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Environmental Assessment

Bearcat Hollow Phase II Project

Pope, Newton, and Searcy Counties, Arkansas

Ozark-St. Francis National Forests
Big Piney Ranger District

For Information Contact:
Mike Mulford
PO Box 427
Jasper, AR 72641
(870) 446-5122 ext: 5136

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Chapter I.

Purpose and Need for Action

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

A. The Proposed Action (PA)

The Ozark-St. Francis National Forest, Big Piney Ranger District, is proposing the following management activities in the Richland Creek area of the district.

The specific proposed activities include:

- Pine seed tree regeneration harvest on 60 acres
- Hardwood Shelterwood harvest on 680 acres
- Commercial thinning on 8,889 acres (Pine 1,547 acres, Hardwood 7,342 acres)
- Existing Woodland Management on 2,694 acres
- Field management for high quality forage by constructing wildlife openings on approximately 1,159 acres
- Management of 74 acres of existing openings
- Cedar thinning on 80 acres
- Site preparation with herbicides and planting for failed pine regeneration on 49 acres
- Seedling release on 911 acres
- Non-Native Invasive Species (NNIS) control throughout the project area (up to 500 acres annually)
- Construction/reconstruction of 20 wildlife ponds
- Designation of approximately 41 miles of horse trails and 4 miles of multi-use trails
- Parking area expansion at Falling Water Falls
- Native cane restoration on 270 acres
- Glade restoration on up to 20 acres
- Placement of large woody debris in streams
- Prescribed burning on 13,792 acres
- Minerals surface rock collection within some timber sale units
- Construction of 1 mile of road
- Reconstruction of 8 miles of roads
- Maintenance of 108 miles of existing roads
- Decommission 6 miles of existing roads
- Closure of 20 miles of existing roads

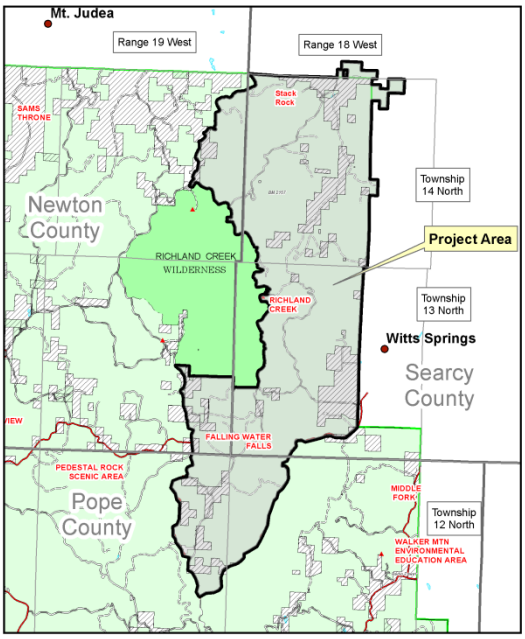
Included in this proposal are associated activities such as clearing slash and debris, brush hogging, and planting of various grasses and forbs. Firewood collection would also be allowed.

B. Location of Project Area

The Bearcat Hollow Phase II project area contains portions of the following townships, and ranges:

Township 12 North, Range 18 West, & Range 19 West
Township 13 North, Range 18 West, & Range 19 West
Township 14 North, Range 18 West, & Range 19 West

The Bearcat Hollow Phase II project area is located east of the Richland Creek Wilderness area, west of the community of Witts Spring, south of FS Road 1201 and the community of Eula, North of the intersection of State Highway 16 and Forest Service Road 1355 (old hwy 27). Part of the project area is bounded by State Highway 16 south from the community of Ben Hur to the community of Witts Spring. This Bearcat Hollow Phase II project area is located in southeastern Newton, northeastern Pope and southwest Searcy counties.



C. Purpose and Need

The primary developmental forces for this project are as follows:

The actions proposed for this project attempt to address the following current conditions within the project area:

- The area is currently comprised of aging overstocked stands with too many trees for optimum growth which has created an unhealthy overall condition. Timber management (thinning, shelterwood, and seed tree) will attempt to address these conditions. Road management would be needed to facilitate timber management.

- Currently there are remnants of past woodlands and glades on xeric and dry sites throughout the project area. Past projects have restored 2,694 acres of woodlands, but comprise less than 10% of the area. Proposal of additional restoration of woodlands and glades along with prescribe fire on a periodic basis would attempt to meet the desired future condition for this area. Fire line construction would be needed to accomplish prescribed burning activities.
- Inventories indicate the existence of over 100 miles of equestrian trails, roads that are no longer needed, roads that need to be closed, and erosion and riparian area damage at Falling Water Falls. Designating equestrian trails, closing and decommissioning roads, and redesigning the parking area at Falling Water Falls would improve watershed health and address unmanaged recreation.
- Currently there are few high quality forage openings in the 3.K Management area (see 3.K description below), with only 74 acres within the entire project area, and water sources are limited. The construction and management of openings, along with construction of ponds, would address the need to provide optimal wildlife habitat as outlined as the desired future condition for this area in the Revised Land and Management Plan (RLRMP or Forest Plan).
- Stream surveys have indicated remnants of native cane along stream banks and a lack of large woody debris within streams. Proposed cane restoration and placement of large woody debris in streams would attempt to address these conditions.
- Silviculture inventories identified several acres of failed regeneration areas and seedlings (young trees) needing released (thinned) from past actions in addition to those that would be needed after proposed regeneration harvest. Releasing seedlings would provide optimal conditions for growth and development of selected leave trees. Proposed actions would attempt to regenerate the failed areas and return them to the desired future condition for these areas.
- Biological inventories have identified numerous Non-Native Invasive Species (NNIS) throughout the project area. Actions proposed are needed to reduce the spread and/or eradicate NNIS species. Without these treatments NNIS will continue to spread and replace native species.
- Rock collection is proposed to meet public demand.

1.) Management Areas:

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

MA 3B Oak Woodland – The desired future condition of MA 3B is an area characterized by a mosaic of woodland and forest with oak woodland occupying approximately 60% of xeric and dry sites. Patches of oak woodland are well connected incorporating other fire dependent communities such as glades. Oak woodlands have open canopies (10-60% canopy closure), sparse midstories, and well developed understories dominated by grasses and forbs. Evidence of fire is common and results in a variety of vegetation conditions across the landscape. The abundance of oak woodlands provides optimal habitat for many indicator and rare species, and

species in demand for hunting such as wild turkey and whitetail deer. Where rare communities are present, they support healthy populations of associated species and are free from threats that would degrade their integrity.

MA 3C Mixed Forest- The desired character of these lands is a forest with diverse succession classes and ecological community types. Thinning, prescribed fire at regular intervals, and regeneration harvests are common silvicultural treatments to reduce stress as trees age. Pine and oak woodlands are found throughout the area. Late –successional to old growth characteristics are provided on suitable lands within this area. Other communities such as glades comprise a small portion of the area and exhibit high levels of ecological integrity and diversity of characteristic species. Rare communities within the management area are maintained. While the landscape character will appear natural, the management activities are visually evident and may on occasion dominate the natural landscape.

MA 3D Oak Decline Restoration Areas- These are areas where red and white oak trees suffered severe mortality due to general oak decline, insect outbreaks and disease. Fuel loading in these areas is high and wildlife mast reduction is greatly reduced. The desired future condition is to have a well-balanced age class scattered over the landscape. Prescribed fire every 3-7 years will effectively release the existing oak seedlings on much of the area. Oak planting may occur where no existing advanced regeneration is present. A series of regular thinning maintains quality oaks in a stress-free environment. This thinning will also help prevent serious outbreaks of pathogens. Rare communities and associated species continue to exist in the area including disturbance dependent communities requiring active management. The conditions are suitable for wild turkey and whitetail deer. The landscape character is of a forest with closed overstory canopies except where thinned to promote oak regeneration. Herbaceous vegetation is created through repeated prescribed fire. In order to balance age classes and to prevent the recurrence of an over mature landscape regeneration, harvests are prescribed.
In this management area

MA 3I Riparian Corridors- This management area is identified based on landform, vegetation, soils, and hydrology 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 3K Wildlife Emphasis Area- 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 birds, and small mammals). In addition to providing for quality habitat for such mammals as deer and black bear, this MA would expand the range of the Arkansas'

population of elk from adjoining Arkansas Game and Fish Commission lands (Gene Rush Wildlife Management Area) onto Ozark National Forest lands. This expansion is encouraged by managing for oak and pine woodlands, creating medium-sized openings and pastures, and providing additional water sources where needed. Oak and pine woodlands are prescribed on appropriate sites through thinning and prescribed fire to maintain widely spaced trees. On north and east slopes with high site indices, appropriate forest prescriptions are used. These prescriptions are aimed at providing optimal habitats to support populations of the plant and animal species associated with these communities.
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. The area is dominated by grass and herbaceous understories with widely spaced large oaks or pines. Light reaching the forest floor is ample to support a widely diverse and abundant herbaceous component.

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

Fire and Fuels: The natural role of fire has been withheld from the National Forests for many years. Research shows that National Forest System (NFS) areas at high risk from wildland fire and ecological degradation (Class 3) come to 51 million acres, or 26 percent of the NFS. Areas at moderate risk (Class 2) amount to 80.5 million acres, or 41 percent. Areas currently within their historical range (Class 1) come to 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. Invasives destroy fish and wildlife habitats, alter nutrient cycling and natural fire regimes, and can reduce biodiversity and degrade native ecosystem health. Invasive aquatic species pose a significant risk to the 220,000 miles of streams, over 2 million acres of lake, and 15,000 miles of coastline cross the National Forest System. There are more invasive species per unit of aquatic eco-systems than in terrestrial ecosystems. All invasives combined cost Americans more than $137 billion a year in total economic damages and associated control costs. Infestations of invasive plants have reached epidemic proportions, spreading rapidly over hundreds of millions of acres, across all landscapes and ownerships. Invasive forest diseases, such as Chestnut Blight, wiped out entire forest species in the East (i.e., the American Chestnut) and Dutch Elm disease virtually eliminated an urban forest tree- the American Elm. Invasive species have been found distributed throughout the project area. There is a need to conserve the native biological diversity of plant communities, species and populations. It is necessary to prevent the displacement of native species and the disruption of plant communities through the introduction of aggressive, persistent, self replicating, long lasting non-native vegetation into managed or natural plant communities.

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

Unmanaged Recreation: The number of 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 the forest plans or through separate access and travel management plans. Management of OHV impacts include use of designated roads, trails, and areas for recreation; closure of sensitive areas; user education; enforcement; and use monitoring. Within the project area, there is a need to protect resources by providing better management of OHV roads and trails as well as a need to provide for recreational opportunities.
Similarly, while cross-country horseback riding, sometimes called 'bushwhacking', is allowed on the Forest, the clearing and repeated use of unauthorized horse trails is creating many of the same problems in this project area as those listed for OHV's above. Most trails are poorly located and none receive the needed maintenance to manage runoff and control erosion. This is compounded by their frequent placement adjacent to and across riparian areas and streams. Consequently, large amounts of sediment can be added to stream flows, contributing to increasing watershed degradation.

3.) Other Developmental Forces:

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

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

The project area contains many open roads that are currently used to access the area. Some of these roads are used by the public but create an unfavorable situation for wildlife through unnecessary disturbance and added soil loss through erosion. To remedy these problems, some open roads need to be seasonally or permanently closed. The roads that are closed to motorized traffic are closed with mounds. In areas where OHVs go over these mounds to access the area, gates may be installed. The district has found that the installation of gates tends to reduce the number of violations, and occurrences of the disturbance to soils and wildlife.

RLRMP objectives that support the need of this project:

1) Restore and maintain at least 22,000 acres of oak woodland over the first decade, with a long-term objective of 110,000 acres (RLRMP page 2.10)
2) Restore at least 20,000 acres of pine woodland over the first decade, with a long-term objective of 100,000 acres of pine woodland (RLRMP page 2.10)
3) Across all community types, annually burn an average of 120,000 acres under prescribed burn conditions. Burn approximately one-third of this acreage within the growing season (April 1 through October 15) (RLRMP page 2.11)
4) Reduce the risk of oak and pine mortality events by thinning and regenerating at least 150,000 acres within the first decade (RLRMP page 2.12)
5) Treat at least 200 acres per year for reduction or elimination of non-native, invasive species (RLRMP page 2.12)
6) Improve and maintain bobwhite quail habitat on 5,000 acres per year for the first decade (RLRMP page 2.13)
7) Improve and maintain habitat for whitetail deer on 10,000 acres per year for the first decade (RLRMP page 2.13)
8) Improve and maintain habitat for eastern wild turkey on 10,000 acres per year for the first decade (RLRMP page 2.13)
9) Improve and maintain habitat for black bear on 8,000 acres per year for the first decade (RLRMP page 2.13)
10) 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).
11) Evaluate historic sites for appropriate management. Develop site management plans for noteworthy heritage resources wherever they occur. (RLRMP page 2.21)
12) Decommission roads and trails unnecessary for conversion to either the road or trail system through the roads analysis process (RAP) (RLRMP page 2.24)
13) Identify by the first decade all system roads that should be obliterated (RLRMP page 2.24)
14) Within 15 years, restore 15 to 20 percent of all ecological communities into Fire Regime Condition Class 1 (RLRMP page 2.26)

15) Annually complete 50,000 to 100,000 acres of hazardous fuel reduction (RLRMP pg 2.26)
16) Provide 731 MMBF (146MCF) per decade of saw timber and pulpwood (RLRMP pg 2.28)
17) Treat up to 300 acres per decade to meet the habitat needs of riparian area species groups. (RLRMP page 2.76)

D. Objective of the Proposed Action

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

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

Vegetation management includes the use of fire, manual, chemical, and mechanical treatments of plants in the service of ecosystem management objectives. The Final Environmental Impact Statement 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 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 Bearcat Hollow Phase II Project
- Heritage Resource Report for the Bearcat Hollow Phase II Project
- Region 8 Scenery Treatment Guide (2008)

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

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.

Elk- National Forests manage habitat not a specific species. Archaeological and historical records indicate that elk occurred in 14 counties in Arkansas but were extirpated by the 1840's (D. R. Angelo, AGFC unpublished report). The Arkansas Game and Fish Commission (AGFC) reintroduced elk in Newton County along the Buffalo National River by releasing 112 elk between 1981 and 1985 (Cartwright1995). Elk population and range have increased since that time. There have been documented occurrences of elk within this analysis area and elk are actively managed just north of this analysis area by the AGFC in the Gene Rush Wildlife Management Area. For the purposes of this analysis Elk is not considered a non-native species.

Jurisdictional Wetlands- Analysis conducted by district personnel has concluded that there are no known jurisdictional wetlands within or adjacent to the project area and therefore would not be impacted.

Heritage, Historic, and Cultural Resources- Heritage resource surveys have been conducted on the area. Sites have been inventoried and management recommendations made to the State Historic Preservation Officer (SHPO) and the Native American Tribes. Protective measures and mitigations would be implemented in order to prevent disturbing any of the sites. If a new site discovery were made during implementation activities would cease until an archeologist could record the site and make a determination of eligibility and site mitigation/protection. A concurrence letter was received for the Bearcat II project from the Department of Arkansas Heritage on August 5th, 2009

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

G. Issues Studied in Detail

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

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

2.) **Creation of Openings**
The creation of wildlife openings (both the number and size) has been determined by the ID Team as an important issue. For this reason, the creation of openings will be considered as an issue studied in detail. The environmental consequences of creating openings are disclosed throughout Chapter 3.

H. Other Concerns and Relevant Effects

Economics- There is a concern about the economic outcome that management actions like those in the proposed action could have within the community, and whether the National Forest is utilizing taxpayer dollars for a positive cost benefit to implement management actions. The economic analysis summary is included as Appendix D. The economics analysis is contained in the process file at the Jasper office.

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

Water Quality- There is a concern that management actions, namely timber harvest, road construction, prescribed burning, wildlife pond construction, and construction of large openings may cause a decrease in water quality in the watershed which the Bearcat Phase II 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 timber harvest, road construction, site preparation, opening construction, and prescribed burning may degrade the recreational experience of forest visitors within the project area. *Source: ID Team*

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

Vegetation- There is a lack of early seral habitat within the watershed. Forest health and stand vigor is declining or at risk due to advanced stand age and overcrowded or densely stocked stands. Several non-native invasive species (NNIS) are present throughout the project area. *Source: ID Team*

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 Bearcat Phase II 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*

I. Decision to Be Made

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

1. Select management action described in the Proposed Action (PA).
2. Not to implement any action by selecting Alternative 1 (the No Action alternative).
3. Select management actions described in Alternative 2 (the No Herbicide alternative).
4. Select management actions described in Alternative 3 (the no construction of high quality openings alternative).
5. Approve the PA or an alternative with some modifications.

Chapter II

Alternatives Including the Proposed Action

The Big Piney Ranger District IDT (interdisciplinary team) initiated internal scoping for the Bearcat Hollow II project on December 13, 2010. External scoping was initiated on July 14, 2011. Scoping letters requesting comments on the proposal were mailed to 256 tribes, agencies, groups, or individuals. The legal notice was posted in the Russellville Courier on July 19, 2011 and the Newton County Times on July 20, 2011. The project was also published in the Ozark- St. Francis National Forest Schedule of Proposed Actions and on the Forest planning website.

A. Process Used to Develop the Alternatives

The ID team represents the range of resources across the forest, such as timber, wildlife, soils, and watershed, and considered the following important 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 Forest.
- Comments received from the public, State and other agencies during the scoping process.
- The laws, regulations, and policies that govern land management on national forests.

B. Alternatives Considered

Three alternatives, including the alternative of taking No Action, were developed in the environmental analysis process. Each action alternative was designed to be consistent with RLRMP direction and respond to significant issues and are outlined below:

The Proposed Action (PA)

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

Pine seedtree regeneration harvest on 60 acres
The seed tree timber harvesting method is designed to regenerate aging pine stands, create early serial stage habitat, and encourage a mixed pine and hardwood community. Approximately 10-20 square feet of residual pine and hardwood basal area (10-15 trees per acre) per acre are retained in the overstory after harvesting is complete. Following pine regeneration harvests, competing vegetation would be reduced to create an adequate seedbed for regeneration using an herbicide application (see herbicide use table). Some areas would be regenerated naturally. Within these areas, if an adequate amount of pine regeneration (300-500 trees per acre) is not established within 5 years of harvest, the area would then be replanted with pine seedlings to meet target stocking levels. Regeneration areas outside burning areas are not suitable for natural regeneration efforts because of the absence of periodic prescribed burning to control brush and other competing vegetation. These areas would be planted with shortleaf pine seedlings

following site preparation activities to a stocking level of approximately 680 trees per acre. Herbicide release of established regeneration (young trees) is also included in this action (see herbicide use table). Residual seed trees may be removed once adequate regeneration has been established. These areas may be utilized for public firewood sale.

Area	Acres	Area	Acres
119	20	**147**	40

Hardwood shelterwood harvest 680 acres

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

Area	Acres	Area	Acres
6	40	**107**	30
47	21	**108**	40
53	37	**112**	40
66	28	**128**	40
101	16	**132**	40

Area	Acres	Area	Acres
133	39	**145**	39
134	30	**150**	40
136	40	**153**	40
140	40	**163**	40
143	40		

Pine Commercial Thinning 1,547 acres

Stands would be thinned to a residual basal area of 50-70 ft^2 per acre based on the average stand diameter in order to improve the growth and health of the stands and the development of higher quality trees. Currently the project area is overstocked (too many trees per acre) reducing health and vigor and creating susceptibility to catastrophic fire, insects and disease. Trees selected for removal 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.

Area	Acres	Area	Acres
3	12	**56**	34
9	22	**61**	23
10	15	**65**	142
13	14	**69**	5
18	17	**75**	12
19	20	**78**	108
24	11	**83**	16
32	49	**88**	12
40	46	**90**	28
42	18	**93**	11
46	44	**98**	5
50	10	**100**	17
51	263	**102**	9

Area	Acres	Area	Acres
103	14	**138**	35
104	27	**139**	27
110	10	**151**	41
120	15	**155**	21
121	19	**157**	10
122	18	**169**	20
123	17	**171**	29
124	15	**177**	58
126	11	**178**	90
127	14		
129	29		
130	44		
135	20		

Hardwood commercial thinning on 7,342 acres

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

On lower productive sites, stands would be thinned commercially, manually (chainsaw), and with herbicide to permit sunlight to reach the forest floor. Thinning would reduce tree cover to 40-80 feet of basal area per acre, based on site specific conditions.

On the lower productive sites a secondary treatment, to promote woodland conditions would be done on no more than 50% of the area listed above (3,671 Acres). Herbicides would be used on under/midstory trees and sprouts to reduce competition and promote the development of forbs (see herbicide use table). This would be done manually (chainsaws or brush saws only) or herbicide treatment (see herbicide use table) to control competition. This would be done one to three years after initial treatment dependent on the height of sprouts in the targeted area, following appropriate ecological land type. Some of the areas proposed (along roadways) would have an additional visual benefit. The goal is to have mature open woodland dominated by native grasses and forbs in the understory. In conjunction with prescribed burning, treatments would increase overall habitat diversity.

Area	Acres	Area	Acres
1	305	62	21
4	1,038	64	27
5	21	70	600
8	43	80	106
17	8	86	129
27	505	92	12
41	181	94	17
44	102	96	65
45	175	97	402
48	30	105	11
49	57	106	24
52	50	109	23
54	16	111	77
57	91	113	68
60	102	114	30

Area	Acres	Area	Acres
115	16	156	60
116	7	158	119
117	33	160	67
118	14	162	92
125	1,152	165	90
131	40	166	20
137	558	167	20
141	37	170	105
142	45	172	101
144	46	176	3
146	150	181	47
148	59	182	40
149	22		
152	26		
154	37		

Existing woodland management on 2,694 acres

Within the project area there are approximately 2,694 acres of existing woodlands that have previously been thinned by various methods to promote the development of native grasses and forbs. Currently the desired future conditions are not being reached because competition from woody species is hampering the growth and development of native grasses and forbs. In order to reach the desired condition, herbicides would be used to control woody species in these areas (see herbicide use table). The goal is to have mature open woodland dominated by native grasses and forbs in the understory. Additional spot treatments would be needed to reach the desired future condition in some areas. In conjunction with prescribed burning, treatments would increase overall habitat diversity.

Area	Acres	Area	Acres
68	34	**91**	675
72	15	**99**	378
76	33	**159**	96

Area	Acres	Area	Acres
161	97	**173**	154
164	350		
168	862		

Field management for high quality forage by constructing wildlife openings on approximately 1,159 acres and management of 74 acres of existing openings

There is a lack of early successional habitats for wildlife. Openings are proposed in areas where the slope of the land will allow the creation and management of wildlife openings. Opening size would range from approximately 5-100+ acres depending on terrain. All trees would be harvested and the area prepared for planting by using a dozer or other mechanical equipment to clear the debris from harvested trees and stump removal. 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 (brush hogging), haying, liming, seeding, fertilizing,

prescribed burning, and/or the use of herbicides to control invasive, woody or encroaching species of vegetation. In addition to the openings listed above there are two existing openings (74 acres) that would be managed in the same manner as outlined above.

Area	Acres	Area	Acres
2	50	**25**	13
7	14	**26**	10
11	72	**29**	11
15	10	**30**	33
16	47	**31**	8
20	87	**33**	3
21	15	**35**	7
22	8	**36**	7
23	11	**38**	14

Area	Acres	Area	Acres
39	13	**82**	148
43	50	**84**	13
67	47	**85**	118
71	23	**87**	11
73	13	**89**	95
74	36	**179***	11
77	45	**180***	63
79	35		
81	92		

* - Existing opening

Cedar thinning on 80 acres

These areas would be thinned commercially or manually (chainsaw) to a residual basal area of 10-50 square feet per acre based on the average stand diameter. Thinning would promote the growth and development of forbs and grasses on these low productive sites.

Area	Acres	Area	Acres
55	53	**95**	12

Area	Acres	Area	Acres
174	7	**175**	8

Herbicide site preparation and planting of failed pine regeneration on 49 acres.

These areas were harvested in the past and planted, but currently don't have enough trees per acre of desirable species to be considered regenerated. The proposed treatment would reduce competing vegetation to create adequate conditions for planted seedlings using an herbicide application (see herbicide use table). These areas would be planted with shortleaf pine seedlings following site preparation activities to a stocking level of approximately 680 trees per acre.

Area	Acres	Area	Acres
58	6	**59**	21

Area	Acres	Area	Acres
63	22		

Seedling release on 911 acres

The table below shows the areas of 122 acres of previously harvested hardwood regenerated stands. In addition to the above 122 acres and after seedlings are established in the failed pine regeneration (49 acres), pine regeneration (60 acres), and hardwood regeneration (680 acres) seedlings would be released from overtop/competing vegetation using hand tools (chainsaws or brush saws) or a herbicide application (see herbicide use table). Acres for the failed pine regeneration and pine/hardwood regeneration are shown in previous tables.

Area	Acres	Area	Acres
12	25	**28**	9
14	43	**34**	10

Area	Acres	Area	Acres
37	35		

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

The table below identifies the NNIS believed to occur in the project area and the herbicides that would be used to control them.

NNIS/ Herbicide treatment Table

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

Recommended controls are those 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 found, they would be treated using appropriate methods, following application rates on herbicide lables. Application rates will be in accordance with manufacture's label.

Construction/reconstruction of 20 wildlife ponds
The construction/reconstruction of wildlife ponds (< ½ acres) would be implemented in order to improve wildlife habitat in the vicinity. These ponds provide permanent water sources to allow for a more even dispersal of wildlife throughout the project area. Pond locations would be identified during implementation when test pits can be dug to determine suitable locations.

Designation of approximately 41 miles of horse trails and approximately 4 miles of multi-use trails on existing roads
The "horse" trails will be constructed to the horse trail standards but other non-motorized use, such as hiking, is acceptable. The designation of "multi-use" trails are being identified for OHV (motorized) users, to be added to the *Back-Country* routes. However, all other types of recreational use (biking, horseback riding and hiking) are welcome. In conjunction with this action two parking areas are proposed, one within the existing Richland Creek camp ground which would also be reconstructed by relocating the road and some campsites, and the other along highway 16 approximately 7 miles southwest of Witts Springs which would include

construction of new fence between the trailhead and the existing field as well as the development of a helispot in the field close to the trailhead.

Parking area expansion at Falling Water Falls
The parking area near the falls would be expanded to a 10 car parking area. Also, included in this action would be the construction of a short section of access trail from the parking area to the falls. In order to reestablish vegetation between the main road and the falls, large rocks would be placed adjacent to the road to discourage use and parking along with signs closing this area to parking. This would reduce sediment entering the creek from the existing county road.

Native cane restoration on 270 acres
Areas of native cane were once more prevalent along the Richland creek and it's tributaries. Due mainly to fire suppression, populations of native cane have been reduced in this area. Commercial/non-commercial thinning of overstory and understory trees within the native canes range would be done to restore and promote the expansion of existing communities. Cane would also be planted in strategic locations to promote the further expansion of this community.

Glade restoration on up to 20 acres
These glades have have become overgrown with woody vegetation that is detrimental to the native grasses and forbs that originally inhabited the area. Glade restoration involves removing cedar and other trees through manual thinning treatments (using tools such as chainsaws) to a residual basal area of 0-10 ft per acre while favoring soft mass producing trees. Each treatment would be approxiamately ½ to 1 acre in size. Maintenance would include prescribed burning and periodic thinning of woody species as needed.

Placement of large woody debris in streams
To improve overall stream habitat up to 10 larger trees, typically 12 inches in diameter at breast height (DBH) and greater/ mile would be felled into streams within the project area. These streams include perennial, intermittent and larger ephemeral streams.

Prescribed burning as needed on 13,792 acres
The project area is a fire adapted ecosystem in which fire has been absent for many years creating an overall unnatural condition. The use/reintroduction of fire into this system would assist in restoring the area to its desired future condition. Prescribed burn control lines may be established along the Wildland Urban Interface (WUI) adjacent to private property where landowners do not want the use of fire on their property. As a result, approximately 6 miles of control line construction and 3 miles of control line maintenance would be done to accomplish this goal. In addition, mechanical treatments would be used in various locations (areas of heavy fuels, WUI areas, hard to access areas, etc.) to facilitate burning operations. After burns are completed, these control lines are water barred and may be seeded with native grasses and forbs where needed to restore vegetative cover. In order to minimize control line construction, some burn blocks extend to natural or existing man-made fuel breaks, such as streams or roads. Prescribed burning would be done on National Forest system lands, during dormant or growing season.

-Dormant season burning- takes place in fall and winter months, (generally Oct. 1 – April 30) and involves the application of controlled, low to moderate intensity fire to reduce accumulated fuels, stimulate growth of native vegetation, and improve wildlife habitat. Some

duff is retained for soil protection. Vegetation 1 ¼ inches or less in diameter would be targeted for reduction to create an open understory, stimulating growth of native grassed and forbs, and increasing forage for browsing animals.

-Growing season burning- takes place in spring and summer months (generally May 1 – Sept. 30 and involves application of controlled, low to moderate intensity fire to control competing vegetation, prepare sites for seeding, and perpetuate fire dependant species. These burns are implemented during the time between leaf emergence and leaf fall. Vegetation 3 inches and less in diameter would be targeted. This will result in less competition for seedlings and other fire dependant species, while creating an open understory. Other added benefits would include reducing accumulated fuels, stimulate growth of native vegetation, and improve wildlife habitat.

Minerals

Public need would be met by allowing surface rock collection in commercially harvested timber units in the project area where Biological Evaluations, Heritage surveys and other permit requirements have been completed.

There are currently no proposed gas wells within this project area, although exploration activity has increased elsewhere on the Forest. Any future proposals will receive site-specific analysis and decisions in separate documents.

Construction of 1 mile of new road and reconstruction on 8 miles and maintenance on 108 miles of existing roads

System roads would be constructed or reconstructed 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 improve the standard to which the road was originally constructed. There are existing roads that would require road maintenance prior to timber hauling. This maintenance includes slide and slump repair, surface blading, spot surfacing with gravel, maintenance of drainage structures, ditch cleaning, and the clearing the roadside of vegetation. The Travel Analysis Report in the process file contains specific information about which roads will have activities on them.

Decommission 6 miles & closure of 20 miles of roads, recommended by Travel Analysis Process (TAP) Report

The decommissioning of existing roads no longer needed for the transportation system in this area would occur. Methods of decommissioning range from blocking the road entrance to full obliteration, and may include re-vegetation, water-barring, fill and culvert removal, establishing drain-ways, removing unstable road shoulders, and restoring natural slopes. The project area contains many open roads that are currently used to access the area. Some of these roads are used by the public but are creating problems due to soil loss and erosion. Other roads being used in the area also create an unfavorable situation for wildlife through unnecessary disturbance. Signs, gates, and/or earthen berms would be used to seasonally and/or permanently close some existing roads to resolve a number of these problems. For road specific information the Travel Analysis Process table is contained in the process file at the Jasper office.

Herbicide Use

The following table shows number of acres, herbicides used, and method of application for the treatments proposed in the PA :

Treatment	Glyphosate	Metsulfuron methyl	Triclopyr (ester)	Triclopyr (amine)	Imazapyr	Triclopyr & Fluroxypyr	Acres
Field Management	Foliar	Foliar		Foliar		Foliar	1,233
Woodland Management	Cut surface		Basal Spray	Foliar &/or stem injection	Stem Injection		6,365*
NNIS Control	Foliar	Foliar		Foliar &/or stem injection	Stem Injection		500 annually
Pine Seedtree	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		60
Hardwood Regeneration	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		680
Release			Basal Spray	Foliar &/or cut surface	Foliar &/or Stem Injection		911
Failed Regeneration	Cut surface			Foliar &/or cut surface	Foliar &/or Stem Injection		49
Total							9,798

* - Includes 2,694 acres of existing woodlands and 3,671 acres of proposed woodland.

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

Alternatives to the Proposed Action

Alternative 1: No Action
This alternative would not implement any part of the proposed action. Ongoing Forest Service permitted and approved activities would continue.

Alternative 2: No Herbicide Use
Herbicide application for field management, non-native invasive species control, pine and hardwood regeneration site preparation, woodland management, failed regeneration, and seedling release would not occur. These activities would be accomplished manually by mechanical means. All other activities would be the same as outlined in the Proposed Action.

Alternative 3: No Field Management for High Quality Forage
This alternative creates wildlife habitat without creating any high quality forage openings within the project area. All of the areas with a proposed treatment of high quality forage openings in the PA will receive a treatment of thinning in this alternative. This will increase the total of thinning from 7,342 acres in the PA to 8,501 acres. There are 74 acres of existing fields that will be managed as fields in this alternative as outlined in the PA. All treatments are the same as the PA for all other proposed activities.

Past, Present and Reasonably Foreseeable Future Actions
Within the project area there are some past, present, and reasonably foreseeable treatments that are **NOT** part of the proposed action **nor** any part of the alternatives to the proposed action, but have occurred or are expected to occur within the foreseeable future. The table below shows the treatments considered in this EA as cumulative effects:

Table showing past and present management activities

Treatments (On USFS Land)	Acres/ Miles	Year Treated
Prescribed burns	5,233	2010
Prescribed burns	3,938	2011
Associated Fire Line Construction	3	2010
Associated Fire Line Construction	3	2011
Pine Salvage thinning	1,171	2009
Woodland Management	377	2011
Richland Slide	17	2011
Ozark Highlands Trail Relocation	1.5	2011
Treatments (On Private Land)	Approx. Acres	Approx. Year
Logging	40	2011-12
Logging	70	2009
Logging/clearing	40	2010

Note:
Gas well development is increasing on private land south and east of the project area along with exploratory activity elsewhere on the Forest.

C. Comparison of Alternatives

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

Table showing comparison of alternatives

Treatments and Acres	PA	Alternative 1	Alternative 2	Alternative 3
Recreation				
Horse trail Designation (mi.)	41	0	41	41
Multi-Use trail Designation	4	0	4	4
Parking Lot Expansion	Yes	0	Yes	Yes
Wildlife				
Field Mgt for High Quality Forage	1,233*	0	1,233	74*
Non-Native Invasive Species Control	500*yr	0	500 yr	500*yr
Wildlife Ponds (no.)	20	0	20	20
Native Cane Restoration	270	0	270	270
Placement of Large Woody Debris	Yes	0	Yes	Yes
Forestry				
Existing Woodland Management	2,694*	0	2,694	2,694*
Pine Seed Tree Regeneration Harvest	60*	0	60	60*
Shelterwood Harvest	680*	0	680	680*
Hardwood Commercial Thinning	7,342**	0	7,342	8,501**
Pine Commercial Thinning	1,547	0	1,547	1,547
Cedar Thinning	80	0	80	80
Failed Pine Regeneration	49*	0	49	49*
Seedling Release	911*	0	911	911*
Prescribe Burning	13,792	0	13,792	13,792
Road Management				
Temporary Roads (mi.)		0		
Road Decommissioning (mi.)	6	0	6	6
Road Construction (mi.)	1	0	1	1
Road Reconstruction (mi.)	8	0	8	8
Road Maintenance (mi.)	108	0	108	108
Road Closure (mi.)	20	0	20	20

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

** Maximum of 50% of area treated with herbicides.

D. Effects Comparison of Treatments to Alternatives

Effects Table Comparing Treatments to Alternatives

Treatments	Proposed Action	Alternative 1	Alternative 2	Alternative 3
Sediment Created (tons)				
Herbicide Use (acres)	9,798	0	0	10,378
Early Successional Habitat %				
OHV/Horse trail (mi.)	41	0	41	41

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 for the Ozark/St-Francis National Forest (OSFNF) would be applied to the PA and Alternatives and are incorporated in this EA. Best Management Practices (BMP) Guidelines for Silviculture Activities in Arkansas would also apply as standard protective measures for all proposed actions.

F. Project Designs

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

G. Monitoring

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

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

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

4) A review of all known occurrences of proposed, endangered, threatened or sensitive species (PETS) has been conducted. In addition, field surveys have been made on all stands to be impacted. If any proposed, threatened or endangered species is newly 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. Mitigation Measures

The following areas would need additional mitigation measures to minimize the recreational and scenic impacts created from the proposed action's vegetative treatments. Each of the areas listed are within management areas where the RLMP goals are to change, promote or enhance the landscape character/setting within that management area. The measures are designed to eliminate obtrusive edges, shapes, patterns and blend the alterations to repeat natural form using line and textures of the natural landscape. The mitigations below are site specific for the following areas:

- Area 89 would also be visible from the Richland Creek Road (FS Rd 1219) by thinning the adjacent hardwood (Area 86) more heavily for 200 feet in two locations to promote a window appearance into Area 89.

- Area 136 eastern 1/3 of the stand would change treatment to thin and included in Area 137 reducing or eliminating the potential view of the regeneration harvest from the Falling Water Road (FS Rd # 1313)

- Areas 132, 133, 134, 136, 140, 143,145, and 147 are within 3.D Oak Decline Restoration Management and are outside of viewing from State Highway 16, Falling Water Road and Moore Rd NE32 (FS Rd #1203). Therefore no addition mitigation measures are needed, standard operation procedures would be implemented which limit recreational and scenic impacts. Such as normal widths for protection of drainage would be adequate to minimize impacts.

- Areas 53, 58, 59, 63, 66, 101, 107, 108, 112, 119, and 128 are within 3.C Mixed Forest Management Areas desired condition is predominately natural appearing with a diversity of forest successional classes and ecological community types with regeneration harvests as a common occurrence. These are in unseen locations away from the major state and county roads. Only standard operation procedures need to be implemented to limit recreational and scenic impacts. Normal lay of the land and shape of the stands would provide adequate opportunities to minimize impacts.

- Areas 6, 12, 14, 37 are regeneration treatments and Areas, 2, 11, 16, 20, 30, 43, 67, 74, 77, 79, 81, 82, 85, and 89 are openings/pastures within 3.K Wildlife Emphasis where the desired condition allows and promotes a change in landscape character from a forested condition to openings and pastures. Only areas 77, 85, & 89 were found to need additional mitigation measures. These areas would use existing natural drainage features/terrain to create 500 foot corridors or breaks and thin to a 70 BA. Area 43 would be visible as you approach the Richland Creek Campground from the north; therefore the portion of the area closest to the road would be dropped from treatment approximately 440 feet. This would reduce the size and provide a buffer along this road. The remaining areas are outside of view and standard operation procedures would be implemented to limit recreational and scenic impacts.

- Areas 150, 153, and 163 are regeneration treatments within 3.B Oak Woodland with direction to restore and maintain current forest type through manual, mechanical, or chemical methods including use of commercial timber sales. The above areas are in unseen locations from the major state and county roads due to the terrain no additional mitigation measures are needed. The following areas 91, 99, 159, 164, 168, and 173 are existing woodland with plans for chemical treatments in the proposed action visible from State Highway 16 or Richland Creek road. To lessen the visual impacts the areas above would be treated with herbicide in late summer to early fall prior to natural fall colors. In Alternative 2 (No Herbicide Use Alternative) these same areas are planned for manual and mechanical treatment. To lessen the visual impacts, areas would be treated during leaf off to minimize the visual impact.

Chapter III
Environmental Effects

A. Soils

Existing Condition

The analysis area for soils will be the activity areas within Compartments 78, 79, 83, 86, 87, 88, 89, 92, 93, 131, 132, 133, 725, 743, and 744. The Project Area is located in a heavily dissected section called the Boston Mountains. Elevation varies from about 2120 feet on the southern edge of the project area on Raspberry Mountain to 763 feet on the floodplain of Richland Creek in the northern part of the project area. Several types of topography exist in this Boston Mountain section. Most of the timber harvest will occur on a common Stair-Stepped landform, called "Bluff-Bench" topography, that developed from the long term weathering/erosion of sedimentary layers of different hardness, mainly shales and sandstones. Chaert and limestone soils are also present in the project area. The remainder of the topography varies from nearly level to rolling mountain tops that developed from weathering of level bedded sandstones to narrow to very narrow alluvial areas along Richland Creek, Falling Water Creek, and Bobtail Creek. Most of the mountain tops, creek bottoms, and some wider benches have been under cultivation or in pastures, and some are still under private ownership. Project area topography varies from 0-3% slope on mountain tops, benches, and creek bottoms, to fairly steep 40-60% on the 200 to 300 foot slopes between the benches and just above the stream bottoms in Richland, Falling Water, and Bobtail Creeks.

The soils in the project area are mostly stable exceot for those in and adjacent to the road beds on the following roads: 1205, 1201A, 1238A,1219A, 92743C, 92743B, 92088C, and 92131C1. Soils are mostly well drained and range from shallow to deep. There are some small areas of poorly drained hydric soils in depressions included in the Ceda very cobbly loam, Dardanelle silt loam, Spadra-Ceda association, and Spadra sandy loam soil map units on the floodplains along Falling Water and Richland Creeks Twenty eight percent of the project area has a severe hazard for off road and off trail erosion mainly due to steep slopes.

There are some stumps in previously harvested stands, but there is little evidence of detrimental soil disturbance. Most of the soils have 100% cover consisting of leaf litter, twigs, limbs, logs, gravel, stones, trees, shrubs, and herbaceous vegetation and have an intact root mat.
Calculations used to estimate loss in soil productivity were based from past observations and field data collection (Weeks).

The Proposed Action

Direct and Indirect Effects

Approximately six percent (703 acres) of the harvested area would sustain a temporary reduction in soil productivity due to harvesting operations. Soil productivity would be lost on approximately two acres due to road construction. Soil productivity would be lost on approximately 4 acres due to road reconstruction. Additionally, soil productivity would be lost on approximately 22 acres due to the designation and construction of 41 miles of trails and parking lot expansion and construction. Approximately 4 acres of the harvested area would sustain a temporary reduction in soil productivity due to fireline construction and maintenance. Six miles of road are proposed for decommissioning which will return approximately ten acres of soil to a productive state.

Total expected temporary reduction of soil productivity would be 734 acres (7% of the harvested area); including skidding, road construction and reconstruction, trail designation and construction and fireline construction. Road decommissioning would reduce the net acreage of soil disturbance to 724 acres, but would not reduce the overall percentage. Primary skid trails, and 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. Road reconstruction will stabilize roads and prevent loss of productivity on soils adjacent to these roads and will reduce erosion and sedimentation. Road maintenance will also prevent the loss of productivity on soils adjacent to the roads by helping to control runoff. Harvesting and burning activities will increase the amount of ground cover, which will help to protect the soil and to cycle the nutrients made available by harvesting and burning. In addition, cane restoration will protect the soil and prevent erosion. There is potential for short-term erosion during the construction of wildlife openings and ponds, but it is expected to be short term because the openings, pond dams, and adjacent areas will be limed, seeded, and fertilized to provide forage, which will protect the soil and 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. Estimates of soil disturbance due to the proposed activities are based on monitoring of similar activities on the forest. The documentation for temporary reduction in soil productivity can be found in the process file. The proposed action would be less than the 15% of reduction soil productivity.

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

Cumulative Effects

There is a potential for additional temporary loss in soil productivity in the stands that are proposed for shelterwood harvest and follow-up seed tree removal harvests that are planned a few years into the future. Seventy- one acres of these units are estimated to sustain a temporary loss in soil productivity due to the initial harvest. Thirty-one acres of additional temporary loss of soil productivity is estimated for these units due to the

follow-up shelterwood and seed tree removal harvest. The existing and estimated additional temporary loss in soil productivity equals 102 acres, which is 13 percent of the shelterwood and seedtree harvested area. The cumulative effects are not sizeable because the existing and estimated temporary loss in soil productivity is expected to be within the LRMP standard. Erosion control will be done on skid trails in the harvested areas to speed the recovery of soil productivity.

There was minimal detrimental soil disturbance in the previously harvested stands that are proposed for treatment in the project area, so minimal cumulative effects are expected to result from the proposed treatments. Ground cover has greatly increased in previously harvested stands, which has helped to protect and restore soil productivity.

Alternative 1 (No Action)

The roads proposed for reconstruction, maintenance, and decommissioning will continue to erode causing soil loss.

Alternative 2 (No Herbicide Use)

Direct and Indirect Effects
The effects are expected to be the same as those in the Proposed Action. Hand tools would be used instead of herbicides. The use of hand tools would not result in any additional detrimental soil disturbance because stumps and rootstock of the treated plants would be left intact and there would be no ground disturbance.

Cumulative Effects
The cumulative effects for this alternative would be the same as those for the Proposed Action.

Alternative 3 (No Openings)

Direct and Indirect Effects
Approximately six percent (771 acres) of the harvested area would sustain a temporary reduction in soil productivity due to harvesting operations. Soil productivity would be lost on approximately two acres due to road construction. Soil productivity would be lost on approximately 4 acres due to road reconstruction. /Additionally, soil productivity would be lost on approximately 22 acres due to the designation and construction of 41 miles of trails and parking lot expansion and construction. Approximately 4 acres of the harvested area would sustain a temporary reduction in soil productivity due to fireline construction and maintenance. Six miles of road are proposed for decommissioning which will return approximately ten acres of soil to a productive state.

Total expected temporary reduction of soil productivity would be 800 acres (7% of the harvested area); including skidding, road construction and reconstruction, trail designation and construction and fireline construction. Road decommissioning would reduce the net acreage of soil disturbance to 790 acres, but would not reduce the overall percentage. Primary skid trails, and 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. Road reconstruction will stabilize roads and prevent loss of productivity on soils adjacent to these roads and will reduce erosion and sedimentation. Road maintenance will also prevent the loss of productivity on soils adjacent to the roads by helping to control runoff. Harvesting and burning activities will increase the amount of ground cover, which will help to protect the soil and to cycle the nutrients made available by harvesting and burning. In addition, cane restoration will protect the soil and prevent erosion. There is potential for short-term erosion during the construction of wildlife ponds, but it is expected to be short term because the pond dams and adjacent areas will be limed, seeded, and fertilized to protect the soil and 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. Alternative 3 would be less than the 15% reduction in soil productivity threshold. The documentation for temporary reduction in soil productivity can be found in the process file.

Cumulative Effects

The cumulative effects would be the same as those for the Proposed Action and for Alternative 2 even though acres reflected in soil disturbance table differ slightly.

Soil Disturbance Table

Detrimental Soil Disturbance	**Proposed Action**	**Alternative 1 No Action**	**Alternative 2 No Herbicide**	**Alternative 3 No Field Management**
Total acres disturbed	724	0	724	790
Total in % of the Activity Area	7%	0%	7%	7%
Cumulative Detrimental Soil Disturbance	**Proposed Action**	**Alternative 1 No Action**	**Alternative 2 No Herbicide**	**Alternative 3 No Field Management**
Cumulative acres disturbed	102	0	102	102
Cumulative % of the seedtree and shelterwood harvested areas	13%	0%	13%	13%

B. Water Quality

Existing Condition

Watersheds in the United States are divided into progressively smaller units known as hydrologic units, recognized by the U.S. Geological Survey (USGS) as regions, sub-regions, basin, and sub-basin units. This hierarchical division of watershed boundaries is useful for assigning address-like codes to drainage basins. This project area falls within the Arkansas-White-Red region (11), the Upper White sub-region (1101), the Upper White basin (110100), and the Buffalo sub-basin unit (11010005) (U.S. Geological Survey, 2003). The Ozark-St. Francis National Forest further classifies land areas into two progressively smaller units: watersheds and sub-watersheds. The proposed project falls into the Richland Creek (1101000503) watershed. At the smallest scale, the proposed project is located within three sub-watersheds as noted in the table below. These sub-watersheds or 6th level HUC areas will serve as the analysis area for the proposed project with respect to water resources. The figure on the following page shows the project area within the associated sub-watersheds. Note that although the project area extends slightly into watershed 110100050401, no activities are planned in this sub-watershed.

Watershed Table

Watershed Number	Watershed Name	Total Acreage	Project Area Acreage Included
110100050306	Headwaters Richland Creek	27,936	1,190
110100050307	Falling Water Creek	14,996	12,770
110100050308	Outlet Richland Creek	40,605	25,506

The model used in the water effects section is “Water Resource Analysis for Cumulative Effects v.1 10/17/05 (WRACE)
Local research has shown that the effects of increase sediment as a result of timber harvest are identifiable for up to 3 years (Miller, Beasley and Lawson 1985). The timeframe of this model is bound by three years prior and one year following the current year. This captures the effect of other management activities that may still affect the project area. Proposed actions are constrained to a single year even though they usually occur over a period of three to five years. This would express the maximum possible effect that could occur in a worst case scenario. Past activities that have a lasting effect (such as roads and changes in land use) are captured by modeling the sediment increase from an undisturbed condition. As a result of the watershed selection, numerous characteristics of the watershed would be used in the calculation of sediment such as watershed size, acres of Forest Service surface ownership, private ownership, land use distribution including vegetation cover (forest, pasture, forest grazing and terrain) road density and eco-region.

Changes in land use and other disturbances can be modeled with respect to estimated

increases in sediment. The model use in this analysis estimates current condition and the effects of various management alternatives. These predictions are then compared to risk levels established by the effects of sediment increases on fish communities (See fisheries section).

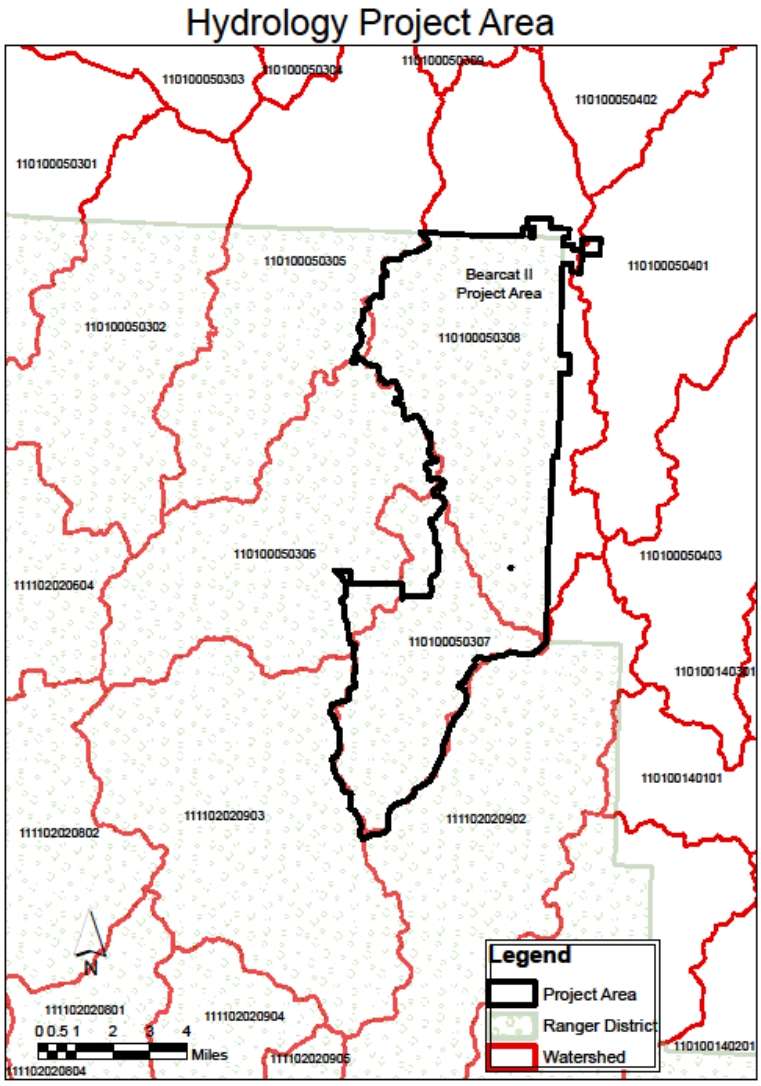
There are approximately 81 miles of primary streams within the project area, which falls within the analysis area that contains approximately 190 miles of secondary streams. The primary streams found in the project area include Big Devils Fork, Long Devils Fork, Richland Creek, Long Branch, Bobtail Creek, and Little Bobtail Creek plus several unnamed tributaries to these streams.

This portion of the Forest is located in the Boston Mountain eco-region with deeply dissected drainages into the Springfield plateau (Boone Formation) which is associated with karst topography (McFarland, 2004).

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 6th level watershed analysis area, approximately 71% of the land is administered by the Forest Service. This leaves a sizable portion of the land within the watersheds as privately owned. Land use within these sub-watersheds is approximately 95% forested. The balance of the land uses are mainly pastures.

Forested land uses indicate a stable landscape that results in minimal amounts of natural or background erosion, especially for Arkansas (Miller and Liechty, 2001). For many parts of the Ozark-St. Francis 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 245 miles of roads within the analysis area and 154 miles of roads within the project area. Within the project area, there are approximately nine stream crossings where the current road system crosses or intersects a stream.

According to the National Wetland Inventory Database, there no wetlands located within the project area. Small wetlands may exist along the edges of streams, especially at lower elevations where floodplains have developed. These inclusions are likely less than one half acre in size and are directly associated with the adjacent stream.

Floodplains are identified on the forest within the project area. These features were mainly found to occur along Richland Creek and a few of its tributaries. Floodplains and

any associated riparian areas occur in narrow strips near the stream channels.

The proposed project is located in the Boston Mountain ecoregion 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 (2004), 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.

Approximately 14.9 miles of Extraordinary Resource Waters (ERW) exist within the analysis area and include both Richland Creek and Falling Water Creek. 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.

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 that show increased nitrogen, phosphorous, and coliform bacteria concentrations occur with increases in agricultural and urban land uses (Davis and Bell, 1998). Forested land use has a much lower concentration of these constituents. This data does not isolate the direct or transient effects of timber harvest on nutrients but it does illustrate the water quality impacts of alternative land uses in the Ozarks and surrounding Arkansas Landscapes.

Proposed Action and Alternative 2 (No Herbicide)

Direct/Indirect/Cumulative Effects

Activities, which could cause direct and indirect effects are those of vegetation management, silvicultural site preparation, road and trail construction, and prescribed burning.

In a study of silviculture activity effects in the Ozark-Ouachita Highlands, Lawson (1986) documented the undisturbed erosion from small watersheds and the amount of sediment produced due to vegetation management practices. The undisturbed sites produced about 13.8 lbs/acre of sediment with 70% of this amount attributed to large precipitation events. A seedtree harvest produced three times this amount of sediment during the first year after harvest with 31.3 lbs/acre, three years after the treatment the erosion rates were similar to the undisturbed state. This is roughly equivalent to a 5-gallon bucket of soil. 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 forest lands 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, effects of silviculture practices on annual average stream discharge was depicted by Stednick (1996). 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 quite rapidly; 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.

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 professional, 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.

Because the WRACE 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 below. Herbicide use under the proposed action would not be broadcasted but applied by direct injection, cut surface, or foliar spray. For these purposes, herbicide use in forestry is likely to occur only once or twice over rotations of 25 to 75 years, and direct application methods would minimize off-site movement. Forestwide Standards 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 rate is measured in runoff water, two common outcomes are apparent. First, measured peak concentrations are of short duration. 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 one tenth of one percent of their use in agriculture settings. 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 pathway 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 time frames.

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. 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. It is these aquifers which are directly exposed to leaching of residues from the root zone. The only known 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 has 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 PA 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 which require buffers between treated vegetation and waterbodies, as well as standards to ensure that drift and direct application to waterbodies does not occur. The PA includes the use of BMP practices and monitoring to ensure environmental quality is maintained.

Roads are the most common source of accelerated erosion on National Forest lands. 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. This may result in modifications to the timing of water delivery to stream systems; however, this is not expected to produce a substantial nor measurable difference from current conditions. The activities of the proposed action or alternative 2 would work toward 'disconnecting' the road system from the stream network.

Approximately 0.64 miles of new road would be constructed for this project. Guidance provided in the LRMP and the Arkansas Forestry Commission's Best Management Practices for Water Quality Protection outline the mitigation measures necessary to conduct these activities while controlling contributions to non-point source pollution. The remainder of the road work is road reconstruction, road maintenance, and road closure; which when properly conducted, should result in a net decrease in sediment production, thus a benefit.

Approximately 41 miles of horse trails and 4 miles of multi-use trails would be designated for all but the No Action alternative. Much of these trail systems would be constructed on existing roads and all would be constructed to appropriate standards for protection of the trails and to minimize accelerated erosion.

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 created 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.

Prescribed fire can affect water quality by altering the nutrient cycle within soils and increasing bioavailability of certain nutrients. Prescribed fire alone is not expected to increase nutrient content of runoff.

The direct and indirect impacts from implementing the proposed action and alternative 2 are not expected to contribute to degradation of the current water quality.
Implementation of the activities associated with this 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 short lived in this part of Arkansas. The most likely effects from this 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 mitigation measures noted in this EA, the activities of the proposed action or alternative 2 should not result in measurable negative effects to the water resources. Road stabilization through maintenance and reconstruction, erosion control through revegetation of disturbed ground, and streamside management zones around surface water features are typical measures used to ensure the mitigation of adverse effects that may occur.

The activities described in the proposed action or alternative 2 are not expected to have a direct or indirect effect on wetland areas or floodplains.

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 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 Forest 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 the table below. All three of the affected sub-watersheds are currently determined to have a low concern level. The concern level for the proposed action and each alternative is estimated to remain low for the future watershed condition.

Water Cumulative Effects Analysis Table

	Percent increase of sediment above undisturbed conditions									
	Current		**Future**							
			Proposed Action		No Action		No Herbicide		No Openings	
Sub-Watershed Analysis Area	% Increase	Concern Level	% Increase	Concern Level	% Increase	Concern Level	% Increase	Concern Level	% Increase	Concern Level
Headwaters Richland Creek	156	Low	159	Low	157	Low	159	Low	159	Low
Falling Water Creek	182	Low	228	Low	183	Low	228	Low	224	Low
Outlet Richland Creek	211	Low	215	Low	214	Low	215	Low	234	Low

The activities proposed by the Forest Service for the proposed action would result in additional sediment production from the landscape, but from a watershed perspective, would contribute only a small (if any) increase to the overall estimated sediment yield. It is most likely that these 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 LRMP 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 (No Action)

Direct/Indirect and 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 are expected to continue. Indirect and or long term effects would continue to result from the existing conditions of the project area. Roads that do not receive necessary maintenance would continue to pose a chronic threat to water quality as problem erosion areas would continue to exist, or worsen.

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

Alternative 3 (No Openings)

Direct/Indirect and Cumulative Effects

Under this alternative, construction of high quality wildlife openings would not occur. The number of thinned acres would increase resulting in a slight overall decrease in sediment above the proposed action. All other effects (indirect and cumulative) would be the same as discussed earlier for the PA and alternative 2.

C. Air

Existing Condition

Air pollution can impact both human health as well as the environment. The two main air pollutants of concern on the Ozark-St. Francis National Forests are ozone and fine particulate matter. This is because when prescribed burn activities are implemented ozone and fine particulate matter are the 2 greatest pollutants released into the air. At elevated ambient concentrations, ground level ozone can cause respiratory distress in sensitive populations, and can cause negative growth impacts to vegetation. Fine particulate matter ($PM_{2.5}$) causes cardiopulmonary symptoms in certain individuals, and significantly contributes to regional haze. Because of these concerns, the U.S. Environmental Protection Agency (EPA) has established national air quality standards, called the NAAQS, for these two pollutants. There are both primary and secondary NAAQS. Primary standards set limits to protect public health, particularly the health of sensitive populations such as children and the elderly. Secondary standards are set to protect public welfare, including visibility, crops, vegetation, animals and buildings.

State air quality agencies monitor for both ozone and $PM_{2.5}$ near the Ozark-St. Francis National Forests. Measured concentrations are compared to the NAAQS for each of the pollutants. There is both a 24-hour and an annual NAAQS for $PM_{2.5}$, while there is currently just one NAAQS for ozone, based on 8-hour average concentrations. Areas that exceed the NAAQS are designated 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.

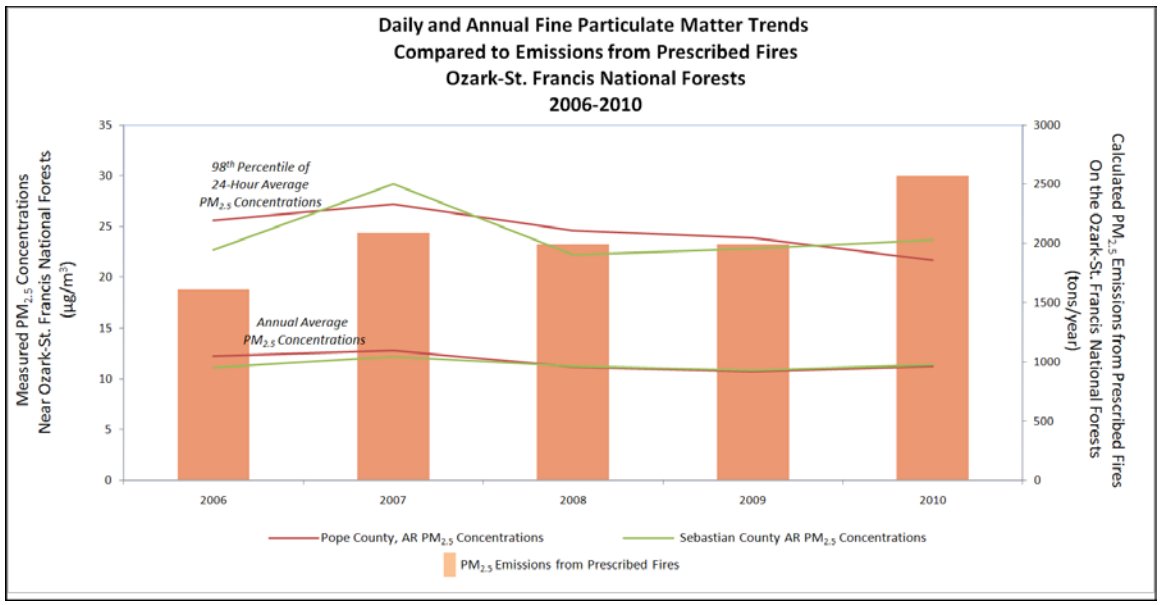
Air Quality Index Table

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

There are currently no counties in Arkansas in non-attainment for ozone or fine particulate matter as of 2011.
Air quality is recognized in the land management plan for Ozark-St. Francis National Forests as an important parameter to measure forest health. The plan lists the following forest-wide standards relating to air quality.

- FW93: Prescribed burning will be conducted in, or adjacent to, counties with forecasted high Air Quality Index (AQI) values (AQI equals orange or higher) only if meteorological conditions indicate that smoke will be carried away from the high AQI area.
- FW94: Conduct all National Forest management activities in a manner that does not result in (1) a significant contribution to a violation of National Ambient Air Quality Standards (NAAQS) or (2) a violation of the applicable provisions in the State Implementation Plan (SIP).

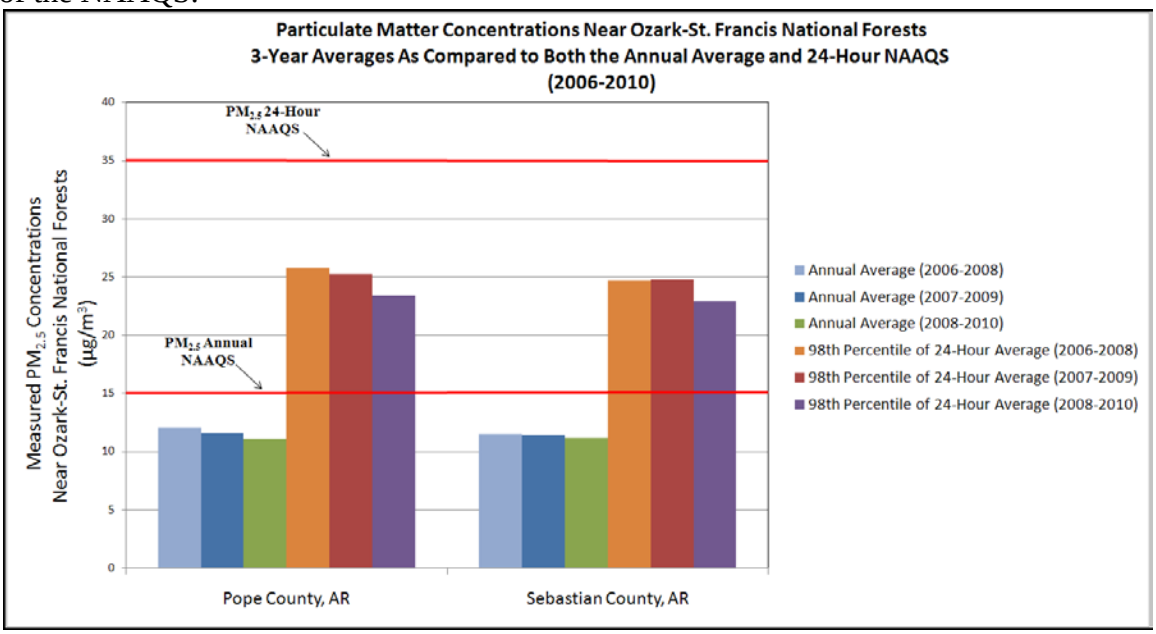
Standard FW93. The use of prescribed fire emits $PM_{2.5}$, along with other pollutants. With the growing prescribed fire program, it is important for the National Forests to be aware of downwind concentrations of fine particulate matter to ensure that prescribed fire emissions are not contributing to any violations of the NAAQS. There are three $PM_{2.5}$ monitors 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 the Forest.



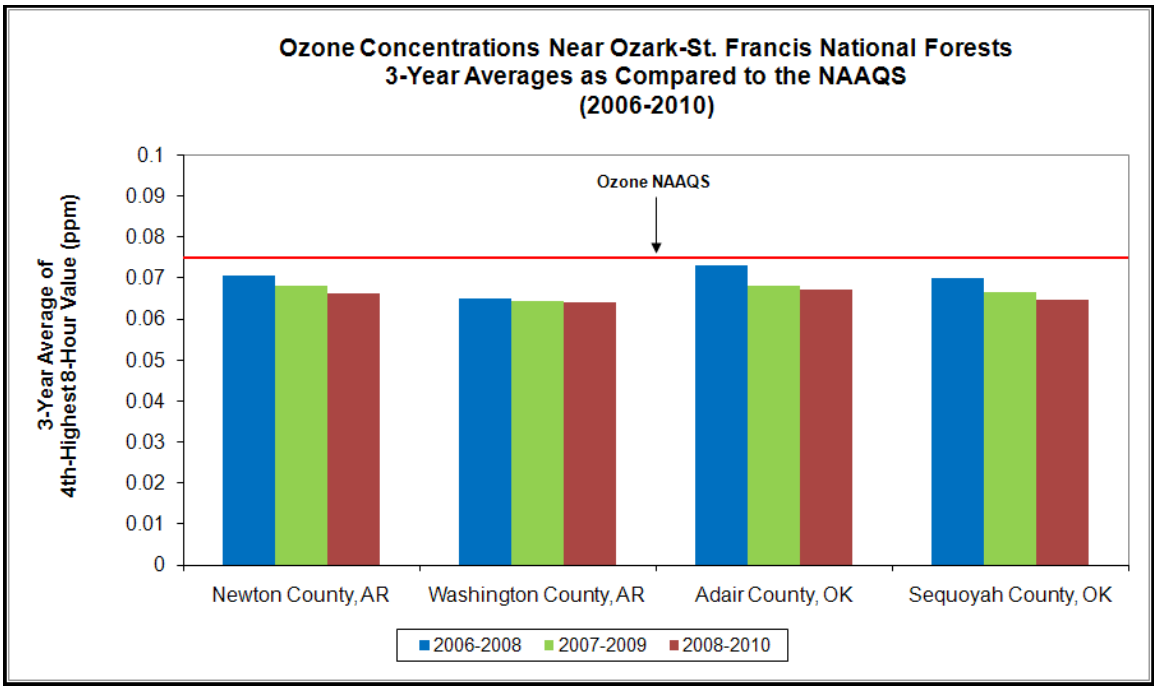
However, the concentrations of fine particulate matter, both on a daily and an annual basis are not higher than the $PM_{2.5}$ NAAQS, which are 35 and 15 µg/m3, respectively. Thus, while prescribed fire is contributing to nearby concentrations of $PM_{2.5}$, the area is still meeting the NAAQS for this pollutant.

Standard FW94. The National Ambient Air Quality Standards are based on three-year

averages of the measured concentrations. Using 2006 through 2010 data, the measured concentrations near the Ozark-St. Francis National Forests were compared to the 24-hour and the annual $PM_{2.5}$ NAAQS. As shown on the graph below, these monitors have not documented any exceedances of the $PM_{2.5}$ NAAQS over the past several years. Thus, it can be concluded that forest management activities are not resulting in any exceedances of the NAAQS.



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



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 manage 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 will impact air quality at Upper Buffalo Wilderness through the Prevention of Significant Deterioration (PSD) permitting process. No permit actions in the past five years have been shown to cause an adverse impact to the Upper Buffalo Wilderness.

Effective fire control, beginning in the early 1900's influenced the existing vegetation. Accounts of early travelers through northern Arkansas frequently describe wildfires and large burned over areas. Dendrochronology studies conducted on the Big Piney Ranger District also indicate that fire has long been a part of the landscape. Due to the removal of fire over the last 100 years, the fuel composition has changed from a grass fuel model to a brush fuel model. Fires in grass fuels can be easier to suppress and respond quicker to weather influences such as relative humidity. Models such as LANDFIRE indicate that this landscape is in Condition Class II and III, meaning it has departed from a reference condition for vegetation, fuels, and disturbance regimes. The communities of Hector, Snowball, Tilly and Witt Springs were all listed in the Federal Register dated August 2001 as Urban Wildland interface Communities within the vicinity of federal lands that are at high risk from wildfires.

Proposed Action (PA)

Direct Effects

Burning would be implemented on 13,792 acres for multiple purposes and would continue moving the landscape toward Condition Class 1. Previously unburned acres will total approximately 4,621 acres.

For the proposed action and alternatives 2 and 3 the prescribed burn acres would vary slightly but the difference is negligible so the effects of each alternative were analyzed together. The PA would not have an effect on the class I air shed.

Community protection and firefighter safety would be enhanced by decreasing fuel loading by an estimated 1.5 tons per acre. Emissions from burns would produce PM-10 and PM 2.5 particulate matter during the burns. PM-2.5 is particularly important because this size of particle when ingested remains in the body.

Herbicides may be used within burn blocks (except Alternative 2). To minimize potential effects the manufacturer's recommendations will be used to determine when it is appropriate to burn following herbicide application. But as per the Forest Wide standard #153 no treatment area will be burned sooner than 30 days after herbicide application.

Burns would be conducted during both the growing and dormant seasons, and each season will have different effects on the vegetation. Dormant season burns typically top-kill smaller diameter woody plants, while growing season burns will top-kill slightly larger woody plants.

Indirect Effects

The public could be exposed to low concentrations of drift smoke, which would create a nuisance rather than a health problem. There is potential for roadways to be impacted by smoke, which could decrease visibility. There would be no indirect effect on the class I air shed from the PA.

Cumulative Effects

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

Alternative 1 (No Action)

Direct Effects

Burning would be implemented on the 6,657 acres previously analyzed in the Middle Fork Environmental Assessment for multiple purposes and would continue moving the landscape toward Condition Class 1. Community protection and firefighter safety would be enhanced on these acres by decreasing fuel loading by an estimated 1.5 tons per acre. Emissions from burns would temporarily increase production of PM-10 and PM 2.5 particulate matter during the burns. Burning would help meet objectives 55, 56, and 57 of the Revised Land and Resource Management Plan. Fuel loading on 7,135 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 communities listed above as WUI areas in at high risk. The no action alternative would have no direct effect on the class I air shed.

Indirect Effects

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

Potential would exist for a more serious wildfire in the 7,135 acres that would not be prescribed burned. If a wildfire did occur within these areas smoke concentrations would be higher. Roads could be temporarily closed leading to an inconvenience for local people living in the communities close by. The no action alternative would not have a indirect effect on the class I air shed.

Cumulative Effects

Burning will continue by other state and Federal agencies as well as public landowners. Based on the IMPROVE monitoring station in Deer Arkansas the air quality in and around the project area is good and there are no areas in threat of reaching non-attainment status or exceeding standards. Over time without moving the 7,135 acres toward the reference Condition Class fuels would continue to build up and potential increases for a serious wildfire to occur in this area. The no action alternative would have no cumulative effect on the class I air shed.

Alternative 2 (No Herbicide)

Direct Effects

Burning would be implemented on 13,792 acres for multiple purposes and would continue moving the landscape toward Condition Class 1. Previously unburned acres will total approximately 4,621 acres. Alternative 2 would not have an effect on the class I air shed.

Community protection and firefighter safety would be enhanced by decreasing fuel loading by an estimated 1.5 tons per acre. Emissions from burns would produce PM-10 and PM 2.5 particulate matter during the burns. PM-2.5 is particularly important because this size of particle when ingested remain in the body.

Burns would be conducted during both the growing and dormant seasons, and each season will have different effects on the vegetation. Dormant season burns typically top-kill smaller diameter woody plants, while growing season burns will top-kill slightly larger woody plants.

Indirect Effects

The public could be exposed to low concentrations of drift smoke, which would create a nuisance rather than a health problem. There is potential for roadways to be impacted by smoke, which could decrease visibility. Alternative 2 would not have an indirect effect on the class I air shed.

Cumulative Effects
Burning will continue by other state and Federal agencies as well as public landowners. Based on the IMPROVE monitoring station in Deer Arkansas the air quality in and around the project area is good and there are no areas in threat of reaching non-attainment status or exceeding air quality standards. Alternative 2 would have no cumulative effect on the class I air shed.

Alternative 3 (No Openings)

Direct Effects
Burning would be implemented on 13,792 acres for multiple purposes and would continue moving the landscape toward Condition Class 1. Previously unburned acres will total approximately 4,621 acres. Alternative 3 would not have an effect on the class I air shed.

Community protection and firefighter safety would be enhanced by decreasing fuel loading by an estimated 1.5 tons per acre. Emissions from burns would produce PM-10 and PM 2.5 particulate matter during the burns. PM-2.5 is particularly important because this size of particle when ingested remain in the body.

Herbicides may be used within burn blocks (except Alternative 2). To minimize potential effects the manufacturer's recommendations will be used to determine when it is appropriate to burn following herbicide application. But as per the Forest Wide standard #153 no treatment area will be burned sooner than 30 days after herbicide application.
Burns would be conducted during both the growing and dormant seasons, and each season will have different effects on the vegetation. Dormant season burns typically top-kill smaller diameter woody plants, while growing season burns will top-kill slightly larger woody plants.

Indirect Effects
The public could be exposed to low concentrations of drift smoke, which would create a nuisance rather than a health problem. There is potential for roadways to be impacted by smoke, which could decrease visibility. Alternative 3 would not have an indirect effect on the class I air shed.

Cumulative Effects
Burning will continue by other state and Federal agencies as well as public landowners. Based on the IMPROVE monitoring station in Deer Arkansas the air quality in and around the project area is good and there are no areas in threat of reaching non-attainment status or exceeding air quality standards. Alternative 3 would not have a cumulative effect on the class I air shed.

D. Recreation/Visual Quality

Existing Conditions

The Bearcat Hollow Phase II project area is located east of the Richland Creek Wilderness area, west of the community of Witts Spring, south of FS Road 1201 and the community of Eula, North of the intersection of State Highway 16 and Forest Service Road 1355 (old hwy 27). Part of the project area is bounded by State Highway 16 south from the community of Ben Hur to the community of Witts Spring. This Bearcat Hollow Phase II project area is located in southeastern Newton, northeastern Pope and southwest Searcy counties.

The proposed actions lies within the following Management Areas as defined in the Forest Plan, which guides its management direction toward multiple uses, among which are wildlife, range, timber, aesthetics and recreation.

- 1.C Designated Wild and Scenic Rivers – 786 acres
- 2.A Ozark Highland Trails - 469 acres
- 3.B Oak Woodland – 5,619 acres
- 3.C Mixed Forest – 8,099 acres
- 3.D Oak Decline Restoration Areas – 1,781 acres
- 3.I Riparian Corridors - 607 acres
- 3.K Wildlife Emphasis 8,871 acres
- Private – 6,190 acres
- Other management areas with less than 100 acres include Wilderness, Special Interest Areas, High Quality Forest Products and Pastures & Large Wildlife Openings

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

Even though the previous LRMP and the Revised LRMP restricted OHV use from general forest and closed roads motorized use was moderate until the landslide closed access along the county road to the Richland Creek Campground. Since the main access to the campground was closed by a land slide which limited access management closed the campground approximately three years ago for safety reason. However under the current plan additional limitations have been imposed following the National direction associated with unmanaged recreation and the OHV National policy to use designated routes only. The opportunities within the project area for OHVs are limited to the Big Point road Forest Service Road (FSR) 1219A that was identified in the 2010 Travel Management Rule. The 2005 rule identified FSR 92091A and 92091B but the routes were removed because of incorrect designation. The accumulation of all of these factors has limited ATVs below the historic use of the area.

Additional opportunities include approximately 16.0 miles of the Ozark Highland Trail and Richland Creek Campground. General dispersed recreation abounds within and adjacent to the project area involving hunting, sight-sightseeing, hiking and horseback riding cross country in addition to the following designations;

Richland Creek Wilderness is immediately west and north of the project area
Richland Creek Wild and Scenic River (portion within the project area)
Stack Rock Special Interest Area to the north of the project area.

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

Equestrian use has a historical foundation within this area. Numerous local landowners ride throughout the project area on existing roads and cross country. Annually the local community sponsors a horse ride to Richland Creek Campground under a Noncommercial Special Use Permit the first weekend in October. Participation's in this event consist of locals, absentees' landowners, out of town family members and the general public horse rider enthusiasts. In spite of these events equestrian use has remained low leaving little or no trace of the recreational use. However, in the recent years two private landowners have developed facilities for horseback riders resulting in an increase of equestrian use to the area. Currently horse use has created paths (undesignated/unauthorized trails) located throughout the general forest and along woods roads. These created paths can and are degrading the forest where a high volume of traffic is occurring, adding to the issue of unmanaged recreation. The difference in the historical use and current use is that currently the paths being used are impacting the forest floor leaving a scar that is evident year round. This use will take more than one growing season to heal if use is eliminated. Most of the scarring from unmanaged use would recover in time if the use were stopped.

The effects on Recreation can be described in terms of three principle components: the recreational activity, the setting in which it takes place, and the resulting experience. These three components make up the Recreation Opportunity Spectrum (ROS) that was originally completed in 1986. However, during each Environmental Assessment, ROS for the area is reviewed and updated as needed. The setting includes both environmental and social factors. The environmental setting is characterized by physical and natural features as well as the amount of apparent modification from human activity. The social setting of an area is characterized by the amount of contact among the visitors using it and the probability of their experiencing isolation from the sights and sounds of non-recreation human activity. The experience is the desired

psychological outcome realized by participating in a preferred activity in a preferred environmental and social setting. Different combinations of these components provide a range of recreation opportunities. The ROS is a way to classify this range of opportunities and to identify the capability of the Forest to provide them. There are five classes of ROS in the Forest Plan: Semi-primitive non-motorized (SPNM), Semi-primitive motorized (SPM), Roaded Natural (RN), Rural (R) and Urban (U). The Forest Plan objective is to maintain a balance of Recreation Opportunity Spectrum on the Ozark- St. Francis National Forest. This project area contains three of the five ROS classifications with the following acres:

Rural approximately 57 acres associated with the community of Ben Hurr
Roaded Natural approximately 18,229 acres associated with the main forest roads, along the major drainages and ridges which include the highway that borders the project.
Semi-primitive motorized (approximately 14,297 acres) associated with the interior roads

Semi-primitive motorized areas are characterized by a predominantly natural or natural-appearing environment of moderate to large size. Motorized use is permitted. In a 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. Alteration in vegetation management is acceptable because recovery time after treatments is relatively short-lived, three to five years.
The RLRMP (pg. 2.20) priorities are to maintain or enhance the visual character of the Forest by establishing scenic integrity objectives. The intent is to manage landscapes and use the best environmental design practices to harmonize changes in the landscape to reduce visual effects of management. The Scenic class numbers range from 1 to 6 with 1 representing high public value and 6 as moderate/low public value which usually is found in unseen areas. The management area combined with the scenic class numbers identifies the Scenic Integrity Objectives for the Bearcat Project which is as follows;

* **High** –(18,606 acres or 57%) The foreground and middle ground along Highway 16, Falling water Road, Richland Creek Road, the Ozark Highland Trail, Richland Creek and most lands adjacent to private property are designated with a high Scenic Integrity objective

***Moderate** – (5,908 acres or 18%) The remainder of the watershed is intermingled with Low scenic class within the middle and back ground along interior roads, east project boundary and northern portion of Richland Creek County Road above Dickey Junction.

***Low** – (7,959 acres or 25%) The remainder of the watershed is intermingled with Moderate scenic class within the middle and back ground along interior roads, east project boundary and northern portion of Richland Creek County Road above Dickey Junction. The areas designated

as low Scenic Integrity objective are seldom visible /unseen except by an occasional visitors hiking or riding through the back country.

The analysis area is mostly forested. Some pastures occur on private land along the eastern boundaries, and along the major drainages or the county roads. Sight-seeing is limited along the gravel roads because the terrain and the vegetation offer little opportunity of any vistas with the exception of areas that have been previously prescribed burned, they allow a greater sight distance for viewing.

Table below shows Scenic Integrity Objectives (SIO) by Management Area showing the Objectives of High, Moderate, and Low scenic classes can be found in the RLRMP Appendix G. The table below shows the distribution of the SIO by Management Areas within the project.

SIO Table

Management	Inventoried Scenic Class				
Areas	1	2	3	4	5-6
	Scenic Integrity Objectives				
1.C Designated Wild and Scenic Rivers	High	High	High	High	High
2.A Ozark Highland Trails	High	High	High	High	High
3.B Oak Woodland	High	Moderate	Low	Low	Low
3.C Mixed Forest	High	High	Moderate	Low	Low
3.D Oak Decline Restoration Areas	High	Moderate	Low	Low	Low
3.I Riparian Corridors	High	High	Low	Low	Low
3.J Pastures & Large Wildlife Openings	High	High	Moderate	Low	Low
3.K Wildlife Emphasis	High	Moderate	Moderate	Moderate	Low

The definitions found in RLRMP on page G-4 for each Scenic Integrity Objectives are described 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.

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.

Low (Moderately Altered- Modification) Scenic integrity refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed, but also compatible or complimentary to the character within.

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 Mgt System (SMS) to achieve scenic integrity objectives.

*Manage landscapes and build elements in order to achieve scenic integrity objectives.

*Promote the planning and improvement of infrastructure along scenic travel routes. Use the best environmental design practices to harmonize changes in the landscape and to advance environmentally sustainable design solutions.

*Restore landscapes to reduce visual effects on nonconforming features.

*Manage scenic restoration to be consistent with other management area objectives.

*Maintain the integrity of the expansive, natural landscapes, and traditional cultural features that provide the distinctive character of places. Maintain the character of key places in order to maintain their valued attributes.

The general landscape character of the area is predominately a mature closed forest canopy with the exceptions of areas where natural events (ice storms, red oak borer infestation, landslides and general decline due to age of the forest) along with pastures and opening on private property. The RLMP has classified the scenic value for the majority of the project as high. It should be understood that Forest Plan mapping was completed using a "broad brush" approach and was mapped at a large scale over the entire Forest. In the case of Scenic Integrity Objectives (SIOs) Forest Plan mapping was based on foreground and middle ground from existing roads without consideration of topography or vegetation. The Forest Plan mapped many areas as "seen or unseen" but did not include factors such as, terrain, viewer positions, vegetative screening etc. that are considered at the project level. Therefore areas may be identified as scenic level high that is located in unseen areas; these areas will receive standard mitigation measures to achieve a more acceptable composition. Other areas in seen location would each be identified with

specific measures as needed based on the desired future condition of the management area and scenic level.

Additional scenery management priorities are identified based on the Management Area it is associated with; such as in Management Area 3D Oak Decline Restoration and 3K Wildlife Emphasis is expected to exceeded the visual guidelines. Example: The Wildlife Emphasis objective is to change a portion of the Landscape character from the current forested setting into an area that is dominated by grass and herbaceous under-stories with widely spaced large trees. This management area goal is to introduce improved pastures and wildlife openings composed of species to create and maintain year round forage. Landscape rehabilitation is a short term management practice with a long term goal of visual enhancement with the objective to achieve the prescribed desired future visual quality within one year. Mitigation measures would be used to make the areas more acceptable.

Proposed Action and Alternative 2

Direct/Indirect Effects

Vegetation

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

Vegetative treatments have been implemented over the years within the project area. However, the amounts of activities proposed are higher due to management direction to manage on a watershed scale and seeking to change some of the forested areas. Such as; changing the forest setting of 3.K Wildlife Emphasis Management Area into openings creating a more pastoral landscape character and within 3.D Oak Decline Restoration where priority is to restore oak and hickory forest type in heavily damaged areas through regeneration. The vegetative treatments are expected to increase the wildlife viewing opportunities enhancing the visitors' recreational experience. These increased viewing opportunities will be available along roads, portions of the Ozark Highlands Trails, cross country hiking and along newly designated horse trails. Noticeable deviations in the above management areas would be present.

The following areas would include additional mitigation measures to minimize the recreational and scenic impacts created from the vegetative treatments. Each of the areas listed are within management areas where the RLMP goals are to change, promote or enhance the landscape character/setting within that management area. The mitigation measures are designed to

eliminate obtrusive edges, shapes, patterns and blend the alterations to repeat natural form using line and textures of the natural landscape. The following mitigations are site specific for the following areas:

- Area 89 would also be visible from the Richland Creek Road (FS Rd 1219) by thinning the adjacent hardwood (Area 86) more heavily for 200 feet in two locations to promote a window appearance into Area 89.

- Area 136 eastern 1/3 of the stand would change treatment to thin and included in Area 137 reducing or eliminating the potential view of the regeneration harvest from the Falling Water Road (FS Rd # 1313)

- Areas 132, 133, 134, 136, 140, 143,145, and 147 are within 3.D Oak Decline Restoration Management and are outside of viewing from State Highway 16, Falling Water Road and Moore Rd NE32 (FS Rd #1203). Therefore no addition mitigation measures are needed, standard operation procedures would be implemented which limit recreational and scenic impacts. Such as normal widths for protection of drainage would be adequate to minimize impacts.

- Areas 53, 58, 59, 63, 66, 101, 107, 108, 112, 119, and 128 are within 3.C Mixed Forest Management Areas desired condition is predominately natural appearing with a diversity of forest successional classes and ecological community types with regeneration harvests as a common occurrence. These are in unseen locations away from the major state and county roads. Only standard operation procedures need to be implemented to limit recreational and scenic impacts. Normal lay of the land and shape of the stands would provide adequate opportunities to minimize impacts.

- Areas 6, 12, 14, 37 are regeneration treatments and Areas, 2, 11, 16, 20, 30, 43, 67, 74, 77, 79, 81, 82, 85, and 89 are openings/pastures within 3.K Wildlife Emphasis where the desired condition allows and promotes a change in landscape character from a forested condition to openings and pastures. Only areas 77, 85, & 89 were found to need additional mitigation measures. These areas would use existing natural drainage features/terrain to create 500 foot corridors or breaks and thin to a 70 BA. Area 43 would be visible as you approach the Richland Creek Campground from the north; therefore the portion of the area closest to the road would be dropped from treatment approximately 440 feet. This would reduce the size and provide a buffer along this road. The remaining areas are outside of view and standard operation procedures would be implemented to limit recreational and scenic impacts.

- Areas 150, 153, and 163 are regeneration treatments within 3.B Oak Woodland with direction to restore and maintain current forest type through manual, mechanical, or chemical methods including use of commercial timber sales. The above areas are in unseen locations from the major state and county roads due to the terrain no additional mitigation measures are needed. The following areas 91, 99, 159, 164, 168, and 173 are existing woodland with plans for chemical treatments in the proposed action visible from

State Highway 16 or Richland Creek road. To lessen the visual impacts the areas above would be treated with herbicide in late summer to early fall prior to natural fall colors. In Alternative 2 (No Herbicide Use Alternative) these same areas are planned for manual and mechanical treatment. To lessen the visual impacts, areas would be treated during leaf off to minimize the visual impact.

NNIS

Specifically the PA would treat Non Native Invasive Species with herbicides over large areas has the potential to directly degrade the recreational and scenic quality dependent on timing and method of treatment. However, if appropriate application methods and timing of application of herbicide is used, management would be subordinate on the landscape character being viewed with little or no negative effect to the recreational or scenic values. Indirectly if the treatments were applied early during the growing season before late summer the scenic quality would be degraded.

Ponds

The initial construction of ponds would have a direct negative effect on the visual quality due to the complete removal of vegetation and exposed soil, however, within a year the disturbed area would be expected to revegetate and have water in the pond. Indirectly this new source of water would have a positive effect as it would be an ideal spot for wildlife viewing.

Trails

The horse trail designation and two additional trailheads would have a direct positive effect on recreation by providing greater opportunities for access to the general forest along approximately 41 miles of designated trails. The trails would leave the landscape intact with no expected deviations in the scenic level; however, the trails would increase the recreational value of the landscape. One positive indirect effect would be these trails would provide greater opportunities to view the landscape thus increasing the scenic value of the landscape. A indirect negative effect would be the conflict between vegetation management in areas of limited recreational use and the designation of trails into these areas.

An effect of trail designation would be to focus equestrian use to sustainable locations and limit/restrict high volume or large group rides cross country which creates impacts to the forest floor that do not recover in a growing season. The designated trails would provide and increase recreational riding that would handle a higher volume of users and larger groups. These proposed trails designation would heighten the recreational experience for equestrian visitors by providing a level of comfort to occasional visitors and increase safety of all riders by providing trail markers maps and signage. By focusing the larger numbers of users on the trail system, individuals would have the opportunity to enhance their enjoyment of the back country without encountering user created paths. The Proposed Action and Alternative 2 would help address "Areas of Concern or Special Emphasis identified by Leadership" of unmanaged recreation.

This proposal would have a negative direct effect by restricting OHVs from Big Point road, FSR1219A, (approximately 3.8 miles). In an attempt to offset this loss three routes would be added totaling approximately 3.6 miles. Additional proposed routes received from the public and ID Team members were considered for connectivity (loop routes), and increased recreational opportunities. These routes were not selected due to steepness of terrain, number of stream crossings, and lack of rights of way across private ownership, and conflict with existing management area desired future conditions. These proposals would not meet all of the motorized recreational users' desires; however, it does provide recreational opportunities and does meet a portion of OHV users' ideal needs associated with other recreational activities (hunting). Therefore, the Proposed Action and Alternative 2 would have a incremental negative effect on current overall OHV motorized use. OHV use in this area has been limited and current management objective would have an indirect negative effect on users by continuing the limited use.

Parking Area Expansion at Falling Water Falls would have a temporary negative effect on the aesthetics due to visual expansion of existing parking area; however because of the extent of the development the negative effects would only be temporary. The purpose of the expansion is to discourage vehicle parking along the road adjacent to the waterfall. As visitors began using the parking area a positive effect would be both the recreational and scenic value would increase. There would be no indirect effects of the parking area expansion.

Native Cane Restoration & Glade Restoration both would have temporary direct negative impact on aesthetics due to the debris from cutting of trees, however, these treatments are designed to restore and enhance the natural setting, along with the recreational and scenic values. The activity would have a temporary indirect negative effect on recreational use in the area where the activity was implemented.

Prescribed Burning

The black appearance of the forest after prescribed burning would have a temporary direct negative effect to users for approximately one year or until spring green up. Indirectly, greater sight distance is expected so hunting and wildlife viewing opportunities would increase.

Minerals

For the purpose of this document the only minerals analyzed are to allow for surface rock collection for building stone or landscaping. This activity would have a temporary direct negative effect on visual quality similar to timber harvesting activities. Surface rock collection consists of loading pallets by hand and transported to a flat bed truck. Small equipment such as a skid steer (bobcat) may be used to transport these pallets to the truck. Rocks would be collected from the surface, i.e., not excavated. No roads would be constructed, and the haul trucks would stay on existing Forest Service roads. A skid steer would be used to pick up larger material and

transport to a haul truck. District rock collection guidelines would be adhered to. It could be expected during the implementation of a rock collection contract to see evidence where surface rock has been removed and a skid steer has been traversing through the woods disturbing the leaves and material on the surface of the ground. This would be a temporary condition lasting no more than one year. No indirect effects

Cumulative Effects

No negative long term effects would be expected with the PA and alternative 2. The long term positive effects for recreation and scenic quality would be an increase in wildlife viewing opportunities with implementation of the vegetation activities and creation of openings. Pond construction would provide a long term positive effect for wildlife viewing. Designation of horse trails would provide a long term positive effect for equestrian users by having a signed and maintained system. The parking area expansion at Falling Water Falls would have a long term positive effect on the area of the falls by providing a more natural setting for users to enjoy. Prescribed burning would have a long term positive effect to recreation by allowing for greater sight distance and wildlife viewing. Wildflowers would be more abundant which would increase the aesthetics of the area.

Alternative 1 (No Action)

Direct/Indirect Effects

The no action alternative would have some direct effects on the current ROS or SMS in the project area since no activities are proposed. The no action alternative would directly affect the environmental setting since currently there is unmanaged horseback riding in the area. Riders are using visitor created paths located throughout the general forest and woods roads, however without designation no funds would be used to maintain or improve acceptable trails. These trails would and are degrading the forest where a high volume of traffic is occurring. This degrading has a direct negative effect on the user's recreational experience because the trails are not marked. The conditions of the trails are not up to standard and this has a direct negative effect on the recreational user's experience. Indirectly if a horse rider comes to this area and has a bad experience due to the lack of trail marking or trail condition the user is less likely to return to the area. This alternative would not address "Areas of Concern or Special Emphasis identified by Leadership" of unmanaged recreation.

Cumulative Effects

Unmanaged recreation has been identified as one of the four major threats to public lands, if trail management in this area is withheld; the continued use of non-maintained and poorly located portions of the user created paths would have a negative effect on the recreational setting and experience of the riders.

Alternative 3

Direct/Indirect Effects

Same as Proposed Action and Alternative 2 except for the increase in wildlife potential viewing associated with the pastoral settings would be changed to thinning lessening the opportunities for viewing of wildlife in a pastoral setting.

Cumulative Effects

Same as Proposed Action and Alternative 2 except for the increase in wildlife potential viewing associated with the pastoral settings would be changed to thinning lessening the opportunities for viewing of wildlife in a pastoral setting.

E. Vegetation

Existing Condition

This project area encompasses approximately 32,585 acres of Forest Service and privately owned lands. Private or other non-Forest Service lands comprise approximately 5,439 acres while Forest Service lands comprise approximately 27,146 acres. Forest types present on Forest Service lands include: pine forest at 5,228 acres or 19%, pine/hardwood forest at 330 acres or 1%, hardwood forest at 21,048 acres or 78%, hardwood/pine forest at 433 acres or 2%, and cedar at 107 acres or less than 1%. Figure 1 illustrates the age class distribution across all forest types present within the Bearcat II project area, while Figure 2 and Table 1 illustrate the current age class distribution present across each forest type.

Figure 1.

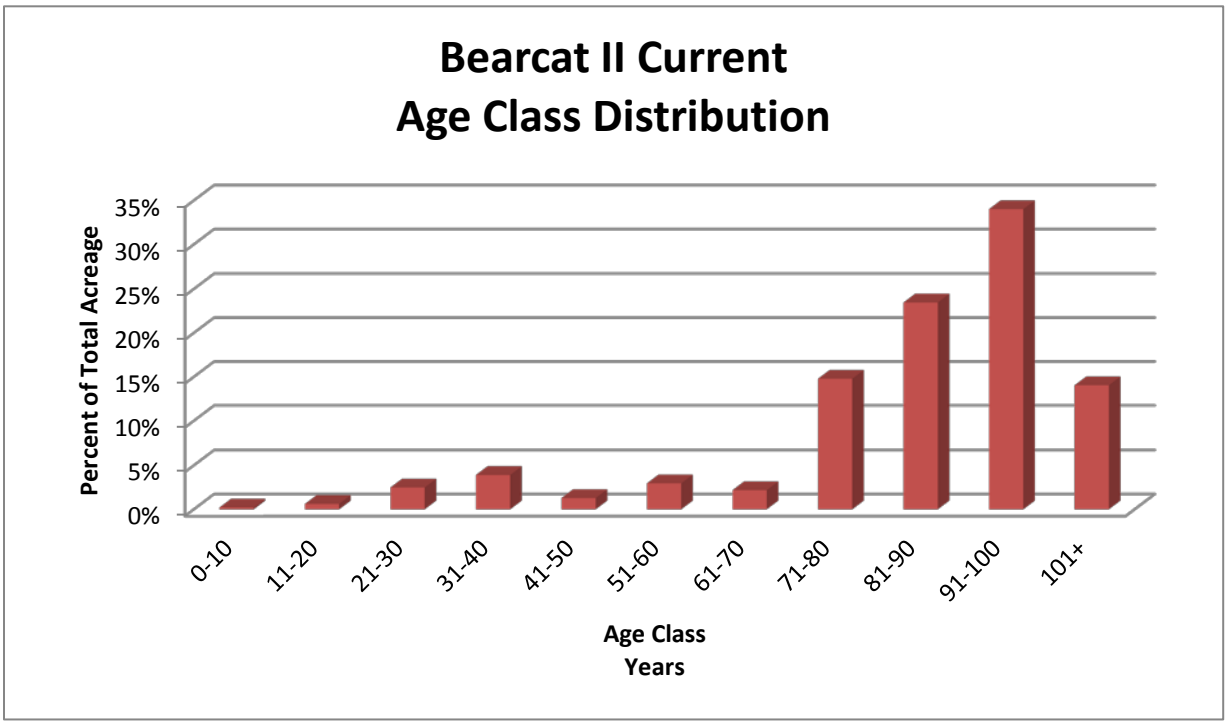


Figure 2.

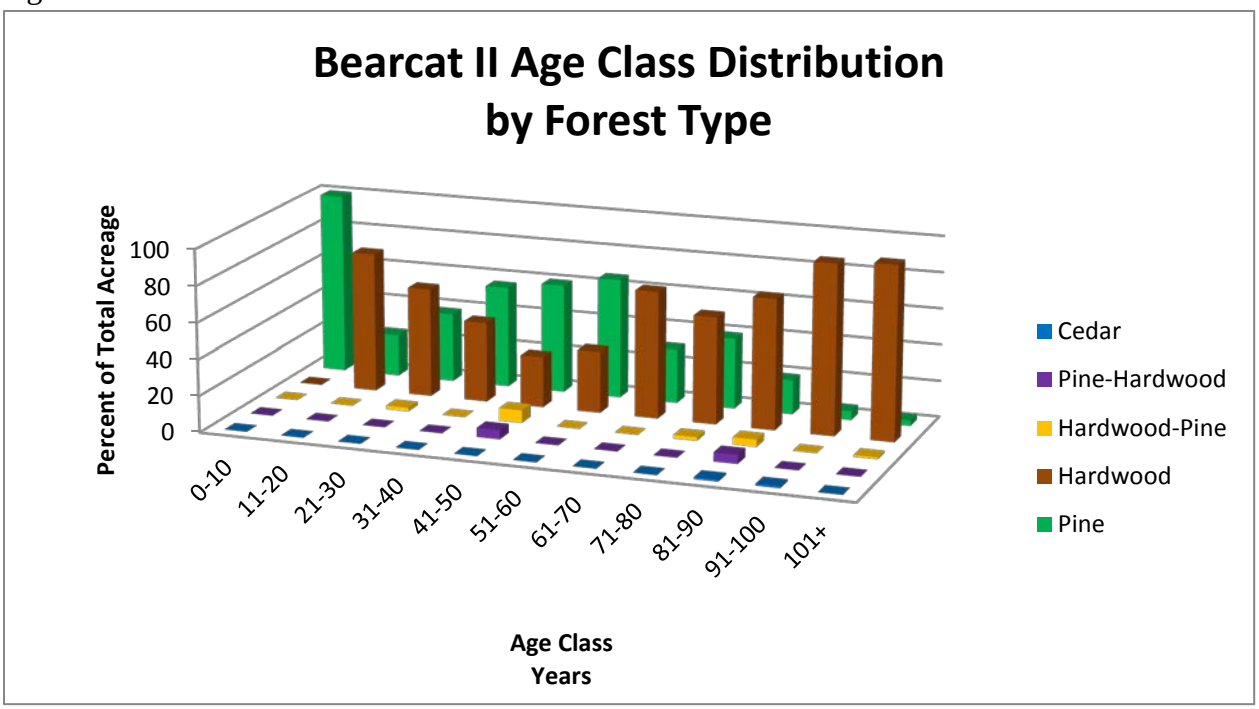


Table 1.

Age Class			Forest Type[1]														
			Cedar			Pine			Pine-Hardwood			Hardwood-Pine			Hardwood		
Years	Acres	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total	Acres	% of Type	% of Total
0-10	55	0%	0	0%	0%	55	1%	100%	0	0%	0%	0	0%	0%	0	0%	0%
11-20	168	1%	0	0%	0%	39	1%	23%	0	0%	0%	0	0%	0%	129	1%	77%
21-30	675	2%	0	0%	0%	258	5%	38%	0	0%	0%	11	3%	2%	406	2%	60%
31-40	1,063	4%	0	0%	0%	593	11%	56%	0	0%	0%	0	0%	0%	470	2%	44%
41-50	351	1%	0	0%	0%	211	4%	60%	18	5%	5%	24	6%	7%	98	0%	28%
51-60	805	3%	0	0%	0%	528	10%	66%	0	0%	0%	0	0%	0%	277	1%	34%
61-70	593	2%	0	0%	0%	175	3%	30%	0	0%	0%	0	0%	0%	418	2%	70%
71-80	4,016	15%	3	3%	0%	1,557	30%	39%	16	5%	0%	80	18%	2%	2,360	11%	59%
81-90	6,371	23%	37	35%	1%	1,206	23%	19%	296	90%	5%	271	63%	4%	4,561	22%	72%
91-100	9,236	34%	67	63%	1%	489	9%	5%	0	0%	0%	0	0%	0%	8,680	41%	94%
101+	3,813	14%	0	0%	0%	117	2%	3%	0	0%	0%	47	11%	1%	3,649	17%	96%
Total Forested	27,146	100%	107		>1%	5,228		19%	330		1%	433		2%	21,048		78%

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

The most predominant age class across the project area is the 91-100 year age class. At 9,236 acres it comprises 34% of the total forested area within the project area. Approximately 23,436 acres or 86% of the stands within the project area are considered mature (older than 70 years of age). Of these 23,436 acres approximately 19,648 acres or 84% are mature growth hardwood types, 3,681 acres or 16% are mature growth pine types, and 107 acres or >1% are mature growth cedar forest types. Currently, there are approximately 55 acres or approximately 0.2% of the forested lands that are considered to be in the early seral l 0-10 year age class. Forest health and stand vigor is declining or at risk due to advanced stand age and overcrowding or densely stocked stands.

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

Within the project area, oak-hickory stands tend to occur on north-facing slopes above 35% and along stream courses. The midstory and understory components on these stands are typically comprised of flowering dogwood, red maple, eastern hophornbeam, and blackgum. The

midstory and understory species composition on north aspects less than 35% typically includes flowering dogwood, vacciniums, rusty blackhaw, and witch hazel.

Pine timber types are typically found on the southern aspects. Their midstory and understory associates include oaks, hickories, flowering dogwood, blackgum, and vacciniums. Species often found on ridge tops include grasses, forbs, serviceberry, post oak, and hickories.

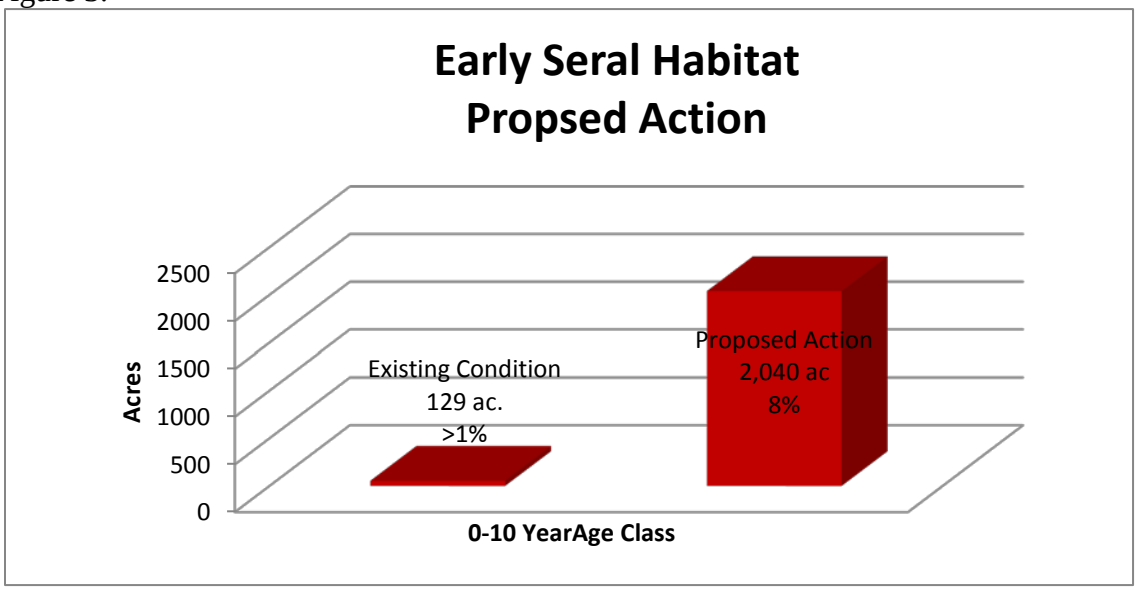
Non-Native Invasive Species (NNIS). An invasive species is identified as "[a] species that can move into an area and become dominant either numerically or in terms of cover, resource use, or other ecological impacts. An invasive species may be either native or non-native" (USDA-Forest Service 2005a p. 132; USDA-Forest Service 2005b p. 172). Several non-native invasive plant species have been identified throughout the project area. These species include shrubby Lespedeza (*Lespedeza bicolor*), Chinese Lespedeza (*Lespedeza cuneata*), Royal Paulownia-(*paulownia tomentosa)*, Japanese privet (*Ligustrum japonicum*), Japanese Honeysuckle (*Lonicera japonica)*, Nonnative Rose (*Rosa multiflora*), Mimosa (*Albizia julibrissn*), and Japanese stiltgrass (*Microstegium vimineum)*.

Effects of Management Activities on Early Seral Habitat

Proposed Action (PA):

Direct Effects:
The amount of early seral habitat within the project area would increase by approximately 2,040 acres (from >1% to 8%) through regeneration harvests, existing opening management, glade restoration, and constructing of wildlife openings (Figure 3).

Figure 3.



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

Indirect Effects:
Under the PA, approximately 2,040 acres of new early seral habitat would be created from the proposed actions. Overtime, the 787 acres of proposed regeneration harvests would continue to grow into older age classes and in time, the amount of early seral habitat available would be reduced. However, the 1,159 acres of opening construction and 74 acres of existing opening maintenance would continue to be maintained in the 0-10 year age class. This would serve to maintain the amount of early seral habitat over time.

By reducing the stand density, the forest floor will receive the required sun light for the germination and establishment of the early seral community. With the reduction of the possible fuel loading, the risk for catastrophic wildfires is reduced. Prescribed burns, repeated on 3-5 year cycles, would retain existing and newly created early seral habitat over time.

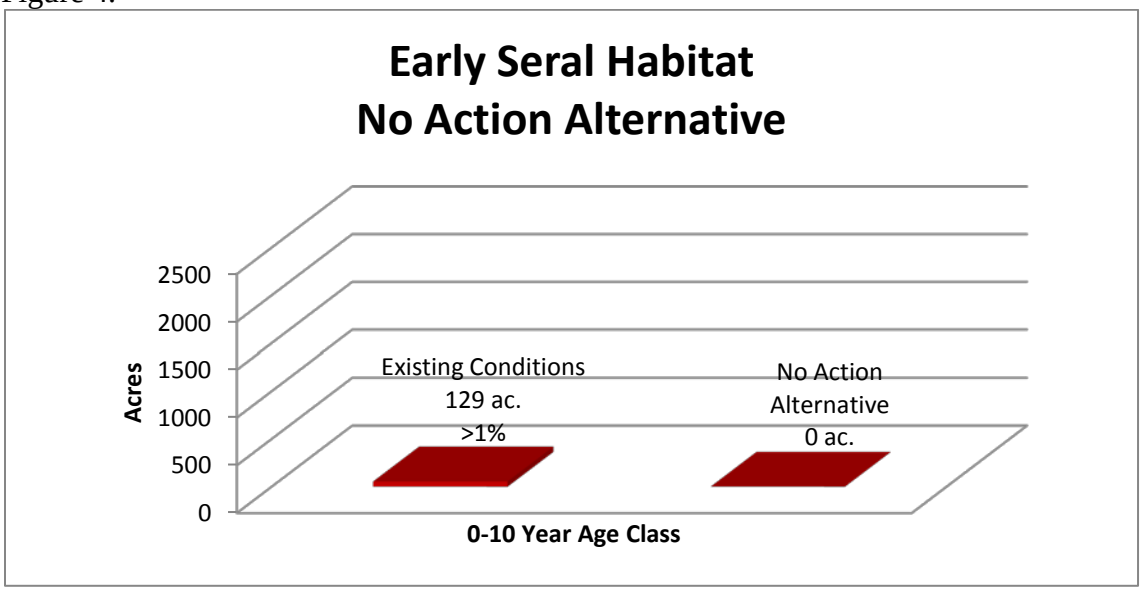
Cumulative Effects:
Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under the PA would increase early seral habitat to 2,080 acres above current conditions. The expected land logging/clearing activities could maintain the 40 acres in early seral habitat depending on management decisions.

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

Alternative 1 (No Action)

Direct Effects:
Alternative 1 proposes no management actions that would result in the creation of any dditional early seral habitat within the project area (Figure 4). No direct effects to early seral habitat would occur.

Figure 4.



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

Cumulative Effects:
As discussed in the indirect effects section, there is a potential for trees and other woody vegetation to take over existing early seral habitat. Only the expected regeneration harvests and land clearing activities on non-Forest Service lands are expected to occur within the project area. These activities would increase early seral habitat 40 acres over existing conditions. The expected logging/clearing activities could maintain the 40 acres in early seral habitat depending on management decisions.

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

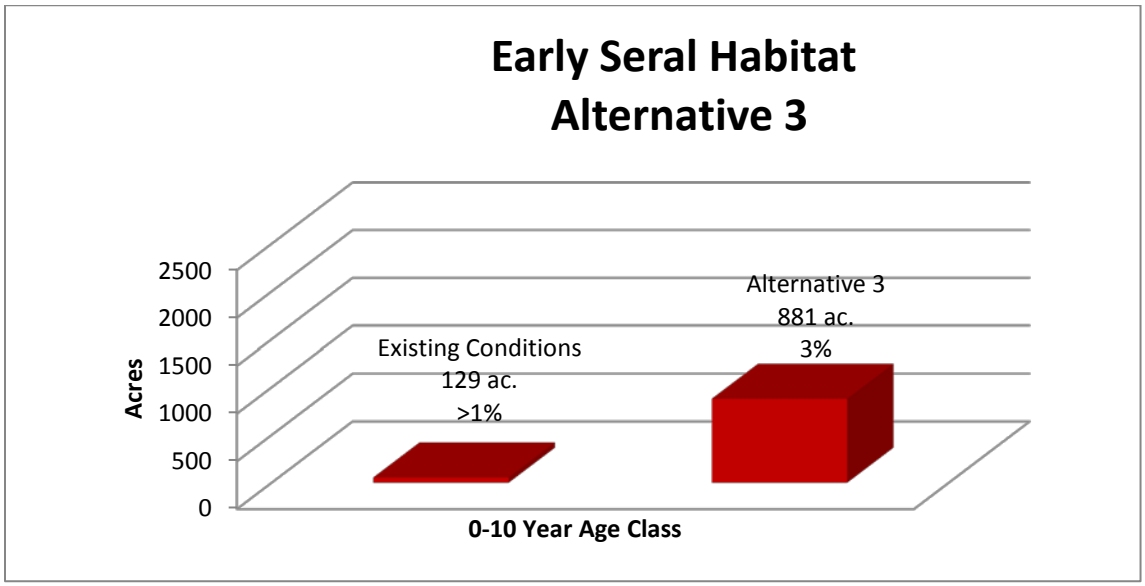
Alternative 2 (No Herbicide Use)

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

Alternative 3(No Field Management for High Quality Forage)

Direct Effects:
The amount of early seral habitat within the project area would increase by approximately 881 acres (from >1% to 3%) through pine and hardwood regeneration harvests (Figure 5). All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning under this alternative, which serve only to reduce basal area and do not affect stand age structure.

Figure 5.



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

Indirect Effects:
Under this alternative, approximately 881 acres of new early seral habitat would be created through regeneration harvests, existing opening management, and glade restoration. Overtime, areas would continue to grow into older age classes and the amount of early seral habitat available would be reduced.

By reducing the stand density, the forest floor will receive the required sun light for the germination and establishment of the early seral community. With the reduction of the possible fuel loading, the risk for catastrophic wildfires is reduced. Prescribed burns, repeated on 3-5 year cycles, would retain existing and newly created early seral habitat over time.

Cumulative Effects:
Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under this alternative would increase early seral habitat 921acres above current conditions. The expected land logging/clearing activities could maintain the 40 acres in early seral habitat depending on management decisions.

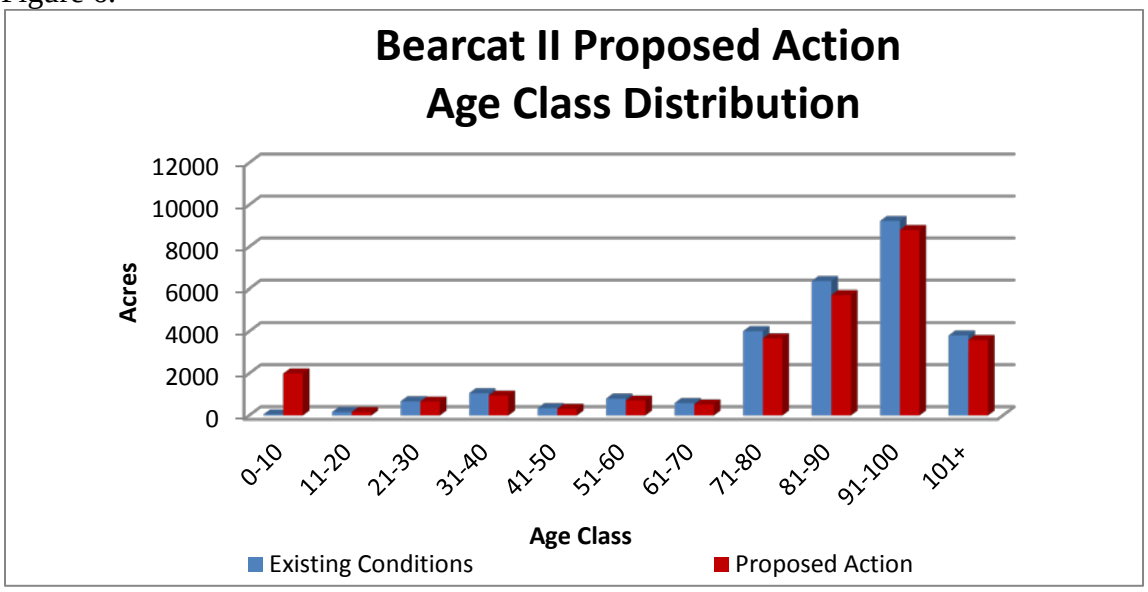
With repeated prescribed burning, existing early seral habitat would be retained over time. Forest pests usually attack older, weaker trees, and are less damaging to trees that are growing vigorously. Increased stand vigor would result in increased resistance to forest pests such as Southern pine beetle.

Effects of Management on Age Class Diversity

Proposed Action

Direct Effects:
Approximately 11 acres of the 21-30 year age class, 116 acres of the 31-40 year age class, 33 acres of the 41-50 year age class, 94 acres of the 51-60 year age class, 65 acres of the 61-70 year age class, 341 acres of the 71-80 year age class, 639 acres of the 81-90 year age class, 431 acres of the 91-100 age class, and 215 acres of the 100+ year age class of pine and hardwood forest types, 1,946 acres total, would shift to the 0-10 year age class through the even-aged regeneration harvests and construction of high quality wildlife openings (Figure 6). In addition, 74 acres from existing wildlife opening maintenance, 20 acres of glade restoration and 49 acres of site prep of failed regeneration areas would be returned to earlier age classes.

Figure 6.



Indirect Effects:
The proposed actions would increase age class diversity by shifting 2,040 acres across several age classes to the 0-10 year age class through regeneration harvests, existing opening maintenance, glade restoration, and construction of high quality wildlife openings. Overall forest health and vigor would be increased. Younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

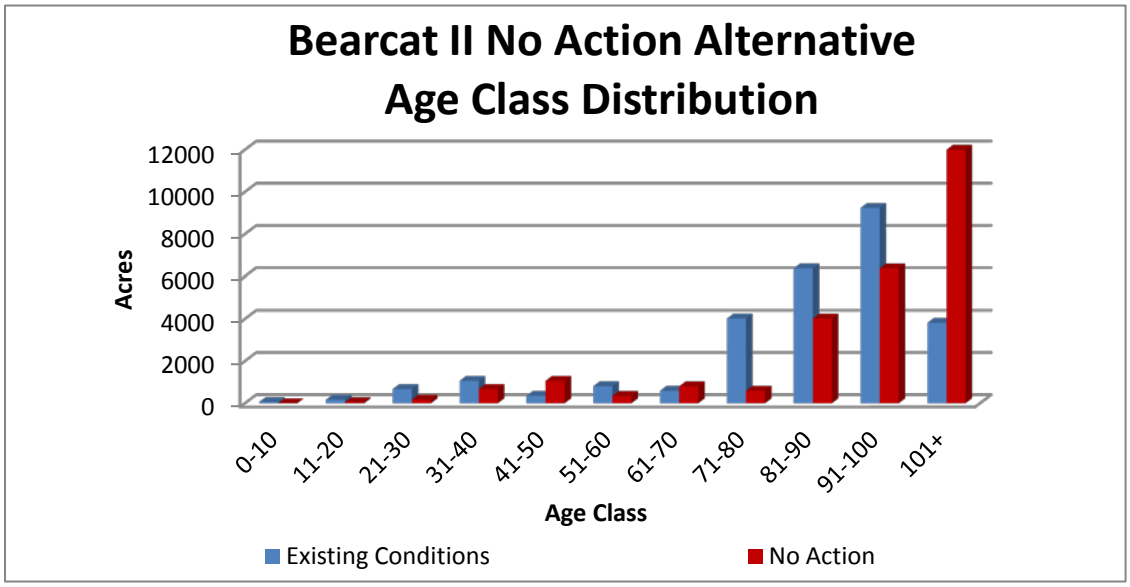
Cumulative Effects:
The 2,040 acres of regeneration harvests and construction of high quality wildlife openings associated with the proposed actions combined with the 40 acres of logging/ clearing activities would increase age class diversity across the entire project area by shifting mature age classes to the 0-10 year age class by a total of 1,985 acres over current conditions. Overall forest health and vigor would be increased. Younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Alternative 1 (No Action)

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

Indirect Effects:
Younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition. In the absence of management activities or natural disturbances, through time the current age classes would retain the same distribution in relation to one another, but the distribution would be increasingly skewed to the older age classes as depicted in Figure 7. This would reduce overall Forest health and vigor.

Figure 7.



Cumulative Effects:
As discussed in the indirect effects section, increased age class diversity leads to increases in the overall forest health and vigor. Only the expected logging/clearing activities on non-Forest Service lands are expected to occur within the project area. These activities would increase early seral habitat 40 acres over existing conditions and may be maintained in the 0-10 year age early seral age class into the future depending on management decisions.

Over time, without the implementation of the proposed vegetation management activities, the current age classes would retain the same distribution in relation to one another, but the distribution would be increasingly skewed to the older age classes. Forest health and vigor would continue to decline.

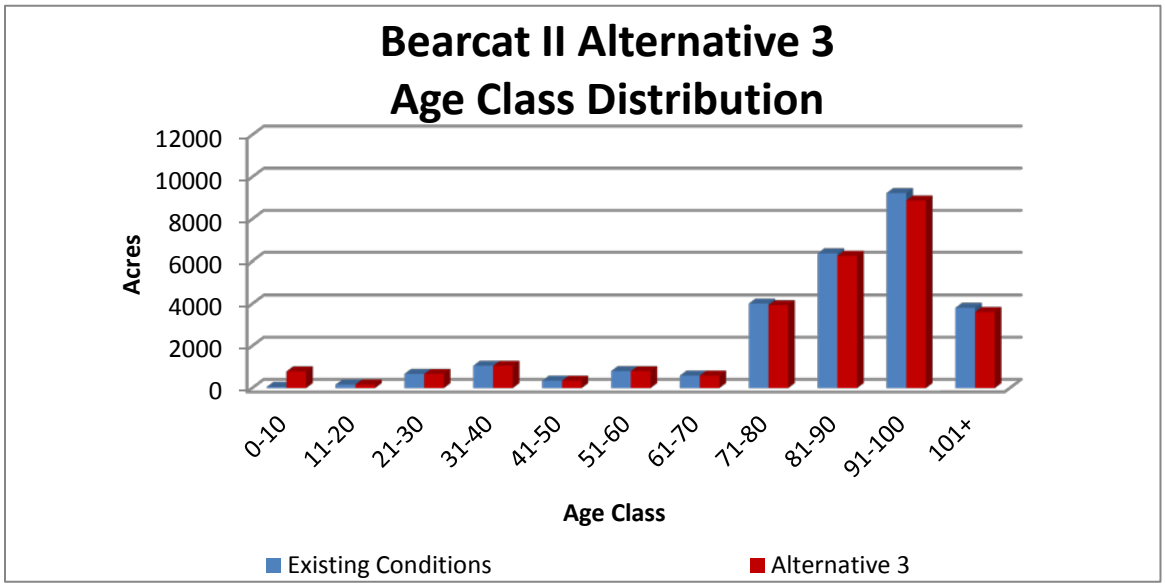
Alternative 2 (No Herbicide Use)

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

Alternative 3 (No Field Management for High Quality Forage)

Direct Effects:
Under this Alternative construction of high quality wildlife openings would not occur. All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning which does not affect age class structure. Approximately 47 acres of the 51-60 year age class, 76 acres of the 71-80 year age class, 116 acres of the 81-90 year age class, 351 acres of the 91-100 age class, and 197acres of the 100+ year age class of pine and hardwood forest types, 787 acres total, would shift to the 0-10 year age class through the even-aged regeneration harvests and construction of high quality wildlife openings (Figure 8). In addition, 74 acres from existing wildlife opening maintenance, 20 acres of glade restoration, and 49 acres of site prep of failed regeneration areas would be returned to earlier age classes.

Figure8.



Indirect Effects:
All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning which does not affect age class structure. Age class diversity would be altered by shifting 930 acres across several age classes to the 0-10 year age class through regeneration harvests. 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. Under this alternative, the overall forest health and vigor would improve but not to the extent as the proposed action.

Cumulative Effects:
Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under this alternative would improve age class diversity across the entire project area by shifting mature age classes to the 0-10 year age class by a total of 921 acres over current conditions. 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. Under this alternative, the overall forest health and vigor would improve but not to the extent as the proposed action.

Effects of Management Activities on Mature Growth

Proposed Action

Direct Effects:
Currently there are approximately 23,436 acres or 86% of mature growth (older than 70) present within the Bearcat II project area. Of the 23,439 acres, approximately 19,648 acres or 84%are comprised of mature growth hardwood forest types, approximately 3,681 acres or 16% are comprised of mature growth pine, and approximately 107 acres or >1% are comprised of cedar forest types. Under the PA, approximately 1,946 acres of mature growth forest types would be reduced through even-aged regeneration harvests and construction of high quality wildlife openings.

Where the activities would be performed, approximately 323 acres would be reduced on mature growth pine types and 1,304 acres would be reduced on mature growth hardwood forest types. This would reduce the amount of mature growth forest types across the project area to 80%.

Indirect Effects:
The mature growth would be reduced by approximately 1,946 acres or 8%. Overtime the younger age classed would continue to grow into older age classes, increasing the amount of mature growth present within the project area. By removing 8% of the current age structure from mature growth age classes to the 0-10 year early seral age class age class diversity in increased. As discussed under the Age Class Diversity section, increases to forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Cumulative Effects:
Management activities under the PA would reduce the amount of mature growth pine forest types to 3,358 acres, and the amount of mature growth hardwood forest types to 18,344 acres. The current age of the expected regeneration harvests and logging/clearing activities on non-

forest Service lands are unknown. The 40 acres of expected activities would only constitute a 0.12 % change across the 32,585 acre Bearcat II project area. As discussed under the Age Class Diversity section, increases to forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Alternative 1 (No Action)

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

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

Cumulative Effects:
Under this alternative, only the expected regeneration harvests and land clearing activities on non-Forest Service lands are expected to occur within the project area. The current age of the expected regeneration harvests and land clearing activities on non-forest Service lands are unknown. However, the 40 acres of expected activities would only constitute a 0.12 % change across the 32,585 acre Bearcat II project area.

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

Alternative 2 (No Herbicide Use)

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

Alternative 3 (No Field Management for High Quality Forage)

Direct Effects:
Under this Alternative construction of high quality wildlife openings would not occur. All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning which does not affect age class structure. Currently there are approximately 23,436 acres or 86% of mature growth (older than 70) present within the Bearcat II project area. Of the 23,439 acres, approximately 19,648 acres or 84% are comprised of mature growth hardwood forest types, approximately 3,681 acres or 16% are comprised of mature growth pine, and approximately 107 acres or >1% are comprised of cedar forest types. Under this Alternative, approximately 787 acres of mature growth forest types would be reduced through even-aged regeneration harvests.

Where the activities would be performed, approximately 60 acres would be reduced on mature growth pine types and 727 acres would be reduced on mature growth hardwood forest types. This would reduce the amount of mature growth forest types across the project area from 86 %to 83%.

Indirect Effects:
Under this Alternative, the mature growth would be reduced by approximately 787 acres or 3% through even-aged regeneration harvests. Overtime the younger age classed would continue to grow into older age classes, increasing the amount of mature growth present within the project area. By removing 3% of the current age structure from mature growth age classes to the 0-10 year early seral age class age class diversity is slightly improved. As discussed under the Age Class Diversity section, increases to forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition. Under this Alternative, overall forest health and vigor would slightly improve but not to the extent as the PA.

Cumulative Effects:
Management activities under this Alternative would reduce the amount of mature growth pine forest types by 60 acres to 3,621 acres, and the amount of mature growth hardwood forest types by 680 acres to 18,968 acres. The current age of the expected regeneration harvests and logging/clearing activities on non-forest Service lands are unknown. The 40 acres of expected activities would only constitute a 0.12 % change across the 32,585 acre Bearcat II project area. As discussed under the Age Class Diversity section, increases to forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition. Under

this Alternative, overall forest health and vigor would slightly improve but not to the extent as the PA.

Effect of Management Activities on Retention and Recruitment of Hardwoods

Proposed Action

Direct Effects:
Approximately 9,184 acres of proposed even-aged regeneration harvests, commercial thinning, existing woodland management, or construction of high quality wildlife openings would occur on hardwood forest types. These activities would remove hardwoods of poor form and condition, retaining those with a higher value in terms of seed production and overall health. These activities would also create canopy openings and disturb the forest floor. Following regeneration harvests, areas would be reforested, either naturally or artificially, to a minimum stocking level of 150 hardwood trees per acre within 3 years following harvest activities. The target stocking level is 250-350 hardwood trees per acre within 3 years following harvest activities (RLRMP, 2005, FW-11, p.3-2). Prescribed fire would remove litter from the ground surface, aiding in the germination of hardwood seeds. In regards to hardwood retention, dormant season burns do not kill the rootstocks of hardwood species. Top-killing could occur, but hardwoods often re-sprout.

Indirect Effects:
Approximately 656 acres or 3% of hardwood forest types present across the Bearcat II project area would be converted to open early seral habitat conditions through the construction of high quality wildlife openings.

Cumulative Effects:
The forest type of the expected logging/ clearing activities on non-forest Service lands is unknown. These activities would reduce the amount of hardwood forest types by less than 1% throughout the project area.

Alternative 1 (No Action)

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

Indirect Effects:
Due to the lack of activities, the competing vegetation could suppress the growth and development of the hardwoods.

Cumulative Effects:
The forest type of the expected regeneration harvests and land clearing activities on non-forest Service lands are unknown. The 40 acres of expected logging/ clearing activities would reduce the amount of hardwood forest types less than 1% across the project area.

Alternative 2 (No Herbicide Use)

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

Alternative 3 (No Field Management for High Quality Forage)

Direct Effects:
Under this Alternative construction of high quality wildlife openings would not occur. All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning. Approximately 9,148 acres of proposed even-aged regeneration harvests, commercial thinning, and woodland management would occur on hardwood forest types. These activities would remove hardwoods of poor form and condition, retaining those with a higher value in terms of seed production and overall health. These activities would also create canopy openings and disturb the forest floor. Following regeneration harvests, areas would be reforested, either naturally or artificially, to a minimum stocking level of 150 hardwood trees per acre within 3 years following harvest activities. The target stocking level is 250-350 hardwood trees per acre within 3 years following harvest activities (RLRMP, 2005, FW-11, p.3-2). Prescribed fire would remove litter from the ground surface, aiding in the germination of hardwood seeds. In regards to hardwood retention, dormant season burns do not kill the rootstocks of hardwood species. Top-killing could occur, but hardwoods often re-sprout.

Indirect Effects:
No indirect effects to hardwood recruitment and retention are expected to occur because all areas classified as hardwood forest types would continue to be managed for hardwood production.

Cumulative Effects:
The forest type of the expected logging/ clearing activities on non-forest Service lands is unknown. These activities would reduce the amount of hardwood forest types by less than 1% throughout the project area.

Effects of Management Activities on Hard Mast Production

Proposed Action

Direct Effects:
Under the PA, approximately 9,148 acres or 34% of the project area would receive treatments that would reduce the overall stand density on hardwood forest types. Within these areas, selected hardwood and soft mast producing trees would be released from competition and would reduce competition, increase available sunlight, and through selection retain the best mast producers.

The removal of hardwoods during regenerative harvests would reduce the hard mast production. Thinning activities within the hardwoods forest types would decrease competition for light and nutrients, reduce canopy closure, and allow for crowns to expand. This would increase the residual trees capability to produce hard mast.

Indirect Effects:
Approximately 656 acres or 3% of hardwood forest types present across the Bearcat II project area would be converted to open early seral habitat conditions through the construction of high quality wildlife openings. This would eliminate hard and soft mast production on these areas. However, the reduced stocking levels on the remaining 8,492 acres would reduce competition, increase available sunlight, and through selective marking retain the best mast producers. This would in turn, improve the health and mast producing capabilities of the remaining areas. Mast production could be reduced in the future from site preparation activities and release treatments on regeneration areas.

Cumulative Effects:
With the increased health of the stands, their mast production would increase, allowing a greater number of seeds for regeneration. With this increased production, the surplus hard mast would be available for the deer, turkeys, and squirrels. These and other species are dependent on the hard mast production as a food source.

Alternative 1 (No Action)

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

Indirect Effects:
Stand densities and competition would continue to increase. The increased competition would reduce overall stand and forest health and could reduce the amount of quality mast available.

Cumulative Effects:
Stand densities and competition would continue to increase. The increased competition would reduce overall stand and forest health and could reduce the amount of quality mast available causing the wildlife dependant on this food source to search elsewhere.

Alternative 2 (No Herbicide Use)

For this alternative, the direct, indirect, and cumulative effects would be the same as those listed under the proposed action. Management activities would still be performed throughout the project area utilizing manual methods instead of herbicides.

Alternative 3 (No Field Management for High Quality Forage)

Direct Effects:
Under this Alternative construction of high quality wildlife openings would not occur. All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning. Under this alternative, approximately 9,148 acres or 34% of the project area would receive treatments that would reduce the overall stand density on hardwood forest types. Within these areas, selected hardwood and soft mast producing trees would be released from competition and would reduce competition, increase available sunlight, and through selection retain the best mast producers.

The removal of hardwoods during regenerative harvests would reduce the hard mast production. Thinning activities within the hardwoods forest types would decrease competition for light and nutrients, reduce canopy closure, and allow for crowns to expand. This would increase the residual trees capability to produce hard mast.

Indirect Effects:
Reduced stocking levels would reduce competition, increase available sunlight, and through selective marking retain the best mast producers. This would in turn, improve the health and mast producing capabilities of the remaining areas. Mast production could be reduced in the future from site preparation activities and release treatments on regeneration areas.

Cumulative Effects:
With the increased health of the stands, their mast production would increase, allowing a greater number of seeds for regeneration. With this increased production, the surplus hard mast would

be available for the deer, turkeys, and squirrels. These and other species are dependent on the hard mast production as a food source.

Effects of Regeneration Harvests on Vegetation

Proposed Action

Direct Effects:
Under the PA approximately 787 acres of early seral habitat would be created through the proposed seedtree and shelterwood regeneration harvests. Seedtree regeneration harvests would retain approximately 10-20 ft^2 of residual basal area while shelterwood regeneration harvests would retain approximately 20-40 ft^2 of residual basal area. Trees that are removed during regeneration harvests include any diseased or damaged trees as well as any overmature, intermediate or suppressed trees. The residual trees that remain exhibit good health with dominant or co-dominant crowns, straight trunks, good pruning and seed producing ability. By removing overmature, diseased, stressed, and stressed trees and leaving the healthy, vigorous, seed-producing trees, the current and future health of the stand is improved. All regeneration harvests would be followed up by site preparation, release, and if necessary planting to ensure adequate reforestation within five years following harvest activities.

Indirect Effects:
As forested stands reach maturity and continue to age, competition for light and nutrients increases and growth and vigor begin to decline. Overtime, the increased competition, combined with the reduction in health and vigor leads to mortality in overmature, diseased, stressed, or suppressed trees. By removing approximately 787 acres of mature forest through regeneration harvests the expected losses from future mortality would be reduced or eliminated and a new early seral age class would be introduced. As discussed in previous sections, the early seral habitat created through proposed regeneration harvests would increase the overall age class diversity across the project area. This would serve to improve the overall health and vigor of the forest because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Cumulative Effects:
The proposed 787 acres of regeneration harvests combined with, 1,159 acres of construction of high quality wildlife openings, 74 acres of existing opening management and up to 20 acres of glade restoration would increase the amount of early seral habitat to 2,040 acres or 4% of the suitable acres within the project area.

The 40 acres of expected logging/clearing activities on non-Forest Service lands would only constitute less than 0.12 % change across the 32,585 acre Bearcat II project area. As discussed

under previous sections, increases to early seral habitat and forest age class diversity and structure improves overall forest health and vigor because younger age classes tend to exhibit more vigorous growth while increased age class structure and diversity helps limit any disease or insect attacks that occur because of the differences in stand structure and composition.

Alternative 1 (No Action)

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

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

Cumulative Effects:
Under this alternative, only the expected logging/clearing activities on non-Forest Service lands are expected to occur within the project area. The current age of the expected regeneration harvests and land clearing activities on non-forest Service lands are unknown. However, the 40 acres of expected activities would only constitute 0.12 % change across the 32,585 acre Bearcat II project area.

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

Alternative 2 (No Herbicide Use)

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

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

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

Alternative 3 (No Field Management for High Quality Forage)

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

Effects of Commercial Thinning on Vegetation

Proposed Action

Direct Effects:
Under the PA approximately 7,447 acres of commercial thinning (1,547 acres on pine forest types and 5,900 acres on hardwood forest types) would occur across the project area. Stocking levels would be reduced to approximately 60 ft^2 of residual basal area. Other activities such as cedar thinning on 80 acres and glade restoration on up to 20 acres involve the removal of existing vegetation to reduce stocking levels. These treatments may be manual or offered commercially. Commercial thinning operations as well as the cedar thinning and glade restoration activities remove the smaller, weaker, damaged or diseased trees within a stand. The residual trees which are retained are the larger dominant and co-dominant trees. These are often the healthiest and most vigorous trees in the stand, due to the position of their crowns in the canopy.

Indirect Effects:
Commercial thinning operations on 7,447 acres, cedar thinning on 80 acres, and glade restoration on up to 20 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. This would improve the number and diversity of plant species present within the forest understory as well as increase the amount of available browse for wildlife species.

Cumulative Effects:
The commercial thinning, cedar thinning, and glade restoration activities combined with prescribed burning and other vegetation management techniques would increase and maintain the amount of reduced stocking levels across the project area. Commercial thinning and other non-commercial activities such as woodland management, glade restoration, seedling site preparation and release, or under/midstory reduction treatments would reduce current stocking levels by removing diseased, damaged, or weakened trees. This would reduce competition for light and available nutrients, as well as increase the amount of sunlight reaching the forest floor thus increasing the amount and diversity of plant species on the forest floor as well as increasing browse for wildlife species. The proposed prescribed burning would help maintain the lower stocking levels over time by controlling the amount of smaller vegetation present in the forest understory.

Alternative 1 (No Action)

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

Indirect Effects:
Under this alternative proposed commercial thinnings and other vegetation management activities would not occur. The forest would continue to grow resulting in increased stocking levels, competition for sunlight and available nutrients as well as a decline in forest growth and vigor. Overtime, the increased competition, combined with the reduction in health and vigor leads would increase natural mortality in overmature, stressed, or suppressed trees as well increase the risk of mortality from insect or disease outbreaks. Thick forest canopies would prevent sunlight from reaching the forest floor. This would reduce the amount and diversity of forest floor species as well as reduce the amount of available browse for wildlife.

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

Alternative 2 (No Herbicide Use)

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

Alternative 3 (No Field Management for High Quality Forage)

Direct Effects:
Under this Alternative construction of 1,159 acres high quality wildlife openings would not occur. All of the areas with a proposed treatment of high quality forage openings within the PA would receive a treatment of thinning. This would increase the amount of commercial thinning acres from 7,447acres to 8,606 acres. While the commercial thinning treatment would improve the health and vigor of these stands by reducing competition for available light and nutrients and selectively removing the smaller, weaker, damaged or diseased trees from these stands it does not improve the over age class diversity or amount of early seral habitat present across the Bearcat II project area.

Indirect Effects:
While the reduced stocking levels would reduce competition, increase available sunlight, and through selective marking removing the smaller, weaker, damaged or diseased trees, age class diversity would only shift 881acres or 3% across several age classes to the 0-10 year age class through regeneration harvests, existing opening management, and glade restoration instead of a potential 2,040 acres or 8%. As mentioned in the age class diversity effects section 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. Under this alternative, the overall forest health and vigor would improve but not to the extent as the PA.

Cumulative Effects:
Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under this alternative would improve age class diversity across the entire project area by shifting mature age classes to the 0-10 year age class by a total of 780 acres over current conditions.

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. Under this alternative, the overall forest health and vigor would improve but not to the extent as the PA.

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

Proposed Action

Direct Effects:
Under the PA, NNIS populations would be suppressed, contained, or eradicated. Identified populations would be treated with a combination of herbicide application, prescribed burning, manual, or mechanical treatments. This would aid in the re-establishment of native plant communities across the project area. Because some species have persistent seeds that remain viable in the soil for years, monitoring would determine the effectiveness of the treatments and if further treatments would be required.

Indirect Effects:
Ground disturbing activities such as timber harvest, road construction, road maintenance, fireline construction, fireline maintenance, and high quality forage area construction could increase the population and spread of non-native invasive species by destroying individual stems which would result in prolific sprouting. They would also provide seedbeds for NNIS germination. Mechanical equipment could also dislodge seeds and transport them to unaffected areas. Treating known NNIS populations prior to or in conjunction with other proposed management activities would help contain infestations while they are relatively small and prevent their spread into uncontaminated areas by vehicles, equipment, foot traffic, etc. Implementation of Best Management Practices would reduce the possibility of introducing or spreading non-native invasive plants during project implementation.

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

Cumulative Effects:
Reduction of NNIS would allow native species that had been temporarily lost from the habitat to become re-established. Activities such as road maintenance, recreation, camping, could transport the NNIS to uninfected parts of the project area. However, by treating existing

populations of NNIS and allowing native vegetation to become re-established, future infestations and spread of NNIS would be reduced or eliminated.

Alternative 1 (No Action)

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

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

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

Alternative 2 (No Herbicide Use)

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

Indirect Effects:
Ground disturbing activities such as timber harvest, road construction, road maintenance, fireline construction, fireline maintenance, and high quality forage opening construction could increase the population and spread of non-native invasive species by destroying individual stems which would result in prolific sprouting. They would also provide seedbeds for NNIS germination. Mechanical equipment could also dislodge seeds and transport them to unaffected areas. Implementation of Best Management Practices would reduce the possibility of introducing or spreading non-native invasive plants during project implementation. Without the use of herbicides, populations of NNIS could continue to increase and spread across the project area.

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

Alternative 3 (No Field Management for High Quality Forage)

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

F. Wildlife

Existing Condition

The analysis area used for this discussion totals 32,585 acres of which 27,146 acres are National Forest lands. Almost 1/3 of the project area lies in a Wildlife Emphasis Management Area (MA 3.K.), as designated by the Forest Plan, and was established to provide optimal wildlife habitat to benefit both game and non-game wildlife species (e.g., elk, deer, bear, turkey, quail, small mammals, and Neo-tropical migrant birds). The desired condition of MA 3.K. is oak and pine woodlands along with openings and pastures, a diverse herbaceous component, and an herbaceous/shrub understory providing high species diversity maintained by frequent fires and thinning. Mixed in will be pine forest and rare communities as well as a mix of early and late successional habitat management.

Currently, timber stands lean heavily to later age classes with approximately 86% above the age of 70. Permanent openings make up less than 1% of the project area, and early successional habitat comprises approximately 10% of the area when you take into consideration the previously thinned existing woodlands as well as the openings. Age class distribution is unknown for private land except forty acres of logging and clearing have occurred reducing that acreage to early successional field or reproduction. Forty-one ponds of various sizes, condition, and origin are scattered throughout the project area.

Elk were re-introduced into Arkansas in the early 1980's and have become established within the boundaries of the Buffalo National River, Gene Rush State Wildlife Management Area, and the Ozark-St. Francis National Forest. During scoping, concerns were voiced about creating wildlife openings and pastures for the expansion of a non-native subspecies of elk, i.e., Rocky Mountain Elk. Although the records of elk in North America have gaps and limitations, there is archeological evidence of elk in Arkansas and across most of the United States (Toweill and Thomas, 2002). The taxonomic status for the Arkansas archeological record is undetermined because "no subspecies of elk was named from the central or eastern United States" (Toweill and Thomas, 2002, pg92). The book *North American Elk: Ecology and Management* (Toweill and Thomas, 2002) is a compilation of work from many biologists that updated the earlier edition *Elk of North America:Ecology and Management* (Thomas and Toweill, 1982). The aforementioned book dedicates a 63 page chapter on the taxonomy of elk and red deer in Europe and North America. There is much discussion, but little consensus, on not only sub-species but species as well, which is why various pieces of literature are inconsistent when classifying elk as *Cervus elaphus* or *Cervus canadensis.* Although there are commonly used subspecies designations, there is little agreement on subspecies validity, delineations, and the significance of that distinction (Toweill and Thomas, 2002; Stalling D., 1994).

The NatureServe database generally uses one description of ecology and life history to address all subspecies of elk (2010). Elk are grazers and browsers that occupy various habitats such as pastures, forest, shrublands and forest edges. Wildlife openings are proposed in this project to support all native wildlife species including elk, bear, white-tailed deer, prairie warblers, Northern bob-white quail, and others. Further discussion on these species can be found in the sections to follow. See also www.natureserve.org for further discussion of elk.

A second issue identified during scoping was forest fragmentation. Although the canopy will 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 certain herpetofauna ("herps"), Northern Bobwhite quail, and ovenbirds would be less adaptable to changes in the landscape in varying degrees. Ovenbirds use a variety of habitats within a limited scope; i.e., mature deciduous and mixed deciduous and coniferous forests and winters in primary or second growth forest (Cornell Lab, 2011). The Ovenbird may have fewer available acres on which to breed, but this species is highly mobile could easily move from one area of acceptable habitat to another (without connecting corridors) for breeding, foraging, and wintering purposes. Just like some species need old growth forests for survival, Northern Bobwhite quails have a need for grassland field/forest edge habitat. Habitat must be available, but they are also mobile and able to disperse to other available habitats; however, Northern bobwhite quails have declined due, in part, to the loss of interconnected acres of fields and pastures which is similar to the impacts of old growth reduction on the species that live only under those conditions (Natural Resource Enterprises, 2011). Certain species of herpetofauna such as amphibians and salamanders may become geographically isolated due to fragmentation because, for instance, the majority of southern herpetofauna do not make long-range migratory movements overland (Gibbons and Buhlmann, 2001). Amphibians and reptiles require both terrestrial and aquatic habitats and movements between them occurs regularly at several hundred meters (Bailey et. al, 2006). Gibbons and Buhlmann also stated that the presence and persistence of certain species may depend on the long term availability of specific habitats as well as acceptable travel habitat between alternate breeding sites (2001, pg.384). Further discussion may be found under the project alternative headings below.

A third concern raised during the scoping process was the effect of prescribed burning on species such as amphibians. The Partners in Amphibian and Reptile Conservation's (PARC) Habitat Management Guidelines for Amphibians and Reptiles of the Southeastern United States indicates that fire was an important ecological process before suppression, and many herps are tolerant of or dependent on fire and its effects on habitats (2006, pg.13). They specifically mentioned that the Ozarks once had more woodland and savanna conditions and herps throughout the Southeast "are adapted to open woodlands and savannas interspersed with grasslands, glades, and scrublands" (pgs.13-14). Recommendations for burning in different land types include: (1) Identify, maintain, and where disrupted, restore natural fire frequency, intensity, and seasonality in xeric oak and pine-oak forests (Bailey et. al,2006, pgs47-48); (2) Where possible, use fire to manage rather than mowing in prairies, glades, barrens, and old fields, but where grasslands habitat is limited try to leave 50% unburned in a given year and vary the timing of burning in order to avoid eliminating entire populations (pgs.55-56); (3) In Mesic Hardwood Forests the duff layer is key habitat for herps, but low-intensiy "cool" fires on an infrequent basis will benefit the community (pgs.41-43); and (4) During timber stand establishment, plan for a

prescribed fire program because planted or disked firebreaks are less disruptive than repeatedly plowed or bladed lines (pg.18). Hossack and Corn (2007) did a study on pond-breeding amphibians and concluded that their results agreed with other studies "showing that most pond-breeding amphibians are resistant to fire, and that some species benefit from fire".

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 described in Chapter 2. The foundation for MIS can be found in the National Forest Management Act and Planning regulations (36 CFR 219.19). 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 Forest's 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 the table below provides information on the current conditions for the 17 MIS chosen for the Forest. The Forest completed a report assessing the population and habitat trends for the MIS (USFS 2010).

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

Northern Bobwhite *(Colinus virginianus)* – For the Forest, 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 marked declined.
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.
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.
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. Turkeys appear to be wide spread on the forest.
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 declining trend for this physiographic region.
Yellow-breasted Chat (*Icteria virens*) - On the Forest, 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 RFLRMP as MIS for the St. Francis NF.
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 historically it was more widespread where mature pine stands once occurred.
Northern Parula *(Parula americana)* – Habitat is typically where there are mature, moist forests along streams and within riparian areas. Commonly found along Ozark wooded rivers and streams.

Rufous-crowned Sparrow *(Aimophila ruficeps)* – A very small population occurs on Mt. Magazine in Logan County. 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.
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.
Red-headed Woodpecker *(Melanerpes erythrocephalus)* – Preferred habitat would include open woodlands or pines. Requires dead trees and snags for nesting. Species is uncommon on the Forest.
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 down woody debris on the forest floor. USFWS Breeding Bird Surveys show this specie is stable or slightly decreasing for this physiographic region.
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 Forest. Long term Breeding Bird Surveys for this physiographic region indicates that this species is increasing on Forest.
Acadian Flycatcher *(Empidonax virescens)* – Prefers moist deciduous forest near streams and bottomland hardwoods. Not uncommon on the Ozark NF in riparian areas.
Small-mouth Bass *(Micropterus dolomieui)* - Cool, clear, mid-order streams, greater than 10.5 m (35 ft), wide with abundant shade, cover and deep pools, moderate current, and gravel or rubble substrate characterize optimum riverine habitat. The largest stream populations of smallmouth bass occur in streams with gradients of 0.75-4.70 m/km, (3-15 ft/mi) that provide alternating pools and riffles, support. Standing crop is generally largest in pools deeper than 1.2 m (4 ft.). In suitable habitat this species is indicative of high water quality.
Largemouth Bass (*Micropterus salmoides)* – prefers larger ponds, lakes, reservoirs, slugh and river backwaters. Usually found close to shore in lakes and reservoirs. This species prefers warm quiet waters with low turbidity, soft bottom and beds of aquatic plants.

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

Two of the MIS species were eliminated from the analysis due to the following reasons: the Yellow Breasted Chat is identified in the Forest Plan as an MIS for the St. Francis NF, and the Rufous-crowned Sparrow's occurrence on the Forest is limited to an area on the Mt. Magazine 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 low intensity and/or frequency of disturbances. An example would be 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. The table below will identify the classification of each of the Terrestrial MIS species. For the purpose of this project analysis, COMPATS (Computerized Project Analysis of Timber Sales) modeling was done for six of these species: Scarlet Tanager, Prairie Warbler, Pileated

Woodpecker, Northern Bobwhite quail, deer, and turkey. COMPATS was developed by researchers and experts of these species to illustrate theoretical effects of forest management practices across alternatives on an individual project level. The Scarlet Tanager and Pileated Woodpecker will represent LDS species. Their responses to management activities according to the model will serve as an indicator for how other LDS such as ovenbirds or southern flying squirrels will respond. The Prairie Warbler, Northern Bobwhite quail, deer, and turkey will represent the HDS species. Their model responses will serve as an indicator for how other HDS species such as elk, bear, Eastern cottontails, or Bluebirds will respond to management activities.

Table Classification of MIS

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

Table MIS/COMPATS*

All units given as individuals per square mile		Species					
		Scarlet Tanager	Prairie Warbler	Pileated Wood Pecker	Quail	Deer	Turkey
Baseline		32	2	39	13	10	10
Proposed Action	Implementation	27.3	64.1	27.1	72.9	21.3	15.5
	% change over baseline	-15.2	2548.3	-31.0	445.7	109.4	56.2
	10 years	28.6	57.1	30.5	100.0	22.1	20.4
	% change over baseline	-11.0	2260.5	-22.4	648.1	117.6	105.5
Alternative 1 No Action	Implementation	28.6	36.0	32.4	33.6	11.6	12.2
	% change over baseline	-11.2	1386.8	-17.5	151.8	13.6	22.5
	10 years	29.8	30.4	34.7	27.5	13.0	18.1
	% change over baseline	-7.2	1156.2	-11.7	106.0	28.0	82.4
Alternative 2 No Herbicides	Implementation	27.3	64.1	27.1	72.9	18.2	15.5
	% change over baseline	-15.2	2548.3	-31.0	445.7	79.0	56.2
	10 years	28.3	47.6	30.7	76.1	21.5	20.0
	% change over baseline	-11.9	1868.4	-21.7	469.5	111.4	101.6
Alternative 3 No Openings	Implementation	28.7	64.6	28.5	74.6	18.4	14.0
	% change over baseline	-10.8	2570.8	-27.4	458.1	81.3	40.6
	10 years	29.9	45.1	34.3	91.0	20.5	15.2
	% change over baseline	-7	1765	-13	581	102	53
No Management Discontinue prior NEPA except raspberry field	Implementation	32	2	39	13	10	10
	% change over baseline	0	0	0	0	0	0
	10 years	32	1	40	13	10	10
	% change over baseline	0	-46	2	-5	-3	3

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

In the previous table, the category named No Management-Discontinue prior approved projects were included to illustrate that the NO ACTION Alternative isn't completely without some type of management in the project area. Prior projects that fall into the current project area include maintenance of Raspberry Fields, wildlife stand improvements (WSI), and prescribed burning. The impacts of these projects will continue (at least short term) to have an influence on species, and some management may continue to occur under previous approved projects. The influences of these activities are reflected in the COMPATS for Alternative 1: No Action.

Proposed Action (PA)

Direct/Indirect Effects

The proposed action will increase permanent openings/glades to approximately 4.6%. Early successional shrub/grassland habitat, including those acres that have a mature overstory component, will increase to approximately 27%. For the purpose of this analysis, the area within the project boundary was used to determine wildlife effects. All four HDS (deer, turkey, prairie warbler, and Northern Bobwhite quail) carrying capacities improved tremendously with the implementation of the PA. Prairie warblers received the most benefit followed by quail, deer, and then turkeys. The warblers were affected most by prescribed burning followed by either thinning in hardwoods or WSI in pine forests. Turkeys and deer received the greatest benefit from seeding, burning, and thinning. Quail preferred thinning the most followed by burning and seeding. A reason for this amount of increase is due to the lack of or insufficient amount of suitable habitat currently existing for these species. Regeneration harvests and glade restoration will improve the habitat for all HDS but especially for species such as the prairie warbler. Glade restoration will also improve basking habitat for herpetofauna.

The PA will decrease the 70 and above age class by approximately 4% and alter stand structure and density. The carrying capacity for LDS (scarlet tanager and pileated woodpecker) would be decreased immediately after implementation of the action alternatives. Effects from thinning varied between the two LDS species. Species that utilize moderately open canopy closures would benefit from the thinnings and mid/understory control like the scarlet tanager, but others would be negatively impacted like the pileated woodpecker. Prescribed burning also had a negative effect on both MIS but was stronger in the pileated woodpecker. Site preparation, Pre-commercial thins, and Release that occurs in stands 20 years old or younger will have no effect on these LDS species. Recommended mitigations for herpetofauna in harvested sites is to leave large cull trees or patches of live trees whenever practical to sustain pockets of shade-dependent species until the harvest area matures (Bailey et. al, 2006, pg. 19). Thinnings, WSI, and Shelterwoods already incorporate this design.

Carrying capacity for the six MIS would vary for the PA over time. The COMPATS model was run again to estimate effects 10 years from implementation. HDS showed an increase in carrying capacity for the PA over the current condition. HDS have very little available habitat under current conditions and show a remarkable increase and a sustained future presence under the PA. The higher carrying capacity would be from better understory control in the WSI and midstory/understory areas from using herbicide, and the increase in areas that would be thinned

and burned repetitively over the 10 year period. For all HDS, the PA showed the greatest sustained benefit compared to any alternative.

Although LDS declined, they are still an element of the system. Carrying capacity for both low density MIS initially decreased but in a 10 year period showed a slight recovery. This recovery may include reasons such as canopies within thinned areas will branch out into the gaps and recover at least partial closure. Some of the timber in the current 41-70 age class will mature into the 71-100 age class. However, LDS did not make a full recovery because prescribed burning continues to be a management tool.

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

Pond construction and reconstruction will improve conditions for HDS such as turkey, deer, and quail. Species such as prairie warblers that primarily utilize shrub/brush habitats and are not limited by water sources would not benefit from these activities. Partners in Amphibian and Reptile Conservation's (PARC) Habitat Management Guidelines indicate that "Many southeastern frogs…and salamanders…breed in ponds or vernal pools but otherwise inhabit adjacent terrestrial forested habitats" (pg.10), and also "backyard pond(s) with 'naturalized' borders attracts frogs, toads, and salamanders from adjacent woodlots" (2006, pg.70). Recommended mitigations for pond construction in fields may include (1) constructing the pond near the forest edge; (2) leave stumps or place logs between the forest edge and the pond for shelter and nesting, and allow that area between the pond and the forest edge to regenerate into a forest stand acting as a corridor between a herp's aquatic and terrestrial forested habitat; and (3) use woody structures to provide basking habitat (Bailey et. al, 2006, pg.28).

Gibbons and Buhlmann(2001) stated that "Although some common species of reptiles and amphibians…adapt readily to man-made habitats such as farm ponds and fields, the majority of southern reptiles and amphibians do not" (pg.388). A chapter written by Corn, Bury, and Hyde (as cited in Semlitsch, 2003) states that stream amphibians rely on the conservation of specialized habitats such as seeps, headwater streams, and riparian zones (pg.36). Such specialized habitats are currently protected on Forest lands by observing Forest Wide Standards for stream-side management and the Arkansas State Best Management Practices (BMPs). Also, there are few management actions (road decommission and horse trail) within the wild and scenic corridor of Richland Creek and therefore species that rely on low disturbance in aquatic systems and adjacent mesic woodlands will receive a measure of protection.

Field maintenance will increase the value of the fields for HDS. Those areas planted with a variety of warm and/or cool season forage will provide higher quality forage than monoculture agricultural fields. Control of NNIS will protect the quality of foraging habitats. PARC's recommended mitigations for protecting grassland herps while maintaining pastures and hayfields include: (1) sowing native grasses; (2) raise the mowing deck to 8 or 12 inches; (3) mow from the center in a back and forth pattern; and(4) leave or develop vegetated corridors between habitat fragments (Bailey et. al, 2006, pg68). These recommendations would be adhered to when possible.

Road closure and decommissioning would benefit the HDS and LDS by decreasing human disturbance especially for the demand species (deer and turkey) as well as elk and herpetofauna. Road closures into fields and openings would decrease disruption to large animals that may be sensitive to exposure in such settings. According to PARC's management guidelines for amphibians and reptiles (2006), "vehicle-related mortality, direct persecution…, and noise-related disruptions of natural behaviors are unfortunate side effects of recreational access"(pg.28).

Road reconstruction will affect up to 8 miles on forested lands in the all of the action alternatives, but these roads will be relatively narrow and would not change the overall structure of the adjacent forest in these areas.

Rock collection within commercial timber sales will reduce available habitat for some species such as the Eastern small-footed bat and certain herpetofauna. Blufflines and talus slopes are off-limits for rock collection and avoided during timber harvest. This is a non-renewable resource; therefore, the reduction of habitat is permanent. Mitigations are built in to the special use permits, which limits the percentage of rock by size that may be removed from the surface only.

The proposed use of herbicides in the PA and Alternative 3 to control undesirable non-native invasive species (NNIS) will improve wildlife habitats for both LDS and HDS species. Noxious weeds are displacing native plant species. Species such as *Serecea* are also prone to spread into areas were disturbances occur that 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 source populations. Although extreme care is advised, the Habitat Management Guidelines for Amphibians and Reptiles (Bailey et. al, 2006) states that "herbicides can be especially effective for meeting some objectives…when combined with prescribed fire" (pg.14). Basic mitigation recommendations are: (1) follow label instructions; (2) use only those chemicals approved for the habitats to be treated; (3) make sure sensitive habitats, especially aquatic systems, are buffered; and (4) give preference to individual stem treatment or spot application (Bailey et. al, 2006, pg. 17).

All herbicides proposed in the PA and Alternative 3 pose a low to no risk to terrestrial wildlife. Only herbicides with aquatic labels may be used near water. The Human Health and Ecological Risk Assessments completed by the USDA, Forest Service www.fs.fed.us/foresthealth/pesticide/risk.shtml (See individual SERA references within text and also in the Reference section in the EA) indicate that the proposed formulations of herbicides are either nontoxic or of low toxicity to birds, mammals, and insects. The risk assessments also indicate that none of the herbicide formulations proposed for use have been shown to cause cancer, birth defects, genetic defects, or problems with fertility or reproduction when applied at label rates.

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

Glyphosate – is strongly adsorbed to soil particles, which prevents it from excessive leaching or from being taken up from the soil by nontarget plants. It is degraded primarily by microbial metabolism, but strong adsorption to soil can inhibit microbial metabolism and slow degradation. Photo and chemical degradation are not significant in the dissipation of glyphosate from soils. The half-life of glyphosate ranges from several weeks to years, but averages 2 months. In water, glyphosate is rapidly dissipated through adsorption to suspended and bottom sediments, and has a half-life of 12 days to 10 weeks. 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. Such formulations are not proposed for use in aquatic systems (SERA 2003a). See also the herbicide discussion in the Vegetation section of Chapter 3.

Triclopyr – Salt formulations are relatively nontoxic to terrestrial vertebrates and invertebrates. The quantitative risk assessment for mammalian wildlife is based on the same data as used in the human health risk assessment. For birds, the most relevant data for this risk assessment are the standard dietary and bird reproduction studies required for registration as well as the acute oral LD50 studies. The acute oral LD50 values of triclopyr range from 849 mg/kg to 2055 mg/kg, similar to the range seen in experimental mammals. The ester formulation is considered more toxic but in this project, the ester formulation will be used for basal spray application only. This method will require less of the herbicide to control the woody species than foliar spray and typically occurs during the dormant period which will minimize its impacts to wildlife.

Based on studies evaluating this, triclopyr acid is classified as being practically non-toxic to slightly toxic to birds and triclopyr in its amine formulation is practically non-toxic to birds. Little information is available on the toxicity of triclopyr to terrestrial microorganisms. Very high concentrations of triclopyr have been shown to cause growth inhibition in bacteria and fungi in laboratory bioassays. In addition to the laboratory bioassays and field observations on single species or related groups of species, there are a number field studies that have assessed the effects of triclopyr on terrestrial organisms, both animal and plant. There is very little suggestion in any of the field studies that triclopyr had any direct adverse effect on terrestrial species and most reported effects may simply reflect changes in habitat secondary to vegetation management practices. The risk characterizations for aquatic organisms for triclopyr in its amine formulation are low over the entire range of application rates that may be used in Forest Service programs. Ester formulations have higher risk levels for toxicity (SERA 2003b).

Metsulfuron methyl - is water-soluble and remains in the soil unchanged for varying lengths of time, depending on soil type and moisture availability. The half-life can range from 120 to 180 days. Soil microorganisms and chemical hydrolysis break it down (SERA 2000, Infoventures 1995d). Metsulfuron methyl is practically nontoxic to birds, mammals, invertebrates, and bees (SERA 2000). Several acute toxicity studies and two reproduction studies are available on the toxicity of metsulfuron methyl to birds. These studies indicate that birds appear to be no more sensitive than experimental mammals to the toxic effects of Metsulfuron methyl, with the major effect again being decrease body weight gain (SERA 2004d).

Metsulfuron methyl has very low toxicity to aquatic organisms. LC50 (96 hour) for rainbow trout and bluegill sunfish are both >150 mg/L. A LC50 (48 hour) for *Daphnia* was also >150 mg/L (EXTOXNET 1996c). The available data suggest that metsulfuron methyl is more toxic to aquatic plants than to aquatic animals. Clear toxic effects in fish are not likely to be observed at concentrations less than or equal to 1000 mg/L. Aquatic plants are far more sensitive to these effects, with macrophytes appearing more sensitive than algae (SERA 2004d). Metsulfuron methyl appears to be relatively nontoxic to aquatic invertebrates based on acute bioassays in *Daphnia* with an acute LC50 value for immobility of 720 mg/L and a NOEL for reproduction of 150 mg/L (SERA 2000/2004b).

Imazapyr – is strongly adsorbed by soils, found only in the top few inches of the soil. Imazapyr is broken down by exposure to sunlight and soil microorganisms (USDA, 2004). As such, it has a low potential for leaching to ground water, but may reach surface water during storm events over recently treated land. Most toxicity studies have failed to demonstrate any significant or substantial association between imazapyr exposure and toxicity. Only a limited number wildlife species that possibly might be exposed to non-target effects have been studied. Bearing this in mind, imazapyr appears to be relatively non-toxic to terrestrial or aquatic animals. No hazards associated with the direct toxic action of this herbicide can be identified for either terrestrial or aquatic animals (SERA 2004e).

Imazapyr is relatively non-toxic to soil microorganisms, aquatic invertebrates, and fish. It is not expected to bio-accumulate in the food chain. In terrestrial animals and birds, imazapyr is practically non-toxic. Aquatic macrophytes appear to be more sensitive to imazapyr than unicellular algae. Peak concentrations of imazapyr in surface water could be associated with adverse effects in some aquatic macrophytes. Longer term concentrations of imazapyr, however, are substantially below the level of concern (SERA 2004e).

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

Cumulative Effects

At a Forest-wide scale, the Monitoring and Evaluation report (2010) suggests that three species are trending down: Eastern wild turkeys, Northern Bobwhite Quail, and Prairie Warblers. Ovenbirds, Scarlet Tanagers, Pileated woodpeckers, deer, and bear were showing a relatively stable trend. 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/. The Monitoring and Evaluation Report (2010) states that the creation and management of early successional habitat should improve the downward trend.

Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under this alternative would increase early seral habitat 2,080 acres above current conditions. The expected private land logging/clearing activities could maintain the 40 acres in early seral habitat depending on landowner management decisions. Arkansas BMPs are voluntary; therefore, streamside buffers and preventative erosion control may be minimal or absent affecting sedimentation.

Previous actions on private land from 2009 - 2010 include 110 acres of logging and clearing. Depending on subsequent management, this may have attracted and supported HDS species resulting in the possibility that USFS land could have an established population of HDS species sooner than later.

Alternative 1: (No Action)

Direct/Indirect Effects

The No Action Alternative for the project area would remain without substantial suitable habitats for species such as Northern bobwhite quail and Prairie Warblers. Prior management within the project boundary would sustain small pockets, but carrying capacity would continue to decline for these and similar species. HDS like deer and turkey would continue to improve, but demonstrated a much slower rate of growth in comparison to the PA and Alternatives 2 and 3. If previous project decisions for burning were suspended, conditions for deer, turkeys, scarlet tanagers and quail would retain current population levels (quail being virtually absent) in the future as shown in the additional COMPATS calculations for "discontinue prior approved projects". Prairie Warblers, which have benefited from past management, would make a steady decline as the forest matured.

Pileated woodpeckers and scarlet tanagers show preference for the No Action and No Opening alternatives but reflect a decrease in carrying capacity due to previous and future prescribed burning. No Action is the worst alternative for Prairie warblers, quail, and deer. Turkeys show a stronger response to openings; therefore, there was little difference between which alternative was the least beneficial for turkeys; i.e. No Action or No Openings (Alternative 3).

The No Action alternative would not restore historic woodland and savanna conditions to which certain herpetofauna are adapted except in previously created WSI/burn areas, but many aquatic and mesic woodland species would continue to benefit from current conditions. Glade dependent species would continue to decline.

Cumulative Effects

Some of the previously managed lands, both FS and private, have created habitat for HDS. Sustainability of current conditions will decrease with time, but some benefits will perpetuate. Unknown intentions for management on private lands leave future conditions unpredictable; however, some early successional habitat is likely to remain.

Forest trends are likely to follow the current trends; i.e. prairie warblers, quail, and turkeys will continue to decline; and deer, bear, pileated woodpeckers and scarlet tanagers will remain stable.

Alternative 2: (No Herbicide)

Direct/Indirect Effects

The Proposed action and Alternative 2 (No Herbicides) initially showed similar benefits to prairie warblers, quail, and turkeys, but habitat conditions with alternative 2 could not be sustained and declined from a previously improved state. Prairie warblers, deer and turkeys showed alternative 2 as the second-most beneficial alternative, likely because this alternative retains the construction of openings as well as maintenance (with fire) of the understory and early successional habitats. Scarlet tanagers and pileated woodpeckers showed equal response to alternative 2 and the proposed action; both being the least favorable. Quail showed a significant improvement compared to the No Action alternative, but it was still one of the bottom two alternatives for this type of species most likely due to the reduced ability to control woody succession in woodlands and grasslands.

Burning alone will not completely control the resurgence of woody growth due to limitations on rotations, burning conditions, and time of year. Eventually open woodlands would advance to shrubby woodlands and early forest. Although species such as fire adapted herps would be less likely to be adversely affected by herbicide, benefits of woodland and savanna habitats would decline.

Non-native invasive species would be difficult to control without the use of herbicide. Burning is unlikely to kill many NNIS such as Tree of Heaven and likely to increase germination in others such as exotic lespedezas (Evans, C.W. et. al, 2006). NNIS displace native species and reduce the variety and quality of available vegetation. "Many reptiles and amphibians are specifically adapted to forage, bask, hibernate, and nest exclusively in native vegetative communities." (Bailey et. al, 2006, pg. 19). With the amount of ground disturbance created by silvicultural treatments and opening construction, it is very likely that NNIS will spread due to known seed sources in the immediate area. Recreational vehicles and horses may spread NNIS along trails. Without effective means of control, any habitat improvements will be counterweighed with the negative impacts from the loss of available native vegetation.

Cumulative Effects

Previous management on both Forest Service and private lands has created "disturbed soil" conditions allowing NNIS to become established. Unless there is an effective tool available for the control of these non-natives, these established populations will continue to be a seed source for the spread of NNIS.

Forest trends are likely to show a temporary increase in species such as prairie warblers and quail and then continue to show a slow decline. Turkeys, deer, and bear are likely to remain stable. Pileated woodpeckers and scarlet tanagers are likely to remain stable or slightly decrease.

Alternative 3: (No Openings)

Direct/Indirect Effects
LDS initially declined but showed some recovery in future conditions. These species preference for this alternative varied little from their preference for alternative one. These were the top two alternatives for the LDS representatives. Scarlet tanagers did not show a clear preference between alternative one and alternative three, but the pileated woodpeckers were slightly more in favor of the Alternative 1: No Action. Thinnings were not shown to affect scarlet tanagers in the COMPATS, but the alteration of the stand structure did have impacts on the woodpeckers. Initially, species such as the Pileated will show a decrease almost as high as the PA, but the future response showed a greater recovery than any of the other action alternatives.

Prairie warblers had a marked initial response but in subsequent years lost a significant amount of ground; however, this alternative was still preferable to the No Action Alternative.

Deer and turkeys initially responded similarly to this alternative as in alternative two; i.e., a noticeable positive response, but future beneficial impacts were lower in this alternative than in the PA or alternative two. This is most likely due to the lack of open habitat. Elk would probably respond similarly; i.e. positively but with habitat limitations.

Northern bobwhite quail showed a larger initial response in this alternative than in the PA, but future benefits were reduced enough to make alternative three the second favored alternative.

Native species diversity would be maintained by controlling NNIS.

Cumulative Effects
Cumulative effects would be similar to the PA; however, suitability of early successional habitat would decrease more quickly than with the PA.

G. Fisheries

Existing Condition

The fishery analysis area for this project is the Richland Creek watershed. Three main tributaries are in the project area: Richland Creek, Falling Water and Bobtail Creek. These streams are typical of perennial streams within the Boston Mountain and Springfield Plateau physiographic regions. Richland Creek originates in Pope County flowing through the Richland Creek Wilderness and off of the Forest where it flows into the Buffalo River in Searcy County. Both Falling Water and Bobtail Creek flow into Richland. Falling water originates in Pope County and flows in to Richland creek near the Richland Creek Camp Ground in Searcy County. Bobtail Creek begins just west of Witts Springs and flows into Richland Creek a little over a mile downstream of Falling Water Creek confluence. Richland Creek and its tributaries such as Bobtail and Falling water Creek exhibit many of the characteristics of a Boston Mountain Stream but as you move downstream more limestone becomes part of the geology of the area.

Pools alternate with riffles and the substrate is generally a combination of gravel, cobble, boulders and bedrock. Runoff is rapid following storm flow events, followed by periods of low

flow, especially during the summer months. Lowest flow is usually during August and September. For more detail on stream habitat characteristics, see table below.

During low flow periods, isolated pools are connected by intragravel and marginal surface flow in riffles. The watershed is primarily forested. Non-forestland is for the most part in private ownership and is typically in small farms and recreational dwellings. For more detail on land use practices, see the soil and water section.

The Richland Creek and the Falling Water tributary supports sport fishery with smallmouth bass (Micropterus dolomieu), Long ear (Lepomis megalotis) and green sunfish (Lepomis cyanellus) being the most popular species. Bobtail Creek is smaller and does not support a sport fishery.

Fish assemblages in these tributaries were determined from surveys conducted by the Center for Aquatic Technology Transfer Section of the Southern Research Station (CATT) out of Blacksburg, Virginia during the summer of 2006.

Table 1. Habitat description of the tributaries in the project area. Numbers in the table are averages for each parameter from the samples taken in those tributaries.

Parameters	Richland Creek	Falling Water	Bobtail Creek
Percent Pool	72	64	33
Percent Riffle	28	32	35
Percent Dry	0	4	32
Number of Pool/km	15	17	15
Number of Riffles/km	10	10	10
Average Pool Depth (cm)	51	50	33
Average Riffle Depth (cm)	17	14	12
Percent Pools Inventoried as Glides	29	16	41
Mean Bank full (m)	16	11	8
Gradient	3	2	5
Large wood Debris (Piece of wood with a length >5 m and diameter >55)	0	0	1

A total of 23 species of fish in six families were identified. The Index of Biotic Integrity from the Arkansas Department of Environmental Quality was used to classify these streams. Richland Creek classified as good. Bobtail and Falling Water creeks classified as poor and fair, respectively. The differences in the classification for these tributaries can in part be contributed

to watershed size and geology. Bobtail and Falling Water have a smaller watershed and the topography is steep, especially on Bobtail Creek. This situation results in less and more flashy water supply for these streams which decreases habitat diversity. Bobtail had an average gradient of 5% with 32% of the stream reaches dry at the time of the survey. At the same time, Richland Creek has an average gradient of 3 with 0% of the stream reaches dry. These streams have a lower percent pool habitat which naturally reduces species richness and diversity.

The smaller headwater streams are typically dominated by minnow species such as creek chubs and stonerollers and have one or two darter species. Most of these areas have few if any bass and sunfish. This assemblage describes what was found in these creeks and is expected for this size watershed. This type of assemblage would drive lower IBI classification such as fair or poor. The streams and fish assemblages in the project area are currently in good shape due to the IBI classification increasing with watershed size and the largest watershed has a classification of good. See Table 2 for specific information on the Fish assemblages.

Table 2. Description of the fish assemblages in the tributaries in the project area

Common Name	Tributaries					
	Richland Creek		Falling Water Creek		Bobtail Creek	
	Number	Relative Abundance	Number	Relative Abundance	Number	Relative Abundance
Central Stoneroller	380	37	386	40	405	51
Horneyhead Chub	3	<1	3	<1	0	0
Bigeye Shiner	126	12	68	7	0	0
Whitetail Shiner	3	<1	20	2	0	0
Ozark Minnow	0	0	84	9	0	0
Southern Redbelly Dace	67	7	0	0	65	8
Bluntnose Minnow	0	0	0	0	1	<1
Creek Chub	11	1	44	5	201	25
Northern Hog Sucker	1	<1	14	1	0	0
Slender Madtom	45	5	40	4	0	0
Northern Studfish	2	<1	0	0	0	0
Shadow Bass	2	<1	1	<1	0	0
Green Sunfish	6	<1	3	<1	12	2
Bluegill	0	0	0	0	1	<1
Longear Sunfish	74	7	40	4	1	<1
hybrid Sunfish (Green x Longear)	4	<1	0	0	0	0
Smallmouth Bass	8	<1	6	<1	0	0

Greenside Darter	40	4	54	6	0	0
Rainbow Darter	93	9	123	13	0	0
Stippled Darter	0	0	3	<1	0	0
Orangethroat Darter	149	15	120	12	106	13
Total number of Species	16		16		8	
Total number of individuals	1015		965		792	
IBI Classification	Good		Fair		Poor	

Proposed Action (PA)

Direct Effects

Timber harvesting has been shown to destabilize stream banks, alter flow regimes and nutrient cycles, and change the morphology of stream channels. These changes in the stream environment may alter fish communities found in the stream. The majority of impacts from timber harvesting are caused by road building activities. This project has 1 mile of road construction, 8 miles of road reconstruction and 20 miles of temporary roads. Implementation of resource protection and mitigation measures will help reduce this sediment yield and the potential for impacts on aquatic organisms.

Closure of 20 miles of system roads, and decommissioning of 6.0 miles of roads would reduce erosion and sediment yield, and contribute to the protection of riparian vegetation. Another significant factor that is contributing sediment to local streams is the condition of the existing roads in the project area. This project would reconstruct and maintain 116 miles of roads in the project area which will reduce erosion and sediment yield to these streams. Vegetative filter strips, and BMP for Silviculture activities will be implemented to reduce the impacts to soil and water resources within the project area.

There will be 41 miles of horse trail and 4 miles of multi-use trail designation. This area currently has numerous unmanaged user made trails that cross several ephemeral drainages and increases the risk to the aquatic system. By designating some of these trails, the Forest Service can begin to direct some of the horse riding and ATV activities in areas that will minimize the impacts to our aquatic ecosystems such as ridge tops, trails outside the riparian habitats and existing roads.

The 1233 acres acres of high quality forage openings may impact sediment yield in the project area for a short period of time. The primary concern will be during the construction of the openings before the establishment of grasses. Some factors that will minimize this impact are

- these activities will be scatter over 6 to 10 year period,
- the duration that the area will not be vegetated will be approximately 2 months or less,
- these activities occur during the months with some of the lower rainfall amounts,

- and they occur in areas with relatively gentle slopes and upon ridge tops. A couple of these openings will be found closer on benches above the stream, but a forested filter strip will be maintained between the stream and field.

Maintenance activities for these fields such as dicing could also impact sediment yield but these impacts should be much less than the construction. This activity is likely to occur once every 3 to 7 years and only on the portion of the field designated for winter forage.

Pond construction could slightly affect sediment yield and hydrology. The primary concern with pond construction is during construction of the pond. During this time, there is no vegetation on the dam or spillway. These areas will be mulched with straw and seeded to speed up the re-vegetation process. As far as changes in runoff, these ponds will be approximately a half of an acre which will not reduce run off significantly. These changes should not impact the aquatic biota in the local streams.

Vegetation removed by prescribed fire could slightly increase sedimentation rates after implementation but these changes would be very short in duration. Within a few weeks after the growing season begins the area will re-vegetate. Also in most areas the mineral soil is not bare and has some duff layer left to protect the soil.

The primary concern for affecting sedimentation rates during prescribed burns is the associated firelines. The States BMP's and Forest Plan standards for this activity will minimize the potential effects.

Based upon the sediment yield model, all of these activities would produce little sediment and would be considered low risk to the aquatic biota. See the soil and water write up.

Site preparation, release, and woody stem and invasive species control associated with several of these activities would require herbicides. Given the resource protection measures that minimize herbicide movement into sensitive surface waters, there should be no significant effect to the fishery from herbicide use.

The toxicity and potential risk associated with these herbicides used in this project are discussed in the wildlife section.

Indirect Effects

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

Loss of large woody debris in streams can affect the habitat diversity, nutrient movements through the stream and the hydrology which affects the morphology and stream process. The habitat data shows that the large woody debris per mile is much lower than the recommended 7 to 20 piece per mile outlined in the Forest Plan. Placement of large woody debris would help restore stream functions and improve habitat diversity to maintain and increase species diversity.

The proposed action has the most potential for improving water quality due to the amount of road Maintenance, Closer and decommissioning proposed.

Cumulative Effects
The lack of impacts these alternatives would have on water quality is typical of the Forest Practice on the Ozark National Forest. The aquatic resources on the Forest have remained in a high quality condition over the years. The EPA's Index of Watershed Indicators (IWI) is designed to describe broadly the condition and vulnerability (sensitivity) of aquatic systems across the U.S. For the Forest, the watersheds were ranked as either "better water quality, low vulnerability" (highest ranking) or "less serious water quality, low vulnerability" (second highest ranking) (USFS 1999). These rankings demonstrate the high quality of the watersheds and how well they compare to the rest of the nation. The fish assemblages and the IBI scores for the Bigger watersheds supports these conclusions in the Richland Drainage.

Alternative 1 (No Action)

Direct Effects
NO-Action Alternative would not have the potential increase in sediment yield during implementation.

Indirect Effects
The NO-Action alternative in the long term would have higher sediment yields. The reason for the higher sediment yields would be the continued deterioration of the road systems in the project area and not restoring habitats such as cane and woodlands. Many of the side roads would not be repaired or maintained allowing the road and the sediment control structures, where they exist, to deteriorate.

Activities such as thinning, and understory control would not occur under this action: as a result, development and maintenance of cane and herbaceous understory in woodland habitats would be impeded. This alternative would not have the improved stabilization, sediment filtering, and potential increases in soil depth that would help to buffer local streams from increase sedimentation or flashiness associated with both natural and man-made disturbances.

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

Cumulative Effects
See the PA.

Alternative 2 (No Herbicide)
Direct Effects
This activity will have no herbicide which will eliminate the risk of contaminating the local streams but the project will require an increase in mechanical treatments to control woody plant species for stand regeneration, woodland restoration activities, and opening maintenance. This change would increase the number of disturbance events, and intensity which will increase the potential for increase sedimentation rates. The difference in sediment yield between the Proposed Action and Alternative 2 is likely to be slight if any. The reason is most of the

mechanical activities would be on ridge tops and/or more gentle slopes, the increase in sedimentation rates from the use of mechanical treatments would likely be small, and no large equipment would be used in the riparian areas. All other effects would be the same as the PA.

Indirect Effects

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

Cumulative Effects

See the PA.

Alternative 3 (No Openings)

Direct Effects

The potential increases in sedimentation yield would decrease with the removal of the openings but again the difference would be small because of the location, slopes and the forest plan standards would have minimized the risk. All other effects would be the same proposed action.

Indirect Effects

Overall this alternative would have little difference in effects over the long term. There would be a slight decrease in potential sedimentation due to field maintenance would not be require, but again the difference would be small because of the location, slopes and the forest plan standards would have minimized the risk. All other effects would be the same as the PA.

Cumulative Effects

Same as the PA.

H. Endangered, Threatened, and Sensitive Species (TES)

Terms Used in TES Analysis

Biological Evaluation - 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 - 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 - 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 - 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 biological evaluation (BE) has been completed that examines all known occurrences of Threatened and Endangered species(T&E), and Sensitive species that occur on the Regional Forester's Sensitive Species list that are applicable to the Ozark-St. Francis National Forest. In addition the 20 federally endangered and threatened species identified through informal consultation with the USFWS (Forest Plan BA) were also considered. All but 3 T&E species were eliminated from further evaluation due to one or more of the following factors:

- The Project Area is not within their known, documented geographic range.
- The species has never been documented from within the Project Area or its sphere of influence in field surveys, monitoring activities, reports, or the scientific literature.
- The treatment area does not provide habitat conditions known to be needed or used by the species.

T&E species known to occur or which may occur within the project area includes:

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Gray bat	*Myotis grisescens*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Ozark big-eared bat	*Corynorhinus townsendii ingens*	Endangered

Sensitive species known to occur or which may occur within the project area of influence includes:

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Eastern small-footed bat	*Myotis leibii*	Sensitive
Bachman's sparrow	*Aimophila aestivalis*	Sensitive
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
Ozark shiner	*Notropis ozarcanus*	Sensitive
Nearctic paduniellan caddisfly	*Paduniella nearctica*	Sensitive
An isopod	*Lirceus bicuspidatus*	Sensitive
Ozark chinquapin	*Castanea pumila var. ozarkensis*	Sensitive
Southern Lady's slipper	*Cypripedium kentuckiense*	Sensitive

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Eastern small-footed bat	*Myotis leibii*	Sensitive
Moore's delphinium	*Delphinium newtonianum*	Sensitive
Glade larkspur	*Delphinium treleasei*	Sensitive
French's shooting star	*Dodecatheon frenchii*	Sensitive
Small-headed pipewort	*Eriocaulon koernickianum*	Sensitive
Large witchalder	*Fothergilla major*	Sensitive
Butternut	*Juglans cinerea*	Sensitive
Alabama snow-wreath	*Neviusia alabamensis*	Sensitive
Ovate-leaf catchfly	*Silene ovata*	Sensitive
Ozark spiderwort	*Tradescantia ozarkana*	Sensitive
Ozark least trillium	*Trillium pusillum var. ozarkanum*	Sensitive
Ozark cornsalad	*Valerianella ozarkana*	Sensitive

The BE was completed for the actions and alternatives proposed and is hereby incorporated by reference. The BE made use of internal expertise, earlier discussions with the US Fish and Wildlife Service (Conway, AR Office), conversations and species data from the Department of Arkansas Heritage, field surveys by District personnel, students and contractors, and inventory records data on the District. It also includes literature and database searches for pertinent species data or information.

No critical habitat for any TES species has been identified within the analysis area. For a complete description of each species needs and habitat conditions, reference the BE found in the process file for this project.
Five (5) of the 19 Sensitive species were examined only because an occurrence record exists for Searcy, Newton, and/or Pope Counties; i.e. the same counties in which the project area lies. All of these species received a NO IMPACT for the PA and all alternatives because records indicate that these species are either not known to occur within the Forest boundary, known to the Forest and County but on a different district, and/or are not known to occur in or near the project area and may have very specific habitat limitations. These species were searched for during field surveys but none were located. The species which will have NO IMPACT for the PA and all alternatives are: Glade Larkspur, Large Witch Alder, Ovate-Leaf Catchfly, Ozark Least Trillium, and Ozark Cornsalad.

Proposed Action (PA)

Direct/Indirect Effects
The PA is not likely to adversely affect any Federal T&E species. Surveys in and around this area have not detected the presence of Gray bats or Ozark big-eared bats nor suitable cave habitat for maternity colonies; however, suitable habitat for transient roosts may exist. Indiana bats have not been documented in the vicinity of the project area, but the area is considered potential habitat for the species. Arkansas State Forestry Commission's Best Management Practices (BMPs) and all standards identified in the RLRMP will be applied to the Proposed Action as well as Alternatives 2 and 3. These measures should minimize or eliminate any potential effect to these species.

The sensitive species that have either been found within the project area or are likely to occur because of potential habitat are listed in the previous table. The PA will have a Beneficial Impact on the Bachman's sparrow because the action would be creating available habitat which is the limiting factor for this species.

A No Impact call was made for Small-headed pipewort because although the proposed action would provide beneficial habitat improvements for the species, the Small-headed pipewort has no record of occurrence in the project area, and unlike the Bachman's sparrow which is highly mobile it would take a long time for the small-headed pipewort to establish itself in a new area.

The remaining 12 species were given the call "May Impact Individuals but Not Likely to Cause a Trend to Federal Listing or a Loss of Viability". Refer to the BE for specific possible impacts to each species.

Cumulative Effects
Including all past, present and foreseeable future actions, a "may affect -not likely to adversely affect" determination is given for the Indiana bat, Gray bat, and Ozark big-eared bat. There should be no effect on any other identified federally endangered or threatened species.

Of the sensitive species identified as occurring within the analysis area, Ozark chinquapin and Butternut will likely continue to decline across the Forest due to the effects of the chestnut blight and the butternut canker across its known range. For the Bachman's sparrow, any negative impacts to individuals would be outweighed by having available habitat.

Because of the protection measures identified, other sensitive species are not likely to be affected. For these, there is a determination that actions may impact individuals but are not likely to cause a trend to federal listing or loss of viability.

Alternative 1 (No Action)

Direct/Indirect Effects
This alternative is not likely to adversely affect any Federal T&E species. There are no known T&E species using the project area, but potential habitat exists.

A "No Action" selection would not provide habitat for Bachman's sparrow. The availability of

breeding habitat will continue disappear across the Forest if we do not do management for this species required habitat. The call for this alternative is: Likely to Result in a Trend to Federal Listing or a Loss of Viability.

There would be No Impact to five (5) additional sensitive species under the No Action Alternative. These are: Ozark Chinquapin, Southern Lady's slipper, Alabama snow wreath, Ozark spiderwort, and the Small headed pipewort

The remaining eight (8) species were given the call "May Impact Individuals but Not Likely to Cause a Trend to Federal Listing or a Loss of Viability". Refer to the BE for specific possible impacts to each species.

Cumulative Effects

Including all past, present and foreseeable future actions, a "may affect -not likely to adversely affect" determination is given for the Indiana bat, Gray bat, and Ozark big-eared bat. There should be no effect on any other identified federally endangered or threatened species.

Of the sensitive species identified as occurring within the analysis area, Ozark chinquapin and Butternut will likely continue to decline across the Forest due to the effects of the chestnut blight and the butternut canker across its known range. Increased canopy cover will not stimulate growth in the Ozark Chinquapin. For the Bachman's sparrow, the continued lack of habitat across its range may eventually result in its listing as a Federally threatened or endangered species.

Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under this alternative would increase early seral habitat 2,080 acres above current conditions. The expected land logging/clearing activities could maintain the 40 acres in early seral habitat depending on management decisions. Voluntary compliance with BMPs on private land may cause an increase in sedimentation.
No impacts are expected for Southern Lady's slipper, Alabama snow wreath, Ozark spiderwort, and the Small headed pipewort by leaving the habitat to age and mature.

Other sensitive species may lose individuals as current conditions progress over the years. Degradation of roads and trails instead of maintenance, closure, and decommission may increase sedimentation. For these, there is a determination that actions may impact individuals but are not likely to cause a trend to federal listing or loss of viability.

Alternative 2 (No Herbicide) & Alternative 3 (No Openings)

Direct/Indirect Effects

These alternatives are not likely to adversely affect any Federal T&E species. Arkansas State Forestry Commission's BMPs and all standards identified in the RLRMP and project will be applied to the Proposed Action as well as Alternatives 2 and 3. These measures should minimize or eliminate any potential effect to these species.

Expected activities on non-Forest Service lands within the project area include approximately 40 acres of logging/ clearing activities. These activities combined with the proposed activities under this alternative would increase early seral habitat at least 40 acres above current conditions. The expected land logging/clearing activities could maintain the 40 acres in early seral habitat depending on management decisions. Voluntary compliance with BMPs on private land may cause an increase in sedimentation.
These alternatives will have a Beneficial Impact on the Bachman's sparrow because the action would be creating available habitat which is the limiting factor for this species.

In addition to the five species for which there is a No Impact call for the PA and all alternatives, these alternatives will also have No Impact on the Small headed pipewort due to the absence of the species from the project area.

The remaining 12 species were given the call "May Impact Individuals but Not Likely to Cause a Trend to Federal Listing or a Loss of Viability". Refer to the BE for specific possible impacts to each species.

Cumulative Effects
Including all past, present and foreseeable future actions, a "may affect -not likely to adversely affect" determination is given for the Indiana bat, Gray bat, and Ozark big-eared bat. There should be no effect on any other identified federally endangered or threatened species.

Of the sensitive species identified as occurring within the analysis area, Ozark chinquapin and Butternut will likely continue to decline across the Forest due to the effects of the chestnut blight and the butternut canker across its known range. Increased sunlight may stimulate growth in both species. Some individuals may reach the age to produce seed before succumbing to their respective diseases. Nuts of both species are a high quality wildlife food. For the Bachman's sparrow, any negative impacts to individuals would be outweighed by having available breeding habitat.

Because of the protection measures identified, other sensitive species are not likely to be affected. For these, there is a determination that actions will have no impact or may impact individuals but are not likely to cause a trend to federal listing or loss of viability.

I. Climate Change

Existing Condition

Forests play a major role in the global carbon cycle by storing carbon in live plant biomass (approximately 50% of dry plant biomass is carbon), in dead plant material, and in soils. Forests contain three-fourths of all plant biomass on earth, and nearly half of all soil carbon. The amount stored represents the balance between absorbing CO_2 from the atmosphere in the process of photosynthesis and releasing carbon into the atmosphere through live plant respiration, decomposition of dead organic matter, and burning of biomass (Krankina and Harmon, 2006).

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

Proposed Action and Alternative 3

Direct Effects:
The proposed harvest operations would result in a release of carbon and reduce carbon storage in the forest both by removing organic matter (trees) and by increasing heterotrophic soil respiration. However, much of the carbon that is removed is offset by storage in forest products. Forest management that includes harvesting provides increased climate change mitigation benefits over time because wood-decay CO_2 emissions from wood products are delayed (Malmsheimer, Heffernan, Brink, et al.). Prescribed burning activities, although a carbon neutral process, would release CO_2, other green house gasses, and particulates into the atmosphere. However, implementing the proposed prescribed burns on a 3 to 5 year cycle would reduce fuel loading and could be expected to reduce fire intensity and severity as well.

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

Alternative 1: (No Action)

Direct Effects:
No management activities would occur under this Alternative, therefore no direct effects on GHG emissions and carbon cycling would occur.

Indirect Effects:
Because no management activities would take place under this alternative, carbon would continue to be sequestered and stored in forest plants, trees, (biomass) and soil. Unmanaged, older forests can become net carbon sources, especially if probable loss due to wildfires are included (Malmsheimer, Heffernan, Brink, et al.). In the absence of prescribed fire, fuel loadings would continue to increase and accumulate on the forest floor. In the event of a wildfire, fuel loading would be higher, increasing the risks of catastrophic damage to natural resources. This would result in a large release of GHG and carbon into the atmosphere. By deferring timber harvest activities, the forests would continue to increase in density. Over time this could pose a risk to density dependent mortality, insects, and disease. This could result both in a release of carbon from tree mortality and decomposition as well as hinder the forests ability to sequester carbon from the environment because live, vigorous stands of trees have a higher capacity to retain carbon.

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

Alternative 2: No Herbicide Use

The effects of Alternative 2 would be the same as those listed under the Proposed Action and Alternative 3 above.

J. Human Health Factors

Existing Condition

Chemicals used to control plants are known as herbicides. Herbicides are being considered in the Proposed Action and in Alternative 3 with the goal of incorporating herbicide treatment along with non-chemical treatments. Herbicides kill the existing plant but often allow remaining seeds to germinate. Herbicides are known through experience with similar activities to be one of the most effective treatment methods for eradicating or controlling weed species that currently exist (For the purpose of this document weed species consists of vegetation that may be outside of management desired objective such as non native invasive species or aggressive native species). When herbicides are used in conjunction with an integrated treatment effort it improves the effectiveness of non-chemical treatments, either concurrently or as follow-up treatments.

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

Only herbicide formulas/products that have been registered with the Environmental Protection Agency (EPA) for rangeland, forest land, or aquatic use would be applied. 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.

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 will 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 will 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:

Herbicide Risk Assessment Information:

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

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

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 will 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 will 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 will 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 will 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 will 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 will 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 will be use to direct the treatment to the soil within 2 feet of the stem union for each plant). Mixing rates will 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 will 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 will 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 will 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 will 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 will 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 and Alternative 3 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.

Alternative 1 (No Action) and Alternative 2 (No Herbicide)

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 in these alternatives. However, the exposure and risk for injury is much greater using manual (chainsaw) methods for vegetation activities than herbicide control.

Proposed Action and Alternative 3

Direct/Indirect effects

The term public includes hikers, campers, hunters, fuelwood gatherers, and other forest users. It basically includes all people who use or work in the project area except those who work with the herbicide treatments.

Risk to the public 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 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 herbicides. When herbicides are used all label precautions and Forest wide Standards will be followed to minimize human exposure to herbicide.

Cumulative effects for all Alternatives

No cumulative effects are expected in any of the alternatives. This includes alternatives that proposed herbicide use. As shown above effects can be minimized or avoided by prudent hygiene, proper handling and 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.

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

Sam Clark – Silviculturist

Anthony Harris – Timber Management Officer

Mark Morales – Fire Management Officer

Leif Anderson – Forester

Mike Waldern – Heritage Resources Technician

Michael (Smoke) Pfeiffer – Archeologist

Ozark National Forest – Supervisor's Office:

Rick Monk – Hydrologist

J. Keith Whalen – Forest Fisheries Biologist

Marvin L. Weeks – Forest Soil Scientist

Robert Flowers – Landscape Architect

Dr. David Jurney – Archeologist

Federal, Tribal, State, and Local Agencies:

Arkansas State Historic Preservation Office

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

Appendix B.
Supporting Literature

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Appendix C.

Public Involvement

To encourage public participation in the **Bearcat Phase II Project** decision process, the District initially published an initial scoping letter in the Russellville Courier (The Official Paper of Record for the Big Piney Ranger District) on July 19, 2011, requesting comments, questions, and offering detailed information to those expressing an interest in the project. An initial scoping letter was also published in the Newton County Times on July 20th, 2011. The project was also published in the Ozark- St. Francis National Forest Schedule of Proposed Actions and on the Forest planning website.

Another way the District seeks out public participation is by sending an initial scoping letter to those landowners located within the proposed project and to those people who have shown a previous interest. On July 14, 2011, 256 neighboring landowners, the Native American Tribes, and other interested parties were mailed a letter with maps, explaining the project proposal. They were asked to comment on, or involve themselves in, the proposed project, and were informed about the kinds of decisions to be made. Nine letters were returned as undeliverable. The initial scoping effort resulted in 54 responses.

Internally, the Interdisciplinary Team met and participated in field trips periodically to develop the Proposed Action and the Alternatives which were analyzed in the EA. The ID team also determined from public scoping the important issues which would be considered in detail.

Appendix D.

Economic Analysis

Assumptions

The economic analysis for the Proposed Action (PA) and Alternatives 2 and 3 includes revenues and costs associated with timber management. It doesn't include costs for discretionary actions, because these actions will only be implemented if funding is available. Examples include, but are not limited to, opening construction, woodland management, pond construction, thinning to create woodlands, prescribed burning.

Results

The following table displays a summary of the economic analysis for this project. For more information or to view the economic analysis in its entirety see the process file for this project.

Criterion	PA and Alt. 2	Alt. 3
Benefit/Cost Ratio	2.29	2.46
Internal Rate of Return (percent)	150.9	170.8
Investment Length (years)	3	3
Net Annual Equivalent ($)	$270,443.61	$307,713.35
Present Net Value ()	$750,505.63	$853,932.55
Present Value (PV)-Benefits ()	$1,334,487.50	$1,437,914.42
Present Value (PV)-Costs ()	($583,981.87)	($583,981.87)

Note: The PV-Costs are the same for the PA and Alternatives 2 and 3, because this is based on the cost of reforestation for all regenerated acres (seedtree and shelterwood acres). The regenerated acres are the same, therefore the costs associated with these activities is the same.

Conclusions

The PA and Alternatives 2 and 3 all have a positive benefit/cost ratio. Meaning more dollars were generated from the sale of timber from timber management actives than was spent. The increase in the benefit/cost ration for Alternative 3 is the result of thinning the acres (1,159) that were proposed for wildlife openings in the PA and Alternative 2.

Appendix – E

Project Designs

1) The Forest Service will approve all log landings, skid trails, and temporary road locations. This insures proper placement of these temporary developments.

2) Minimize the number of stream crossings and maximize distance from streams in developing the transportation system. Limiting the number of stream crossings will reduce the opportunity for sediment reaching streams. Maximizing the distance from streams will reduce sediment loadings in streams by providing an opportunity for sediment to be deposited before it reaches the stream.

3) Where practical, cross streams at right angles to the main channel. Only designated stream crossings may be used by vehicles. This will reduce the surface area of approaches and disturbed area within the stream thus reducing sedimentation.

4) To reduce erosion/sedimentation all broad based dips will be installed in accordance with FSM 2482-1. This will insure that water is distributed off the road and onto vegetated areas where the water velocity will be decreased and thus reducing its sediment carrying capacity.

5) Spot gravel, as needed, to stabilize the soil (prevent rutting), and reduce erosion at stream crossings and wet areas.

6) During the sale the purchaser will maintain all drainage/erosion control structures (broad based dips) and road surfaces. This will insure proper function of drainage/erosion control structures.

7) During times of potential resource damage, the Forest Service will suspend timber-harvesting operations (e.g. too wet causing excess rutting and soil compaction).

8) Slash from the road ROW (Right of Way) will be placed on downward side of roads to serve as water energy dissipaters to help reduce velocities of water, which in turn reduces erosion/sediment loads.

9) The marking crew, while marking the stands, will establish streamside management zones as outlined in the RLRMP. Width and management of these zones will follow RLRMP standards and guidelines. These protection zones reduce velocities of water and sediment loadings.

10) Close and re-vegetate selected roads (see road table for road status after harvest) following project completion. This reduces the disturbance or destruction of erosion control structures.

11) Temporary skid trails and all haul roads will be re-vegetated to facilitate restoration to previous conditions and reduce erosion. After harvest the TSA will conduct a site-

specific inspection of the harvested area to determine which skid trails need to be re-vegetated.

12) Mulch slopes on roads, which are greater than 10% to retard erosion, hold seed in place, and prevent moisture loss.

13) The Forest Service will conduct follow up site visits to determine if seeding fails to establish ground cover, if so then follow up erosion work and seeding will be done.

14) Timber harvest would be conducted utilizing rubber tired skidders and conventional logging equipment.

15) Recommended from the Scenery Treatment Guide April 2008:

A. Root wads and other unnecessary debris should be removed or placed out of sight within 150 feet of key viewing points.

B. Leave tree marking or unit boundary marking should be applied so as to not be visible within 100 feet of roads.

C. When possible, log landings, roads and bladed skid trails should be located out of view to avoid bare mineral soil observation from travel routes.

D. Removal of over-story should be delayed until understory is approximately one-third the height of the adjacent stand.

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

F. Openings and stand boundaries should be organically shaped. Straight lines and geometric should be avoided. Edges should be shaped and/or feathered where appropriate to avoid a shadowing effect in the cut unit. Openings should be oriented to contours and existing vegetation patterns to blend with existing landscape characteristics, as appropriate.