

United States Department of Agriculture
Forest Service
Shawnee National Forest
Hidden Springs Ranger District

Environmental Analysis

Prescribed Burning of Cave Hill, Dennison Hollow, and Stoneface Research Natural Areas and Simpson Township Barrens Ecological Area and Adjacent Forest Communities

Saline County, Illinois
Township 9 South, Range 7 East, Sections 34 and 35; Township 10 South, Range 7 East, Sections 2, 3, 9, 10, 15, 16, 21, and 22
and
Johnson County, Illinois
Township 12 South, Range 4 East, Sections 10, 11, 14, and 15

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SUMMARY

The Hidden Springs Ranger District of Shawnee National Forest (Forest) proposes to actively manage Cave Hill, Dennison Hollow, and Stoneface Research Natural Areas (RNAs) and Simpson Township Barrens Ecological Area (EA) and adjacent forested lands with prescribed fire in order to restore and maintain their native plant and animal communities. Tree and shrub removal will be employed as necessary if new individuals or populations of the federal threatened Mead's Milkweed (*Asclepias meadii*) are found following prescribed fires. A maximum of 2 acres per year will be treated with tree and shrub removal for the four natural areas, collectively, and will be dependent on findings and environmental needs of Mead's Milkweed. At this time, no locations of Mead's Milkweed are known from the proposed action areas, however, suitable unoccupied habitat does occur at the three RNAs. All of the subject natural areas have been actively managed in the past using these methods of restoration (Stritch 1990), but it has been several years since we last considered the proposed actions under the National Environmental Policy Act (NEPA). During March 2007, 82 acres were prescribed burned at Simpson Township Barrens EA, 119 acres at Cave Hill RNA, 25 acres at Dennison Hollow RNA, and 36 acres at Stoneface RNA, however, these prescribed burn areas are not included in this project proposal (see maps Figure 1 and Figure 2).

The ecological communities to be restored in the 4 natural areas include limestone and sandstone glades and barrens including xeric, dry, and dry-mesic upland forest—all of which are dependent upon fire to remain healthy and vigorous. See Table 1 for information on the subject natural areas. The proposed action is needed not only because these glade and barrens communities are unique, but also because many are habitats for federally listed threatened and endangered species and Regional Forester sensitive species.

This action is needed because the lack of disturbance, such as fire, in these areas has led to the encroachment of woody and competitive species that threaten the survival of the rare and uncommon plant communities within these natural areas. The use of fire (and shrub and tree removal when needed) are required to suppress this encroachment and ensure the health and viability of the plant and animal communities. Prescribed fire would be introduced at one to five year intervals for up to 5 burns within a 10-year period.

The proposed action will result in the restoration, maintenance and/or enhancement of the affected plant communities. In addition to the proposed action, the Forest Service also evaluated the following alternative:

- The no action alternative in which no vegetation management would be done.

Given the purpose and need, the deciding official will review the proposed action and the other alternatives in order to make the following decision: Whether the proposed management of the four natural areas and adjacent forested lands should proceed, and what site-specific design criteria or monitoring standards should be included.

CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

Document Structure

The Forest Service has prepared this environmental assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect and cumulative environmental effects that would result from the proposed action and alternatives. The document is organized into three parts:

Chapter 1. Purpose of and Need for Action: This section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2. Alternatives, including the Proposed Action: This section provides a detailed description of the agency's proposed action as well as alternatives. These alternatives were developed based on key issues raised by the public and other agencies. This discussion also includes possible mitigation measures and a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This section describes the environmental effects of implementing the proposed action or other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative, which provide a baseline for evaluation and comparison to the other alternatives that follow. Additional documentation, including the detailed analyses of project-area resources (often referred to as working papers), is located in the project record located at the Hidden Springs Ranger District Office in Vienna, Illinois.

Background

The project area containing the three RNAs is located about eight miles east-southeast of Harrisburg in Saline County, and is within the Hidden Springs Ranger District at Township 9 South, Range 7 East, Sections 34 and 35 and Township 10 South, Range 7 East, Sections 2, 3, 9, 10, 15, 16, 21, and 22. Cave Hill RNA is within the Black Branch/Eagle Creek, Horseshoe Creek/South Fork Saline River, and Spring Valley Creek/South Fork Saline River watersheds, Dennison Hollow and Stoneface RNAs are within the Black Branch/Eagle Creek and Spring Valley Creek/South Fork Saline River watersheds, and Simpson Township Barrens EA is within the Cedar Creek Watershed (Hydrologic Unit Code 6 watersheds). A further discussion of the watersheds and soil types is found in the Soil and Water Resources Working Papers in the Project File.

During the late 1800's and early 1900's, much of the southern Illinois hills were stripped of timber and ridge-top farms were common. These ridge-top farms were originally productive, but because of the erosive nature of the soils many of these farms were soon depleted of topsoil and could not produce enough crops to sustain a living. The lands were abandoned as settlers moved to more productive areas. In 1931, the State of Illinois asked the federal government to purchase

and restore lands that had been abandoned by farmers after failed attempts at agriculture. In answer to this request, the Shawnee National Forest proclamation boundary was established in 1933 and the Forest was officially created in 1939 by President Franklin Delano Roosevelt. A history of The Making of the Shawnee can be found in the References of the Project File (Soady, Jr. 1965). A synopsis of pre-settlement fires in Illinois by the Native Americans and later by early settlers was described with actual accounts during the Illinois Forest Conference and can also be found in the References of the Project File (McClain and Elzinga 1994).

The Forest contains many natural and scenic wonders. Cave, cliff, creek, swamp and several different types of barrens communities provide a varied and diverse landscape across the Forest. These areas are unique landscape features with ecologically important plant and animal habitats. Eighty of these community locations were identified in the Forest's 2006 *Land and Resource Management Plan* (Plan) as natural areas to be managed under the Natural Area Management Prescription. Approximately 16,497.9 acres of the Forest's 279,072 acres are managed under this prescription, about 5.91 percent of the Forest.

The Natural Area Management Prescription and Plan (Appendix D) addresses the preservation, protection or enhancement of the unique scientific, educational or natural values found within natural areas. Natural areas include several different types of natural features and are categorized as: research, geological, zoological, botanical and/or ecological areas.

The project area is about 3602 acres, or about 1.29 percent of the Forest area (Figure 1, vicinity map). Other areas of the Forest were evaluated for restoration treatment, but these areas were chosen as sites for prescribe burning and possible tree and shrub removal (only if new *Asclepias meadii*, Mead's milkweed plants/populations are found) because of successful past management and the presence of the barrens communities. This project area has great potential to respond to improved growing conditions (*e.g.* additional light, space, past management actions such as burning and tree and shrub removal). There are no inventoried roadless areas, wilderness areas, candidate wild and scenic rivers or other research natural areas, or other special management areas in the immediate vicinity or watersheds for this project. The project area does not include any known significant historical or cultural resources. Site-specific inventory of the project area has revealed various sensitive plant species or unique habitats for sensitive plant and wildlife species. These natural areas are further divided into specific community-types, including several barrens and forested habitats (Table 1).

Barrens are among the rarest of Midwestern natural communities, with several noticeable features (Olson et al. IN Thompson 2004). They have dual, dominating components: the herbaceous layer composed of dry forest and dry prairie grass and forb species, and a woody overstory composed of scattered, stunted, limby oaks and hickories. Vines are commonplace, with catbriers (*Smilax* spp.) and grapevines (*Vitis* spp.) making travel difficult in places. Lichens and mosses are found scattered in and among the grasses and forbs. Patches of bare ground and rock devoid of vegetation are characteristic and often contribute to unstable soil surface conditions. Soils are generally droughty, usually highly leached, alkaline or acidic (rarely neutral), eroded and often deficient in certain minerals or nutrients.

Barrens are complex communities that owe their fragile existence to a precarious balance of natural forces that prevent their succession to a forest community. In the absence of periodic fire, barrens soon succeed to dry-upland forests and, even though grazing or tilling may eliminate these communities, some barrens are on sites where remnant native barrens vegetation and their seeds have re-colonized the disturbed areas.

The Forest contains representatives of ten types of barrens: loess (Cretaceous, Shawnee and Ozark Hills types), gravel (Cretaceous and Ozark Hills types), limestone (Shawnee and Ozark Hills type), sandstone, sand, and shale. The natural areas considered in this EA (Table 1) include sandstone and shale barrens; dry barrens; xeric, dry and dry-mesic upland forests; loess hill prairie; sandstone glade; sandstone cliff and terrestrial cave at the RNAs and limestone barrens with xeric to dry upland forests at the Ecological Area. Management is needed in all of these unique types to ensure their perpetuation within the larger forest.

Over the past 200 years, environmental changes have affected the quantity, distribution and composition of plant communities in Illinois. In the past, disturbances such as tornadoes, fire and primitive agriculture created and maintained a mosaic of plant communities. Modern agriculture and other development have disrupted natural cycles and suppressed much of the natural plant and animal community diversity that once existed in Illinois. In some areas, major plant communities have been lost to agriculture and development. This is particularly true of barrens plant communities that often require fire for community health. Without maintenance and periodic disturbance, these areas are gradually overgrown by encroaching woody shrubs and trees and become detrimental to rare plant species and unique barrens communities.

Barrens plant communities are adapted to and are dependent upon disturbance to suppress the woody plant species that would otherwise replace them naturally. Without disturbance, these plant communities will disappear. Disturbances of sufficient intensity must occur with appropriate frequency to delay the onset of forest development and maintain the grass, forb and herbaceous species characteristic of the barrens habitat. Historically, naturally-occurring disturbances, such as tornadoes, fire and primitive agriculture, maintained and enhanced barrens habitat in balance with natural succession to later seral stages. Fire-suppression, conversion of land to modern agriculture and other types of human development and activity have limited barrens habitat maintenance in Illinois.

Rare communities in southern Illinois, such as barrens and southern prairies, have been destroyed since settlement or have succeeded to a closed forest in the absence of fires (Anderson and Anderson 1975; Anderson and Schwegman 1971; 1991; Anderson 1970; 1991; Bowles and McBride 1994; Fralish, Franklin and Close 1999). More recently, additional barrens communities are seriously threatened by encroaching trees and shrubs as well as exotic species such as *Lonicera japonica*, Japanese honeysuckle (Anderson and Schwegman 1971; 1991). The mesic barrens at Burke Branch RNA has all but disappeared (Anderson and Schwegman 1991; Anderson 1995) and rare species such as *Gymnopogon ambiguus*, Beard grass, which was only discovered in 1966 (Schwegman and Mohlenbrock 1968), and *Lysimachia fraseri*, Fraser's loosestrife (Bates 1998), have recently become extirpated from the RNA.

Table 1. Location and community type of natural areas on the Hidden Springs Ranger District proposed for management.

Natural Area	Natural Area Type*	County	Location	Acres**	Natural Communities	Management History
Cave Hill	RNA/EA	Saline	T9S R7E Sec. 34, 35; T10S R7E Sec. 2, 3, 10	943 acres of 1063- acre EA (RNA 465)	Sandstone and shale barrens: dry barrens; xeric, dry and dry-mesic upland forests; loess hill prairie; sandstone glade; sandstone cliff and terrestrial cave	Approximately 24 acres burned in March 1987, 24 acres in Spring 1988, 40 acres in November 1990, March 1992, 386 acres April 1993, April 1994, March 1995, and 119 acres March 2007 (note: acres burned above may include portions or all of 119-acre area of RNA excluded from this proposal); Tree/shrub removal as needed for Mead's Milkweed in 119-acre excluded area.
Stoneface	RNA /EA	Saline	T10S R7E Sec. 9, 10	121 acres of 157- acre RNA (Establi shment record states 176- acre)	Sandstone and shale barrens: xeric, dry and dry-mesic upland forests; dry barrens; loess hill prairie; sandstone glade and cliffs	Approximately 40 acres burned and tree/shrub removal on 2 acres March 1991, 1 acre burned April 1993, and 36 acres March 2007 (note: acres burned above may include portions or all of 36- acre area of RNA excluded from this proposal);. (1987, 1992 prescription.
Dennison Hollow	RNA/EA	Saline	T10S R7E Sec. 10, 15, 16,	437 acres of 462- acre EA (RNA 205)	Sandstone and shale barrens: dry barrens; xeric, dry and dry-mesic upland forests; sandstone glade and cliffs	Approximately 25 acres burned March 2007 adjacent to proposed site (Note: this area is excluded from the current proposal). Tree/shrub removal as needed on 1 acre for Mead's milkweed in excluded 25-acre area of RNA.
Forest lands and private lands adjacent to Cave Hill, Stoneface and Dennison Hollow		Saline	T9S R7E Sec. 34, 35; T10S R7E Sec. 2, 3, 9, 10, 15, 16, 21, 22	1607 acres	Sandstone and shale barrens: xeric, dry and dry-mesic upland forests; sandstone cliffs	1990 and 1995 of 330 acres adjacent lands to Cave Hill RNA ('90 prescription).
Simpson	EA	Johnson	T12S R4E	104	Limestone barrens: xeric to dry upland	Approximately 5 acres of burn of

Natural Area	Natural Area Type*	County	Location	Acres**	Natural Communities	Management History
Township Barrens			Sec. 10, 11, 14, 15	acres of the 186-acre EA	forests	glades in 1988 , 100 acres of west side and 25 acres east side 1989, east side spring 1990, west side fall 1991,east side spring 1992, area in November 1992, west side spring 1994, east side March 1995, and 100 acres of east side in March 1997 (of 235-acre 1987 and 1993 prescription) and tree/shrub removal in 5 acres Jan 1988 and 1989, 1993. 82 acres burned within EA but adjacent to proposed project area and excluded from this proposal.
Forest lands and private lands adjacent to Simpson Township Barrens		Johnson		226 acres	Dry to dry-mesic upland forests	

*EA=ecological area, RNA=research natural area

**Acreage is approximate.

Each of the 4 natural areas has been analyzed under the NEPA in the past, and related decisions were implemented for the most part in each of the natural areas. The management for the natural areas proposed in this Environmental Assessment includes generally the same as what has been approved and implemented in the past. See Table 1 for details of past management in each area. The prescribed burns and tree and shrub removals that were done in the past have been shown through monitoring to have accomplished their desired effects (Shimp 1991; 1992; 1993; USDA Forest Service 1994; 1995; 1996; 1997; 1998). However, without ongoing fire management and tree and shrub removal in the years since these activities were last performed in the 1990's (Cave Hill 1995, Stoneface 1993 and Simpson Barrens 1997), these natural areas have been encroached upon by woody and non-native invasive species that threaten the existence of the unique natural features and communities found in these areas.

A return to active management is necessary to perpetuate the species and communities for which each natural area was preserved. Many of the species are disturbance and/or fire-dependent, meaning that if their habitat area is not burned, the species and their communities will eventually disappear. The project areas have not been managed for more than ten years. Without prescribed burning, undesirable plants have out-competed native plants in the glade, barrens and prairie communities. Native animal species coexist with these native plants and are dependent upon the communities that this management will benefit. Allowing these natural communities to degrade and eventually disappear due to lack of management would represent a tremendous loss for the diversity of plants and animals on the Forest and in Illinois.

Purpose of and Need for Action

The purpose of the proposed action is to ensure the continued existence of these habitat types on the Forest and to meet the desired condition identified in the Forest Plan. The Forest Plan describes the desired condition for natural areas:

The areas are biologically or geologically unique and contain a variety of wildlife species and diverse vegetation, predominantly in natural-appearing condition. Because some trees in forested areas may be up to 200 years in age, the areas display some old-growth characteristics, such as multi-layered canopy, large snags, cavities and fallen logs. Existing public use and other human activities range from unnoticeable to very evident. Road networks vary from none to low density.

The objective of the proposed action is the restoration and maintenance of the 4 natural areas' native plant communities, contributing to the maintenance of the biological diversity of the Forest. Many of the species to be managed in these communities are fire-dependent. If these areas are not managed as proposed, the communities and dependent species will be suppressed further and eventually disappear.

Proposed Action

The Forest proposes to initiate and/or resume and continue the management of 4 natural areas (as listed in Table 1) to restore, maintain and/or enhance their native plant and animal communities. In accordance with the specifications of Forest Plan Appendix D, as well as with the establishment records of some of the research natural areas, management in and around any area could include the use of prescribed fire and tree and shrub removal where necessary.

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Decision Framework

Given the purpose and need, the Hidden Springs District Ranger will review the proposed action and its alternatives in order to decide whether the proposed management of the 4 natural areas should proceed, and what site-specific mitigation or monitoring standards should be included.

Public Involvement

The Shawnee Quarterly announced this prescribe burning project as a potential Categorical Exclusion in its July and October, 2007 issues. A scoping postcard and letters were mailed to interested members of the public November 9, 2007. The proposal was posted on the Forest website and published in the Southern Illinoisan newspaper describing the project and requesting public and agency input. Comments on the proposed project were received by mail and email from the public and other agencies and reviewed by the interdisciplinary team. Using these comments, the team identified two issues to address. In addition, the Shawnee Quarterly again announced the project in its January 2008 issue but this time it was presented as an Environmental Assessment.

Issues

Issues were separated into two groups: key and non-key. Key issues are those directly or indirectly caused by implementing the proposed action. Non-key issues are those outside the scope of the proposed action; already decided by law, regulation, the Forest Plan or other higher-level decision irrelevant to the decision to be made; or conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality's NEPA regulations require this delineation in section 1501.7: "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..." In addition, resource areas that would remain unaffected by the proposed action are considered non-key issues. Non-key issues are those that are:

- 1) outside the scope of the proposed action,
- 2) already decided by law, regulation, Forest Plan, or other higher-level decision,
- 3) irrelevant to the decision to be made,
- 4) conjectural and not supported by scientific or factual evidence, or
- 5) an analysis need that will be addressed in the EA or project record but the concern would not create a need for alternative actions to be developed.

The following were determined to be key issues and within the scope of the project decision. These key issues were addressed during development of the proposed action and alternatives. The effects of the proposed alternatives are detailed in Chapter 3. Each issue is listed below along with the indicators used to determine the probable effects of the proposed management in each alternative.

Key Issue: Prescribe burning and tree and shrub removal will impact the diversity and abundance of birds and bats and kill non-target organisms such as snakes, turtles, and amphibians.

Indicators:

- Changes in bird species diversity and abundance.
- Changes in bat species diversity and abundance in Cave Hill Cave (Equality Cave).

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- Observations of reptile and amphibian mortality following prescribed burns.

Key Issue: Prescribe burning may increase the density of exotic plant species as well as kill non-target organisms such as lichens, mosses, trees and other plants.

Indicator:

- Changes in the numbers and frequency of native and non-native plant species.

CHAPTER 2 - ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences among them and providing a basis for choice among options by the decision-maker. It also provides a range of alternatives based on the issues brought forward by comments from the public.

The information used to compare the alternatives is based on the indicators identified for the key issues. These indicators were selected based upon the design of the alternative and the environmental and economic effects of implementing each alternative (i.e., the amount of erosion or cost to the government of implementing the alternatives).

Alternative 1 – No Action

Under the No Action Alternative, current management would continue to guide activities in the project area. No management activities would be implemented to encourage establishment and maintenance of barrens herbaceous and tree species. The 4 natural areas would not be managed with fire or tree and shrub removal and the succession of each to a forest-type community would be allowed to continue.

Alternative 2 – The Proposed Action

Under this alternative the Forest would manage the 4 natural areas with prescribed fire, and tree and shrub removal where necessary. As in the past (see Table 1), each of the 4 natural areas would be managed based on a site-specific assessment of vegetative conditions and management needs. Management will be applied as necessary to enhance, maintain or restore an area and, in accordance with Plan Appendix D, would occur over a multi-year period, with prescribed burns repeated on appropriate cycles. The burns would be implemented when weather and site conditions are conducive to meet site-specific management objectives. Burns would be planned and implemented during the most optimal periods, depending on the natural community. Roads, trails, streams and ravines will be used as natural fire-control lines whenever possible. Other fire-control lines—areas cleared of vegetation by leaf blowers, raking, mowing or other mechanical means—would be prepared before burning, as necessary.

Tree and shrub removal will be employed as necessary if new individuals or populations of the federal threatened Mead's Milkweed (*Asclepias meadii*) are found following prescribed fires. A maximum of 2 acres per year will be treated with tree and shrub removal for the 4 natural areas, collectively, and will be dependent on findings and environmental needs of Mead's Milkweed. At this time, no locations of Mead's Milkweed are known from the proposed action areas, however, suitable unoccupied habitat does occur at the 3 RNAs.

Prescribed fire would be introduced at one to five-year intervals for up to five burns within the next ten years. The prescribed burning would include associated firelines to contain the fire. Control lines would be constructed manually or mechanically and would generally follow past fire-control lines along the perimeter of the project area. In accordance with Forest Plan standards and

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guidelines to protect the Indiana Bat, no burning would be conducted between May 1 and September 1.

Design Criteria

In order to plan the prescribed burning and tree and shrub removal that will accomplish the restoration goals of the project and minimize the impact to other natural resources, we have included several design criteria that will be implemented as integral parts of the project (Table 2).

Table 2. Design Criteria summary for the Management of 4 Natural Areas and adjacent Forested Lands Project.		
Resource Area	Design Criteria	Rationale / Effectiveness
Non-native Invasive Species	Remove mud, dirt, and plant parts from project equipment before moving it into a project area.	FS policy; use equipment cleaning contract provisions WO-C/CT 6.36 (Appendix 1 Guide to Noxious Weed Prevention Practices (2001) and BT6.35 (Project Record) as a guide.
	Clean all equipment before leaving the project site if operating in areas infested with weeds.	National Strategy and Implementation Plan for Invasive Species Management, (2004). Minimize spread of noxious weeds from one site to the next.
	Workers should inspect, remove and properly dispose of weed seed and plant parts found on clothing and equipment.	Follow suggested Guide to Noxious Weed Prevention Practices (2001). Practice should include before entering and leaving project site.
	Avoid creating favorable conditions that encourage weed establishment by minimizing soil disturbance.	Follow suggested Guide to Noxious Weed Prevention Practices (2001). Monitor established vegetation plots for changes in species and frequency.
Soil and Water Resources	Trees will be felled away from streams and ponds where practicable and slash would be removed by hand far enough to prevent slash from accumulating in stream channels and ponds.	This will minimize soil impacts and disturbance and is in accordance with Forest Plan (page 41).
	Operators will not operate heavy equipment in a manner that causes excessive soil displacement, rutting or compaction.	
	Bare-soil exposure is limited to ten percent within riparian corridor filter strips.	This will minimize runoff and sedimentation into adjacent streams.
	Erosion control measures will be applied to constructed fire trails (hand or machine) upon completion of project activities and/or prior to winter rainy season.	
Fisheries	(1) Maintain a minimum filter strip width of 100 feet along perennial streams, 50 feet along intermittent streams and 25 feet along ephemeral streams (greater filter strip widths for intermittent and perennial streams will be needed when slope exceeds 10%). (2) Ensure that bare soil exposure limits (ten percent of each 150-foot linear segment of filter strip width) are not exceeded. (3) Construct fire lines by hand on any crossings of ephemeral, intermittent, or perennial streams. (4) Restore all disturbed areas (e.g., fire lines) promptly to limit impairment of downstream water resources.	As presented in the Forest Plant (USDA 2006)
Recreation and Visual Resources	Cut and scatter brush and trees so as not to leave unsightly stumps or slash near forest system trails or within barrens openings.	
Human Health and Safety	Signs will be placed at public access points leading to affected natural areas to keep forest users away during management activities. Adjacent landowners will be notified prior to burning.	

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<p>Heritage Resources</p>	<p>As detailed in the 2008 Prescribed Fire Programmatic Agreement, all heritage resources identified as cemeteries, or historic sites with above-ground combustible elements will be avoided during prescribed fire activities. All fire line locations will be reviewed prior to implementation.</p>	<p>These measures have been agreed to through consultation with the Illinois State Historic Preservation Officer and the Advisory Council on Historic Preservation in order to protect and preserve archaeological sites and other heritage resources that might be affected by prescribed fire.</p>
<p>Wildlife Resources</p>	<p>#1-Avoid removal of live suitable Indiana bat roost trees from 4/1 through 9/1 unless necessary for human safety or resource objectives. Removal can only proceed after exits counts have determined non-use by roosting bats. -Where feasible, “girdle” standing trees to serve as future roost trees.</p>	<p>Required “reasonable and prudent measure” in Dec. 2005 USFWS Biological Opinion to minimize the impacts of incidental take of Indiana bats. To maintain availability of suitable summer roost trees.</p>
	<p>#2-Retain all standing dead trees unless necessary to cut for human safety or to accomplish resource objectives. Dead suitable Indiana bat roost trees cannot be removed from 4/1 through 9/30 unless they are evaluated to document non-use by roosting bats.</p>	<p>Required “reasonable and prudent measure” in Dec. 2005 USFWS Biological Opinion to minimize the impacts of incidental take of Indiana bats.</p>
	<p>#3-To reduce the chances of affecting maternity roosts and foraging habitats, no prescribed burns shall be done from 5/1 through 9/1.</p>	<p>Required “reasonable and prudent measure” in Dec. 2005 USFWS Biological Opinion to minimize the impacts of incidental take of Indiana bats.</p>
	<p>#4-Burning within the vicinity of Equality Cave will be conducted in such a manner (wind direction, fuel moisture, buffer zones, i.e.) so as to prevent smoke from entering the cave and impacting roosting bats.</p>	<p>Forest Plan standards and guidelines to provide for the conservation of biological diversity.</p>
	<p>#5-No Class One Indiana bat roost trees >9”dbh will be cut/removed unless necessary to (REMOVED ONE “TO”) release Mead’s Milkweed plants. Where necessary, trees will be girdled-not cut/removed.</p>	<p>To maintain quality of Indiana bat summer maternity roosting habitat. To improve availability of suitable maternity roost trees.</p>
	<p>#6- Within 50 feet of pond perimeters or dams, any trees to be removed will be directionally felled away from ponds or dams.</p>	<p>To maintain amphibian habitat in old wildlife ponds.</p>
	<p>#7-No trees containing hawk or owl nests will be felled, girdle, removed from April 1 through August 31.</p>	<p>To reduce the likelihood of direct mortality to nesting hawks and owls.</p>

Monitoring for Action Alternative

Project level monitoring is designed to determine whether or not the resource management objectives of the environmental analysis have been implemented as specified and whether or not the design criteria measures for mitigating the environmental effects were effective. Monitoring the implementation will show whether resources have been adequately protected and if adaptive management actions are needed. The monitoring outlined in Table 3 will be done at appropriate times, before, during and/or after prescribed burning and tree and shrub removal. If monitoring exposes unacceptable resource damage, appropriate measures would be implemented to correct problems.

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Table 3. Monitoring for all Action Alternatives.		
Monitoring Activity	Description	Location and Timing
Soil Erosion	Visual inspection for sheet, rill and gully erosion.	Before, during and after burning activities in project area.
	Inspection of soil disturbance.	
Aquatic Habitat	(1) Maintain a minimum filter strip width of 100 feet along perennial streams, 50 feet along intermittent streams and 25 feet along ephemeral streams (greater filter strip widths for intermittent and perennial streams will be needed when slope exceeds 10%). (2) Ensure that bare soil exposure limits (ten percent of each 150-foot linear segment of filter strip width) are not exceeded. (3) Construct fire lines by hand on any crossings of ephemeral, intermittent, or perennial streams. (4) Restore all disturbed areas (e.g., fire lines) promptly to limit impairment of downstream water resources.	Before and after burning activities in project area.
Non-native Invasive Plant Species	Develop and propose for implementation measures to control NNIS that spread or are a result of project implementation.	Periodically for the first ten years after decision. Throughout the Project Area
Vegetation	Monitoring plots have been established to determine vegetative changes.	Post-burn monitoring will determine effectiveness in meeting the purpose and need.
Heritage Resources	Prescribed fire burn units will be redesigned if they pose a threat to a significant archaeological site or other heritage resource. All heritage resources identified as cemeteries, or historic sites with above combustible elements will be avoided during prescribed fire activities. All fire line locations will be reviewed prior to implementation.	Heritage resources on the Shawnee National Forest are monitored annually to assess the nature and degree of damage to historic properties due to vandalism, visitor use, natural deterioration, as well as management activities, at which time protective measures are identified. After implementation, this project will be included in the Forest monitoring plan.
Wildlife Resources	Summer/Winter bat population surveys will be conducted for number, age, and gender of bats by species present.	Twice per year at Cave Hill Cave (Equality Cave): summer survey (May 1-August 31) and winter survey (January 1-March 15). This will be done at least once every three years.
	Fall bat population surveys will be conducted for number (draft sent out had a capital N-I changed to lower case n), age, and gender of bats by species present	Once per year at Cave Hill Cave: Harp trap surveys during the fall swarming period (October 1-10). This will be done at least once every three years.
	Check for amphibian and reptile mortality	Following prescribed fires, check areas for mortality occurrences.
	Bird point transects for number and species of birds	Once per year at Cave Hill RNA at 15 stations along the transect.

Note: see Forest Plan (2006) monitoring requirements on page 98, Chapter 6, F. Monitoring Prioritization. Monitoring priorities will be established each year based on limited time, money and personnel.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 4 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 4. Effects of the proposed Alternatives on the Key Issues.		
Issue Statement:		
Fauna: Prescribe burning and tree and shrub removal will kill non-target organisms such as snakes, turtles, snails as well as detrimental to insects, amphibians, mollusks, and others.		
Indicator	Alt. 1	Alternative 2
Bat species diversity and abundance	No change	<i>Short-term:</i> slight decrease in small-diameter snags predicted. <i>Long-term:</i> increase in larger-diameter snags and tree cavities predicted; <i>Short-term and Long-term:</i> improvement in quality of summer foraging and roosting habitat predicted.
Amphibian and reptile mortality	No change	<i>Short-term:</i> slight increase in mortality, slight decrease in amphibian species numbers predicted. <i>Long-term:</i> increase in species diversity predicted; substantial increase in diversity and abundance of reptiles predicted.
Avian species diversity and abundance	No change in avian species diversity-perpetuation of habitat conditions favoring species associated with somewhat closed canopy mature forest conditions.	<i>Short-term:</i> slight increase in habitat conditions for species requiring more open understory conditions, and slight decrease in shrub-nesting species predicted. <i>Long-term:</i> substantial increase in species numbers and diversity, especially species associated with snags and cavity trees, and “savanna” conditions predicted.
Issue Statement:		
Flora: A. Prescribe burning may increase the density of exotic plant species. B. Prescribe burning will kill non-target organisms such as lichens, mosses, trees and other plants.		
Indicator	Alternative 1	Alternative 2
A. Number of Non-Desirable Plant Species	Increase Predicted	No Change Anticipated
A. Non-Desirable Plant Species Abundance	Increase Predicted	Decrease Predicted
B. Kill non-target lichens, mosses, trees, and other plants	No Change Anticipated	Short-term: Slight Increase Predicted only for lichens and mosses Long-term: No Change Anticipated for lichens and mosses

Alternatives Considered But Eliminated From Detailed Study

Only Tree and Shrub Removal

The interdisciplinary team discussed and disclosed the trade-offs and environmental effects associated with removal of trees and shrubs instead of using prescribe burns to achieve a barrens woodland. Mowing and tree and brush cutting alone were considered as an alternative to prescribed burning to improve habitat conditions, but were dismissed from further detailed analysis. These activities alone would not fully meet the project objectives of restoring each area’s natural

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community because they would fail to stimulate the growth and flowering of native plants. Mowing and/or tree and brush cutting alone would also not effectively remove standing dead vegetation.

Further discussion revealed the lack of beneficial impacts from a prescribed burn. Potential effects from prescribed burning involved release of carbon (C), nitrogen (N), and sulfur (S), which are volatilized as well as calcium (Ca), magnesium (Mg), potassium (K), and phosphorus (P), and other elements. Ash is leached by rains into the mineral soil which increases its base saturation and pH (Alban 1977). Increased nutrient availability at higher pH's may result in positive plant responses following fire (Van Lear and Kapeluck 1989). Atmospheric inputs over the period after the burn would also add additional nutrients to the soil. The prescribed burn adds nutrients as the ash is soon leached into the soil.

In addition, mowing and/or tree and brush cutting alone would not be feasible since the acreage involved would become cost-prohibitive. The amount of time and energy it would take to canvas the 4 natural areas and adjacent forested lands would far exceed the resources available on the Forest.

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes by resource area the physical, biological and social/economic conditions that may be affected by the proposed action and its alternatives. As directed by the Council on Environmental Quality (CEQ) implementing regulations for NEPA, the discussion focuses on resource conditions associated with the key issues. The discussion of environmental consequences forms the scientific and analytical basis for comparing the alternatives. Environmental consequences are discussed in terms of direct, indirect and cumulative effects. Direct effects are caused by the proposed activities and occur at the same time and place. Indirect effects are caused by proposed activities and occur later in time or further removed in distance, but are still reasonably foreseeable. Cumulative effects result from the incremental effects of proposed activities when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

Cumulative Effects

Resource specialists analyzed the cumulative effects of implementing the proposed action on their respective resource area. These cumulative effects analyses are displayed under each resource section presented in this chapter. The spatial and temporal boundaries for the cumulative effects analysis may differ for each respective resource area.

The analysis of cumulative effects considers all known actions past and present, and reasonably foreseeable future actions. We present this information here so that the public, the resource specialists and the decision-maker will have a common understanding of the analysis area. The following discussion describes the past, present and future actions. These actions will be used in this chapter for the discussion of cumulative effects in each resource area. The effects of these projects are bounded in time and space and then analyzed cumulatively with the anticipated effects of the proposed action. The June 24, 2005 CEQ guidance on cumulative effects was considered in the development of this environmental analysis.

Past actions generally include land-disturbing activities that have historically been practiced around the project area. The numbers presented for past actions in the tables below generally look back about five and ten years because the effects from those type of activities fade into the landscape in five to ten years. Present actions generally describe the existing condition, and future actions are generally described for the next five to ten years, which is roughly the time-span covered by the Forest Plan. Most of the numbers presented in the table below are based on an analysis of the Black Branch/Eagle Creek, Horseshoe Creek/South Fork Saline River, Spring Valley Creek/South Fork Saline River, and Cedar Creek watersheds (Hydrologic Unit Code 6 watersheds).

Past Actions

Southern Illinois, including the Forest, has a rich agricultural history. Settlers cleared the land for fields and homestead development and some of this land eventually became the Forest. Both active and passive management have shaped the Forest today. Shortly after the Forest was formed, pine and hardwood were planted to stabilize old fields and to begin to establish the forest. Throughout

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the years, management objectives have changed, but the goal remains sustained multiple benefits as set forth by the first Chief of the Forest Service.

Activities occurring on Forest and private lands in the project area watersheds throughout the years include, but are not limited to, farming and grazing, mining, timber harvest (primarily on private land), wildfires, creation and use of system and non-system equestrian and hiker trails, wildlife management including wildlife openings and pond and waterhole construction, outdoor recreational use (including picnicking, hunting, fishing, hiking), use of all-terrain vehicles (ATV's, authorized and unauthorized) and off-highway vehicles, artifact hunting and collection, issuance of special-use permits, recreational facilities construction and maintenance, road construction, maintenance and use, tree-planting and timber-stand improvements, including tree-thinning, power-line construction and maintenance, and electrification of rural areas. Traceable activities occurring on national forest and private lands in the project area watersheds are included in Table 5a for a 5-year span. We looked at the last five years because beyond that timeframe any impacts from these activities would have been stabilized and no longer contributing to the cumulative effects. Five years was also chosen because the effects of these activities would be negligible beyond a five-year timeframe. Since the original Table 5a was created, an Environmental Assessment for use of herbicide and prescribed fire in 23 natural areas was prepared with new figures. This new table is depicted in Table 5b.

Present Actions

Many of the past activities that occurred on Forest land and private land in the project area watershed are still occurring, however, the prevalence of many of the past activities has changed. Present actions in the project area watershed include, but are not limited to, trail construction, maintenance and use, power-line maintenance, ATV use (authorized and unauthorized, see below), timber harvest (predominantly on private lands), agricultural management (row-cropping and pasture) on private lands, fire (wild and prescribed) and fire suppression, use of non-system trails, road maintenance and use, tree-planting, equestrian use, public visitation and outdoor recreational use (hiking and hunting), special-use permitting and openland management.

Within the project area watersheds there is some amount of ATV use on the existing roads and trails. Some of this use is permitted (authorized) and some is unauthorized. Authorized use includes disability permits that allow ATV access to the Forest, exclusive of wilderness areas, natural areas, recreational and riparian areas. Unauthorized use is common throughout the project area watersheds and is evident on roads and trails. The amount of ATV use affects soil and water conditions and contributes to trail degradation on both system and non-system trails. The effects of ATV use are generally spread over the large watershed area. However, in areas where ATV riders congregate for hill-climbing or mud-bogging, this use can extensively damage plant and animal communities. Occasional to frequent ATV use has been noted within the project area watersheds.

Table 5a. All past (in the last five years) and present actions within the project area watersheds with potential for cumulative effects. Data extracted from GIS layers (see GIS specialist report in Project File).

Type of Action	Action	Scope of Action
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Private Land	Private land ownership	About 66,486 acres
	Agricultural land	About 36,525 acres
	Wildfires	Estimate less than 500 acres of private land
	Prescribed fire	Estimate less than 500 acres
	Forested land	About 17,142 acres
	Wetlands	About 5,325 acres
	Barren exposed land/surface water	About 17,142 acres
Forest Service	ATV/OHM use	Variable use in the watersheds
	Forest Service managed lands	About 19,214 acres
	Roads	About 192 miles
	ATV/OHM use	Variable use in the watersheds
	Prescribed burning	About 918 acres.
	Forested land	About 18,158 acres
	Openlands/brush	About 1,055 acres
	Wetlands	About 262 acres
	Trail maintenance and use	About 20 miles of trails
	Horseback riding	Across the watershed in the project area.
	User-developed (non-system) trails	Estimated less than 25 miles of trail.
Wilderness Area – Garden of the Gods	About 1,728 acres	
Utilities	12 main power lines	

Table 5b. All past (in the last ten years) and present actions within the Shawnee National Forest with potential for cumulative effects. Data extracted from GIS layers.

Action	Scope of Action
Agriculture (cultivated - row-cropping)	About 526,500 acres (past, present and future).
Agriculture (pastureland)	About 59,200 acres (past, present and future).
Prescribed burning *	About 3,000 acres per year (past). About 10,000 acres (present and future).
Wildfires	About 85 acres per year (past). About 1,000 acres per year (future).
Timber harvest/firewood cutting	About 1,000 acres per year (past, present and future).
Timber stand improvement	About 800 acres per year (past, present and future).
Recreational use **	About 300,000 people visited the Forest for recreation. About 37,000 for horseback riding About 150,000 for hiking or walking About 37,000 for hunting About 16,000 for fishing About 5,000 for gathering forest products (mushrooms, berries, and others). About 600 for bicycling.
ATV use	Variable use in watersheds (past, present and future).
Road (including right of way) maintenance	About 300 miles per year (past, present and future). About 1000 acres per year (past, present and future).
Tree planting	About 500 acres per year (past, present and future).
Utility right of way maintenance	About 250 miles per year maintained with herbicide (past, present and future).
Trail construction, reconstruction and maintenance	About 75 miles maintained per year (past, present and future). About 10 miles per year constructed or reconstructed.

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Non-system trails	Estimate less than 100 miles of trail (past, present and future).
Special-use permits (telephone, electric, water and driveways).	Estimate less than 20 acres per year (past, present and future).
Invasive species control (private land)	About 200 acres treatment per year (past and present). About 400 acres herbicide treatment (future).
Openlands management	Disking and planting about 200 acres (past). Disking and planting about 100 acres (future).
Residential development	About 2,000 houses per decade (past and future).
* The Forest is planning on burning about 8,000-12,000 acres per year in the future. The prescribe burns in the proposed project would be included in these acres.	
** Based on the 2008 National Visitor Use Monitoring Survey.	

Reasonably Foreseeable Future Actions

On Forest Service land, activities similar to past activities that have occurred are reasonably foreseeable in the future (Table 5a). In the next 15 years, the Forest plans to continue to maintain roads and trails, issue special-use permits ranging as they are requested from access-road and utility permits to outfitter-guide permits, and suppress wildfires as they occur. In general, special-use permits allow activities such as communications, outfitting and guiding for hunting, hiking and horseback riding, roads, water, power, gas and telephone utilities, commercial and non-commercial recreation events, and cemetery and church access. The Forest also plans on implementing at least 3626 acres of prescribed burning on forest land and barrens during 2008 as well as additional openlands prescribed burns. Reasonably foreseeable future actions on Forest land include those activities that are awaiting implementation, planned or listed on out-year schedules such as the Quarterly Schedule of Proposed Actions.

It is difficult to quantify the extent of future damage that could be caused by unauthorized ATV use or cross-country horse riding because of the nature of off-trail use. It is impossible to predict where this use will occur and the extent of damage to various resources. We have examined this incomplete information using the procedure outlined in 40 CFR 1502.22. Knowledge concerning the extent of this damage in the analysis area is incomplete and we have no scientific means to predict or quantify these impacts. It is impossible to quantify how many individual plants, plant populations, or other resources could be affected.

Vegetation Resources

In order to explain the effects of the proposed action on vegetation resources it is necessary to define the area of the effects being examined both spatially (the area effected) and temporally (the time period of the effects). The spatial boundary for the vegetation effects analysis is the project areas because the effects of the management will not extend beyond these areas. The temporal boundary for the analysis extends from the existing conditions from approximately 1990 to conditions at 5 and 15 years in the future. These periods were chosen to reflect changes habitat quality that would result from the prescribed burning. The 1990 date also represents the time-frame that the Establishment Records were written for each of the RNAS and the 15-year future time-frame corresponds to the life-span of the Forest Plan. This is long enough to accurately gauge the

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management effects and short enough that any deleterious effects resulting could be addressed, reversed or mitigated.

Existing Condition - Vegetation Resources

The Establishment Record for the Cave Hill RNA (Hutchison *et al.* 1990a) describes this area up to 1988 as relatively undisturbed natural community types consisting of xeric upland forests, dry upland forest, dry-mesic upland forest, barrens, sandstone glades and sandstone cliffs. The cave within the RNA is a significant example of a maze cave in the Interior Low Plateaus Physiographic Province and is also significant for its terrestrial cave community and aquatic cave habitat.

The RNA is also significant for its rare plant resources as described in the Botanical Resources Section of this Environmental Assessment. Other significant features include the hogback-like ridge, which is an interesting geomorphic feature on a fault-line scarp. This ridge has a great amount of displacement with many bedrock formations being exposed and the area is also significant for its exposure of Tradewater chert (Hutchison *et al.* 1990a).

The RNA has never been significantly disturbed by livestock or cultivation although there has been some minor logging in parts of the area prior to Forest Service acquisition. The Rugged terrain and thin rocky soils has not made the area very suitable for cultivation. Trees grow slowly and are of poor form and quality, therefore, lumbering of the land has not been very desirable. There are assemblages of plant species in the glades, barrens, and xeric forests that are usually considered to be more characteristic of the prairies further to the north and west in Illinois. These are remnants of community types that were common in the Shawnee Hills prior to settlement (Hutchison *et al.* 1990a).

The dry barrens and xeric forest communities are both dominated by blackjack oak (*Quercus marilandica*), the principal difference between them being the incomplete canopy and the grass dominated groundcover of the barrens. The barrens have short, limby trees, dense stands of farkleberry (*Vaccinium arboreum*), and openings with prairie species such as little bluestem (*Andropogon scoparius*), Indian grass (*Sorghastrum nutans*), and panic grass, (*Panicum microcarpon*). Forbs include goldenrods (*Solidago nemoralis* and *S. ulmifolia*), flowering spurge (*Euphorbia corollata*), and white prairie clover (*Petalostemum candidum*). The xeric forest sites have oak thickets with poison ivy (*Toxicodendron radicans*), farkleberry, and greebriers (*Smilax* spp.). The groundcover in the xeric forest is dominated by poverty oat grass (*Danthonia spicata*). In the dry upland forest, post oak (*Quercus stellata*) is dominant although blackjack is occasional. On the ridgetops, black oak (*Q. velutina*) and white oak (*Q. alba*) are codominants with shadbush (*Amelanchier arborea*), farkleberry, and greenbriers common in the understory. Pussytoes (*Antennaria plantaginifolia*) and dittany (*Cunila origanoides*) are indicator herbs of the drier sites on the ridges (Hutchison *et al.* 1990a).

The dry-mesic forest communities are dominated by red oaks (*Q. rubra*) and white oaks but hickories (*Carya* spp.) and chinkapin oak (*Q. muhlenbergii*) are also common. Redbud (*Cercis canadensis*) and flowering dogwood (*Cornus florida*) are frequent in the understory. Toothworts (*Dentaria laciniata*) are abundant in the early spring and poison ivy dominates the groundcover in the summer. The loess hill prairies are dominated by little bluestem, big bluestem (*Andropogon gerardii*), Junegrass (*Koeleria macrantha*), and prairie dropseed (*Sporobolus heterolepis*). Common forbs include woodland sunflower (*Helianthus divaricatus*), blazing star (*Liatris aspera*),

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slender bushclover (*Lespedeza virginica*), and white prairie clover. Sandstone glades are mostly exposed massive rocks covered by lichens and mosses. Vascular vegetation that grows in crevices and pockets of soil include poverty oats, pinweed (*Hypericum gentianoides*), and prickly pear (*Opuntia compressa*). Scattered stunted trees include oaks, hickories, and eastern red cedars (*Juniperus virginiana*). Farkleberry is a common shrub here. The exposed rocks along the sandstone bluffs have several species within the crevices but also include Allegheny stonecrop (*Hylotelephium telephiodes*) (Hutchison *et al.* 1990a).

Under vegetative management guidelines, it is recommended to control aggressive exotic species such as Japanese honeysuckle (*Lonicera japonica*), throughout the area. Prescribed burning and hand removal of trees and shrubs are also permitted for the control of woody vegetation in the naturally open areas such as the glades, barrens and hill prairies. Periodic burning should not be necessary every year, and a regular schedule of burning will be developed as results are monitored (Hutchison *et al.* 1990a).

The Establishment Record for the Stoneface RNA (Hutchison *et al.* 1990b) describes this area up to 1988 as containing relatively undisturbed natural community types such as xeric upland forest, dry upland forest, dry-mesic upland forest, loess hill prairies, barrens, sandstone glades, and sandstone cliffs. Agricultural and lumbering conditions are about the same as described for Cave Hill RNA. Species composition is very similar to Cave Hill except that black chokecherry (*Aronia melanocarpa*) occurs on the blufftop and there appears to be more of an abundance of blazing star (*Liatris squarrosa*) than at Cave Hill RNA. Alum root (*Heuchera parviflora*) and sedges (including *Cyperus filiculmis*) are common on the cliffs. Farkleberry (both *Vaccinium arborea* and *V. vacillans*) form thickets and greenbriers are common (*Smilax* spp.). There is a nearly permanent trickle of spring water in the valley that keeps that portion of the RNA moist. Here several species of sedges and ferns grow among the boulders, including the royal fern (*Osmunda regalis*), which is unique to this RNA. Management guidelines are the same as for Cave Hill in reference to the control of Japanese honeysuckle and prescribed burning.

The Establishment Record for the Dennison Hollow RNA (Hutchison *et al.* 1989) describes this area up to 1988 as containing relatively undisturbed natural community types such as xeric upland forest, dry upland forest, dry-mesic upland forest, barrens, sandstone glades, and sandstone cliffs. This RNA is on the back slope of a ridge along a fault-line scarp where there has been a great amount of displacement. It contains a valley with a stream flowing eastward, in the direction of a dip of the bedrock. This dip is so steep that there are only narrow outcrops of each of the alternating resistant sandstones and shale units that make up the bedrock. Agricultural conditions are similar to Cave Hill and Stoneface RNAs but there has been more selective logging prior to Forest Service acquisition. The logging was at a minimum due to rugged terrain and difficult access.

Similar species that occur at Cave Hill and Stoneface RNAs are also found here except that old growth stands of chestnut oak (*Quercus prinus*) is found locally abundant in upper slopes of the valley and on ridgetops. The uncommon wavy-leaved aster (*Aster undulatus*) is also known from drier portions of this RNA as well as butterfly pea (*Clitoria mariana*). Management guidelines are the same as for Cave Hill and Stoneface RNAs in reference to the control of Japanese honeysuckle and prescribed burning. "It is assumed that the tendency of natural openings in the Midwest to

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succeed to forest will result in the disappearance of these communities without fire or the replication of control measures that kept them open in pre-settlement times” (Hutchison *et al.* 1989).

Simpson Barrens Ecological Area is described in West’s “A Natural Heritage Program for the Shawnee National Forest (Illinois)” (1982) and is also described in the Forest Plan (2006) Appendix D. West (1982) described problems at this natural area including woody plant encroachment, lack of fire in the system, exotic plant invasion, human disturbance problems, and roadside drainage problems. Identified management needs included selective tree and shrub removal by hand cutting, hand pulling and herbicide treatment of exotic plants, correcting road drainage problems, some protective fencing along public road interfaces, and instituting prescribed burning management in the areas. All of these recommended management actions have taken place since 1988 except for herbicide treatment. The last time this area was prescribed burned was 1995. Remnant pockets of glade species within the dry upland forest between established glades could be lost without continued fire management. Pre-settlement conditions for the dry upland forest in the Simpson area are theorized to be more open woodland than dense forest. These open woodland conditions and the plant and animal diversity associated with these overstory and understory conditions could not be achieved without instituting prescribed burning in the dry forest community adjacent to the limestone glades (USDA Forest Service 1989).

In the glade communities of the ecological area, barrens/prairie species are found scattered. These include little bluestem, Indian grass, tick trefoil (*Desmodium ciliare*), woodland sunflower (*Helianthus divaricatus*), elm-leaved goldenrod (*Solidago ulmifolia*), tall boneset (*Eupatorium altissimum*), rattlesnake master (*Eryngium yuccifolium*), drooping coneflower (*Ratibida pinnata*), rosinweed (*Silphium integrifolium*), and prairie dock (*Silphium terbinthenaceum*). The entire area, glades and forest, appears to have been much more open in the past (1938 aerial photographs) than it was in 1988 prior to the start of active management. The largest individual trees are open-grown and scattered. Absence of recent fire is the apparent cause for rather dense woody understories (USDA Forest Service 1991).

Effects of Alternative 1

Alternative 1 is the no-action alternative. Negative impacts are expected to be incurred by the rare barrens community types. Without management of these project areas, the natural community types will succeed to more shade-tolerant species. Woody shrub and tree encroachment will force barrens species to be suppressed or to be extirpated. See more discussion in the Rare Botanical Resources and Non-native Invasive Species Sections of this Environmental Assessment.

Effects of Alternative 2

Alternative 2 propose prescribed burning. The additional sunlight should encourage the health and vigor of existing native sun-loving species, such as oaks and hickories and barrens species. An example of effective prescribed burning can be observed at the 262-acre project areas of Cave Hill, Dennison Hollow, and Stoneface RNAs and Simpson Barrens Ecological Area. A similar burn regime has been successful in promoting barrens species’ growth, health and vigor.

The prescribed fire would temporarily remove the ground-surface litter, providing ground conditions suitable for the regeneration of oaks and hickory as well as promoting conditions

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conducive to native forbs and grasses. Acorn germination occurs most successfully on mineral soil with a thin layer of leaf-litter (Van Lear and Watt 1992). This would allow for the continued recruitment of oak/hickory seedlings. Repeated fire would also reduce or kill some species that compete with the sun-loving oak and hickory community (Brose, Van Lear, and Keyser, 1999). The use of fire will also limit the development of invading pines in the project areas. Shortleaf pine may resprout but as a seedling but would compete poorly with the hardwood stems that maintain larger established root systems. The effects of prescribed fire have been addressed in the Environmental Impact Statement for the Forest Plan, and are incorporated by reference (Final Environmental Impact Statement, Chapter 3, pages 72-75, 90-96, 133-117). Periodic prescribed fire could be used to reduce the numbers of shade-tolerant species, favoring sun-loving species.

In Alternative 2, the cutting of trees and shrubs where new federal threatened *Asclepias meadii*, Mead's milkweed, individuals and populations are found will not have any negative impacts to the barrens area since the debris will be scattered where future prescribed burns will not concentrate with heat.

Cumulative Effects

Alternative 1

The no-action alternative is expected to have cumulative impacts in the long-term (10 to 15 years and beyond) since it is expected that the barrens community types will continue to deteriorate and may eventually disappear from these areas. See further discussion in the Rare Botanical Resources and Non-native Invasive Species Sections of this Environmental Assessment.

Alternative 2

Because the effects of the proposed project on vegetation resources would be restricted to the project areas and not have impacts beyond the boundaries of the project areas, there would be no negative cumulative effects. No other management actions by the Forest, other agencies or private individuals are anticipated to have any effect on the vegetation resources within the project areas. There may be some positive cumulative effects to individual species as discussed in the Rare Botanical Resources Section of this Environmental Assessment.

Wildlife Resources

This section discusses the wildlife resources that exist within the proposed restoration project and the effects of the alternatives on these resources. This section is organized as follows:

Affected Environment and Effects of the Alternatives

- *Affected Environment*
- *Key Issue Identification*
 - Changes in bird species diversity and abundance.
 - Changes in bat species diversity and abundance in Cave Hill Cave (Equality Cave).
 - Observations of reptile and amphibian mortality following prescribed burns.
- *Federally Listed Animal Species,*

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- Indiana Bat
- **Regional Forester's Sensitive Animal Species,**
 - Eastern timber rattlesnake
 - Southeastern myotis
- **Illinois State-Listed Animal Species,**
- **Management Indicator Species,**
 - Wood thrush
 - Worm-eating warbler
 - Scarlet tanager
- **Population Viability Concern Species,**
 - Gray Treefrog
 - Redheaded woodpecker
 - Eastern Woodrat
 - American Woodcock
- **Other Wildlife Concerns,**
 - Fragmentation/Nest Parasitism/Nest Predation
 - Migratory Birds

Affected Environment

The exclusion of fire from these four areas over the past 50 years has permitted the areas to become artificially overstocked with hardwood trees, saplings, brush and red cedar, resulting in more dense canopy conditions than what is believed to have historically prevailed. Non-native invasive plants, such as Japanese honeysuckle and multi-flora rose have become established in areas along open roadsides. The resulting action has been a reduction in plant and animal diversity, and the establishment of non-native invasive plants within/adjacent to portions of the four areas. Much of the cliff lines, boulder fields, and rock outcrop areas are un-naturally shaded, thus retarding the development of a diverse forest floor flora and fauna.

All four areas have had some degree of dormant season prescribed burning and tree/shrub removal conducted over the past five to ten years carried out to enhance the adjacent lands to Mead's milkweed (*Asclepias meadii*), which is a listed by the U.S. Fish and Wildlife Service (USFWS) as "threatened." All four areas are dominated by a mix of upland hardwood forest types. Several small stands of mature yellow pine are also located within portions of the four areas. These areas once were agricultural fields but were planted by the Forest Service in yellow pine. All four areas have well traveled open roads that lie adjacent to the areas, serving as a continual potential source of non-native invasive plants and animals.

Unique wildlife habitat features (i.e. caves, karst, wetlands, spring seeps, bogs, rock outcrops, boulder fields, cliff lines, etc.) are known to exist in all four areas. Rocky cliff line (sandstone and limestone) habitat is well distributed throughout portions of all four areas. Rock outcrops and boulder fields are also prevalent throughout many portions of the areas. One limestone cave is present (Cave Hill Cave or Equality Cave) within the Cave Hill Area. This cave supports a known population of a Regional Forester's Sensitive bat species (Southeastern Myotis, *Myotis austroriparius*), as well as several more common species of bats, such as little brown bats (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), big brown bat (*Eptesicus fuscus*), and

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eastern pipistrelle (*Pipistrellus subflavus*). The population of Southeastern *Myotis* was first discovered in 2006, and represents one of only a few known populations on the Forest.

The predominant overstory forest type of the four areas is upland mixed hardwood. Several relatively small stands of yellow pine are present in some of the areas. Habitat needs for wildlife species dependent upon larger hardwood snag and cavity tree habitat is abundantly available. Large hardwood cavity trees are very abundant throughout the four areas. A variety of hardwood snags are distributed throughout all four areas, with some areas having higher densities of larger diameter snags. The amount of down woody debris varies throughout the four areas, with some areas having very good amounts of larger diameter down woody debris.

The availability of early seral habitat is very limited in the project area. Numerous abandoned wildlife openings are scattered throughout portions of the project area. Active management of these wildlife habitat improvements has been suspended for several years, and they are consequently succeeding into shrub-sapling habitat. Very little grass/forb old field habitat remains on National Forest lands in these four areas, existing as small remnants within the old wildlife openings. No timber harvesting has occurred within the project area within the past 10 years. There is no other early seral habitat (less than 10 years of age) that exists in the project activity area.

Numerous permanent to semi-permanent watered ponds are scattered throughout the four areas. Some of them may have fish in them. All of the ponds serve as potential aquatic habitat for amphibian species, especially those ponds that have no fish in them. All four areas are believed to support healthy and abundant populations of traditional game wildlife species, such as white-tailed deer, eastern wild turkey, and gray squirrel. The deer population in all four areas is believed to be moderate, based on the amount of deer sign (trails, droppings, buck rubs). The turkey population is also believed to be moderate. Turkey sign is commonly visible throughout the four areas (turkey tracks, turkey feathers, scratching in hardwood leaves, etc.). All four areas are heavily used for public hunting, including deer hunting, turkey hunting, and squirrel hunting.

Key Issue Identification

The inter-disciplinary team identified potential undesirable impacts on wildlife populations from the prescribed burning project as a key issue for the analysis.

Key Issue: Prescribe burning and tree and shrub removal will impact the diversity and abundance of birds and bats and kill non-target organisms such as snakes, turtles, and amphibians.

Indicators:

- Changes in bird species diversity and abundance.
- Changes in bat species diversity and abundance in Cave Hill Cave (Equality Cave).
- Observations of reptile and amphibian mortality following prescribed burns.

Indicator: Changes in bird species diversity and abundance.

Prescribed burning may affect avian species differently. Artman (*et al.* 2001) evaluated the effects of repeated burning on the bird community in a southern Ohio closed canopy, mixed-oak forest. Prescribed burning was done in late March and early April before leaf-out and before the arrival of

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most Neotropical migrant species. This study by Artman *et al.* (2001) found that four bird species were negatively affected by burning: ovenbird, worm-eating warbler, hooded warbler, and northern cardinal. Ovenbird populations declined in response to burning frequency due to the reduction of leaf litter. Hooded warblers generally nest within 1 meter above the ground in dense shrub thickets, and declined in this study because these thickets were burned in the fire. Northern cardinals were not directly affected by the burn and were uncommon in the treatment units before the burn. Worm-eating warblers nest on the ground, placing their nests in depressions along steep slopes along stream bottoms and other areas with high moisture. Cooler fires were reported to have less of an impact on worm-eating warbler populations. No changes were observed in the overall composition of the breeding bird community and no species was eliminated or added as a result of prescribed burning.

Burning would be conducted before most birds, with the exception of owls and turkey, would be nesting or raising young. Consequently, implementation of either Alternative Two or Three should have no direct effects to most avian species. Burning may constitute a disturbance to nesting owls, potentially causing them to temporarily leave the nest while burning activities are being carried out. However, since burning activities would only persist for one day, and only during daylight hours, adult owls should return to the nest once activities cease. This should not impact successful nesting.

In a spring when warmer than usual weather is experienced, burning conducted later in the spring (early into April), has the potential to cause disruption to any turkey hens that have initiated nesting/egg laying early. For those hens who have initiated egg laying, fire could directly kill any eggs already laid. The overall effects to turkey populations should be ameliorated by several factors: 1) with this type of early nest loss, it is highly likely that hens would re-nest; 2) any reduction in turkey production should be restricted to the burn area; and, 3) a projected mosaic burn pattern should only directly affect a few nests. There should be no direct effects to turkey poults, since all prescribed burning should have ceased prior to the time that young turkeys would have begun to hatch. Additionally, the creation of small forest openings (Alternative Two) should improve the quality and quantity of turkey brood habitat.

Alternative One will perpetuate the existing poor quality wild turkey habitat into the long-term, until such a time that dominant canopy trees begin to die, thus creating scattered canopy gaps. However, this is not expected to occur in any substantive amounts in the near-term. Both Alternatives Two and Three would result in an increase in important wild turkey cover through the development of more early seral vegetation. In the short-term, potential food sources would be expected to increase substantially, with an abundance of seed-producing plants, succulent green vegetation, berry-producing (softmast) plants, and insects available for use. The edges of treated areas would most likely be heavily used by turkeys for nesting. Because burning and shrub/tree felling/removal will improve turkey habitat, implementation of Alternative Two should have both positive indirect and cumulative effects on the turkey population in the four areas.

Shrub/tree felling/removal (Alternative Two), if conducted during the bird nesting season, could result in direct negative effects (mortality) to bird nestlings, if occupied shrubs/trees are cut. However, the effects from this action would be restricted to an extremely small area each year (less than 2 acres), and for a short time period each year.

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The perpetuation of prescribe burning should have long-term indirect beneficial effects for species associated with more open “oak savanna” habitat conditions, and species that rely on snags and cavity trees.

Raptors are expected to be more common in the project activity area, as a result of an opening up of the canopy, establishment of a diverse herbaceous ground cover, and increase in prey species. The beneficial effects from the creation of a more “oak savanna” habitat condition should be perpetuated into the long-term by continual prescribe burning.

Indicator: Changes in bat species diversity and abundance in Cave Hill Cave (Equality Cave).

Implementation of Alternative One will maintain existing foraging and roosting habitat conditions throughout the four areas. The risk of smoke generated from prescribed burning entering Equality Cave is non-existent. There will be no improvement in the quantity, quality, or distribution of summer roosting habitat. There will be no improvement in foraging or summer roosting habitat. There should be no direct or indirect effects, and consequently no cumulative effects to bats..

Winter cave surveys and fall harp-trapping has documented Equality Cave (Cave Hill Cave) serving as a winter hibernacula for Southeastern Myotis (*Myotis austroriparius*), little brown bats (*Myotis lucifugus*), big brown bats (*Eptesicus fuscus*), northern long-eared bats (*Myotis septentrionalis*), and eastern pipistrelles (*Pipistrellus subflavus*). Equality Cave is also used as a roosting site during the summer by male Southeastern Myotis, as well as eastern pipistrelle, northern long-eared bats, and big brown bats. No eastern small-footed bats (*Myotis leibii*), Rafinesque’s big-eared bats (*Corynorhinus rafinesquii*), gray bats (*Myotis grisescens*) or Indiana bats (*Myotis sodalis*) have been documented using Equality Cave. However, conditions within Equality Cave are conducive for use by eastern small-footed bats, Rafinesque’s big-eared bats, and Indiana bats, both as a summer and winter roosting site.

Since prescribe burning will only take place during the dormant season (October-April), there is no risk to summer roosting bats. Consequently, Implementation of Alternative Two could affect Southeastern Myotis in the following way: 1) smoke could enter the cave while winter roosting bats are roosting in the cave during prescribe burning activities, potentially causing increased winter mortality; 2) the availability of suitable summer roost trees could be affected; and/or 3) the quality of summer foraging habitat could be improved.

Implementation of either Alternative Two or Three should reduce the density of the tree canopy, and mid and understory shrubs-trees, creating a more diverse forest floor flora. This should result in an improvement in bat foraging habitat quality, due to increased insect production. Grindal and Brigham (1998) reported that small forest openings may offer opportunities for bats to forage. Some smaller-diameter snags could catch fire during burning and fall to the ground. However, this loss should be more than offset by a projected increase in snags created by tree mortality associated from burning.

Indicator: Observations of reptile and amphibian mortality following prescribed burns.

Implementation of Alternative One is not expected to have any direct or indirect effects to reptiles and amphibians, since no action will take place. Reptile and amphibian species diversity and abundance would be expected to remain constant into the future. Implementation of Alternative One

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would not reduce overall forest stand density, maintaining the somewhat closed canopy monotypic vegetative communities, and existing reptile and amphibian species assemblages. Failure to implement burning would preclude the development of more diverse vegetative communities, and increased invertebrate diversity. Consequently, implementation of Alternative One is expected to have negative long-term cumulative effects on overall reptile and amphibian diversity and abundance.

Studies show individual herpetofauna respond differently to fire. Many reptiles and amphibians avoid adverse impacts from fire by seeking refuge under surface objects, burrowing into the soil, or simply dispersing from burning areas. One study indicated that fire intensity and seasonality may influence mortality rates of herpetofauna. Russell et al. (1999) concluded that: 1) the currently available research indicates that fire in general has little direct effect on most amphibian and reptiles; 2) prescribed fire is indicated as an appropriate management tool that can be used with other treatments to benefit herpetofauna by restoring a historical mosaic of successional stages, habitat structures, and plant species compositions; and 3) while fire-induced disturbance may decrease herpetofaunal diversity within a particular patch, a mosaic of successional stages and habitat structures should increase diversity on a broader scale. Floyd et al. (2002) found no significant difference between burned and unburned treatments for abundance, richness, diversity, or evenness of the herpetofauna community from prescribed burning within hardwood forests of the Upper Piedmont of South Carolina.

It is likely that implementation of Alternative Two may result in reductions in the numbers of some amphibian and reptile species, no effects to some species, and an increase in numbers of other reptile and amphibian species. Since burning should create a mosaic of burned and unburned areas, amphibian species which favor more shaded and moist areas may be less abundant in some areas, but should have an adequate distribution of refugia (unburned areas, escape areas, etc.) so as to provide for a diversity of amphibian species throughout the four areas. At the same time, many reptile species are expected to increase in diversity and abundance. A scenario of unburned and burned areas, small forest openings and untreated closed canopy forest should provide for a greater diversity of reptiles and amphibians across the landscape. Burning and the creation of small forest openings may have localized indirect negative effects for some species of reptiles and amphibians, and positive indirect effects for other reptile and amphibian species. Consequently, burning and shrub/tree felling should have an overall positive cumulative effect on reptile and amphibian species diversity and abundance.

Cumulative Effects Rationale - Wildlife Resources

This section presents the rationale for the cumulative effects analysis for various wildlife species. The temporal boundary used in conducting the cumulative effects analysis for wildlife species is 5 years in the past extending out to 50 years into the future. Going back beyond five years would not provide useful information because the effects of projects greater than five years ago are not readily apparent. Fifty years into the future was chosen because the full effects of the proposed action should be realized in about 50 years.

Because wildlife species have differing levels of mobility and home ranges, the analysis of cumulative effects to wildlife species has been applied at different spatial levels. The spatial boundaries used in conducting the cumulative effects analysis for different species are found in Table 6.

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Table 6. Cumulative Effects Analysis Spatial Boundaries.	
Species	Cumulative Effects Spatial Boundary
Bats	5-mile radius from project area
MIS Birds	Johnson, Pope, and Saline Counties
Timber Rattlesnake	5-mile radius from project area

TES Bats: Several Indiana bat research studies have suggested that Indiana bats will travel as far as 2.5 miles from individual summer roost trees. A 3 mile radius extending from the project activity area boundary would seem appropriate to cover any potential project-level effects to Indiana bats. A 5 mile radius extending from the project activity area boundary would seem appropriate for analyzing potential cumulative effects to Indiana bats. The Forest Plan also conducted a comprehensive cumulative effects analysis to the Indiana bat at the Forest-wide scale. This cumulative effects analysis tiers to this analysis in the Forest Plan EIS and the Biological Assessment.

MIS Birds: Since many Neotropical migratory birds are long-distance migrants, the appropriate cumulative effects analysis area might be the entire Shawnee National Forest. The 2006 Forest Plan conducted a comprehensive landscape-level cumulative effects analysis of potential effects to Neotropical migratory birds and MIS birds from the implementation of land management activities. Many avian species are long-distance migrants. Analyzing the potential cumulative effects to avian species is appropriate to be conducted at a scale larger than at the project-level. This document incorporates by reference the Forest-wide cumulative effects analysis conducted in the Forest Plan EIS. However, cumulative effects to neo-tropical migratory birds has also been analyzed at the project-level. For this analysis, the cumulative effects boundary was conducted a 5 mile radius extending out from the project activity area boundary.

Timber Rattlesnake: Rattlesnake activity ranges can be as large as 500 acres and males have been found as much as 4.5 miles from their den (Brown 1993). Therefore, we analyzed the potential cumulative effects out to a 5- mile radius from the project area. This distance should cover adequately any potential rattlesnake dens within a distance that a rattlesnake could travel and be present in the project area.

Federally Listed Animal Species

Indiana Bat

The analysis concluded that the Indiana bat (*Myotis sodalis*) is the only federally-listed animal species that has the potential to occur within or near the proposed project area (see the Wildlife Working Paper for more detail). Effects to Indiana bat were considered in this analysis because it is assumed the entire Forest represents potential habitat (summer roosting and/or summer foraging) for this species. This analysis of effects is tiered to the December 3, 2005 U.S. Fish and Wildlife Biological Opinion (BO) for the Programmatic Biological Assessment prepared for the 2006 Shawnee National Forest Land and Resource Management Plan; and, the 2006 Final Environmental Impact Statement for the Proposed Shawnee National Forest.

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A diversity of different size classes of snags and live cavity trees are present throughout the four areas to be treated; thus, providing potential summer roosting habitat for both single male bats as well as summer maternity colonies. Large snags and suitable live roost trees are very abundant throughout the four areas to be burned. Smaller diameter hardwood snags are also abundant throughout the project area. Summer roosting habitat for bachelor male Indiana bats, as well as Indiana bat maternity colonies, is abundantly available throughout the four areas.

Alternative One

Alternative One will perpetuate existing habitat conditions for Indiana bat within the four areas. The lack of burning will most likely maintain the existing somewhat dense canopy, mid-story and understory condition, which will continue to perpetuate the somewhat poor foraging habitat condition prevalent throughout most of the four areas.

Alternative Two

The felling of snags or tree cavities during the summer roosting period (April 1-September 30) has the risk of directly impacting roosting bats. This risk only exists for Alternative Two. The felling of standing snags or cavities >9" dbh during the summer period (April 1-September 30) has the risk of directly affecting maternity roosts that may be present in trees being felled, increasing the risk of "harm" to young of the year as well as adults. The felling of standing snags or cavity trees from 3"-9" dbh during the summer period has the risk of directly affecting bachelor male Indiana bats. Should any bats be "harmed", such an action could be deemed to constitute a "take", requiring Tier Two consultation with the Marion, IL USFWS Office.

Additionally, no suitable live summer roost trees will be mechanically "removed" (felled) from April 1-September 30 without having conducted exist counts to determine non-use by summer roosting bats. The "Terms and Conditions" spelled out by the December 2005 BO will be fully implemented. Additionally, compliance with Design Criteria 1, 2, and 5 will reduce the potential for the taking of Indiana bats. Consequently, the risk associated with the felling of trees on up to two (2) acres each year having a direct effect on Indiana bats is reduced to the extent practicable. In the event that any suitable standing live roost trees must be girdled/felled from April 1-September 30 for the purpose of releasing Mead's Milkweed plants, exit counts will be conducted to determine non-use by bats. Should counts document the presence of roosting bats, the girdling or felling of trees will occur outside of the summer roosting period (October 1-March 31). This fully complies with the "Terms and Conditions" provided by the December 2005 USFWS Biological Opinion on the Forest Plan.

Burning the four areas during the non-summer maternity period (December through late March) would virtually eliminate the potential risk of direct mortality occurring to bats roosting in live or dead roost trees within burned areas. The later in the winter that burning is conducted the greater the chance that individual Indiana bats may be disturbed by burning, since adult females quite often depart winter hibernacula in early to mid April in search of maternity roost sites. However, burning earlier in the winter hibernation period increases the likelihood of smoke emissions disturbing winter roosting bats. The likelihood of smoke emissions adverse affecting any Indiana bats is virtually non-existent since the nearest known Indiana bat hibernacula is well over ten miles away. At this distance, smoke dispersion should be such that in the event any smoke would travel in the direction of the hibernacula, smoke concentrations would be miniscule. Prescribed burning operations should pose virtually no risk to winter roosting bats.

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While extending burning into early April slightly increases the risk of female bats being present within summer roost trees, the risk is considered to be minimal since young of the year will not have been born yet and the female would be mobile enough to vacate roost trees. Since the most recent research indicates that the majority of male Indiana bats do not emerge from hibernacula until after May 1, dormant season burning is unlikely to directly affect roosting male Indiana bats. Ceasing burning activities after May 1st should minimize the potential for prescribed burning operations having an adverse direct effect on both male Indiana bats and Indiana bat maternity colonies. The potential for direct effects to summer roosting Indiana bats could be virtually eliminated by restricting all burning to before April 1st.

Prescribed burning may burn up some standing snags, depending upon specific burning conditions. This could be minimized by: raking around suitable roost trees, applying foam around the base of suitable roost trees, or burning under wetter conditions such that snags are unlikely to catch fire. Dormant-season prescribed burning conducted on the Hidden Springs Ranger District over the past several years has taken place when moisture conditions are such that few standing snags become consumed by fire. It would be virtually unpractical to rake around, or to apply foam to, every suitable Indiana bat roost tree, since live roost trees are very abundant in all four areas and the total size of the proposed burn area is quite large. Burning under wetter conditions would minimize the likelihood of snags catching fire and being consumed.

Prescribed burning operations will undoubtedly result in additional mortality to some live hardwood and pine trees, which should further increase the availability of summer roost trees within the project area. Boyles and Aubrey (2006) conducted a study in Missouri looking at the impacts to evening bats (*Nycticeius humeralis*) from prescribed burning. They found that there were a significantly higher proportion of dead trees, which evening bats commonly use as roost trees, in burned forests compared to unburned forests. They concluded: *“Prescribed burning appears to initially lead to creation or restoration of favorable cavity-dwelling bat habitat and its continual implementation perpetuates an open sub-canopy. Therefore, we suggest that prescribed burning may be a suitable tool for management of roosting habitat for cavity-roosting bats”*.

It is highly likely that any snags consumed by burning conducted in the four areas will be more than offset by the creation of additional snags resulting from burning and/or girdling of trees to release TES plants, ultimately resulting in an improvement in roosting habitat conditions for cavity-roosting bats. The distribution and abundance of hardwood tree cavities should increase as the result of butt scarring from repeated burning.

The likelihood of smoke entering any Indiana bat hibernacula should be virtually non-existent, since the closest hibernacula is well over 10 miles away from any of the areas proposed for burning. The likelihood of smoke generated by prescribed burning carried away from the four areas is extremely low of every reaching the closest Indiana bat hibernacula over ten miles away. Winter cave surveys, plus two years of fall harp trapping, have failed to document any Indiana bats using Equality Cave (Cave Hill Cave). Thus, it is assumed that Equality Cave is not currently being used by Indiana bats. Consequently, any smoke that might inadvertently enter this cave should have no adverse direct effects to winter or summer roosting Indiana bats.

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If the repeated burning is successful in reducing the density of dominant canopy trees, as well as understory and mid-story shrubs, saplings, and pole timber, there should be an increase in the amount of solar radiation to snags and live roost trees. Summer maternity colonies require somewhat stable warm summer temperatures during the summer months to facilitate growth and development of young bats. Increased solar radiation to suitable roost trees should improve the suitability of summer roost trees. Implementation of Alternative Two should have beneficial indirect effects by improving the suitability of summer roost trees within the four areas.

Indiana bats oftentimes avoid areas that are dense with mid-story vegetation (“vegetative clutter” for foraging during the summer months. Reducing tree spacing and vegetative clutter should improve the quality of Indiana bat foraging habitat within the four areas. The creation of small forest openings may also have positive indirect habitat benefits by providing bat foraging areas (Grindal and Brigham 1998). Implementation of Alternative Two should have positive indirect effects by improving the quality of foraging habitat within the four areas.

Responding to an unprecedented die-off of thousands of bats in New York, biologists and researchers from around the country are working to identify a fungus found on hibernating bats, and to assess the threat to bat populations nationwide. The disease, dubbed “white-nosed syndrome” because of the presence of a white fungus around the muzzles of some affected bats, is a major concern to the bat conservation community (USFWS Ecological Services 2008). White-nose syndrome was first detected at caves and mines in New York in 2007, where it is believed to be associated with the deaths of approximately 8,000 to 11,000 bats. This winter (2008) the disease has again been found at the previously infected New York sites, and has spread to several other sites there as well as one site in Vermont and Massachusetts. Wildlife managers, including the US Fish and Wildlife Service, the Illinois Department of Natural Resources, and the US Forest Service are concerned about the outbreak because hibernating bats congregate by the thousands in caves and mines throughout the eastern US. This behavior and the fact that many species of bats migrate considerable distances from summer habitats to winter hibernation sites, increases the potential that the disease will spread to hibernation sites in Illinois.

Biologists from the Illinois Department of Natural Resources examined many of the larger Indiana bat hibernacula in southern Illinois during January and February of 2008, and have thus far found no presence of this new and potential damaging infectious agent (Forest Service email 2008). The Shawnee National Forest has been in communication with the Marion Office of the US Fish and Wildlife Service to discuss the implications of this new disease and any need to reinstate consultation issued for “take” for the 2006 Forest Plan. The USFWS has indicated that at the present time, there is no new information that would warrant re-initiation of formal consultation on “take” issued in the December 2005 Biological Opinion issued for the 2006 Forest Plan (Forest Service email 2008). In summary, there is no evidence that white-nosed syndrome is currently posing a risk to the Indiana bat in southern Illinois. Mortality to Indiana bats appears at this time to be confined to New York, Vermont, and Massachusetts.

Additionally, the mortality documented thus far to Indiana bats in New York, Vermont, and Massachusetts, when taking into account all past, present, and foreseeable actions that may affect Indiana bat numbers and habitat on non-Forest Service and Service lands, is not considered to have an adverse cumulative affect on the Indiana bat population.

Regional Foresters Sensitive Species

Eastern Timber Rattlesnake (*Crotalus horridus*)

Alternative One is not expected to have any direct or indirect adverse impacts to this species. Maintenance of the existing open public roads as open to motorized vehicles maintains the current risk of snakes coming into contact with humans and motorized vehicles. With no direct or indirect adverse impacts, there should be no cumulative adverse impacts. Timber rattlesnake habitat quality should remain somewhat constant over time.

Suitable denning habitat is scattered throughout portions of all four areas in the form of rock outcrops, cliff-lines, rock shelters, and boulder fields. There is a risk of direct mortality occurring to hibernating rattlesnakes resulting from prescribed fire. However, the risk of burning directly affecting hibernating rattlesnakes is considered to be low, since snakes should be far enough removed in rocky areas to be insulated from any approaching flame or other adverse effects. Alternative Two is not expected to have any direct or indirect adverse effects on rattlesnake denning habitat.

While fairly frequent burning may reduce the amount of small downed logs on the forest floor, the frequent burning, over time, should result in tree mortality and subsequent increase in the availability of large downed woody debris. This should improve habitat for rattlesnake prey species, and increase the amount of refugia scattered throughout the four areas. Alternative Two should have positive indirect effects to timber rattlesnake habitat, both in the short-term as well as in the long-term.

Alternative Two proposes the creation of up to two acres per year of scattered small forest openings throughout the four areas, which may have indirect habitat benefits by creating small forest openings and increased prey species. However, the low amount of acreage is considered to be such that any improvement should be very minor indirect positive habitat improvement. The felling of shrubs/trees should pose no direct threat to timber rattlesnakes in the four areas.

Implementation of Alternative Two should have no cumulative adverse impacts to timber rattlesnake populations or habitat due to the low level and type of activity proposed for the project area, as well as past, present, and projected to occur on non-National Forest and National Forest lands that could involve timber rattlesnake habitat. Timber rattlesnake habitat should be improved in the project area in the long-term, potentially benefiting rattlesnake populations on the Forest.

Southeastern Myotis (*Myotis austroriparius*)

Implementation of Alternative One will maintain existing foraging and roosting habitat conditions throughout the four areas. The risk of smoke generated from prescribed burning entering Equality Cave is non-existent. There will be no improvement in the quantity, quality, or distribution of summer roosting habitat. There will be no improvement in foraging or summer roosting habitat. There should be no direct or indirect effects, and consequently no cumulative effects.

Equality Cave (Cave Hill Cave) is known to harbor both a summer roosting bachelor colony, as well as winter roosting bats. Since prescribe burning will only take place during the dormant season (October-April), there is no risk to summer roosting bats. Consequently, Implementation of Alternative Two could affect Southeastern Myotis in the following ways: 1) smoke could enter the

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cave while winter roosting bats are roosting in the cave during prescribe burning activities, potentially causing increased winter mortality; 2) the availability of suitable summer roost trees could be affected; and/or 3) the quality of summer foraging habitat could be improved.

M. austroriparius, like most other cave-dwelling bats, is particularly sensitive to disturbance in hibernacula (Amelon et al. 2006). Any activity that results in the disturbance to winter roosting bats could adversely affect bats by causing bats to become aroused too frequently, which could lead to a premature depletion of winter fat reserves, ultimately causing starvation and death. The introduction of smoke generated from prescribe burning could cause such an adverse disturbance. However, if smoke would enter into the cave later in the winter/early spring months, in conjunction with warm weather such that flying insects have emerged, disturbed bats could replenish fat reserves by foraging during suitable nights, which would minimize the magnitude of the effects from this disturbance.

Implementation of Design Criteria #4 should reduce the likelihood, to the extent practicable, of smoke generated from prescribed burning entering Equality Cave. Implementation of Alternative Two should have no direct negative effects from fire.

Prime summer foraging habitat is reported to be wetlands, riparian, and/or bottomland hardwoods. However, it is possible that *M. austroriparius* could use portions of the project area as summer foraging habitat. No wetland or bottomland habitat is present within the four areas, so no prime summer foraging habitat will be directly affected by implementation of Alternative Two.

It is feasible that this species may utilize more upland habitats present within the Cave Hill, Dennison Hollow, or Stoneface Areas for foraging. It is unlikely that *M. austroriparius* would be using Simpson Barrens, since there are no known records of this species in close proximity to the Simpson area. Implementation of either Alternative Two or Three could result in positive indirect effects to upland foraging habitat. Burning should open up the forest floor to a greater amount of solar radiation, resulting in the development a more lush herbaceous vegetative strata on the forest floor, which should increase insect abundance. Alternative Two is expected to have the most beneficial indirect effects to foraging habitat, due to the creation of small canopy gaps (Grindal and Brigham 1998). Riverine, wetland, and bottomland hardwood has been reported to represent the most highly suitable habitat for summer roosting sites, using hollow trees. None of this habitat type is available in any of the four areas proposed for restoration.

Alternative Two is not expected to have any direct effects to this species from shrub/tree felling/removal/girdling since no suitable summer roost trees will be felled/removed from April 1 through September 30.

Eastern Small-footed Bat (Myotis leibii)

While there are no EOR's for the project area, suitable habitat is present, and the species is known to occur at Fink Sandstone Barrens, which is located several miles from the project area. This EOR is the only record of this species in Illinois-it occurs in no other known location. Illinois is located at the extreme edge of its range. Given the low known occurrence of this species in Illinois, it is highly

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unlikely that this species is present within any of the four areas. Additionally, recent bat surveys conducted in Equality Cave have failed to document the presence of this species.

Implementation of Alternative One should have no direct or indirect effects to *M. leibii*, since no management action would take place.

However, for Alternative Two, the possibility remains that eastern small-footed bats could be affected in the following ways: 1) bats roosting within rocky formations (caves, rock crevices, rock shelters, boulder fields, etc.) during prescribed burns could be directly affected by smoke, disturbance, and/or flames; and, 2) indirect beneficial effects to foraging habitat and roost trees.

It is possible that eastern small-footed bats could be present roosting in rock crevices, under rocks or within boulder fields, or in Equality Cave, when prescribed burning activities would be carried out. It is unlikely that bats would be directly harmed, since it is unlikely that any bats would come in direct contact with flames.

Several factors have the potential to minimize the likelihood that *M. leibii* would be directly affected by prescribed burning. Since *M. leibii* has been found to be one of the last to enter hibernacula, seldom entering before mid-November and often departing by early March, it is feasible that any bats roosting in crevices would have already exited from hibernation prior to the time that prescribed burning would take place. Additionally, periods of activity observed during hibernation suggest this species may not spend as much time in deep torpor as do other cave-hibernating species (Amelon and Burhans 2006). Consequently, any potential disturbance to any roosting bats present during the time when burning is conducted is likely to be very minimal. The likelihood of smoke generated from burning entering Equality Cave is minimal, since burning will only be conducted under the appropriate burning conditions (i.e. prevailing wind) or with a “no-burn” buffer zone established around Equality Cave. Consequently, it is unlikely that implementation of prescribed burning activities (Alternative Two) will have any direct adverse effects.

Implementation of Alternative Two should reduce the density of the tree canopy, and mid and understory shrubs-trees, and in create a more diverse forest floor flora. This should result in an improvement in foraging habitat quality for *M. leibii*, due to increased insect production. Grindal and Brigham (1998) reported that small forest openings may offer opportunities for bats to forage. Some smaller-diameter snags could catch fire during burning and fall to the ground. However, this loss should be more than offset by a projected increase in snags created by tree mortality associated from burning.

M. leibii might be present roosting in standing snags during the summer, and potentially directed affected by the felling/removal of trees. No snags will be felled as part of either Alternative Two or Three. Additionally, the likelihood of this occurring is further minimized to the extent practicable by implementation of Design Criteria #2. Implementation of Alternative Two is not expected to have any direct negative effects to the *M. leibii* roosting in snags within the project area, since no snags will be intentionally felled.

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Implementation of burning (Alternative Two) is expected to have positive indirect habitat effects by improving foraging habitat, and the creation of additional snags and cavity trees.

Rafinesque's big-eared Bat (Corynorhinus rafinesquii)

Known habitat frequented by *C. rafinesquii* should not be affected by implementation of Alternative Two as the species is not known from any of the four areas. Bat surveys conducted of Equality Cave in 2006 and 2007 have failed to document the presence of *C. rafinesquii*. All of the records for this species in Johnson County have been summer records and associated with man-made dwellings (i.e. houses/barns). No man-made dwellings are located within the four areas proposed for restoration work. It is unlikely that this bat species would be present during the time of year when prescribed burning would be conducted. Consequently, the likelihood of this species being directly affected by burning is low to non-existent.

Alternative One should have no direct or indirect effects on *C. rafinesquii* since no roosting or hibernating habitats for this species will be affected. With no direct or indirect effects, there should also be no cumulative effects.

The species is most likely to be present within the four areas during summer months, roosting (daytime and/or night-time feeding roosts) in rock shelters and/or hollow trees, or foraging. In Alternative Two, no burning will be conducted during this time of year. Also, no suitable roost trees occupied by bats will be felled/removed from April 1-September 30, which should effectively eliminate the possibility of this species being directly affected by slashing/felling/girdling of trees during summer months.

For Alternative Two, prescribed burning may have immediate short-term negative indirect effects in reducing the number of hollow trees. However, in the long-term burning should have beneficial indirect effects by improving summer roosting habitat through the creation of additional hollow tree cavities and snags resulting from fire-associated mortality. Burning should have beneficial short-term and long-term effects on *C. rafinesquii* foraging habitat as fire reduces canopy density, and increases the diversity and density of the forest floor flora. Grindal and Brigham (1998) reported that small forest openings may offer opportunities for bats to forage.

For the aforementioned reasons, implementation of Alternative Two is not likely to have any adverse direct or indirect effects on *C. rafinesquii*.

Illinois State-Listed Species

The analysis concluded that the bobcat (*Lynx rufus*), red-shouldered hawk (*Buteo lineatus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*) and golden mouse (*Ochrotomys nuttalli*) are state-listed species that have the potential to occur within or near the project area. Information on these species can be found in the Wildlife Working Paper within the Project File.

Management Indicator Species - Animals

Three animal management indicator species wood thrush, worm-eating warbler and scarlet tanager are either known or have potential to occur within the project area. Suitable habitat is present that could support any of these species, or suitable habitat will be created by implementation of the project (see the Wildlife Working Paper for more detail).

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Wood Thrush

Given the quality of habitat, and the somewhat contiguous blocks of mature forested habitat, it is likely that the wood thrush is present in all four areas proposed for restoration. Preferred habitat is larger blocks of mature forest, nesting in the shrub understory. Wood thrush is one of the more abundant bird species (third in numbers of birds) detected each year at a forest bird monitoring transect located in the Cave Hill area.

Alternative One: There should be no direct, indirect, or cumulative adverse effects to this species from the selection of the no action alternative. Habitat conditions would remain into the future somewhat similar to present conditions. In the long term, as individual trees begin to die out and fall out of the canopy, there should be a small increase in nesting cover available.

Alternative Two: There should be no direct effects to wood thrush from prescribed burning, since burning will be completed prior to nesting and fledging. Burning is expected to have immediate short-term negative indirect effects on habitat, since burning could decrease the understory shrub layer.

Burning is expected to have immediate short-term negative indirect effects on habitat, since burning could decrease the understory shrub layer (including abandoned wildlife openings). Aquilini *et al.* (2000) reported that Neotropical migrant birds that nest on the ground or in low shrubs were less abundant in burned areas than in adjacent unburned area. Adverse effects included reduced relative abundance and reduced reproductive success. The study did recommend that habitat for ground and shrub-nesting birds could be maintained by leaving patches of unburned each year. In Alternative Two, habitat for wood thrush would be provided by rotating burn units each year to provide residual shrub cover and burning under conditions that provides a mosaic burn pattern (scattered patches of unburned area), resulting in minimal adverse indirect effects.

The creation of small forest openings (Alternative Two) has the potential to cause direct negative effects to individual birds, through felling of shrubs/trees. It is possible that individual birds could be killed, nests destroyed, or nesting disrupted. However, the direct effects would be very small in magnitude-restricted to a maximum of two acres per year, and of short-term duration such that population viability would not be adversely affected within the project area, nor across the Forest. The opening up of the forest canopy, and creation of small forest openings, is likely to improve habitat quality for post-fledging juvenile wood thrush (Rivera *et al.* 1998 and Anders *et al.* 1998), as well as by adults along the edges of treatment areas and in patches where the canopy is not opened up as much.

Any adverse direct or indirect adverse impacts resulting from the proposed project may reduce habitat quality and bird numbers in the project area for the short-term, but these effects will be for the most part restricted to the immediate project area, relatively short-term in duration, and should not adversely effect the availability of suitable habitat or population levels across the Forest. Consequently, there should be no cumulative effects from the implementation of Alternative Two.

Worm-eating Warbler

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Given the quality of habitat, and the somewhat contiguous blocks of mature forested habitat, it is likely that the worm-eating warbler is present in portions of all four areas proposed for restoration, but in low numbers. Worm-eating warbler is one of the least common bird species detected each year at a forest bird monitoring transect located in the Cave Hill area. Preferred habitat is larger blocks of mature forest having a rich understory of shrubs or saplings. The worm-eating warbler is a ground nester.

Alternative One: There should be no direct, indirect, or cumulative adverse effects to this species from the selection of the no action alternative. Habitat conditions would remain into the future somewhat similar to present conditions. The best habitat consists of the abandoned wildlife openings, and other riparian areas having a shrub understory. In the long term, as individual trees begin to die out and fall out of the canopy, there should be a small increase in suitable habitat.

Alternative Two: There should be no direct effects to worm-eating warbler from prescribed burning, since burning will be completed prior to nesting and fledging. Burning is expected to have immediate short-term negative indirect effects on habitat, since burning could decrease the understory shrub layer (including abandoned wildlife openings). Aquilini *et al.* (2000) reported that Neotropical migrant birds that nest on the ground or in low shrubs were less abundant in burned areas than in adjacent unburned area. Adverse effects included reduced relative abundance and reduced reproductive success. The study did recommend that habitat for ground and shrub-nesting birds could be maintained by leaving patches of unburned each year. In both Alternative Two and Three, habitat for worm-eating warblers would be provided by rotating burn units each year to provide residual shrub cover and burning under conditions that provides a mosaic burn pattern (scattered patches of unburned area), resulting in minimal adverse indirect effects.

Greenberg *et al.* (2006) compared the effects of three fuel reduction techniques, one of which was only dormant season burning, and a control on breeding birds during 2001-2005 in western North Carolina. Worm-eating warblers declined temporarily in some or all treatments, likely in response to understory and leaf litter reductions. The creation of small forest openings (Alternative Two) has the potential to cause direct negative effects to individual birds, through felling of shrubs/trees. It is possible that individual birds could be killed, nests destroyed, or nesting disrupted. However, the direct effects would be very small in magnitude-restricted to a maximum of two acres per year, and of short-term duration such that population viability would not be adversely affected within the project area, nor across the Forest.

The opening up of the forest canopy, and creation of small forest openings, is likely to improve habitat quality (positive indirect effects) for worm-eating warblers by creating areas with a greater abundance of understory shrubs and vegetation. A study conducted by Greenberg and Lanham (2001) in the Southern Appalachian Mountains of Western North Carolina found worm-eating warblers to be more abundant in hurricane created canopy gaps than in untreated mature forest. These researchers also found wood thrush numbers to be lower in gaps.

Any adverse direct or indirect adverse impacts resulting from the proposed project may reduce habitat quality and bird numbers in the project area for the short-term, but these effects will be for the most part restricted to the immediate project area, relatively short-term in duration, and should not adversely effect the availability of suitable habitat or population levels across the Forest. Consequently, there should be no cumulative effects from the implementation of Alternative Two.

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Scarlet Tanager

Scarlet tanagers prefer mature deciduous upland forests, being more abundant in tracts if mature forest greater than 100 ha. However, group selection logging, which creates a mosaic of even-aged patches, may create favorable habitat conditions (The Nature Conservancy 1998). Scarlet tanager is one of the more abundant bird species (fifth in numbers of birds) detected each year at a forest bird monitoring transect located in the Cave Hill area.

Alternative One: There should be no direct, indirect, or cumulative adverse effects to this species from the selection of the no action alternative. Habitat conditions would remain into the future somewhat similar to present conditions. Scarlet tanagers are canopy nesters, preferring larger blocks of mature hardwood forest, such as is prevalent in all four areas proposed for restoration.

Alternative Two: There should be no direct effects to scarlet tanagers from prescribed burning, since burning will be completed prior to nesting and fledging. Burning may result in both short-term and long-term positive indirect habitat effects for scarlet tanagers, by creating a mosaic of unburned and burned area. Nesting habitat should be relatively unaffected, since tanagers are canopy nesters.

The creation of small forest openings (Alternative Two) has the potential to cause direct negative effects to individual birds, through felling of shrubs/trees. It is possible that individual birds could be killed, nests destroyed, or nesting disrupted. However, the direct effects would be very small in magnitude-restricted to a maximum of two acres per year, and of short-term duration such that population viability would not be adversely affected within the project area, nor across the Forest.

No cumulative adverse effects are anticipated to occur to scarlet tanager populations or habitat from implementation of Alternative Two, due to the relatively low level of activities proposed for this project, as well as a low level of activity occurring on non-National Forest and National Forest lands that could involve suitable tanager habitat.

Potential Effects to Population Viability Concern Species

Gray Treefrog (*Hyla chrysoscelis*)

There should be no direct, indirect, or cumulative effects from the implementation of either of the alternatives, since no restoration activity is proposed to take place that will potentially affect ponds within the four areas. Should it be necessary to fell/remove shrubs/trees to release rare plants in close proximity to ponds, implementation of Design Criteria #6 will provide for the maintenance of quality aquatic habitat for gray treefrog and other amphibian species.

Redheaded woodpecker (*Melanerpes erythrocephalus*)

Implementation of Alternative One should have no direct effects to redheaded woodpecker populations in the project area or across the Forest. However, the continued absence of fire in the four areas will perpetuate, into the future, the un-natural and biologically undesirable closed canopy condition, which perpetuates unsuitable or marginal habitat for redheaded woodpeckers.

Implementation of Alternative One is likely to have negative cumulative effects to the species.

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Implementation of Alternative Two is not expected to have any direct effects to redheaded woodpecker populations, since no cavity trees or snags will be felled. Prescribed burning activities will take place outside of the nesting season.

Implementation of Alternative Two is expected to have both negative and positive indirect effects. Repeated burning is likely to transform substantial portions of the four areas into a more “oak savannah” habitat condition, which represents highly suitable redheaded woodpecker habitat. Burning is likely to reduce the number of snags in the project area in the short-term. However, in the long-term, the number of snags is expected to increase, due to tree mortality from repeated burning. The creation of small forest openings (Alternative Two) is expected to further increase the distribution and abundance of suitable habitat, due to the creation of patches of early seral habitat. Implementation of Alternative Two is expected to have positive cumulative effects for the species within the project area.

Eastern Woodrat (*Neotoma floridana*)

Since the most recent monitoring data provided by researchers at Southern Illinois University have documented the longest dispersal distance of translocated woodrats as 1 km, it is felt that woodrats are not currently present in any of the four areas proposed for restoration work. Whether or not woodrats eventually colonize any of the four areas proposed for burning is yet to be determined. However, with the current information, there should be no direct effects to the species from implementation of any of the three alternatives.

However, repeated burning over time, should improve habitat conditions in all four areas, making it more likely that eventually woodrats will colonize at least the closest suitable habitat in Cave Hill, Dennison, and Stoneface, since these areas presently have the best habitat connectivity to each other and to the Garden of the Gods release site. The creation of additional early seral habitats should improve habitat conditions for woodrats all four areas. Since woodrats do not currently exist in any of the four areas proposed for restoration work, implementation of Alternative Two should have no direct, indirect, or cumulative effects.

American Woodcock (*Scolopax minor*)

Early seral and old field habitat is for the most part absent from much of the project area. Abandoned wildlife openings represent the only potentially suitable habitat in the four areas, which consists of somewhat dense shrub and sapling habitat. It is unlikely that woodcock would be using the four areas as courtship, nesting, or brooding habitat, due to the absence of suitable open early seral habitat. Woodcock may utilize rich moist riparian streamside zones for foraging. It is unlikely that woodcock would be present within any of the four areas when either prescribed burning or shrub/tree felling/removal.

Implementation of Alternative One should have no direct effects to woodcock populations in the project area. However, Alternative One is likely to have negative indirect effects by perpetuating the un-natural and biologically undesirable closed canopy condition. The continued exclusion of fire, or some other vegetative treatment that would set-back succession in the abandoned wildlife openings, will further degrade woodcock habitat quality in the four areas.

Implementation of Alternative Two should have no direct effects to woodcock, since it is highly unlikely that woodcock would be present when restoration activities (burning and/or shrub-tree

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falling). However, over time, repeated burning should have positive indirect habitat effects by: 1) creating more a more open understory forested condition (both Alternative Two and Three); and, 2) the creation of small forest openings (Alternative Two only). Given the magnitude of negative habitat trends occurring throughout the range of the American woodcock, the changes in habitat conditions within the four areas is of such a low magnitude so as to have negligible cumulative effects to the species.

Other Wildlife Concerns

The Wildlife Working Paper (Project File) contains much more detailed information on the affected environment and environmental effects to the species addressed above. Additionally, many other concerns were addressed in the wildlife working papers that are not presented in this environmental assessment for the sake of brevity. In response to concerns raised during scoping, we also address the potential impacts of hardwood restoration activities on the following (with more detailed information in the Wildlife Working Paper):

- Fragmentation/Nest Parasitism/Nest Predation
- Migratory Birds

Fragmentation/Nest Parasitism/Nest Predation

In the past five to ten years, an extensive amount of research has documented a problem with habitat fragmentation, and resulting adverse impacts on Neotropical migrant songbirds. Any activity that creates early successional vegetation, and/or reduces the amount and distribution of mature interior forest, may result in habitat fragmentation impacts. Conversely, the loss or fragmenting of early successional, shrub/scrub, and grassland habitats has also been shown to have adverse impacts on Neotropical migrant songbirds associated with early successional habitats. Increased nest predation and nest parasitism rates are often associated with fragmentation impacts.

While this project may remove mature trees on up to two acres each year, and thus create early successional habitat conditions within a predominantly mature forested landscape, the magnitude (<2 acres per year/10 acres in a five year period) and size of forest openings, should be so small that there should be negligible fragmentation effects. The small forest openings that result should also be small enough, and of such a low magnitude, so as to have negligible effects in creating additional nest parasitism or nest predation to nesting Neotropical migrant songbirds. The resulting forest openings should also small enough, and of such a low scope, so as to have negligible effects in habitat connectivity. The small forest openings that may result from implementation of this project should not be large enough in size, or of have suitable habitat connectivity, to support viable populations of Neotropical migrant songbirds associated with early successional habitats.

Burns proposed for the Cave Hill, Stoneface, and Dennison Hollow RNA's are located within two FIMU's. However, neither the burns nor creation of small canopy gaps would be conflict with the FIMU's standards and guides established in the Forest Plan. Alternative Two will result in the creation of forest openings to such a degree so as to diminish the value or intent of the two FIMU's to continue to provide forest interior wildlife habitat.

No roads will be constructed as a result of the implementation of this project, so there should be no increased amount of linear edge habitat created. Any new fire control line that may be required to be constructed should be of such a nature, and low magnitude, so as to not constitute the creation of new linear edge habitat.

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Migratory Birds

Executive Order 13186 signed on January 10, 2001, among other things, directed all Federal Agencies to “take certain actions to further implement the Act” (i.e. Migratory Bird Treaty Act). For purposes of this project, the applicable sections of EO13186 are Sec.3.(e) that each agency shall “to the extent permitted by law... and in harmony with agency missions: (1) ...avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;” and “(6) ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.”

The Forest has taken, and continues to take, many planning and administrative actions, at both the Forest level and the project-level, to conserve populations of migratory birds across the Forest. The Forest is complying with Executive Order 13186, to the extent practicable to work with the USFWS to conserve populations of migratory birds. The Forest consulted with the US Fish and Wildlife Service on the proposed management of migratory birds (planning record) and received no indication that possible Plan actions do not comply with the Migratory Bird Treaty Act (MBTA) and meet fully the intent of Executive Order 13186. The Forest has historically been a leader in Illinois and the Midwest in management to benefit and conserve many species of migratory birds on the Forest. The new Forest Plan expands the amount of area on the Forest on which management will be emphasized to reduce forest fragmentation and improve forest diversity for migratory birds, especially those that need un-fragmented forest, which will be emphasized. This expansion represents an 89 percent increase in habitat, or 99,400 acres managed with emphasis for migratory bird species that are primarily forest-interior species. Thirty-two Forest Interior Management Units (FIMU’s) were designated in the 2006 Forest Plan to be managed to provide habitat to support viable populations of wildlife species associated with forest interior habitat conditions. The Cave Hill, Dennison Hollow, and Stoneface RNA’s fall within two of the FIMU’s established by the 2006 Forest Plan. The 2006 Forest Plan also emphasizes management for both resident and migratory grassland birds with the inclusion of the Large Openlands management prescription and its direction and guidelines.

Standards and guidelines (both at the Forest level and the management prescription level) have been developed in the 2006 Forest Plan to minimize potential direct and indirect adverse effects, and to implement actions to enhance habitat and populations of resident and migratory birds.

The best science available was used to develop the 2006 Forest Plan management strategies and direction for migratory birds, which was developed after consultation with recognized avian scientists. The Forest has been, and is, an active partner in the Central Hardwoods Bird Conservation Region. By participating in Partners in Flight, the Forest is coordinating our efforts with the efforts of many other state, federal, local government, and private conservation agencies to focus bird conservation efforts where they will do the most good. The new Forest Plan employs the latest avian, wildlife, and forestry scientific information and input from these avian scientists. Plan management directions and strategies evolved to serve as countermeasures to identified major threats by insuring forest interior, early-successional forest, and grasslands in the Hoosier-Shawnee ecological assessment area.

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The action alternative proposed and evaluated for this proposed project fully incorporates the standards and guidelines outlined in the 2006 Forest Plan to reduce the potential for adverse impacts to migratory birds from implementation of land management actions, and thus comply with the intent of Executive Order 13186 to protect and conserve migratory birds.

Sec. 3.(e)(1) of Executive Order 13186 also directs federal agencies to “*support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities...*” Sec 3.(e)(2) further states that federal agencies shall “*restore and enhance the habitat of migratory birds, as practicable.*”

The Shawnee National Forest has worked toward these goals for decades. The 1992 Forest Plan contained standards and guidelines designed to provide a wide variety of forested habitat conditions, as well as special standards and guidelines for protection and management of specialized habitats (wetlands, caves, glades, riparian, bottomland hardwoods, ponds, and shortleaf pine forest) to restore and enhance habitats for a diversity of avian species. The 2006 Forest Plan carried forth many of the essential elements of the 1992 Forest Plan, but with expanded effort directed toward the designation of areas within which habitat conditions would be restored/perpetuated to support interior migratory birds, restore historical open grasslands, and in restoring/maintaining high quality bottomland hardwood and riparian forest habitat conditions. The standards and guidelines recognize that all successional stages of forest, open habitats, and unique ecological conditions are important components of a healthy ecosystem that will support viable populations of all native species.

Aquatic Regional Forester’s Sensitive Species

An analysis of the project area indicated that only one Regional Forester Sensitive Species, the Indiana crayfish (*Orconectes indianensis*) was known to occur within Saline and Johnson Counties. This species is listed as endangered in Illinois. Upon further review, this species was not found to occur directly within the project area, nor was habitat for any of the species known to exist in the project area.

The Indiana crayfish has a limited range in the lower Ohio River Valley, where it occurs in southeastern Illinois and southwestern Indiana. Habitat for the Indiana crayfish is rocky riffles and pools of small to medium-sized streams (Taylor 2003, page 1985). Other important habitat components include rocks and woody debris, which provide interstitial space for cover. The primary threat to this species is habitat alteration, including impoundment of streams, removal of cobble and gravel substrate and woody debris from streams, and loss of preferred habitat via sedimentation (Taylor 2003).

At present, there is little information on habitat availability and distribution and abundance of this species on the National Forest. Taylor (2003) stated that populations of this species likely occur on the Shawnee Forest in headwater tributaries of Eagle Creek. Surveys conducted by the Shawnee Forest in the upper portion of the Eagle Creek Drainage in September of 2004 found no crayfish and poor habitat (i.e., steep gradient, ephemeral streams) in tributaries flowing north into Eagle Creek from the Garden of the Gods (Saline and Gallatin counties). A second survey conducted by the

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Forest in 2006 did find the Indiana Crayfish in Eagle Creek, Saline County. Other known sites on the Shawnee Forest include Rocky Branch (tributary to Battleford Creek; Saline County) and Sugar Creek in Johnson County. Good quality habitat also likely exists in the upper portion of the Little Saline River. Although this species is found within the drainage, it has not been observed in any areas that would be directly affected by the prescribed burn.

Effects of the Proposed Action

Indiana Crayfish

Direct/Indirect Effects:

Given that this species is not found within the project area, there will be no direct effects to the species or their habitat. One potential indirect effect would be increased sedimentation within the Saline River watershed from activities upstream that are associated with the prescribed burn (e.g., soil disturbance from fire line construction and use of heavy equipment). Because these species are known to occur within the watershed downstream of the project area, increased sedimentation would negatively affect habitat outside the project area. However, the use of hand tools to build lines across ephemeral, perennial, and intermittent streams, combined with rehabilitation (e.g. disking and seeding) of fire lines, should minimize the potential for increased sedimentation. In addition, stimulation of growth of grasses and forbs will likely reduce future sedimentation, resulting in a slight positive indirect effect.

Cumulative Effects:

The Cumulative Effects Area (CEA) for aquatic species for this project includes the project sites and downstream of the project area. The CEA represents a landscape surrounding the project area where past, present, and future management actions by humans have and/or will occur. A discussion of past, present, and reasonably foreseeable future actions are found in the “Biological Evaluation of Aquatic Regional Forester’s Species” within the Project Record. Since there are no RFSS found within the project area, there are no direct or indirect effects. Thus, there will be no cumulative effects on RFSS.

Determination

As a result of this evaluation, it is my professional determination that implementation of this prescribed burn will not impact individual Indiana crayfish populations or existing habitat. Thus, it will not contribute to a trend toward Federal listing or cause a loss of viability to the population or species.

Management Recommendations

No recommendations were identified for this project for sensitive aquatic species.

Affected Environment - Botanical Resources

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The area used for the analysis of effects on botanical resources is the project area because the effects of the proposed alternatives would be confined to this area. The analysis is temporally bound by a time frame extending from the mid-1800's, when much of the land was cleared for agriculture, to a point 15 years into the future (corresponding to the life-span of the Forest Plan). This is long enough to accurately gauge the management effects and short enough that any deleterious effects resulting could be addressed and reversed or mitigated if necessary.

Rare Plant Resources

There are rare plant species, rare plant communities, and natural areas within or adjacent to the project area. The rare plant communities and natural areas are discussed in Chapter 1 under the heading "Background" and descriptions with discussion are also found in Appendix D of the Forest Plan (USDA 2006). Rare plant resources include:

- Federally listed Threatened and Endangered species,
- State of Illinois listed Threatened and Endangered species,
- Regional Forester's Sensitive species (Forest Plan), and
- Species with Viability Evaluations (Forest Plan).

Federal Listed Plant Species

There are no known locations of federal threatened or endangered plant species within the project areas but suitable unoccupied habitat does occur for the federal threatened *Asclepias meadii* (Mead's Milkweed) within the Saline County Research Natural Areas. A detailed discussion is found in the "Federal Biological Evaluation" in the Wildlife Resources within the Project Record.

Environmental Effects

Alternative 1

Alternative 1, the no-action alternative will have no direct or indirect effects on the federal threatened Mead's milkweed since it is not known from the proposed project areas.

Alternative 2

Alternative 2 will have positive effects on the suitable unoccupied Mead's milkweed habitat within the project site but will have no negative effects to known locations of this species. This species and its habitat are dependent on fires that help stimulate its health and vigor. Without fire, the habitat closes in with trees and shrubs and no longer becomes conducive to Mead's milkweed requirements.

Cumulative Effects

Alternative 1

The no-action alternative will have no direct or indirect effects on the federal Mead's milkweed, and, therefore, will have no cumulative effects to be analyzed for.

Alternative 2

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Alternative 2 will have no direct or indirect effects on known locations of the Mead’s milkweed, and, therefore, will have no cumulative effects to be analyzed for.

Regional Forester’s Sensitive Plant Species and other Rare Plant Resources

Floristic surveys of the project areas have been performed by various botanists and ecologists during the last few decades. There are 32 Regional Forester’s Sensitive plant species (S) and plant Species with Viability Evaluations (SVE), and 29 other State of Illinois listed plant species (IL-T or IL-E) that are known from or have been documented as historically occurring within Johnson and Saline counties where the proposed natural area fire management areas are located. Of these species, 15 are known from the project areas and may potentially be impacted. Detailed information on rare plant resources, their Environmental Effects and Cumulative Effects can be found in the “Federal Biological Evaluation” and the “Biological Evaluation for Regional Forester’s Sensitive Species, Species with Viability Evaluations, and other State of Illinois Listed Plant Species” within the Botany Working Papers (Project Record). Table 7 summarizes the 15 Regional Forester’s Sensitive, Species with Viability Evaluations, and State of Illinois listed species that were analyzed.

Table 7. Regional Forester’s Sensitive (S), Species with Viability Evaluations (SVE) and IL-E (Illinois Endangered) and IL-T (Illinois Threatened) Plant Species Known from the Project Areas. Counties: A = Alexander, G = Gallatin, H = Hardin, Ja = Jackson, Jo = Johnson, Pu = Pulaski, M = Massac, P = Pope, S = Saline, U = Union, and W = Williamson.

Counties/Site	Scientific and Common Name	Status
A,P,S	<i>Amorpha nitens</i> (Shining False Indigo)	(IL-E, S)
Ja,S,U	<i>Asplenium bradleyi</i> (Bradley's Spleenwort)	(IL-E, S)
G,Jo,P,S,U	<i>Carex willdenowii</i> (Willdenow's Sedge)	(IL-T)
G,H,Ja,Jo,P,S	<i>Cirsium carolinianum</i> (Soft Thistle)	(SVE)
H,Jo,P,U	<i>Echinacea simulata</i> (Wavyleaf Purple Coneflower)	(S)
G,H,P,S	<i>Hylotelephium telephioides</i> (Allegheny Stonecrop)	(IL-T, S)
G,H,Ja,Jo,P,W	<i>Lilium superbum</i> (Turk’s-cap Lily)	(S)
H,Jo,P,S	<i>Matelea obliqua</i> (Climbing Milkvine)	(SVE, IL-T)
A,H,Ja,Jo,M,P,S,U	<i>Panax quinquefolius</i> (American Ginseng)	(S)
A,Ja,Jo,P,S,U	<i>Penstemon tubiflorus</i> (White Wand Beardtongue)	(IL-E)
Ja,Jo,P,S	<i>Plantago cordata</i> (Heartleaf Plantain)	(IL-E, S)
G,Ja,Jo,P,S,U	<i>Polytaenia nuttallii</i> (Nuttall’s Prairie Parsley)	(SVE)
A,G,H,S,U	<i>Quercus prinus</i> (Chestnut Oak)	(IL-T)
(G),Ja,Jo	<i>Trifolium reflexum</i> (Buffalo Clover)	(IL-T, S)
Jo,P,S,U	<i>Talinum parviflorum</i> (Sunbright)	(IL-T)

Environmental Effects and Cumulative Effects

Regional Forester’s Sensitive Plants and Species with Viability Evaluations

Cirsium carolinianum (Soft Thistle) is known from Cave Hill RNA. *Echinacea simulata* (Wavyleaf Purple Coneflower) and *Trifolium reflexum* (Buffalo Clover) are known from

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Simpson Township Barrens EA. *Matelea obliqua* (Climbing Milkvine) and *Polytaenia nuttallii* (Nuttall's Prairie Parsley) are known from Cave Hill and Dennison Hollow RNAs and Simpson Township Barrens EA. These plant species are fire-dependent and rely on this type of disturbance for their perpetuation. Studies and observations have shown that not only do these species withstand periodic fire, but become more robust and vigorous; fire suppression can lead to encroaching trees and shrubs that compete for the same habitat as these species (Fogo 2004; Davis *et al.* 2002; Campbell *et al.* 1991; NatureServe 2008; Baskin *et al.* 2007; Ohio Department of Natural Resources 2008; and Eilers 1993).

Alternative 1

In the short-term, there will be no direct or indirect impacts to Soft thistle, Wavyleaf purple coneflower, Buffalo clover, Climbing milkvine, or Nuttall's prairie parsley. In the long-term, within the next 10 to 15 years, a marked reduction in individuals and populations are expected at these natural areas. If the barrens and small openings within these areas are allowed to close in with shade-tolerant species, these rare plant species may eventually become extirpated or severely suppressed at these sites.

Alternative 2

In the immediate short-term, it is expected that more of these individuals will become apparent and those that are already present will become healthier and more vigorous. Minimizing competition from shade-tolerant species will increase the ability of these species to re-establish themselves in the barrens and woodland openings. In the long-term, these species will become more "stable" in their community; they will be in a dynamic natural community that allows them to perpetuate and expand in population size as the community types are restored.

Amorpha nitens (Shining False Indigo) and *Asplenium bradleyi* (Bradley's Spleenwort) are known from Cave Hill RNA. *Hylotelephium telephioides* (Allegheny Stonecrop) is known from Cave Hill and Stoneface RNAs. *Lilium superbum* (Turk's-cap Lily) is known from Simpson Township Barrens EA. *Panax quinquefolius* (American Ginseng) is known from Dennison Hollow RNA. *Plantago cordata* (Heartleaf Plantain) is known from Cave Hill RNA and Simpson Township Barrens Ecological Area. These species are not fire-dependent but they are adapted to fires and can withstand burns that are not severe. All of these species have been exposed to prescribed or wild fires on the Shawnee National Forest and have persisted; often, species such as Turk's-cap lily, American ginseng, and Heartleaf plantain have increased in vigor and/or plant numbers following a prescribed burn (KY State Nature Preserves Commission 2006; Farrington 2006; US Fish and Wildlife Service 1997; Hutchison 1987a; 1987b; Hill 2003a; Schwegman 1987; observations made by Elizabeth Longo Shimp and Stephen Widowski following a prescribed burn April 2, 1997 at Fink Sandstone Barrens Ecological Area; Shimp 2007 monitoring data at Teal Pond Burn Unit).

Alternative 1

In the short-term, there will be no direct or indirect impacts to Shining false indigo, Bradley's spleenwort, Allegheny stonecrop, Turk's cap lily, American ginseng or Heartleaf plantain. In the long-term, within the next 10 to 15 years, a marked reduction in individuals and populations are expected at these natural areas. As these areas are allowed to close in with shade-tolerant species,

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these rare plant species may eventually become extirpated or severely suppressed at these sites. These species are dependent on some direct sunlight in order for them to survive. They exist in a partially shaded environment (with the exception of Allegheny stonecrop) but require the sun flecks to reach the forest floor and cliff edges for their perpetuation.

Alternative 2

In the immediate short-term, it is expected that more of these individuals will become apparent and those that are already present will become healthier and more vigorous. Minimizing competition from shade-tolerant species will increase the ability of these species to re-establish themselves on the forest floor and cliff edges. In the long-term, these species will become more “stable” in their community; they will be in a dynamic natural community that allows them to perpetuate and expand in population size as the community types are restored. No negative impacts are expected to these species, which are fire-adapted.

State-listed Plant Species

Carex willdenowii (Willdenow’s Sedge) is known from Dennison Hollow RNA. *Penstemon tubiflorus* (White Wand Beardtongue) is known from Cave Hill RNA. *Quercus prinus* (Chestnut Oak) is known from Cave Hill and Dennison Hollow RNAs. *Talinum parviflorum* (Sunbright) is known from Stoneface RNA and Simpson Township Barrens Ecological Area. These species are discussed in detail within the “Botanical Resources” working papers within the Project File.

Cumulative Effects

Alternative 1

In the short-term, there will be no cumulative impacts to Soft thistle, Wavyleaf purple coneflower, Buffalo clover, Climbing milkvine, Nuttall’s prairie parsley, Shining false indigo, Bradley’s spleenwort, Allegheny stonecrop, Turk’s cap lily, American ginseng or Heartleaf plantain. In the long-term, within the next 10 to 15 years, there may be negative cumulative impacts to many of these species at these project areas. As the barrens and open woodland areas continue to be encroached on by competing shade-tolerant species, these species may become extirpated or severely suppressed at these sites. With further time, the community types that these species inhabit may become deteriorated further or completely lost with increased shade-tolerant species.

Alternative 2

In the long-term, there will be beneficial cumulative impacts to Soft thistle, Wavyleaf purple coneflower, Buffalo clover, Climbing milkvine, Nuttall’s prairie parsley, Shining false indigo, Bradley’s spleenwort, Allegheny stonecrop, Turk’s cap lily, American ginseng and Heartleaf plantain. With their surrounding habitat becoming restored through prescribed burning, these species should increase in numbers and their populations should become healthier and with more vigor. Additional sunlight to these species and the addition of minerals and nutrients from prescribed burns will help enhance the present populations and should help expose any suppressed populations.

Non-native Invasive Plant Species

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Background on NNIS

Non-native Invasive Species (NNIS) are well documented as having overtaken native plant communities and impacted wildlife habitat as well as costing millions of dollars per year in agricultural crop and livestock damage (Pimentel et al. 2000; McKinney 2002; Alpert et al. 2000; Langeland and Stocker 2001). NNIS are recorded from in and around the Harris Branch restoration project area. NNIS vary in the rate of invasion and spread. Humans and animals are very effective at facilitating the spread of NNIS (plants). Trail impacts include introduction of exotic species (Marion 1994). Benninger-Truax *et al.* (1992) indicate that the number of exotic species is higher along trail corridors than in the forest interior. Benninger (1989) cites several studies as well as her own research that indicates trail corridors are important in the distribution of exotic species. Horse manure collected along trails and at stables contained viable non-native seed. Trail problems attributed to horse use includes exotic-seed containing manure, although NNIS seeds may also be introduced from horse feed, equipment, and mud stuck to horses' hooves (Marion, 1994). Deer dung can contribute to the spread of NNIS, however, Campbell (1996) found that many exotic species were found germinating in horse dung samples but were rare in the deer dung in southern Illinois.

The most aggressive NNIS within the project areas are Japanese honeysuckle and Nepalese browntop. Table 8 presents a list of non-native species commonly found in the project area.

NNIS rates of Spread

Species with rapid establishment and growth rates correlate directly with the greatest potential to overtake native plant communities and change ecological processes for those communities (www.invasivespecies.gov). In the project areas some of these plant species are autumn olive, Japanese honeysuckle, white sweet clover (*Melilotus alba*), yellow sweet clover (*Melilotus officinalis*), Nepalese browntop, and multiflora rose (*Rosa multiflora*).

Those with more moderate rates include hairy chess (*Bromus commutatus*), common day flower (*Commelina communis*), orchardgrass (*Dactylis glomerata*), Deptford pink (*Dianthus armeria*), climbing euonymus (*Euonymus fortunei*), large Fescue (*Festuca arundinacea*), Korean bush clover (*Kummerowia stipulacea*), Japanese bush clover (*Kummerowia striata*), black medic (*Medicago lupulina*), beefsteak plant (*Perilla frutescens*), timothy (*Phleum pratense*), Canadian bluegrass (*Poa compressa*), creeping smartweed (*Polygonum cespitosum* var. *longisetum*), smartweed (*Polygonum hydropiper*), curly dock (*Rumex crispus*), dandelion (*Taraxacum officinale*), low hop clover (*Trifolium campestre*), red clover (*Trifolium pratense*), and white clover (*Trifolium repens*).

Some species, although identified as NNIS, have become naturalized to southern Illinois. These species apparently do not have rapid growth and spread rates and pose less (in a relative sense) of a threat to native ecosystems. Some of these species are Queen Anne's lace (*Daucus carota*), Bitter dock (*Rumex obtusifolius*), and Yarrow (*Achillea millefolium*). Some species are native to the United States, but are not native to portions of southern Illinois or have escaped plantings. One of these species includes shortleaf pine (*Pinus echinata*). Some species are not native, but are

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considered desirable nonnatives and are planted, or an occasional individual escapes cultivation. A couple of these include white mulberry (*Morus alba*) and black locust (*Robinia pseudoacacia*).

Noxious and invasive species (NNIS) have been a problem since early settlement in southern Illinois. With the settlers came new seeds and plants from Asia and Europe. The various species introduced came for ornamental and agricultural purposes. Sometimes, seeds were unintentionally introduced by merely adhering to a horse’s coat or trapped in the mud of a wagon wheel. Trails and roads became conduits for easy dispersal and wildlife became adapted to feeding on the new seed and vegetation brought in. Planting pine plantations with stock from other states also introduced new species to the area. Up until a few decades ago, there didn’t seem to be a major concern regarding exotic species because the problems were not as apparent as they are today. No one ever suspected that the exotics could replace the native vegetation so quickly.

NNIS on the Shawnee National Forest

Past prescribe burns have been extremely beneficial to the native species within forested areas including several ecological areas. Fire is one of the Shawnee’s best management tools for enhancing native populations and habitat especially within the barrens and glade areas. In many cases, this tool allows the more conservative native species to have a competitive edge over the more aggressive exotics and weedy natives. Fire has proven to be effective in native plant recovery on many parts of the forest as well as benefiting wildlife and many of these areas have been/are currently being monitored for the effects of fire (Shimp 1993, 1992, 1991; Spivey 1996; Ulaszek 1995; USDA Forest Service 2007, 2005, 2004, 2003, 2002, 2001a, 2001b, 1998, 1997, 1996, 1995, 1994). Also, the frequency of prescribed fires will be variable depending on the circumstances of each individual area. Alternative 2 would be the preferred alternative since it employs prescribed fire and tree/shrub removal in the event that any new federal threatened Mead’s milkweed populations are discovered.

Table 8. Non-native plant species known to occur at the project sites.

Tree Species	Herbaceous Plants	Herbaceous Plants
<i>Elaeagnus umbellata.</i>	<i>Medicago lupulina</i>	<i>Trifolium pratense</i>
<i>Morus alba</i>	<i>Melilotus alba</i>	<i>Trifolium repens</i>
<i>Robinia pseudoacacia</i>	<i>Melilotus officinalis</i>	<i>Verbascum thapsus</i>
Shrub and Vine Species	<i>Perilla frutescens</i>	Monocots
<i>Euonymus fortunei</i>	<i>Phleum pratense</i>	<i>Agrostis alba</i>
<i>Lonicera japonica</i>	<i>Pinus echinata</i>	<i>Allium vineale</i>
<i>Rosa multiflora</i>	<i>Plantago lanceolata</i>	<i>Bromus commutatus</i>
Herbaceous Plants	<i>Polygonum cespitosum</i> var. <i>longisetum</i>	<i>Bromus inermis</i>
<i>Achillea millefolium</i>	<i>Polygonum hydropiper</i>	<i>Commelina communis</i>
<i>Asclepias syriaca</i>	<i>Prunella vulgaris</i>	<i>Dactylis glomerata</i>
<i>Daucus carota</i>	<i>Rumex acetosella</i>	<i>Digitaria sanguinalis</i>
<i>Dianthus armeria</i>	<i>Rumex crispus</i>	<i>Festuca arundinacea</i>
<i>Kummerowia stipulacea</i>	<i>Rumex obtusifolius</i>	<i>Microstegium vimineum</i>
<i>Kummerowia striata</i>	<i>Setaria faberi</i>	<i>Poa compressa</i>
<i>Lespedeza cuneata</i>	<i>Taraxacum officinale</i>	
<i>Leucanthemum vulgare</i>	<i>Trifolium campestre</i>	

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Past prescribed burns have been extremely beneficial to the native species within several of the ecological areas as well as to other forested areas. Fire is one of best management tools for enhancing native populations and habitat especially within the barrens and glade areas. In many cases, this tool allows the more conservative native species to have a competitive edge over the more aggressive exotics and weedy natives. With the exception of Nepalese browntop, a grass that responds well to fire, most non-native invasive species are controlled or knocked back in vigor with prescribed fire.

Effects of the Alternatives – Botanical Resources

The following effects analysis assumes that the Design Criteria (Table 2) will be implemented. The Inter-disciplinary team identified the potential increase in exotic plants as a result of the prescribed burning as a key issue for the analysis. The indicators used to track changes among the alternatives are the changes in number and frequency of native and non-native plant species.

Key Issue: Prescribe burning may increase the density of exotic plant species.

Indicator: Changes in the numbers and frequency of native and non-native plant species.

Alternative 1

Alternative 1, the no-action alternative, would not have direct impacts on the existing native vegetation in the immediate short-term because although there would be no actions that would enhance native species or discourage the proliferation of non-native invasive species (NNIS) this alternative would have negative indirect impacts to native vegetation over the long term (within 10 to 15 years). No efforts would be made to reduce the spread of NNIS or to encourage the health and vigor of native plant species. A slight increase in both the numbers and abundance of NNIS over the next 10-15 years would be anticipated under the no-action alternative. This alternative is the least favored for the reduction of NNIS and promotion of native plant species.

Alternative 2

Alternatives 2 would have direct positive impacts on the native vegetation. An indirect effect of prescribed burns would be that more sunlight would reach the forest floor encouraging the native shade-intolerant oaks, hickories and herbaceous species to grow more competitively with other shade-tolerant species including NNIS. The proposed prescribed fires would stimulate and favor native vegetation and would help reduce the spread of NNIS. Prescribed fires are typically moderate-intensity fires lit during periods of high soil moisture. These types of fires have positive effects on native plant resources, increasing native diversity and helping reduce NNIS, with the exception of some grass species. Native vegetation should increase in health and vigor with the reduction of the pine needle and duff layer on the ground. Native ground flora from the seed bank should be able to be expressed, in the absence of the thick suppressing mulch, that is currently present. Spring ephemerals and newly established seedlings will have root systems that will aid in the control of any potential erosion by securing the soil during times of heavy rainfall.

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Fire gives native plant species a competitive edge, with the exception of some exotic grasses. It reduces the spread of species, such as Japanese honeysuckle, although it does not completely eliminate it. Some exotic grasses and seeds from shortleaf pine cones may be stimulated by the prescribed fires, but they would have more native species to compete with and site preparation work would focus on removing the woody species such as pine. Most of the other NNIS will typically wane in the presence of prescribed fire.

A decrease in abundance of NNIS over the next 10-15 years is anticipated under this alternative. The number of NNIS species may or may not increase over the next 10-15 years because fire will probably not eliminate all NNIS species. These alternatives would provide the best conditions for the reduction of NNIS and promotion of native plant communities.

Cumulative Effects

The cumulative effects analysis on botanical resources focuses on the subset of actions that have affected or could potentially affect these resources. These include: agriculture (row-cropping), wildfire, prescribed fire, timber harvest, pasture/grassland, ATV/OHM use, roads, disking and seeding, road maintenance and use, trail maintenance, horseback riding, user-developed (non-system) trails and special use permits.

Alternative 1 would not change the current management situation. We do not anticipate an increase in any of the potential past, present, or reasonably foreseeable future actions with the exception of prescribed burns. Over the next 10-15 years this alternative would result in the continued spread of NNIS. These negative effects when viewed in light of the activities currently occurring and those reasonably foreseeable are expected to result in a small cumulative effect. Roads and trails are inevitable conduits for NNIS travel within the project area and adjacent areas. Not only would NNIS continue to spread within the project area, but would also continue to spread to adjacent areas as road and trail use continues. NNIS would continue to increase in number of species and abundance and these increases would translate into an increase in the NNIS in adjacent areas of the Forest.

The action alternative would benefit the project area by reducing the abundance of NNIS. Alternative 2 includes prescribed burns, which offers the best reduction of NNIS within the project area. There should be no negative cumulative impacts on native vegetation in the project area, when considering the above past, present, and reasonably foreseeable future actions. The effects of the actions are localized and will not greatly affect areas beyond the project area. If anything there would probably be a reduction in the spread of NNIS from the project area to adjacent lands. Eventual prescribed burning in these alternatives will aid in the reduction of NNIS spread and give desirable native plant species a competitive edge.

Soil and Water Resources

Affected Environment - Soil and Water Resources

The four project areas are each located within one of four Huc 6 watersheds. All watersheds discussed are those classified by the U.S. Geological Survey as Hydrologic Unit Code 6 watersheds.

A. Soils

The acreage in the Cave Hill project area is located on approximately 18 soil mapping units. The project areas for Dennison Hollow and Stoneface are located on 9 soil mapping units and the project area for Simpson Barrens is located on 14 soil mapping units. Soil mapping units on which this project are located and presented in Tables 1 – 3 of the “Soils and Water Working Paper” within the Project File. Potential damage to soil from fire and soil erosion potential is included in these tables. Potential damage to soil from fire is based on several factors including surface layer, soil texture and rock fragments, slope, and organic matter. Project areas located on relatively gentle slopes are rated as having a slight erosion potential, areas located on moderate slopes are rated as having a moderate potential on roads and trails (slight potential off roads and trails) and those located on steeper slopes are rated as having a severe erosion potential on roads and trails (moderate potential off roads and trails).

B. Water Resources

The Illinois Environmental Protection Agency (IEPA) 2006 Water Quality Report was consulted to assess the water quality of major streams in and adjacent to the project area. Beneficial use support (full support, non support, not assessed), causes for less than full support, and sources of the cause are given for seven streams in Table 8 in the of the “Soils and Water Working Paper” within the Project File. The major source for less than full support of beneficial uses was surface mining. Forest activities were not mentioned in this report as a source of concern.

C. Air Quality

The IEPA 2005 Air Quality Report was consulted to assess the air quality of the project area and surrounding areas. The closest air quality station is in Carbondale, IL. In 2005, the report listed only particulate matter of at least 10 micrometers (PM10) monitoring values from the Carbondale station. The primary standard for this pollutant is 50 micrograms per cubic meter (50 ug/m³) for the annual arithmetic mean and 150 ug/m³ as the 24 hour averaging time. No samples exceeded 150 ug/m³ as samples ranged from 41 – 56 in 2005 and the annual arithmetic mean was 24 ug/m³. Short term trends taken from 2000 to 2005 ranged from 19 – 24 ug/m³ (primary annual standard was 50 ug/m³). Table 13 of the “Soils and Water Working Paper” in the Project File lists estimated county stationary source emissions (tons per year for five pollutants for Johnson and Saline County along with the statewide county high for reference. These two counties have relatively low emissions compared to some other counties in the state.

Forest management must comply with the federal Clean Air Act as amended and applicable state laws and regulations. The IEPA has been designated by the state to administer the Clean Air Act and regulations. All air pollution emissions from Forest Service projects and activities must meet applicable pollution control requirements.

Prescribed fire has the potential to affect air quality. In the early 1990’s the Forest Service accomplished prescribed burning on an average of 1,300 acres per year; but, by the late 1990’s, the average dropped to a few hundred acres. Prior to each burning season, a burning permit must be

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obtained from the IEPA. All areas planned for burning are included in the annual permit. In addition to the state permit, burn plans are written to comply with Forest Service regulations. The permit and the burn plan help ensure that smoke is dispersed in a safe manner with low emissions.

The Forest is located in a Class II airshed. Class II airsheds are all areas of the country not designated as Class I, generally large national parks and wilderness areas. A higher level of air pollution can be added to Class II than to Class I areas and remain within EPA standards. According to IEPA, air within the Forest meets state air quality standards.

Particulate matter is the most important category of pollutant that results from prescribed fire. It is the major cause of reduced visibility, and serves as sorption for harmful gases. No specific health effects of these complex organic chemicals have yet been identified. Certain volatile organic compounds (VOCs) may be of concern to human health. The aldehydes also may be of concern. Of these, formaldehyde has been extensively studied and is known to cause cancer in laboratory animals, and is regulated as a human carcinogen. However, using maximum assumptions of emission and exposure, it is clear that exposure to smoke from prescribed burns does not represent a significant carcinogenic risk. Respiratory irritation and allergic responses are the most important short-term consequences of smoke exposure (Sandberg and Dost 1990).

Carbon monoxide is a poisonous gas that can reach toxic levels above and adjacent to prescribed fires, but these concentrations decline rapidly with increasing distance from the flame. Nitrogen oxides are not likely to be released in significant amounts during prescribed burning because the threshold temperature necessary for their release, 1,500 degrees Celcius (2,732 degrees Fahrenheit), is hotter than temperatures normally occurring during prescribed fire (McMahon and Ryan 1976).

Because prescribed fire is a valuable and essential forest management tool that can potentially have serious effects on air quality, smoke management guidelines have been developed by the Forest Service to reduce the atmospheric impacts of prescribed fire (USDA 1976). This system consists of five steps: (1) plotting the trajectory of the smoke; (2) identifying smoke-sensitive areas such as highways, airports, hospitals, etc.; (3) identifying critical targets; i.e., targets close to the burn or those which already have an air pollution problem; (4) determining the fuel-type to be burned, e.g., whether the fuel load is light, as with a mature pine-stand with a grass understory, or heavy, as the logging slash following clearcutting; (5) minimize risk by burning under atmospheric conditions which hasten smoke dispersion, or by using appropriate firing techniques and timing to reduce smoke pollution (Van Lear and Waldrop 1989). The Forest's prescribed burning plans include smoke management requirements that provide for smoke dissipation to meet state and federal air quality standards, which are found in the Forest Plan (2006, Chapter V pages 47-48).

For the proposed action, the relevant regulatory requirements under the conformity provision of Section 176(c) of the Clean Air Act provide that federal agencies are prohibited from engaging in any activity which does not conform to an applicable state implementation plan under the Clean Air Act. Federal actions must be in conformity with whatever restrictions or limitations a state has established for air emissions necessary to attain compliance with national ambient air quality standards (NAAQS). All counties in which the Forest is located are in attainment for all NAAQS.

All federal activities that are not transit-related must meet the U.S. Environmental Protection Agency's (USEPA) General Conformity Rule. To comply with the Rule, a conformity

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determination must be made for each pollutant, where the total of direct and indirect emissions in a non-attainment or maintenance area caused by a federal action would equal or exceed the *de minimis* thresholds established under the Rule. The term *de minimis* refers to, among other things, emissions that are “so small as to be negligible or insignificant.” The thresholds established under the General Conformity Rule are 100 tons per year or less for each criteria pollutant in order to qualify for *de minimis*. If the total emissions resulting from an action are below the *de minimis* emission thresholds, or if the action is listed as exempt under the Rule due to no emissions or clearly *de minimis* emissions levels, then a conformity determination is not required under the Rule.

Effects of the Proposed Action

Alternative 1

There would be no adverse effects on soil and water resources and existing air quality conditions in the area would be unaffected.

Alternative 2

Soil and water resources can be affected. Sources of sediment on forest lands in the project area are likely. The location in the project area associated with transportation systems, mainly roads and trails can be sources of erosion and sediment under conditions outlined below.

Lopping and scattering of up to two acres of trees and shrubs per year would result in higher initial ground cover on the scattered areas thereby reducing erosion. Over a period of years, this biomass would break down and be converted into an O horizon and later incorporated into the soil. The additional biomass would also provide additional fuel for prescribed burning resulting in a burn of slightly higher intensity. The effect of this would be minimal and short-term.

Low intensity prescribed fire can expose bare soil which can lead to accelerated erosion. The effects of prescribed burning on soil erosion and nutrient loss are related to the severity of the burn. These effects are complex and depend on a host of factors but certain generalizations seem relatively consistent. Burning has its most pronounced effect on the forest floor where carbon (C), nitrogen (N), and sulfur (S) are volatilized and calcium (Ca), magnesium (Mg), potassium (K), and phosphorus (P), and other elements are left as ash. The ash is leached by rains into the mineral soil which increases its base saturation and pH. (Alban 1977) Increased nutrient availability at higher pH's may result in positive plant responses following fire. (Van Lear and Kapeluck (1989) These coincide with results from a variety of more recent reviews and studies. (DeBano 1998) (Liechty, Luckow, & Guldin 2004) (Neary, Ryan, & DeBano 2005) Erosion can increase as a result of prescribed fire, but WEPP model runs indicate that the erosion levels are much lower than erosion and sedimentation levels after a high severity stand replacement fire.

Erosion levels have been modeled using the aforementioned WEPP model runs and these are in Tables 10 – 12 of the “Soils and Water Working Paper” within the Project File. Erosion control measures such as water bars would reduce these levels.

Many of fire lines may occur on areas with fragipans in the soil profile. The stands with areas of fragipans in the profile have been covered above. Ground disturbing activities, particularly in wet soil conditions would have the potential to degrade soil structure, especially in those locations on

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soils with fragipans. The hazard to these soils would result from machine based fireline construction. Fireline location employing roads as fire breaks and hand fireline construction in sensitive areas would reduce soil disturbance to these soils to minimal levels.

Areas with a steeper gradient have a greater erosion potential than areas with a lower gradient and steep trails have higher potential for erosion. Some steep gradients do exist in the project area. (USDA 2006, Appendix B) Trail conditions in these areas will require monitoring and to ensure that they do not degrade to the point where they impact watershed resources due to erosion, sedimentation, compaction or other disturbance.

Some of the project area will have areas of ephemeral, intermittent and perennial streams and fire trails will cross these streams. These crossings are direct points of sediment delivery. Localized disturbance to banks and channel substrate can occur. Fire trail crossings at larger stream channels can cut the banks causing them to become unstable and erode. Some of the fire trails are located on soil mapping units identified as riparian soils and located at or adjacent to these trail crossings (USDA 2006) (see Tables 1 – 3 of “Soils and Water Working Paper” within the Project File)

Air quality can be influenced by prescribed fire in the short term. Prescribed fire is carried out in strict adherence to the burn plan and a permit from IEPA. Short term changes in air quality can be expected to be minor based on past experience (Peterson, personal communication).

Cumulative Effects

The Cumulative Effects Area (CEA) for watershed resources for this project includes all of the four watersheds in which the proposed vegetation management project occurs. These watersheds are: Black Branch/Eagle Creek, Horseshoe Creek/South Fork Saline River, Spring Valley Creek/South Fork Saline River, and Cedar Creek (85,700 acres total with 19, 214 acres in Forest Service jurisdiction). The time period for this analysis is five years.

Cumulative effects analyses takes in to account all known past actions, the proposed action, present actions, and reasonably foreseeable future actions which could or will impact the analyses areas.

Table 5, 6, & 7 of the “Soils and Water Working Paper” within the Project File give the ownership patterns in the CEA, occurrence of wilderness, national natural landmarks, and natural areas, and prescribed burning history back to 2003.

Forest Service Activity

Prescribed burning - Prescribed burning activity in the CEA is outlined in Table 7 of the “Soils and Water Working Paper” within the Project File. The majority of burning has occurred in the Black Branch/Eagle Creek and Horseshoe Creek/South Fork Saline River watersheds and this activity is likely to continue. The purpose of future prescribed burning in the CEA in the wilderness and natural areas is to aid in sustaining their wilderness character.

Watershed assessment – Forest watershed assessments will begin in FY '08 and continue for several years after. Black Branch/Eagle Creek are scheduled for assessments in FY '09. The assessments will include recommendations for projects. These projects will likely be located in the 1,728 acres of wilderness which includes 726 acres of natural areas.

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Non-Forest Service Activity

Sources unknown, channelization, stream bank modification / destabilization, surface mining have degraded water quality in the South Fork Saline River. Surface mining have influenced water quality in Eagle Creek and Cedar Creek has degraded water quality due to unknown sources. (Illinois EPA 2006). These influences can be expected to remain at current levels or to increase in the next five years.

Agricultural activity has not been identified as a cause of degraded water quality in the major streams associated with the project areas by the IEPA. Agricultural activity for crops and livestock (2001 and on) for Johnson and Saline County is given in Tables 9a thru 9j in the “Soils and Water Working Paper” within the Project File. These tables do not give an indication of private activity adjacent to the project areas but give an indication of activity on a portion of the 66,480+ acres not under Forest Service jurisdiction. (USDA – National Agricultural Statistics Service 2007) These activities are likely to have a far greater effect on watershed resources in the CEA than activities the Forest Service would undertake in the long run.

Summary

With proper maintenance, periodic monitoring, and strict adherence to the burn plan, the IEPA permit, and Forest LRMP, the activities associated with the proposed Categorical Exclusion are expected to add minimal amounts to the current erosion and sediment levels in the CEA. If prescribed burning is undertaken at past levels, then there would be a minimal increase in the combined erosion and sediment delivery within the watersheds. The cumulative effect of all of the sediment generated in these watersheds relative to Forest activity is minimal (immeasurable) when added to the natural watershed processes. Smoke from prescribed fire may have a minor, short term effect and an immeasurable long term effect.

Determination

As a result of this evaluation, it is determined that the proposed vegetation management project is not likely to impact watershed resources.

Management Recommendations

No recommendations were identified for this project for watershed resources.

Fire and Fuels Resources

This section analyzes the potential effects of prescribed burning, tree, and shrub removal at Cave Hill, Dennison Hollow, Stoneface Research Natural Areas, Simpson Township Barrens Ecological Area and Adjacent Oak-Hickory Forest Communities. This section will primarily focus on the environmental effects of the application of fire as a land management tool. Detailed information can be found in the “Fire/Fuels Analysis Working Paper” within the Project File.

Enabling Policy and Procedure

Shawnee National Forest Land Management Plan

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The Land Management Plan states the following as goals in the 2006 Land and Resource Management Plan Executive Summary:

“Fire-use, the combination of prescribed and wildland fire-use fire, is applied on the landscape to restore and/or maintain desired vegetative communities, ecological processes and fire-adapted ecosystems; and fire regimes, condition classes and desired fuel-loadings.

The Forest will utilize various vegetation-management activities, such as landscape-level prescribed burning, timber harvesting and timber-stand improvement to help create and/or maintain the ecological conditions necessary to regenerate and maintain the oak-hickory forest-type.

Unique natural environments, such as national natural landmarks and other natural areas, will be managed to preserve and protect their special features.”

Protecting People and Sustaining Resources in Fire-Adaptive Ecosystems: A Cohesive Strategy (USDA 2000); Addressed in the umbrella of the National Fire Plan.

- 1. Improve the resilience and sustainability of forests and grasslands at risk.*
- 2. Conserve priority watersheds, species, and biodiversity.*
- 3. Reduce wildland fire costs, losses, and damages.*
- 4. Better ensure public and firefighter safety.*
- 5. Prioritize treatments by 1) wildland urban interface 2) municipal watersheds, and 3) Threatened and Endangered Species habitat protection. Additional priorities include moving from condition class-3 to condition class-1 or condition class-2 vegetation.*

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment – 10 Year Comprehensive Strategy (USDA 2001)

The Comprehensive Strategy has four primary goals. They are listed below. Specific actions under goal 3 “Restore Fire Adapted Ecosystems” applies to this project.

- Improve Fire Prevention and Suppression Programs*
- Reduce Hazardous Fuels*
- Restore Fire Adapted Ecosystems*
- Promote Community Assistance*

Existing Conditions

Fuel – See the discussion under Vegetation Resources for a description of the project areas. The primary carrier of fire will be leaf litter, dead and downed woody material, grasses, and forbs.

Four Standard Fire Behavior Fuel Models (2006) were selected to represent the fuels within the project area. Table 1 of the “Fire/Fuels Analysis Working Paper” within the Project File depicts the modeled fuel type and its distribution. The photo series method was used to determine fuel loadings for the project area. The total fuel loading was light to moderate and is considered normal for Southern Illinois. The average fuel loading was 13.9 tons per acre. Table 2 of the “Fire/Fuels

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Analysis Working Paper” within the Project File depicts the distribution of fuels by size class for the project.

Fire History - Fire history for Southern Illinois was well documented in the 2006 Shawnee National Forest Land and Resource Management Plan. Excerpts from The Forest Plan are found in the “Fire/Fuels Analysis Working Paper within the Project File”.

Detailed fire history records for the Shawnee National Forest are available from 1986 to present. Table 9 depicts the known wildland fires that occurred within the project area during this period.

Table 9: Project Area Fire History (1986 – Present)

Fire Name	Size	Year
Weidman	133	2005
Eagle Mountain	55	2004
Eagle Mountain Road	5	2004
Former	1	2002
Sulphur Springs	6	2000
No Name	80	1994
No Name	2	1994
No Name	1	1998
Trigg	1	1995
Upper Simpson	5	1998

Limited fire history records are available from 1961 to 1983. These records divide fires into two groups, greater than 10 acres and less than 10 acres. During this period, there were six fires recorded within the project area. Five fires were greater than 10 acres and one less than 10 acres. The majority of the large fires occurred in the Cave Hill, Stoneface, and Dennison area. The largest acreage fire recorded in the Simpson unit was only five acres. Additionally, it was reported that much of the Cave Hill area burned during wildfires in the mid 1950s (Personal communication between Carl Joe Frick and Elizabeth Shimp during 1991 and August 25, 2004).

Prescribed burning has also historically occurred within the project area. During March 2007, 82 acres were prescribe burned at Simpson Township Barrens EA, 119 acres at Cave Hill RNA, 25 acres at Dennison Hollow RNA, and 36 acres at Stoneface RNA, however, these prescribed burn areas are not included in this project area. See Table 1 of the Environmental Assessment for an account of the past prescribe burns to these areas. These burns were typically 200 acres or less.

Fire Regime and Condition Class - Fire Regimes are used to classify geographic areas based upon historical fire frequency and severity (See Exhibit 1). Condition Class describes a geographic area’s departure from its historic Fire Regime (See Exhibit 2). The project area is classified as a Fire Regime class 1 according to analysis done by the USDA Forest Service’s Rocky Mountain Research Station.

- Exhibit 1:** Forest Fire Regimes (Schmidt *et al.* 2002)
- I = 0-35 year frequency, low severity
 - II = 0-35 year frequency, stand replacement severity
 - III = 35-100+ year frequency, mixed severity
 - IV = 35-100+ year frequency, stand replacement severity

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V = 200+ year frequency, stand replacement severity

Utilizing the fire history and fire regimes for the project area, it was determined that the timbered units have missed between 2 and 4 fire return intervals, making them a condition class 3 (See Exhibit 2 of the “Fire/Fuels Analysis Working Paper” within the Project File for definitions of each condition class). USDA Forest Service’s Rocky Mountain Research Station analysis shows most of the Shawnee National Forest to be a condition class 3 with only small portions of the Mississippi Bluffs Ranger District at condition class 1 or 2.

Fire Behavior - Fire behavior predictions, as discussed in the effects section, were modeled using the BEHAVE Plus program. The inputs required for the models are in the categories of Fuels, Weather, and Topography. The fuels inputs include downed dead woody debris moisture content. The topography input required is slope. Slopes were averaged 15 % and ranged from 0 – 40% for the project area. Weather inputs were derived using the districts existing burn plan prescription parameters. Modeling was done at both the “hot” and “cool” end of the prescription in order to determine the full range of expected fire behavior. See Table 4 of the “Fire/Fuels Analysis Working Paper” within the Project File for prescription variables that were used. Predicted fire behavior was averaged for the project area with a weighting factor used for different fuel types. The following table represents the range of expected fire behavior for the environmental prescription listed in Table 4 of the “Fire/Fuels Analysis Working Paper” within the Project File.

Rate of Spread (chains/hour)	Flame Length (feet)	Scorch Height (feet)	Probable Tree Mortality (Sugar Maple) (%)
1 – 6.8	1 – 2.7	1.9 – 11.8	21.9 – 27.2

Resistance to Control - Burn plans are developed to ensure enough resources are assigned to the burn to ensure control of any spot fire or escape even at the hottest end of the prescription. The containment objectives for any spot fire or escape are to confine, contain, and control them as soon as possible. The safest and most efficient method of suppression is through direct attack tactics. Direct attack methods for handcrews and engines suggest that flame lengths be less than 4 feet and fireline intensity should be less than 100 BTU/ft/second. The conditions within this project area meet the requirements for direct attack and are similar to other burns recently conducted on the forest. More detailed information is found in the “Fire/Fuels Analysis Working Paper” within the Project File.

Alternative 1

Under the No Action alternative there would be no prescribed fire activities and no tree removal activities. Natural process of succession, and disturbances such as insect and disease infestations and mixed severity wildfires would continue to occur over time.

Direct Effects

There are no known direct effects to fuels or change to surface loading in the short term by taking no action.

Indirect and Cumulative Effects

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Over time, in the absence of prescribed fire or any treatment that would reduce surface fuels, ladder fuels, and crown bulk density, the fuel loading may continue to increase. Debris is added to the forest floor annually. At some point, the amount of debris added may equal the amount that decays yearly, but this scenario is impossible to predict. If fuels continue to increase, the area may experience a high severity wildfire. Smoke production related to a high severity wildland fire may exceed the Ambient Air Quality Standards for PM 2.5, PM 10, and Carbon Monoxide. This smoke production could likely effect population centers such as Harrisburg. The timbered portions of the project area that were in a condition class two will be replaced with condition class three. Condition Class three is described as having a high risk of losing key ecosystem characteristics due to wildland fire.

Alternative 2

The burns would be implemented when weather and site conditions are conducive to meet site-specific management objectives. Burns would be planned and implemented during the most optimal periods, depending on the natural community. Roads, trails, streams and ravines will be used as natural fire-control lines whenever possible. Other fire-control lines—areas cleared of vegetation by leaf blowers, raking, mowing or other mechanical means—would be prepared before burning, as necessary.

Prescribed fire would be introduced at one to five-year intervals for up to three burns within the next ten years. The prescribed burning would include associated firelines to contain the fire. Control lines would be constructed manually or mechanically and would generally follow past fire-control lines along the perimeter of the project area. In accordance with Forest Plan standards and guidelines to protect the Indiana Bat, no burning would be conducted between May 1 and September 1.

Direct Effects

Trees and shrubs will be cut around populations of Meads Milkweed. Cut material may be removed, left on-site in piles and burned, or scattered. If left on-site, this will increase fuel loadings by 3 – 8 ton per acre in these areas. Burning will reduce this material back to an acceptable level, however, there will be a time-lag between the cutting and burning in which increased fuel loadings will be present. If the material is scattered, it may require multiple burns to reduce fuel loadings back to the desired level of 10 ton per acre or less.

Prescribed burning will reduce surface fuel loads to 10 tons per acre or less in units both units. Some snags may be removed along control lines to reduce the probability of spot fires outside the project area. Snag removal will adhere to Indian Bat protocols. The project area will be returned and/or maintained at a condition class one.

Smoke emissions from prescribed burning would be managed to meet the Clean Air Acts Ambient Air Quality Standards for PM 2.5, PM 10, and Carbon Monoxide. A smoke management plan will be completed for this burn. A smoke permit will be obtained from the Illinois EPA and burning will only be conducted with concurrence from the State. The nearest smoke sensitive areas are the communities of Harrisburg, Equality, Herod, and Simpson. Burning will be conducted under conditions that prevent negative impacts to smoke sensitive areas.

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Indirect Effects

Cut material from the tree and shrub removal, if left on-site and piled, will burn at very high intensities. This may cause small areas of soil sterilization. Piles should not be placed within riparian filter strips or increased run-off could occur.

Cut material from the tree and shrub removal, if left on-site and scattered, will burn at higher intensities when fuel moistures are low. This would likely not sterilize the soil, but it may remove ground cover provided by the duff layer and expose mineral soil. Material should be scattered widely and should not be placed in the riparian Streamside Management Zone to ensure a filter strip remains and run-off does not occur.

Reducing fuel loadings to 10 tons per acre or less will change the Fire Behavior Fuel Model for the timbered units to a TL2 (low load, broad leaf litter). In the event a wildfire should occur within the project area, fire behavior would be reduced and effects from the fire would be less severe. Table 6 of the "Fire/Fuels Analysis Working Paper" within the Project File depicts expected fire behavior and effects for TL2, TL6, and TL9 at the hot end of the prescribed burn prescription.

Introducing fire into the barrens habitat will likely reduce the encroachment of early successional species and encourage more grasses and forbs. As this occurs, the barrens will convert from Fire Behavior Fuel Model GR2 (low load, dry climate grass) to GR4 (moderate load, dry climate grass) or GR7 (high load, dry climate grass). This change will be due to a more continuous fuel bed and increased fuel loading. This change will increase potential fire behavior. This increase is actually seen as beneficial in meeting the resource objectives. It will aid in reducing the encroachment of pioneer species into the barrens, and may help increase the size of the barrens by killing adjacent over-story trees. Increased fire behavior is not a fire management concern because the barrens are relatively small and surrounded by timbered units where wildfires can easily be contained. Table 7 of the "Fire/Fuels Analysis Working Paper" within the Project File shows a comparison of fire behavior for the three grass fuel models at the hot end of the prescribed burn prescription.

Cumulative Effects

Past Projects: Prescribed burning has historically occurred within the project area. During March 2007, 82 acres were prescribe burned at Simpson Township Barrens EA, 119 acres at Cave Hill RNA, 25 acres at Dennison Hollow RNA, and 36 acres at Stoneface RNA, however, these prescribed burn areas are not included in this project area. Prescribed burns occurring within the project area are depicted in Table 1 of the Environmental Assessment.

The Eagle Mountain prescribed burn is adjacent to the project area on the south side of Dennison Hollow Natural Area. This project, 542 acres, was burned in the fall of 2006. It is likely that it will be burned again in the next two to four years.

Future Projects: The Shawnee National Forest plans to burn 5162 acres in fiscal year 2008. Approximately 3100 acres are planned on the Hidden Springs Ranger District. There are no burns planned in close proximity to the project area (all are greater than 5 miles away).

The Shawnee National Forest Land and Resource Management Plan allows up to 12,000 acres per year of prescribed burning forest wide. Current planning and implementation capabilities do not

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have the capacity to meet this element of the Forest Plan. In the near future, it is expected that the forest will burn an average of 5000 – 7000 acres per year.

Smoke Emissions: (note: See Soil and Water Resources – Air Quality discussion for more information regarding smoke emissions) All burn projects must comply with the elements of the Clean Air Act (CAA) as amended, 1990, and State Implementation Plans (SIP), which are state-derived implementation documents of the elements of the CAA. The State of Illinois has not yet finalized their SIP, so only compliance with the CAA is dealt with here.

The CAA prescribes National Ambient Air Quality Standards (NAAQS) for criteria pollutants (Particulate Matter < 10 microns in diameter (PM₁₀), Particulate Matter < 2.5 microns in diameter (PM_{2.5}), Total Suspended Particulate Matter (TSP), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Ozone, Carbon Monoxide (CO), and Lead (Pb)) to limit the negative health or welfare effects from air pollution. Areas not meeting these standards are considered “non-attainment areas,” and states must develop plans to improve air quality there. In general, southern Illinois has good air quality and meets the NAAQS. In fact, the area around Carbondale had the lowest annual average in the state for PM₁₀ at 19µg/m³ in 2005 (the year of most recent data). The only non-attainment areas in Illinois are in the Chicago Metro Area and Madison, Monroe, and St. Clair Counties in the East. St. Louis Metro Area, which were non-attainment for 8-hour ozone concentrations only. These counties are over 90 miles northwest of the project area and are outside of the range that expected smoke emissions will reach.

The Clean Air Act also proscribes measures called Prevention of Significant Deterioration (PSD) to prevent limit the impacts to visibility in certain areas. The entire Shawnee NF and surrounding counties are in a Class II area, which allows for some incremental increase in pollution, but not to the limit of the NAAQS. Class I areas are those with high air quality that allow only minor additional pollution. The nearest Class I areas are at the Mingo Wilderness Area in southeast Missouri (approximately 95 miles to the southwest) and Mammoth Cave National Park (approximately 180 miles east-southeast in central Kentucky). These areas will not be affected by this project.

Burning is expected on 5000 - 7000 acres per year over the next 10 years on the Shawnee National Forest. This is an increase from historical levels which began in 2007 when the forest burned 4700 acres. Previous to 2007, the forest burned less than 1500 acres per year annually. Burn Bosses will coordinate with the Illinois State EPA to ensure emissions are within Air Quality standards and smoke does not negatively impact the public. Burns will be conducted under conditions that provide good lift and transport of smoke away from population concentrations. Size of units burned may be limited to reduce the volume of smoke generated at one time. Public notices will be provided to the local media, fire departments, and residents neighboring the projects. Visibility on roadways could be impacted, so burn bosses will ensure affected roads are signed throughout the burning periods to mitigate this hazard.

Effects from Fireline Construction

Firelines throughout their many stages (construction, utilization, restoration) have not had any negative effects to project sites when constructed with leaf blowers. These lines are only 2 - 4 feet in diameter, do not remove the organic duff layer, and often leave decaying woody debris across the

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line. As conditions become more dry in the late spring, leaves are more easily blown around by the wind and these lines will usually have 25 - 50% ground cover on them by spring green-up. By fall leaf off, these lines are completely covered over and can't be seen. No rutting, channeling, or other evidence of an erosion problem associated with leaf blown lines (Fire/Fuels Analysis Working Paper).

Firelines constructed with the dozer in timbered stands do remove the organic duff layer and are approximately 5 - 6 feet in diameter. The State Best Management Practices are followed when constructing dozer lines, so these lines will have water control structures when built on a slope. Additionally, berms on the downhill side of the line are knocked down in order to prevent water channeling. Like leaf blown lines, these lines will become partially leaf covered from wind blown material beginning in late spring. By fall leaf-off, these lines are also completely covered. No evidence of erosion on these types of firelines have been apparent either (Fire/Fuels Analysis Working Paper).

Heritage Resources

This section describes the heritage resources concerns with the Hidden Springs Natural Area Management project area, including: (1) Affected Environment, (2) Design Criteria developed to protect and preserve the heritage resources, and (3) a discussion of the potential effects of each of the proposed alternatives.

Affected Environment - Heritage Resources

The primary heritage resource issue in this analysis is the preservation and protection of heritage resources in the Cave Hill, Dennison Hollow, and Stoneface Research Natural Areas (RNAs) and the Simpson Township Barrens Ecological Area (EA) and the assurance that significant heritage resources are not affected by the implementation of the planned activity. Archaeological sites are located on and in the ground and are affected by any activity that disturbs the soil. Because all earth-disturbing activities will be confined to the project area, the area under consideration is the project area itself. Since project activities are confined to the project area and other heritage resources beyond the project boundary are protected by law and it is reasonable to limit the analysis to the project area boundary.

Prescribed fire on the Shawnee National Forest is generally of low intensity and short duration. With few exceptions, prescribed fires will not burn hot enough to reach mineral soil. Temperatures are typically not high enough to cause heat alteration, exfoliation, or other damage to stone, concrete, mortar, or glass, metal and ceramic artifacts. Given the low intensity of typical prescribed fires, controlled burning is not expected to adversely affect prehistoric and historic sites that do not contain above-ground combustible elements. Thermal alteration is expected to be limited to combustible residue deposits (soot), which generally is washed off in the rain.

Design Criteria - Heritage Resources

The design criteria developed for the analysis of the Hidden Springs Natural Area Management Project included methods developed decades ago with the passage of the National Historic Preservation Act of 1966 (NHPA) , and its implementing regulations. According to Section 106 of

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the NHPA, “The agency official shall take the steps necessary to identify historic properties within the area of potential effects. The area of potential effect is defined as “...the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties...The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.” [36CFR Part 800.16(d)]. In addition, the site identification process for projects related to the prescribed fire program is also further guided by a Programmatic Agreement between the Shawnee National Forest, the Advisory Council on Historic Preservation and the Illinois State Historic Preservation Officer. Section 106 of the NHPA also allows for the development of programmatic agreements to govern the implementation of a particular program and multiple projects [36 CFR Part 800.14(b)].

The methods agreed to in the Prescribed Fire Programmatic Agreement are not designed to locate all cultural resources that may be within the APE, but to locate those that have the potential to be affected by the undertaking, including: 1.) site with above-ground combustible features; 2.) historic cemeteries; and 3.) prehistoric Native American sites in close proximity to areas of high fuel build-up. This methodology, therefore, is applicable only to prescribed burning, and is not applicable to any other activities carried out by the Shawnee National Forest.

A reasonable and good faith effort will be made to locate all cultural resources with above ground combustible features and cemeteries within the entire APE. This includes a search of previously documented site records, a literature search of historic acquisition maps and aerial photographs, as well as a pedestrian survey of known roads within the project area. Because historic sites are largely related to the historic transportation system, a cultural resource inventory using the old road system within the APE will allow the heritage program specialist to find and record historic sites with above ground combustible elements.

Effects of the Alternatives – Heritage Resources

Alternative 1

There will be no direct, indirect or cumulative effects to heritage resource as a result of the implementation of this alternative because no natural area management activities (vegetation removal and/or prescribed fire) would occur, and therefore, earth-disturbing activities would not take place.

Alternative 2

In the proposed action, the Hidden Springs Ranger District proposes to actively manage four natural areas on the Forest. Planned management activities include prescribed fire, along with tree and shrub removal where necessary. Trees and shrubs will be removed by cutting and girdling, which is not considered to be an earth-disturbing activity. Firebreaks will be constructed with rakes and blowers, and when possible, will also utilize natural firebreaks such as roads, as well as old fire lines.

All efforts to identify, evaluate, and manage historic properties (heritage program activities) in connection with the planning of prescribed burn activities were carried out in accordance with the stipulations specified in the Prescribed Fire Programmatic Agreement, and 36 CFR Part 800. All sites with above ground combustible features, historic cemeteries will be avoided during project implementation. There is

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no prehistoric rock art located within the project area and potential affects to prehistoric sites will be avoided through project redesign. There will be no effect to heritage resources as a result of the implementation of this project.

Summary of Effects

There are no indirect effects as a result of the implementation of any of the three alternatives included in this analysis. As discussed in Section A. Soil and Water: Soil Erosion, fire lines made with leaf blowers or hand rakes leave a root mat intact and do not require mitigation. If the soil and root mat remain intact, the artifacts buried in the soil will also remain intact. Because there will be no heavy equipment on archaeological sites, there will be no bare soil and no subsequent erosion, and again no indirect effects to heritage resources. In addition, researchers (Cusha et al. 1971; Dobrowolski et al. 1992; McKee 1982; Swift et al 1993; Van Lear and Waldrop 1989) have determined that prescribed fires have very little impact on soil movement or erosion.

The analysis of cumulative-effects takes into account all known past actions, present and reasonably foreseeable future actions which would be likely to affect the area of analysis: vegetation management, recreation use, prescribed and wildland fire. Because there are not expected to be adverse effects (direct or indirect) to the archaeological resources as a result of the actions proposed in any of the alternatives, there would be no overlapping cumulative effects.

Socioeconomics

Because of the limited nature and extent of the project, there would be no significant effect of any kind on the economic resources of Saline or Johnson counties. Implementation of any of the alternatives would not contribute to any negative impacts to the socioeconomics of either of the counties.

RECREATION AND VISUAL RESOURCES

The affected natural areas are within the natural area management prescription. Recreation is allowed in this management area although the primary focus is the protection of unique natural features. Hiking is permissible but horses are not allowed within the natural areas except on designated trails. Overnight camping is prohibited. Although the unique geographic or other natural features draw numerous hikers to some natural areas, empirical observation indicates that for most of these sites hunting season is the primary period of concentrated recreational use.

The following measures would reduce impacts to recreationists:

- Conduct cutting and burning activities outside of the shotgun deer season and weekends during turkey season.
- Cut brush so as to not leave unsightly stumps or slash near forest system trails.

Avoid burning the largest units (over 300 acres) on autumn weekends when leaf color is peak, or ensure that smoke dispersal is adequate to prevent obstruction of scenic views from other locations on the forest.

EFFECTS ON RECREATION AND VISUAL RESOURCES

Alternative 1

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Under this alternative, no active management would be conducted on the natural areas. In the short-term (5-10 years) there would be little change in recreation opportunities from the present condition. However, the long-term decrease in the natural diversity of forest plant communities would decrease the areas attractiveness for recreation.

Alternative 2

Active management of the natural areas may initially have adverse impacts on recreation. The presence of workers cutting brush and trees, or the resulting blackening of the post-burn landscape might be surprising to someone not expecting to see the evidence of such activities. Areas of high heat intensity, especially when resulting in overstory mortality, can be particularly disturbing to those persons unaccustomed to the immediate effects of fire. These visual references to management activities and the response they elicit in the public would however, diminish over a very short time. If the prescribed burn is implemented in the late fall or winter, spring ephemerals will be established within a few months where leaf litter has been alleviated by the fire. The results following a spring prescribed burn will be within a few short weeks and the ground flora will become established with ephemeral wildflowers as well as other emerging vegetation.

If treatment methods work as anticipated the proposed action will have the most long term effect on the structural composition of the forest. As subsequent treatments of fire reduce stocking levels and lessen the density of the brush layer, the forest will assume a more open, park-like appearance. This may be visually appealing to some, while being seen as detrimental by anyone whose recreational activity is enhanced by heavy cover or short sight distances. Success in the proposed action will restore a greater mosaic of forest and grassland types across the forest and would enhance the visual and recreational experience.

During burning operations everybody not involved in the project would be precluded from entering the area, thus potentially displacing some recreationists. This will probably have the greatest effect on hunters, but no management will occur during the shotgun deer seasons. The presence of work crews in large numbers, or operating noisy power equipment, would also impact the type of experience that users seek when they pursue activities in remote, back country locations.

Burning large areas on a given day can produce enough smoke to temporarily effect visibility. Smoke emissions would likely be most detrimental to the recreationists on fall days when many people visit the Shawnee to view the autumn leaves. Because the natural areas and adjacent managed lands will be broken up into smaller burn units, it is unlikely that the proposed action would produce enough emissions to impact the view outside of the immediate project area. Typically a smoke plume would become another feature of the view and not an obstruction. It is anticipated that smoke would only be a problem from vantage points with long, unencumbered views, such as Garden of the Gods, and then, only when the largest units are being burned. Mitigation defined in Table 3 would preclude this effect.

CUMULATIVE EFFECTS ON RECREATION AND VISUAL RESOURCES

Alternative 1

Looking at the past, present and reasonably foreseeable future actions in these areas there would be a cumulative loss of recreational opportunity if these areas are lost to forest succession. These

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unique natural areas provide for a type of educational and scientific recreation experience that would be lost.

Alternative 2

There may be an immediate short-term negative impact on recreation and visual resources for those persons who may view the temporary smoke in the air during the prescribed burn or who view the immediate blackening of the burned vegetation on the ground following the burn as unattractive. In the later short-term, within one to three months, the ground flora will be flourishing with spring ephemerals, grasses and sedges, and a reduction of Japanese honeysuckle and leaf litter accumulation. There will be no negative impacts to recreational and visual resources as these conditions replace the blackened ground-layer.

There should be no negative impacts to recreation and visual resources if trees and shrubs are cut for new findings of the federal threatened *Asclepias meadii*, Mead's milkweed. This is because the areas cut will be minimal and tree/shrub pieces will be scattered and dispersed so as not to be noticeable to a passerby. As a result, there should be no cumulative loss of recreational opportunities and visual resources with this alternative.

HUMAN HEALTH AND SAFETY

According to the Forest Plan, the Forest operates and maintains recreational facilities on public land and provides for the protection of public health and safety. The current deteriorating conditions of the natural areas pose no health and safety risks to users.

EFFECTS ON HUMAN HEALTH AND SAFETY

Alternative 1

Under the no-action alternative, the natural areas would not be restored and the current deteriorating condition of the natural areas would continue to worsen over time. However, this poses no threat to human health and safety.

Alternative 2

During natural area management, only trained employees would operate brush-cutting and prescribed fire equipment. The affected natural area will be closed during management, and every attempt will be made to warn forest users of the activity in progress. With these measures in place, the potential to pose a safety risk to forest users during management would be very low.

Equipment, materials and workers would be transported to the affected trail segment by truck, using existing roads and then by 4-wheel carry-alls on forest trails and firebreaks. However, the level of vehicular use experienced on the affected roads would deviate negligibly from normal levels, and the risk of increased vehicular accidents as a result of the proposed action would be very low. In the event of an accident, emergency response would be the same as currently exists for accidents in the project area.

No hazardous materials would be required for the project and no hazardous wastes would be generated as a result of the project. Although petroleum, oils and lubricants would be needed to

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operate some of the equipment, no fuel or chemicals would be stored on the site. As noted above, the potential for a chemical or fuel spill to occur is negligible; therefore, the potential for adverse effects on human health and safety due to a spill would be negligible.

CUMULATIVE EFFECTS ON HUMAN HEALTH AND SAFETY

Alternative 1

Under the no action alternative, no cumulative effects would occur to human health and safety.

Alternative 2

Some beneficial cumulative impacts on human health and safety would be anticipated under the proposed action. Under the proposed action, the affected natural areas would be managed predominantly with prescribed burns, providing better and safer conditions for recreational use over the long-term. The burns would thin out the underbrush and alleviate the accumulation of debris on the ground making for a better view of the forest floor while recreating. Overall, with better walking conditions, recreational safety would be enhanced in the vicinity of the affected natural areas as a result of the management activity.

IRREVERSIBLE EFFECTS AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in normally forested areas that are kept clear for use as a power-line rights-of-way or a road. Resources analyzed in this assessment are those that could be affected by the proposed action. Given the mitigation measures planned under the proposed action, no long-term negative impacts to any of these resources are anticipated; therefore, no irretrievable commitment of resources is associated with the proposed action.

Soils

None of the alternatives will cause substantial irreversible or irretrievable commitments of soil resources. Soil erosion above natural rates is an irretrievable effect, in that soil is effectively removed from the landscape; however, little loss of soil is anticipated. While there may be some relatively minimal soil loss from implementation of the action alternatives, there would be no long-term impact to soil productivity from soil erosion or soil compaction anticipated for any alternative.

Water Quality

None of the alternatives will cause irreversible or irretrievable commitments to water resources. There may be some short term decrease in water quality but there should be a positive effect to water resources in the long-term.

Vegetation and Natural Communities

There are no known irreversible effects on vegetation resources or natural communities from the selection of any alternative. The natural areas will be monitored for detection and control of exotic species. Weed prevention practices will also be followed. Overall, the effects on vegetation

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resources would be beneficial because of the predicted increase in plant diversity and gradual decrease in Japanese honeysuckle.

Botanical Resources

There are no known irreversible or irretrievable commitments to rare plant resources from Alternative 2. Over the long-term Alternative 1 may have irreversible and irretrievable commitments to rare plant resources. Rare plant species that depend on fire as a disturbance factor for survival may not perpetuate in these areas and could become either extirpated or suppressed. The barrens community types may succeed to dry-mesic forests without open glades or sunny areas conducive to barrens and prairie species.

Wildlife Resources

There are no known irreversible or irretrievable commitments to wildlife from the selection of any alternative.

Disclosures

Clean Water Act - Silvicultural activities identified in the action alternatives comply with Section 319 of the Federal Clean Water Act. The Illinois Non-point Source Management Program, which recommends using Illinois Department of Natural Resources (IDNR) Best Management Practices (BMP's), was developed to comply with Section 319 of the Federal Clean Water Act (IEPA, 2001; IDNR, 2000). These practices, as well as Forest Plan Standards and Guidelines and soil suitability limitations, as determined by the USDA NRCS will be used to guide all action alternatives (Project Record).

Air Quality - The air quality of the Forest meets EPA standards (USDA Forest Service 2003 Annual Monitoring Report, 2004). Implementation of any of the alternatives would result in a few thousand hours of heavy equipment use over the next 1-3 years. The amount of exhaust generated from the level of activity expected in any of the alternatives would not have a measurable effect on air quality in the Forest. There would be a short-term detrimental effect on air quality in the project area and in the watershed during periods of prescribed burning. This could result in long-term, negligible, direct and indirect effects and an insignificant addition to the cumulative air quality of the Forest.

Prime Farmland, Timberland, and Rangeland – Little to no prime farmland occurs in the project area. Most of the soils in the project area are classified as prime timberland soils. There is no prime rangeland on the Forest (USDA NRCS, 1988). More details are available in the Project Record. Site productivity would be maintained in the project area in all alternatives.

Floodplains - Site productivity and riparian function would be maintained in the project area in all alternatives.

Wetlands - Neither of the alternatives will have an adverse effect on the site productivity or function of the sites in the watershed areas near the project areas identified as having one or more wetland characteristics.

Adverse Consequences Which Cannot Be Avoided - Slight, temporary accelerated rates of soil erosion could occur in Alternative 2 from building fire lines when crossing creeks. There could be

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temporary, minor increases in turbidity in adjacent streams after storm events resulting from runoff. Design criteria will be implemented to keep this impact to a minimum.

Irreversible or Irrecoverable Commitment of Resources - None of the alternatives would have an irreversible or irretrievable commitment of resources in the project area or adjacent area if mitigation measures are strictly adhered to.

Irreversible Effects - There are no known irreversible effects on soil and water resources from any alternative.

Irrecoverable Effects - Soil erosion above natural rates is an irretrievable effect. Alternative 2 would result in a temporary, slight increase in erosion rates above natural geologic rates.

Environmental Justice

Neither of the alternatives would have disproportionate, direct or indirect negative effects on any minority populations and individuals living below the poverty level.

Consultation and Coordination

See project record for listing of agencies and persons contacted.

Interdisciplinary Team Members:		
Name	Contribution	Degree
John DePuy	Soils	M.S. Forest Ecology
Mary McCorvie	Heritage	B.A. Anthropology
Elizabeth Shimp	Botany	M.S. Botany
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Mike Welker	Fisheries	M.S. Zoology
Matthew Lechner	NEPA	M.S. Fisheries Science
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References and literature cited are available in the project record.