67
1247A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.86
1253	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.81
1253	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.05
1253	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.63
1253A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.31
1259	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.44
1262	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.04
1301	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	3.63
1301	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	1.21
1301B	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.41
1304	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	2.67
1304A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.25
1304B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.08
1304B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.90
1305	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	1.43
1305	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	5.26
1305C	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.43
1306	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	3.49
1309	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	4.58
1309	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	2.54
1309	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.06
1315	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	2.61
1315	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.55
1315A	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.08
1318	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.43
1319	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.85
1319	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	4.03
1320	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.46
1326	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.28
1329	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.47
1331	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	4.44
1334	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	2.51
1335	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.07
1335	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.08
1337	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.79
1337	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.07
1337	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.86
1337	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.67
1339	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.29
1340	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.47
1340	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.18
1344	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.25
1365	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.22
1365	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.05
1365	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.11

1366	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.64
1367	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.39
1367	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.75
1368	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.56
1369	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.99
1384	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	2.97
1388	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	1.25
1800	4 - MODERATE DEGREE OF USER COMFORT	4 - MODERATE DEGREE OF USER COMFORT	Pre-Haul Maintenance	0.92
1812	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	4.14
1813	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Pre-Haul Maintenance	0.64
1817	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	4.33
1827	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.97
92098A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.43
92098E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.81
92099D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.24
92120A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.14
92120A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.38
92120C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
92120E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.46
92120F	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
92120I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.16
92121A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.31
92121A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.46
92121B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.27
92121D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.34
92122A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	2.14
92122B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.88
92122C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.37
92122D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.44
92122H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.11
92122I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.65
92126A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.13
92126A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.37
92126D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.67
92126E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.20
92126E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.60
92126F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.77
92127A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.20
92175A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.64
92631A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.36
92631D	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.30
92631E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.35
92631F	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.38
92631J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
92730A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.61
92730B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.17
92730D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.29
92730E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.36
92730F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.13
92737A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.48
92737B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.37
92737C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.17

92737D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.29
92737F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.11
92738B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.54
92738E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.29
93011A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93013A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.43
93014A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.22
93014H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.46
93014H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93014K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.05
93014L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.11
93014M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12
93014N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.29
93014O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.30
93014R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.24
93014V	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.06
93014Y	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.16
93015B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.03
93017H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.56
93018A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.37
93018A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.10
93018A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93018C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.72
93018F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.29
93018G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.45
93018J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.59
93018K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12
93018V	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.39
93018W	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.07
93019A1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.21
93019A2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.06
93019B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93019B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.29
93019C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.53
93019C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.89
93019G	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.71
93019L	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.14
93019M	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.36
93019P	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.59
93019S	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.70
93019W	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93020A1	DECOMMISSIONED	D - DECOMMISSION	Pre-Haul Maintenance	0.07
93020A2	DECOMMISSIONED	D - DECOMMISSION	Pre-Haul Maintenance	0.16
93020B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.55
93020C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.72
93020E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.98
93020F1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.16
93020F2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93020F3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.11
93020G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.50
93020H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.46
93020I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.30

93020J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.50
93020M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.30
93020N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.38
93020O	1 - BASIC CUSTODIAL CARE (CLOSED)	D - DECOMMISSION	Pre-Haul Maintenance	0.46
93020R	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.27
93021B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.17
93021C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.54
93021D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.19
93021F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.17
93021F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.17
93021H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.07
93021H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.58
93021I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.40
93021J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.51
93021K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.33
93021K	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.29
93021K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.54
93021L	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.48
93021M	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.25
93021N	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.48
93021P	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.13
93021R	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.12
93021S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.17
93021T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.49
93021U	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.78
93021Y	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.55
93022A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.18
93022A3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.10
93022A4	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.23
93022A5	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.46
93022A6	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93022B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.55
93022D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.44
93022G	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.15
93022G1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.14
93022H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.91
93022H1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.14
93022H2	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.18
93022I	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.74
93022T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.11
93022U	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.29
93022Z	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.08
93023A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.45
93023C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.87
93023D	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.24
93023E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.44
93023K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
93023L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.23
93023N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93023O		D - DECOMMISSION	Pre-Haul Maintenance	0.44
93023P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.28
93023S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.17

93023V	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.33
93024A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.10
93024A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.01
93024B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.21
93024D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.30
93024F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.67
93024H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.23
93024J	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.78
93024L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.12
93024M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.20
93024P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.13
93024Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93024R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.34
93024T	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93024U	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.47
93025A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12
93025A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.59
93025A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.34
93025B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.97
93025B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.14
93025C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.84
93025E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.89
93025E	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.26
93025H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.25
93025I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.52
93025I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.41
93025K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.11
93025M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.10
93025N	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.10
93025O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
93025Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.10
93025R	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.13
93025S	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.17
93025T	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.07
93025U	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.39
93025X	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93025Y	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93026B	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.39
93026C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.21
93026C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.22
93026D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.15
93026F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.44
93026H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93026I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12
93026J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.59
93026J1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.08
93026L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93026M	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.52
93026N	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.18
93026P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.09
93026Q	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.31
93026R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12

93026S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93027A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.58
93027A1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.33
93027A3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.31
93027A5	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.09
93027B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.35
93027B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.38
93027B3	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.13
93027D1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.14
93027E	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.14
93027F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.66
93027H	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.24
93027J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
93027K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.30
93027L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.28
93027M	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.09
93027O	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.30
93027P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.15
93027S	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.18
93027T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.14
93027T	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.07
93027U	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.10
93027W	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93027X	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.08
93027Y	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.52
93027Y1	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.13
93027Z	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.22
93028A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.79
93028A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.52
93028C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.40
93028F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.38
93028F1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.14
93028G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.51
93028H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.23
93028K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
93028M	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.68
93028M1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.24
93028N	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93028O	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93028P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.06
93028R	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12
93029B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.48
93029D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.72
93030A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.18
93030A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.59
93030B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.49
93030B	2 - HIGH CLEARANCE VEHICLES	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.75
93030C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.05
93030C1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93030E	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.30
93030F	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.77
93030K	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.31

93030N	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.20
93031A	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	1.52
93031B	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.85
93031C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.56
93031F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
93031G	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.68
93031H	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.12
93031I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.39
93031J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.16
93031K	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93031L	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.07
93031M	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.21
93036J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.08
93203A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.86
93203A1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.41
93204A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.98
93204C	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.44
93237A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	1.90
93237I	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.24
93237J	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93237N	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.15
93237O	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.19
93237P	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.18
93238F	1 - BASIC CUSTODIAL CARE (CLOSED)	1 - BASIC CUSTODIAL CARE (CLOSED)	Pre-Haul Maintenance	0.50
93688B1	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.10
93688D	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.45
93688J	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.21
93688O	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.25
93693A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	2.07
93693C	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.07
93694A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Pre-Haul Maintenance	0.35
SR16	5 - HIGH DEGREE OF USER COMFORT	5 - HIGH DEGREE OF USER COMFORT	Pre-Haul Maintenance	1.30
SR16	5 - HIGH DEGREE OF USER COMFORT	5 - HIGH DEGREE OF USER COMFORT	Pre-Haul Maintenance	0.74
SR7	5 - HIGH DEGREE OF USER COMFORT	5 - HIGH DEGREE OF USER COMFORT	Pre-Haul Maintenance	2.61
			TOTAL	248.59
1209	3 - SUITABLE FOR PASSENGER CARS	3 - SUITABLE FOR PASSENGER CARS	Reconstruction	4.36
1309A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	0.57
92730A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	0.67
93019A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	2.09
93019X	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	0.43
93021W	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	0.26
93023A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	0.13
93023A	2 - HIGH CLEARANCE VEHICLES	2 - HIGH CLEARANCE VEHICLES	Reconstruction	1.40
			TOTAL	9.91

Appendix –H (Aquatics)

Table 1. Describes amount and types of Large Woody Debris in streams on the Big Piney Ranger District, Ozark-St. Francis National Forests.

HUC/STREAM	Length of Inventory (Miles)	Total Wood Debris (Mile)	Length >16.4 (FT)	
			Diameter < 21.7/Mile	Diameter >21.7/Mile
110100050308				
Bobtail Creek	4.7	23.9	0.0	1.1
Falling Water Creek	7.5	15.5	0.1	0.0
Richland Creek	15.5	3.4	0.1	0.0
110100140201				
Brushy Fork	7.1	27.2	0.1	0.7
South Fork Little Red River	5.6	16.1	0.2	2.1
111102020606				
Bear Creek				
Gee Creek	4.3	45.2	0.0	0.7
111102020704				
Sulphur Creek	2.3	41.1	0.0	0.4
111102020801				
Moccasin Creek	6.1	70.3	0.0	3.0
111102020802				
Gunter Branch	3.3	160.3	0.3	0.3
Indian Creek	6.0	64.7	0.0	0.0
Lick Creek	2.7	154.4	0.0	0.4
111102020803				
Spring Creek	4.1	68.7	0.0	1.0
Trace Creek	3.1	98.5	0.0	0.6
111102020901				
East Fork Illinois Bayou	9.1	47.2	0.0	0.5
Hurricane Creek	5.0	48.6	0.0	0.0
111102020902				
Meyer Branch	2.7	118.2	0.0	0.7
Middle Fork Illinois Bayou	17.6	25.7	0.0	0.6
Snow Creek	2.5	58.0	0.0	4.4
111102020903				
Dry Creek	5.8	96.0	0.0	0.3
Payne Creek	4.3	103.6	0.9	0.9
Right Hand Prong	2.1	161.5	0.0	0.0
Sulphur Creek	5.2	75.5	0.0	0.2

Table 1. Continued

HUC/STREAM	Length of Inventory (Miles)	Total Wood Debris (Mile)	Length >16.4 (FT)	
			Diameter < 21.7/Mile	Diameter >21.7/Mile
111102020904				
Campbell Hollow				
Cowan Creek	3.2	160.8	0.0	0.3
111102020905				
Mill Creek	6.9	37.2	0.0	0.0
111102030101				
Brock Creek	8.8	70.1	0.0	0.5
Driver Creek	5.9	79.8	0.2	0.0
111102030103				
Anderson Creek	0.9	59.0	0.0	0.0
Poe Creek	2.0	135.9	0.0	2.5
111102030105				
Rock Creek	1.7	52.6	0.0	0.0

Table 2. Describes the fish assemblages in 32 streams on the Big Piney Ranger District, Ozark-St. Francis National Forests.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
110100050308			
Bobtail Creek	**8**	**792**	
Centrarchidae		14	2%
Lepomis cyanellus		12	2%
Lepomis macrochirus		1	0%
Lepomis megalotis		1	0%
Cyprinidae		672	85%
Campostoma anomalum		405	51%
Phoxinus erythrogaster		65	8%
Pimephales notatus		1	0%
Semotilus atromaculatus		201	25%
Percidae		106	13%
Etheostoma spectabile		106	13%
Falling Water Creek	**16**	**920**	
Catostomidae		14	2%
Hypentelium nigricans		14	2%
Centrarchidae		50	5%
Ambloplites ariommus		1	0%
Lepomis cyanellus		3	0%
Lepomis megalotis		40	4%
Micropterus dolomieu		6	1%
Cyprinidae		516	56%
Campostoma anomalum		386	42%
Cyprinella galactura		20	2%
Nocomis biguttatus		3	0%
Notropis boops		18	2%
Notropis nubilus		42	5%
Semotilus atromaculatus		47	5%
Ictaluridae		40	4%
Noturus exilis		40	4%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Percidae		300	33%
Etheostoma blennoides		54	6%
Etheostoma caeruleum		123	13%
Etheostoma punctulatum		3	0%
Etheostoma spectabile		120	13%
Richland Creek	**16**	**1011**	
Catostomidae		1	0%
Hypentelium nigricans		1	0%
Centrarchidae		90	9%
Ambloplites ariommus		2	0%
Lepomis cyanellus		6	1%
Lepomis megalotis		74	7%
Micropterus dolomieu		8	1%
Cyprinidae		590	58%
Campostoma anomalum		380	38%
Cyprinella galactura		3	0%
Nocomis biguttatus		3	0%
Notropis boops		126	12%
Phoxinus erythrogaster		67	7%
Semotilus atromaculatus		11	1%
Fundulidae		2	0%
Fundulus catenatus		2	0%
Ictaluridae		46	5%
Noturus exilis		46	5%
Percidae		282	28%
Etheostoma blennoides		40	4%
Etheostoma caeruleum		93	9%
Etheostoma spectabile		149	15%
110100140201			
Brushy Fork	**14**	**381**	
Catostomidae		3	1%
Erimyzon oblongus		3	1%
Centrarchidae		24	6%
Lepomis cyanellus		7	2%
Lepomis megalotis		17	4%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Cyprinidae		187	49%
Campostoma anomalum		60	16%
Notropis boops		54	14%
Pimephales notatus		3	1%
Semotilus atromaculatus		70	18%
Fundulidae		1	0%
Fundulus olivaceus		1	0%
Ictaluridae		29	8%
Noturus exilis		29	8%
Percidae		137	36%
Etheostoma blennoides		9	2%
Etheostoma caeruleum		83	22%
Etheostoma punctulatum		19	5%
Etheostoma spectabile		6	2%
Etheostoma whipplei		20	5%
South Fork Little Red River	**16**	**292**	
Catostomidae		2	1%
Erimyzon oblongus		1	0%
Moxostoma duquesnei		1	0%
Centrarchidae		51	17%
Lepomis cyanellus		5	2%
Lepomis megalotis		45	15%
Micropterus dolomieu		1	0%
Cyprinidae		133	46%
Campostoma anomalum		10	3%
Notropis boops		112	38%
Pimephales notatus		2	1%
Semotilus atromaculatus		9	3%
Esocidae		1	0%
Esox americanus		1	0%
Fundulidae		1	0%
Fundulus olivaceus		1	0%
Ictaluridae		21	7%
Noturus albater		1	0%
Noturus exilis		20	7%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Percidae		83	28%
Etheostoma blennoides		9	3%
Etheostoma caeruleum		72	25%
Etheostoma whipplei		2	1%
111102020606			
Bear Creek	**9**	**574**	
Cyprinidae		390	68%
Campostoma anomalum		28	5%
Notropis boops		2	0%
Phoxinus erythrogaster		22	4%
Semotilus atromaculatus		338	59%
Ictaluridae		21	4%
Noturus exilis		21	4%
Percidae		163	28%
Etheostoma blennoides		9	2%
Etheostoma flabellare		4	1%
Etheostoma spectabile		127	22%
Etheostoma whipplei		23	4%
Gee Creek	**7**	**476**	
Cyprinidae		308	65%
Campostoma anomalum		10	2%
Notropis boops		4	1%
Semotilus atromaculatus		294	62%
Ictaluridae		40	8%
Noturus exilis		40	8%
Percidae		128	27%
Etheostoma blennoides		4	1%
Etheostoma spectabile		99	21%
Etheostoma whipplei		25	5%
111102020704			
Sulphur Creek	**10**	**413**	
Catostomidae		1	0%
Hypentelium nigricans		1	0%
Centrarchidae		1	0%
Lepomis megalotis		1	0%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Cyprinidae		268	65%
Campostoma anomalum		35	8%
Phoxinus erythrogaster		91	22%
Semotilus atromaculatus		142	34%
Ictaluridae		35	8%
Noturus exilis		35	8%
Percidae		108	26%
Etheostoma blennoides		4	1%
Etheostoma flabellare		16	4%
Etheostoma spectabile		80	19%
Etheostoma whipplei		8	2%
111102020801			
Moccasin Creek	**11**	**181**	
Catostomidae		2	1%
Erimyzon oblongus		1	1%
Hypentelium nigricans		1	1%
Centrarchidae		5	3%
Lepomis cyanellus		3	2%
Lepomis megalotis		2	1%
Cyprinidae		115	64%
Campostoma anomalum		53	29%
Notropis boops		11	6%
Semotilus atromaculatus		51	28%
Ictaluridae		10	6%
Noturus exilis		10	6%
Percidae		49	27%
Etheostoma blennoides		10	6%
Etheostoma spectabile		36	20%
Etheostoma whipplei		3	2%
111102020802			
Gunter Branch	**7**	**712**	
Cyprinidae		369	52%
Campostoma anomalum		38	5%
Semotilus atromaculatus		331	46%
Ictaluridae		31	4%
Noturus exilis		31	4%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Percidae		312	44%
Etheostoma blennoides		2	0%
Etheostoma flabellare		3	0%
Etheostoma spectabile		284	40%
Etheostoma whipplei		23	3%
Indian Creek	**18**	**1624**	
Catostomidae		10	1%
Hypentelium nigricans		10	1%
Centrarchidae		123	8%
Lepomis cyanellus		10	1%
Lepomis megalotis		101	6%
Micropterus dolomieu		12	1%
Cyprinidae		435	27%
Campostoma anomalum		267	16%
Luxilus cardinalis		32	2%
Notropis boops		60	4%
Pimephales notatus		22	1%
Semotilus atromaculatus		54	3%
Fundulidae		9	1%
Fundulus catenatus		1	0%
Fundulus olivaceus		8	0%
Ictaluridae		261	16%
Ameiurus natalis		1	0%
Noturus exilis		260	16%
Percidae		786	48%
Etheostoma blennoides		215	13%
Etheostoma flabellare		61	4%
Etheostoma spectabile		445	27%
Etheostoma whipplei		23	1%
Etheostoma zonale		42	3%
Lick Creek	**5**	**220**	
Cyprinidae		122	55%
Campostoma anomalum		11	5%
Semotilus atromaculatus		111	50%
Ictaluridae		20	9%
Noturus exilis		20	9%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Percidae		78	35%
Etheostoma spectabile		63	29%
Etheostoma whipplei		15	7%
111102020803			
Spring Creek	**10**	**498**	
Catostomidae		1	0%
Erimyzon oblongus		1	0%
Centrarchidae		7	1%
Lepomis cyanellus		3	1%
Lepomis megalotis		4	1%
Cyprinidae		294	59%
Campostoma anomalum		79	16%
Luxilus cardinalis		1	0%
Semotilus atromaculatus		214	43%
Ictaluridae		27	5%
Noturus exilis		27	5%
Percidae		169	34%
Etheostoma blennoides		12	2%
Etheostoma flabellare		9	2%
Etheostoma spectabile		97	19%
Etheostoma whipplei		51	10%
Trace Creek	**6**	**231**	
Cyprinidae		134	58%
Campostoma anomalum		17	7%
Semotilus atromaculatus		117	51%
Ictaluridae		20	9%
Noturus exilis		20	9%
Percidae		77	33%
Etheostoma blennoides		2	1%
Etheostoma spectabile		60	26%
Etheostoma whipplei		15	6%
111102020901			
East Fork Illinois Bayou	**20**	**1512**	
Atherinopsidae		10	1%
Labidesthes sicculus		10	1%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Catostomidae		14	1%
Hypentelium nigricans		6	0%
Moxostoma duquesnei		8	1%
Centrarchidae		65	4%
Lepomis cyanellus		8	1%
Lepomis megalotis		50	3%
Micropterus dolomieu		7	0%
Cyprinidae		553	37%
Campostoma anomalum		202	13%
Cyprinella whipplei		2	0%
Notropis boops		18	1%
Pimephales notatus		15	1%
Semotilus atromaculatus		316	21%
Ictaluridae		42	3%
Noturus exilis		42	3%
Percidae		826	55%
Etheostoma blennoides		100	7%
Etheostoma flabellare		125	8%
Etheostoma punctulatum		20	1%
Etheostoma spectabile		554	37%
Etheostoma whipplei		20	1%
Etheostoma zonale		6	0%
Percina caprodes		1	0%
Petromyzontidae		2	0%
Ichthyomyzon castaneus		2	0%
Hurricane Creek	**7**	**253**	
Centrarchidae		10	4%
Lepomis cyanellus		10	4%
Cyprinidae		174	69%
Campostoma anomalum		25	10%
Semotilus atromaculatus		149	59%
Ictaluridae		25	10%
Noturus exilis		25	10%
Percidae		44	17%
Etheostoma blennoides		5	2%
Etheostoma spectabile		24	9%
Etheostoma whipplei		15	6%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
111102020902			
Meyer Branch	**7**	**66**	
Cyprinidae		30	45%
Campostoma anomalum		5	8%
Phoxinus erythrogaster		13	20%
Semotilus atromaculatus		12	18%
Ictaluridae		1	2%
Noturus exilis		1	2%
Percidae		35	53%
Etheostoma blennoides		5	8%
Etheostoma spectabile		28	42%
Etheostoma whipplei		2	3%
Middle Fork Illinois Bayou	**9**	**283**	
Centrarchidae		6	2%
Lepomis cyanellus		6	2%
Cyprinidae		155	55%
Campostoma anomalum		73	26%
Notropis boops		66	23%
Notropis greenei		5	2%
Pimephales notatus		11	4%
Ictaluridae		9	3%
Noturus exilis		9	3%
Percidae		113	40%
Etheostoma blennoides		37	13%
Etheostoma flabellare		24	8%
Etheostoma spectabile		52	18%
Snow Creek	**3**	**73**	
Cyprinidae		38	52%
Campostoma anomalum		9	12%
Semotilus atromaculatus		29	40%
Percidae		35	48%
Etheostoma spectabile		35	48%
111102020903			
Dry Creek	**10**	**892**	
Centrarchidae		1	0%
Micropterus dolomieu		1	0%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Cyprinidae		598	67%
Campostoma anomalum		13	1%
Pimephales notatus		4	0%
Semotilus atromaculatus		581	65%
Ictaluridae		48	5%
Noturus exilis		48	5%
Percidae		245	27%
Etheostoma blennoides		28	3%
Etheostoma flabellare		13	1%
Etheostoma punctulatum		4	0%
Etheostoma spectabile		114	13%
Etheostoma whipplei		86	10%
Payne Creek	**9**	**333**	
Cyprinidae		192	58%
Campostoma anomalum		2	1%
Pimephales notatus		2	1%
Semotilus atromaculatus		188	56%
Ictaluridae		4	1%
Noturus exilis		4	1%
Percidae		137	41%
Etheostoma blennoides		3	1%
Etheostoma flabellare		2	1%
Etheostoma spectabile		49	15%
Etheostoma whipplei		82	25%
Etheostoma zonale		1	0%
Right Hand Prong	**6**	**149**	
Cyprinidae		59	40%
Campostoma anomalum		9	6%
Pimephales notatus		6	4%
Semotilus atromaculatus		44	30%
Ictaluridae		1	1%
Noturus exilis		1	1%
Percidae		89	60%
Etheostoma blennoides		25	17%
Etheostoma spectabile		64	43%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Sulphur Creek	**9**	**225**	
Centrarchidae		1	0%
Micropterus dolomieu		1	0%
Cyprinidae		136	60%
Campostoma anomalum		17	8%
Notropis boops		1	0%
Semotilus atromaculatus		118	52%
Ictaluridae		24	11%
Noturus exilis		24	11%
Percidae		64	28%
Etheostoma blennoides		4	2%
Etheostoma flabellare		4	2%
Etheostoma spectabile		35	16%
Etheostoma whipplei		21	9%
Unnamed 2259	**6**	**148**	
Cyprinidae		106	72%
Semotilus atromaculatus		106	72%
Ictaluridae		2	1%
Noturus exilis		2	1%
Percidae		40	27%
Etheostoma blennoides		8	5%
Etheostoma flabellare		2	1%
Etheostoma spectabile		18	12%
Etheostoma whipplei		12	8%
111102020904			
Campbell Hollow	**8**	**108**	
Centrarchidae		6	6%
Lepomis cyanellus		6	6%
Cyprinidae		57	53%
Campostoma anomalum		4	4%
Notropis boops		1	1%
Semotilus atromaculatus		52	48%
Ictaluridae		2	2%
Noturus exilis		2	2%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Percidae		43	40%
Etheostoma blennoides		2	2%
Etheostoma spectabile		27	25%
Etheostoma whipplei		14	13%
Cowan Creek	**6**	**229**	
Cyprinidae		151	66%
Campostoma anomalum		1	0%
Semotilus atromaculatus		150	66%
Ictaluridae		1	0%
Noturus exilis		1	0%
Percidae		77	34%
Etheostoma blennoides		1	0%
Etheostoma spectabile		52	23%
Etheostoma whipplei		24	10%
111102020905			
Mill Creek	**14**	**403**	
Catostomidae		10	2%
Erimyzon oblongus		10	2%
Centrarchidae		24	6%
Lepomis cyanellus		13	3%
Lepomis megalotis		10	2%
Micropterus dolomieu		1	0%
Cyprinidae		202	50%
Campostoma anomalum		62	15%
Notropis boops		11	3%
Pimephales notatus		2	0%
Semotilus atromaculatus		127	32%
Ictaluridae		26	6%
Noturus exilis		26	6%
Percidae		141	35%
Etheostoma blennoides		10	2%
Etheostoma flabellare		4	1%
Etheostoma punctulatum		6	1%
Etheostoma spectabile		89	22%
Etheostoma whipplei		32	8%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
111102030101			
Brock Creek	**18**	**846**	
Catostomidae		12	1%
Erimyzon oblongus		12	1%
Centrarchidae		78	9%
Lepomis cyanellus		60	7%
Lepomis macrochirus		16	2%
Lepomis megalotis		2	0%
Cyprinidae		350	41%
Campostoma anomalum		126	15%
Lythrurus umbratilis		1	0%
Notropis boops		19	2%
Pimephales notatus		2	0%
Semotilus atromaculatus		202	24%
Esocidae		1	0%
Esox americanus		1	0%
Fundulidae		2	0%
Fundulus olivaceus		2	0%
Ictaluridae		48	6%
Ameiurus natalis		3	0%
Noturus exilis		45	5%
Percidae		355	42%
Etheostoma blennoides		17	2%
Etheostoma flabellare		43	5%
Etheostoma spectabile		174	21%
Etheostoma whipplei		110	13%
Percina caprodes		11	1%
Driver Creek	**12**	**463**	
Catostomidae		2	0%
Erimyzon oblongus		2	0%
Centrarchidae		4	1%
Lepomis cyanellus		4	1%
Cyprinidae		216	47%
Campostoma anomalum		125	27%
Notropis boops		9	2%
Semotilus atromaculatus		82	18%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Esocidae		1	0%
Esox niger		1	0%
Ictaluridae		29	6%
Ameiurus natalis		4	1%
Noturus exilis		25	5%
Percidae		211	46%
Etheostoma blennoides		2	0%
Etheostoma flabellare		4	1%
Etheostoma spectabile		140	30%
Etheostoma whipplei		65	14%
Etheostoma whipplei		40	9%
111102030103			
Anderson Creek	**2**	**100**	
Cyprinidae		30	30%
Campostoma anomalum		30	30%
Percidae		70	70%
Etheostoma whipplei		70	70%
Poe Creek	**7**	**320**	
Centrarchidae		97	30%
Lepomis cyanellus		97	30%
Cyprinidae		124	39%
Campostoma anomalum		124	39%
Fundulidae		2	1%
Fundulus olivaceus		2	1%
Ictaluridae		16	5%
Ameiurus natalis		2	1%
Noturus exilis		14	4%
Percidae		81	25%
Etheostoma spectabile		56	18%
Etheostoma whipplei		25	8%
111102030105			
Rock Creek	**12**	**115**	
Catostomidae		3	3%
Erimyzon oblongus		3	3%

Table 2. Continued.

HUC/STREAM/FAMILY/ SPECIES	Species Richness	# of Individuals	% of Assemblage
Centrarchidae		49	43%
Lepomis cyanellus		33	29%
Lepomis macrochirus		1	1%
Lepomis megalotis		15	13%
Cyprinidae		35	30%
Campostoma anomalum		9	8%
Lythrurus umbratilis		12	10%
Notropis boops		7	6%
Semotilus atromaculatus		7	6%
Ictaluridae		7	6%
Ameiurus natalis		2	2%
Noturus exilis		5	4%
Percidae		21	18%
Etheostoma spectabile		9	8%
Etheostoma whipplei		12	10%

Table 3. Describes some of the characteristics of the streams where fish inventories had occurred. Data are from the 2010 Center of Aquatic Technology Transfer Team Report. Streams highlighted in green are most similar to the reference streams and ranked excellent. Streams highlighted as pink are not similar and ranked poor.

HUC/Stream	Distance Sampled (miles)	Width (Ft)	Depth (Inches)	Gradient	Percent Fines	Dominate Substrate	Cascade	Glide	Pool	Riffle	Run	Underground	Fish Assemblage Similarity Ranking
110100050308													
Bobtail Creek	4.6	12.2	6.8	5.4	7.8	Small Gravel/ Large Gravel	0.00%	12.39 %	17.14 %	29.70%	0.00%	40.77%	Poor
Falling Water Creek	7.5	21.4	11.8	2.0	9.3	Bedrock	0.00%	10.02 %	51.45 %	29.75%	0.00%	8.78%	Fair
Richland Creek	15.5	27.3	12.1	2.8	8.5	Bedrock/ Cobble	0.00%	21.45 %	45.61 %	22.43%	1.81%	8.72%	Good
110100140201													
Brushy Fork	7.1	19.7	10.3	2.2	8.5	Cobble/ Bedrock	0.00%	8.79%	43.46 %	33.27%	0.65%	13.83%	Excellent
South Fork Little Red River	5.6	30.0	11.9	2.5	8.6	Cobble/ Bedrock	0.00%	8.49%	64.41 %	25.47%	1.63%	0.00%	Excellent
111102020606													
Bear Creek	5.3	8.7	6.2	5.5	9.6	Cobble/ Boulder	2.26%	0.50%	43.32 %	41.96%	0.08%	11.88%	Fair
Gee Creek	4.3	8.3	5.2	3.9	9.7	Cobble/ Bedrock	0.00%	7.90%	39.20 %	29.99%	0.86%	22.05%	Fair
111102020704													
Sulphur Creek	2.3	6.8	5.1	1.9	11.8	Cobble/ Boulder	0.28%	2.01%	47.15 %	44.57%	0.83%	5.16%	Fair

Table 3. Continued.

HUC/Stream	Distance Sampled (miles)	Width (Ft)	Depth (Inches)	Gradient	Percent Fines	Dominate Substrate	Cascade	Glide	Pool	Riffle	Run	Underground	Fish Assemblage Similarity Ranking
111102020801													
Moccasin Creek	6.1	12.2	9.0	3.2	8.7	Cobble/ Bedrock	0.71%	2.54%	39.70 %	29.27%	3.28%	24.49%	Fair
111102020802													
Gunter Branch	3.3	8.8	4.7	4.2	7.1	Bedrock/ Cobble	2.11%	9.06%	32.27 %	32.57%	0.23%	23.77%	Fair
Indian Creek	6.0	20.6	8.4	1.2	10.1	Large Gravel/ Cobble	0.00%	3.29%	62.77 %	29.89%	0.74%	3.31%	Good
Lick Creek	2.7	7.0	4.2	3.3	9.5	Large Gravel/ Small Gravel	3.53%	3.65%	29.44 %	47.86%	0.00%	15.52%	Fair
111102020803													
Spring Creek	4.1	13.8	8.2	3.5	10.0	Cobble/ Bedrock	3.74%	6.01%	41.94 %	37.31%	0.00%	11.01%	Fair
Trace Creek	3.1	10.9	6.0	2.8	10.3	Boulder/Small Gravel	1.35%	8.81%	35.00 %	48.15%	2.40%	4.28%	Fair
111102020901													
East Fork Illinois Bayou	9.1	20.3	9.9	2.6	8.2	Cobble/ Bedrock	0.15%	10.35 %	53.70 %	27.86%	2.73%	5.20%	Fair
Hurricane Creek	20.2	9.5	4.9	2.5	6.3	Bedrock/ Large Gravel	0.14%	12.80 %	39.86 %	30.41%	2.94%	13.85%	Fair

Table 3. Continued.

HUC/Stream	Distance Sampled (miles)	Width (Ft)	Depth (Inches)	Gradient	Percent Fines	Dominate Substrate	Cascade	Glide	Pool	Riffle	Run	Underground	Fish Assemblage Similarity Ranking
111102020902													
Meyer Branch	2.7	12.1	8.8	2.8	1.0	Bedrock/ Cobble	0.49%	19.94 %	25.09 %	53.95%	0.53%	0.00%	Fair
Middle Fork Illinois Bayou	17.6	34.1	18.2	3.7	11.6	Bedrock/ Cobble	0.05%	12.02 %	48.29 %	28.58%	11.05 %	0.01%	Good
Snow Creek	2.5	17.2	9.3	2.9	8.0	Bedrock/ Large Gravel	1.03%	17.30 %	24.34 %	49.15%	8.19%	0.00%	Fair
111102020903													
Dry Creek	5.8	10.0	6.0	2.5	9.9	Cobble/Small Gravel	0.10%	2.63%	44.35 %	34.36%	0.00%	18.57%	Fair
Payne Creek	4.3	9.6	7.5	2.8	6.9	Cobble/ Bedrock	1.98%	6.31%	35.13 %	43.19%	10.01 %	3.37%	Not
Right Hand Prong	2.1	11.8	6.1	3.4	6.0	Bedrock/ Boulder	0.73%	5.55%	32.16 %	40.88%	0.23%	20.44%	Fair
Sulphur Creek	5.2	12.8	8.8	2.2	7.9	Bedrock/ Large Gravel	0.41%	2.44%	42.25 %	47.99%	1.05%	5.86%	Fair
Unnamed 2259	2.5	7.5	4.0	4.6	12.0	Large Gravel/ Cobble	0.00%	4.01%	31.04 %	45.01%	7.65%	12.29%	Fair
111102020904													
Campbell Hollow	4.2	8.9	6.3	2.7	11.6	Small Gravel/ Boulder	0.00%	8.58%	26.01 %	42.93%	2.86%	19.63%	Fair

Table 3. Continued

HUC/Stream	Distance Sampled (miles)	Width (Ft)	Depth (Inches)	Gradient	Percent Fines	Dominate Substrate	Cascade	Glide	Pool	Riffle	Run	Underground	Fish Assemblage Similarity Ranking
111102020905													
Cowan Creek	3.2	11.1	5.8	4.4	7.9	Large Gravel/ Cobble	0.79%	1.87%	31.94 %	55.60%	2.98%	6.83%	Not
111102020905													
Mill Creek	6.9	10.2	6.5	3.4	7.1	Large Gravel/ Bedrock	0.31%	5.19%	45.72 %	29.22%	1.18%	18.37%	Good
111102030101													
Brock Creek	8.8	17.7	7.5	2.2	9.1	Bedrock/ Cobble	0.00%	6.60%	35.64 %	22.31%	3.02%	32.42%	Good
Driver Creek	5.9	8.7	6.1	2.0	7.0	Large Gravel/ Cobble	0.00%	13.92 %	34.90 %	27.23%	20.86 %	3.09%	Good
111102030103													
Anderson Creek	0.9	8.7	1.3		7.5	Bedrock/ Boulder	0.00%	0.73%	4.60%	0.00%	0.00%	94.67%	Fair
Poe Creek	2.0	7.9	4.7	2.3	7.0	Bedrock/ Boulder	0.09%	13.90 %	22.47 %	12.84%	5.88%	44.82%	Fair
111102030105													
Rock Creek	1.7	10.9	4.8	4.0	7.0	Cobble/ Large Gravel	0.00%	7.44%	11.09 %	1.05%	1.43%	78.99%	Good