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Forest Service
Shawnee National Forest
Mississippi Bluffs Ranger District

Environmental Assessment

Buttermilk Hill – Talbott Hollow Blowdown Project

Jackson County, Illinois
T8S, R3W, Sections 19 and 28-33
T8S, R4W, Sections 20-29, 33-36
T9S, R3W, Sections 5-6
T9S, R4W, Section 1

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Chapter 1 - Introduction and Purpose of and Need for Action

The Forest Service has prepared this environmental assessment in compliance with the National Environmental Policy Act (NEPA), the Healthy Forests Restoration Act of 2003 and other relevant federal and state laws and regulations. This assessment discloses the direct, indirect and cumulative environmental effects that would result from the proposed action and a no action alternative. The document is organized into three parts:

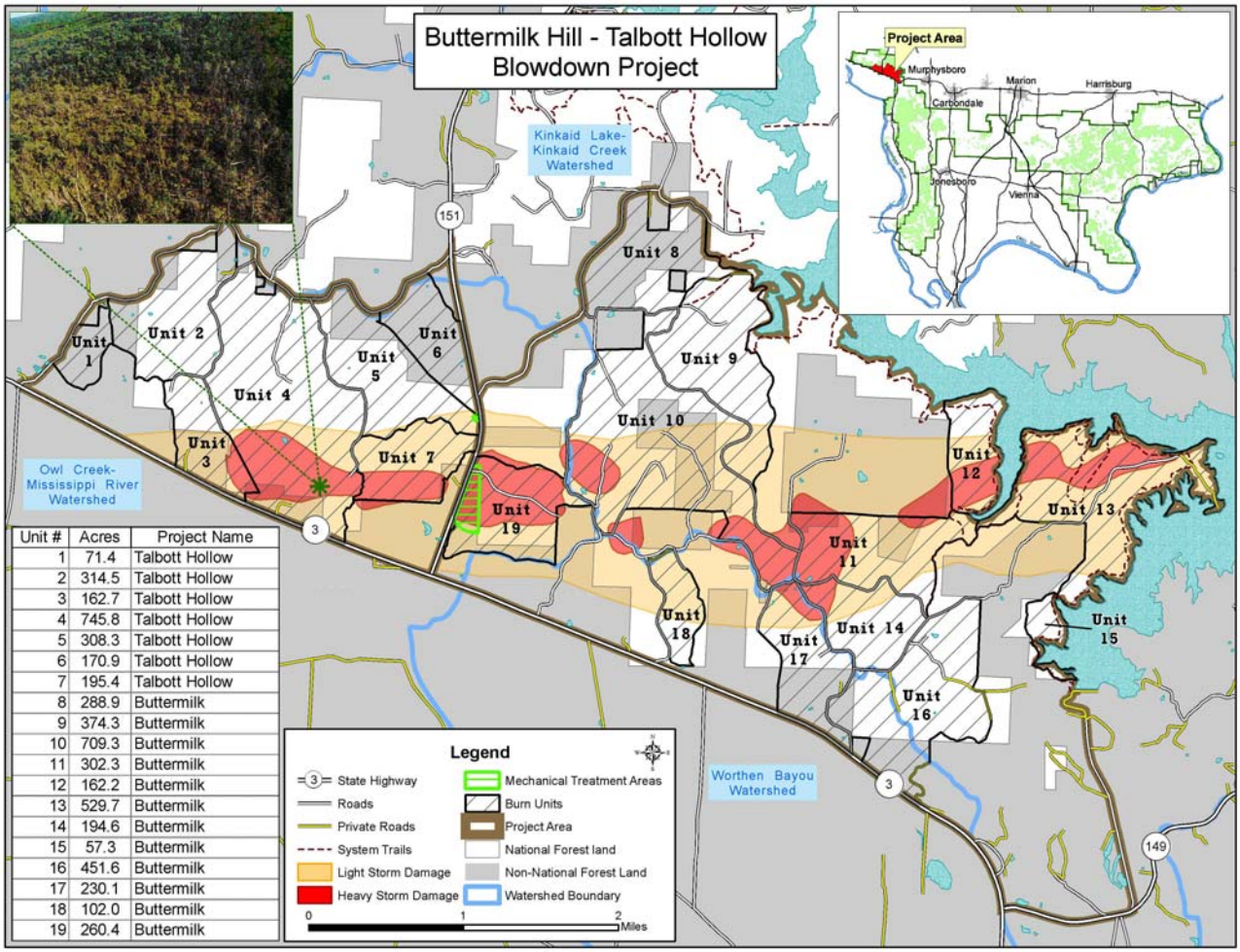
Chapter 1. Introduction and Purpose of and Need for Action: The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
Chapter 2. Alternatives: This section provides a detailed description of the no-action alternative and the proposed action for achieving the stated purpose. The proposed action was developed based on issues raised by the public, other agencies and internally within the Forest Service.
Chapter 3. Affected Environment and Environmental Consequences: This section describes the environmental effects of implementing the proposed action and the no action alternative.

Additional documentation, including the detailed analyses of project-area resources (working papers), is located in the project record at the Murphysboro Work Center, Mississippi Bluffs Ranger District, 2221 Walnut Street, in Murphysboro, Illinois.

Background

On September 22, 2006 a tornado crossed from Missouri into Jackson County, Illinois. The tornado traversed the Mississippi River floodplain before entering the uplands of the Shawnee National Forest (Forest) about 12 miles west-northwest of Murphysboro. After entering the Forest at the mouth of Talbott Hollow, the twister moved east to the Buttermilk Hill area. The storm impacted about 3800 acres including about 2450 acres of Shawnee National Forest and 1350 acres of private land.

Storm effects varied throughout the impacted area with several large areas sustaining moderate to severe canopy damage (areas estimated to have greater than 50 percent of the ground covered with downed wood). Many trees were "snapped off" at about 8 ft above the ground, while others were toppled intact. Over much of the area light damage resulted, such as occasional broken limbs, tops and isolated windthrown trees and small clusters of trees. Light and distinct heavily damaged areas were mapped and are displayed in Figure 1.



Unit #	Acres	Project Name
1	71.4	Talbott Hollow
2	314.5	Talbott Hollow
3	162.7	Talbott Hollow
4	745.8	Talbott Hollow
5	308.3	Talbott Hollow
6	170.9	Talbott Hollow
7	195.4	Talbott Hollow
8	288.9	Buttermilk
9	374.3	Buttermilk
10	709.3	Buttermilk
11	302.3	Buttermilk
12	162.2	Buttermilk
13	529.7	Buttermilk
14	194.6	Buttermilk
15	57.3	Buttermilk
16	451.6	Buttermilk
17	230.1	Buttermilk
18	102.0	Buttermilk
19	260.4	Buttermilk

Figure 1. Project Area Map

The storm radically changed the structure of the forested ecosystem within the impacted area (Figure 2). As we assessed the changed conditions and considered options for responding to them, it became clear that given the intermingled nature of the ownership in the area and the widespread nature of the damage, any management actions on Forest land would be facilitated and enhanced by expanding the actions to adjacent private land. That way any treatments and derived benefits would be applied at the landscape scale. This is important because ecosystem processes rarely operate on a single stand or ownership. After the tornado, the Forest Service approached local landowners and local agencies to discuss options for treating the impacted areas. Several ideas were initially considered, including salvage timber harvests, mechanical fuels reduction, prescribed burning, firewood sales and simply leaving the area to recover naturally. Prescribed burning was chosen as the cornerstone of the treatment proposal because of the ecological benefits and the relatively low cost of implementation.

Tornado-damaged areas as seen from the air one week after the tornado.

The mouth of Talbott Hollow one week after the tornado.

Fuel loadings in a similar stand were measured at 78 Tons/Acre.

This pocket was interspersed with lightly damaged forest.

Figure 2. Photos of Blowdown damage.

Concerns were expressed about the large amount of downed wood and a corresponding increase in the risk of a high-intensity fire. The downed wood coupled with the increased growth in the newly created openings has greatly increased the fuel loading (the amount of combustible vegetative materials). Fuel loading influences the characteristics of a fire. Generally, the higher the fuel loading, the greater the fire behavior and hence the greater the potential for a severe fire (Table 1). Before the blowdown, the fuel loading in the project area was considered average for the central hardwoods region, about 15 tons/acre. During the summer of 2007, we collected fuels data from 60 plots spread throughout the project area (Fire and Fuels Working Paper, Project Record). Fuel loadings more than doubled in some heavily damaged zones and increased across most of the area. Pine stands were particularly susceptible to the winds and fuel loading is now very high in these areas (about 78 tons/acre). The increased fuel loads are predicted to increase flame lengths and rates of spread 2-20 times that of the pre-storm conditions (Fire and Fuels Working Paper). Increases in flame lengths and rates of spread translate into an increase in the potential for a high-intensity fire and more resistance to control.

Table 1. Fuel Loading in the Talbott Hollow and Buttermilk Hill Project Area after the September 22, 2006 Tornado.	
Vegetative Fuel Condition	**Total Average Loading (Tons/Acre)**
Heavy Damage (Hardwood Stands)	28
Heavy Damage (Pine Stands)	78
Light Damage (All Stands)	19
No Damage (Oak-Hickory)	14
No Damage (Mesophytic)	14

Such fires are uncommon but do occur in the central hardwoods. Missouri, Arkansas and Kentucky have each recorded fires of several thousand acres in the past 10 years. In the early 1900's, a Forester with the Illinois Natural History Survey documented widespread fire activity in southern Illinois (Miller 1920). From the top of Bald Knob, he could see six separate smoke columns on March 23, 1920, and numerous smoldering patches on adjacent hillsides. He estimated that two square miles (about 1,280 acres) were already blackened within his viewshed. He further estimated that "fully 80 percent of the mature trees at Fountain Bluff, in Jackson County … show fire scars due to burning." Reports from the 1950's show a very large fire (at least 8,000 acres) occurred near Oakwood Bottoms south of the project area. Two fires of about 400 acres occurred in the early 1980s, one in Jackson and one in Union County. Fire histories in the Ozark Highlands of Missouri and Arkansas reveal even bigger fires (Guyette et al 2006).

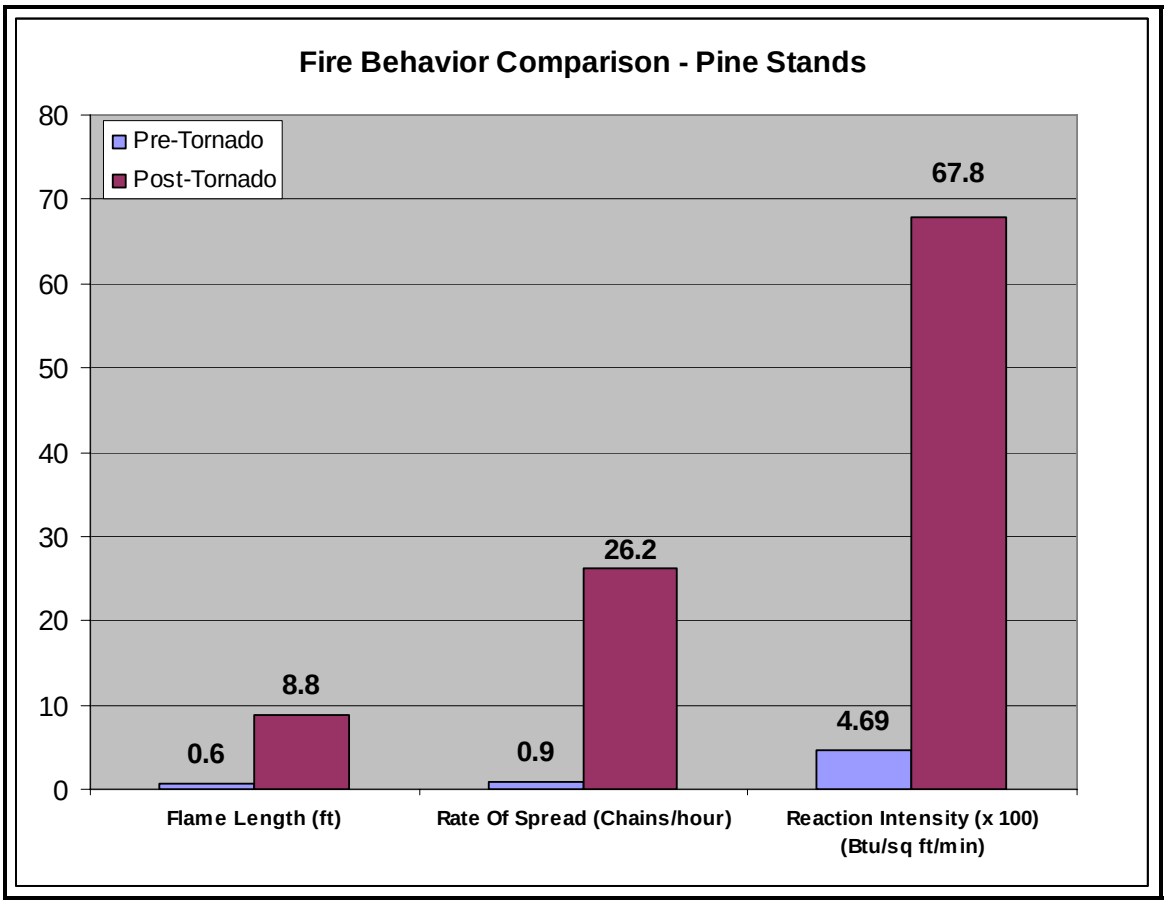


Figure 3. Predicted fire behavior outputs for undamaged and heavily damaged pine stands.

The Healthy Forests Restoration Act directs the Forest Service to reduce the threat of destructive wildfires to local communities, public water supplies and forest ecosystem resources. The proposed project lies, in part, within the watershed for Kinkaid Lake, a municipal water supply watershed. There are higher fuel loadings caused by the tornado event and the entire project area is within close proximity to private property. This act also allows a streamlined analysis process for the implementation of these types of projects. Two alternatives will be analyzed in this environmental assessment, the proposed action and the no action alternative. The increased fire hazard makes it well suited for this type of analysis.

In addition to the threat of a severe fire, some people also saw the storm as an opportunity to help enhance and restore the native hardwood ecosystem. The composition of tree and understory plant species has changed since presettlement times. While oaks and hickories have been dominant in most locations of these forests for thousands of years, these hardwood communities also include other native species such as sassafras, yellow poplar (tulip tree), ash, elm, maple and beech. Many of these moisture-loving trees were formerly restricted to deep coves, stream terraces, and lower slopes. Oaks and hickories tended to dominate the majority of the landscape, including most upland positions. Evidence indicates that oak-hickory forests evolved with and are dependent on frequent disturbance, such as fire, tornados, ice damage, insect damage and human influences. These disturbances perpetuated the oak-hickory system by influencing seedling/sapling survival and allowing sunlight to reach the forest floor. Frequent surface fires favored oak seedlings and saplings over other species, so that when there was a canopy disturbance, oak and hickory trees could grow into the new opening. In recent decades without fire and other disturbances other species have come to be prevalent in the understory and midstory on almost all sites. Their density is so high that it blocks sunlight and dramatically increases the shade.

Shade inhibits seedling growth of many hardwood tree species as well as associated sun-loving herbaceous plants. Oaks and hickories are slow-growing, sun-loving species. Species such as tulip poplar and black cherry grow more quickly but still need direct light. These species are referred to as sun-loving or shade-intolerant species and will die in dense shade. Native shade-tolerant species, such as maple, elm and beech, can survive under dense shade and will respond with rapid growth when given light and room. In dense forest situations like the project area maple and beech dominate the understory. When an event such as the blowdown or natural death of overstory oaks occurs and sunlight reaches the forest floor, these species will replace the oaks and hickories, creating a different type of forest ecosystem.

The 2006 Environmental Impact Statement (EIS) on the Shawnee National Forest Land and Resource Management Plan (Forest Plan) explains that a diversity of habitats across the landscape is most desirable to sustain overall biological diversity. With no action to stem the tide of understory and midstory encroachment of shade-loving trees, many oak-hickory stands would eventually convert to domination by maple-beech forest communities. The Forest Plan prescribes the management and restoration of the majority of the Forest as an oak-hickory hardwood ecosystem. A primary reason for the Forest Plan decision to actively manage for an oak-hickory hardwood ecosystem is that deciduous forests dominated by oaks and hickories produce nuts and acorns, or “hard mast,” high-energy food critical to wildlife during the winter and early spring. Also, the Forest Plan documented that oak-hickory hardwood communities are biologically diverse. Research has shown that total diversity, including plant, insect, bird and mammal species-diversity, is substantially higher in oak-hickory forests (Thompson 2004, Fralish 2004). Conversely, maple-beech forests produce “soft mast” that provide fewer energy reserves needed by native animal communities. Maple-beech forest ecosystems are typically less diverse than oak-hickory ecosystems. The project is not designed to eliminate maple-

beech forests; rather it is intended to move the Forest towards the desired conditions. These include maple-beech communities within a matrix of oak-hickory dominated forests and woodlands. Oak and hickory composition objectives for the project area are 70 to 90 percent in the uplands and 30 to 90 percent on low slopes and alluvial plains (Forest Plan Chapter V, page 59) and low slopes adjacent to stream terraces and floodplains (Forest Plan Chapter V, page 90). This site-specific analysis is tiered to the 2006 EIS on the Forest Plan.

Purpose of and Need for Action

This proposal has been designed to reduce the potential for a high-intensity wildfire and begin the restoration of a native hardwood forest community. Current fuel properties (amount, arrangement and continuity of burnable material) increase the potential for a high-intensity wildfire. The increased severity of wildfire leads to higher risk of injury to personnel, damage to property, infrastructure and natural resources. Fires could experience higher rates of spread, higher intensities, longer and more profuse spotting, and could therefore grow larger and cost more to suppress. Since the project area lies partially within a municipal watershed and is intermixed with private land, a high-intensity wildfire is not desirable. Changes in fuel abundance and arrangement are needed to avoid negative impacts.

Oak and hickory regeneration in most of the area is not adequate to maintain dominance in the stand (Fralish et al 2002, Haugen 2003). Seedlings of these sun-loving species cannot survive for long in the dense shade created by the thick forest. As all stands in the area trend towards maple-beech forests, there is a potential loss of landscape and community diversity, and a corresponding loss of plant and animal diversity. Non-native invasive species are found in the area and further contribute to degraded ecosystems. Prescribed fire would favor development of sun-loving species and move the ecosystem towards the desired condition.

The resource objectives for the proposed action are as follows:

- To reduce the risk of a severe wildfire:
    - Reduce amount and continuity of fuels.
- To begin to restore a healthy native hardwood forest:
    - Stimulate germination and growth of sun-loving species (oak and hickory),
    - Maintain and/or improve natural community diversity and species richness, and
    - Reduce non-native invasive species.

Proposed Action

The action proposed to meet the purpose and need is to treat about 5,650 acres to reduce the risk from high-intensity wildfires and improve vegetation composition and structure. The Forest identified 19 blocks of land to be treated including most of the impacted area and some undamaged areas (Figure 1). Undamaged areas were included due to intermingled ownership, steep topography and the existence of roads, streams and trails that could be used for firelines. By expanding the burn unit boundaries to these existing lines, fewer firelines would need to be constructed and these lines would be easier and safer to hold, reducing costs, risks, and soil disturbance. Burning these parcels together would reduce fuels and help restore native forest conditions over a larger area. Forty-six private landowners have expressed a willingness to participate. If other landowners wish to participate additional analysis would be necessary. Should landowners who are now considered part of this project decline and new firelines have to be constructed to exclude their property, appropriate inventories for archeological and botanical resources would be conducted prior to fireline construction. Prior to burning, mechanical fuel treatments (mowing, cutting, and piling or chipping) would be used to reduce downed woody fuels near certain structures. The proposed action is covered in more detail in Chapter 2.

Decision Framework

Given the purpose and need, the responsible official, Dan L. Lentz, Mississippi Bluffs District Ranger, will review the proposed action and the no action alternative in order to make the following decisions:

- Should prescribed fire and mechanical treatments be used to reduce the risk of severe fire and begin the restoration of the native hardwood forest within the project area?
- Should the Forest work in cooperation with local landowners to treat both public and private land?
- What design features and mitigation should be used to achieve desired resource objectives?
- What monitoring should be done to evaluate implementation of the project?

Public Involvement

Shortly after the tornado occurred and while damage assessments were still underway, the Forest Service began to approach landowners in the area to see what actions they were already undertaking to respond to the damage, to gauge the interest and acceptability of conducting a cooperative multi-ownership project, and to discuss various options for treating the changed conditions. The Forest Service made dozens of site visits and had numerous conversations with area landowners. On April 18, 2007 a letter was sent to all the landowners in an effort to discuss the potential project with those landowners with whom we had not previously had contact. Input from local land management and emergency response agencies was also sought in designing the project.

A formal scoping letter was sent to the Forest's mailing list, local landowners, and other concerned citizens (about 350 people) on December 13, 2007 and a public meeting was held on January 23, 2008 in Ava, Illinois to inform interested people and seek comments on the proposal. The project was listed in the January, 2008 edition of the Schedule of Proposed Actions and has been listed every quarter since. Comments received from these efforts were used to focus subsequent analysis. On June 20 postcards announcing the availability of an Environmental Assessment (EA) on the Shawnee website were sent to the above list of interested persons. These postcards, web postings, and an associated legal notice (published in the *Southern Illinoisan* June 24, 2008) invited comments on the EA. A second round of postcards was sent and a legal notice published on July 17, 2008, clarifying the objection procedures and extending the objection period for interested persons to object to a draft Decision Notice (DN) and Finding of No Significant Impact (FONSI). These latest public involvement efforts did not follow the exact procedures outlined in the Healthy Forest Restoration Act and 36 CFR 218, so the Responsible Official is withdrawing the draft DN and FONSI and considering all the comments and “objections” received as comments. These comments have been addressed in the EA and the supporting working papers.

Issues

The Forest Service separated the issues into two groups: key and non-key issues. Key issues are those directly or indirectly caused by implementing the proposed action or alternative. A list of non-key issues and reasons may be found in the Project Record. The following were determined to be key issues and within the scope of the project decision.

Key Issue: The increased fuel loading has amplified the risk of a high-intensity wildfire.

- **Indicator:** Fuel loading (tons per acre of combustible vegetation).

Key Issue: The project area needs restoration of native plant communities and species.

- **Indicator:** Percentage of the project area in each Fire Regime Condition Class (vegetation composition and structure resulting from changes in the fire regime).
- **Indicator:** Changes in the relative abundance of native and non-native plant species.

Chapter 2 - Alternatives

This chapter includes a description of both alternatives and compares the alternatives considered.

No Action Alternative

Under the no action alternative, current management plans would continue to guide management of the project area. No prescribed burning, fireline construction or mechanical fuel treatments would be implemented to accomplish project goals. The risk of a severe fire would remain higher and the opportunity to enhance the native hardwood forest would be foregone. Ecologically the forest would continue to trend toward a climax forest.

Proposed Action

Prescribed fire would be used to treat a total of about 5,650 acres including about 4,375 acres of Forest Service land and 1,275 acres of private land. The project area would be subdivided to make burns more manageable (Table 2 and Figure 1), but units may be combined if weather and funding allows. Burns would be lit with handheld devices or from the air using a helicopter mounted plastic sphere dispenser or heli-torch. Helicopters are used to ignite large areas more economically and more safely than by using ground ignition alone. With a plastic sphere dispenser, small plastic balls partially filled with about 3 grams of potassium permanganate fall through chutes in which they are injected with about 1 cubic centimeter of ethylene glycol. The two chemicals form a heat-producing reaction as the ball falls, and after a few seconds the mixture heats to the ignition point. A small flame protrudes through the sphere, lighting a small fire in surrounding vegetative fuels. Plastic spheres are best used in light fuels such as leaves, grass, or pine needles since these require less external heat to light. With a heli-torch, flammable liquids are pumped over an igniter from a holding drum suspended beneath the helicopter. A heli-torch is used to ignite large fuels or moist fuels that would not ignite with other means. While burn intensity can be influenced by firing pattern, there is a maximum intensity that can be produced from any given fuel bed. This is influenced largely by the amount, type, distribution, arrangement, and fuel moisture values of the fuels. For hardwoods, this is fairly low. Even with many ignition points as in aerial ignition, the expected fire behavior in hardwoods is many small, low intensity flames slowly growing together in places and going out in others. In fact, this is how units are ignited by hand as well, but since helicopters can cover much more ground the area is burned much faster. Slash fuels, on the other hand, have a much greater energy release potential. It is because of this potential that a fuel reduction purpose and need was developed for this project. Given the scattered and discontinuous nature of pine slash, it is expected that pockets would burn intensely while adjacent areas burn lightly. Aerial ignition also has the added benefit of saving ground-based firefighters from the arduous and possibly dangerous task of interior ignition.

We proposed to burn each unit three times in the next 10-15 years. Burns would be conducted between September 1 and May 1. First entry on all units would likely be made within two to three years and successive burns would be made 2-5 years later.

Table 2. Burn Units for the Buttermilk Hill–Talbott Hollow Blowdown Project.							
Unit	Size (acres)			Unit	Size (acres)		
	Total	Forest Service	Private		Total	Forest Service	Private
1	71	0	71	11	302	240	62
2	314	227	87	12	162	162	0
3	163	88	75	13	530	530	0
4	746	680	66	14	195	195	0
5	308	233	75	15	57	57	0
6	171	15	156	16	452	353	99
7	196	189	7	17	230	127	103
8	289	76	213	18	102	102	0
9	374	374	0	19	261	184	77
10	709	544	165	Total	5632	4376	1256

Fireline construction is an important part of the preparation for prescribed burning. Natural features (trails, roads or streams) are used for firelines whenever possible. Under the proposed action, about 11 miles of firelines would be constructed. Where lines must be constructed, hand raking or leaf-blower lines are preferred but dozer line (up to two miles of this total) may be used where wider lines are needed near heavy fuel concentrations, structures and other areas of high value.

Fireline construction involves removing combustible material to stop the movement of the fire. The Forest typically uses the type of fireline that provides the minimum amount of disturbance and exposure yet would safely and effectively contain the fire. Hand raking or leaf-blower lines are usually an 18-20 inch wide swath of bare soil within a 3-4 foot leaf blown area, though at times leaf-blowing alone is sufficient. Dozer-lines are usually a 4-6 foot wide swath cleared of vegetation down to mineral soil. Firelines would be rehabilitated as needed following the fire. Dozer-lines are always rehabilitated to minimize soil loss. The berms created during construction are pushed back into the path, water bars are installed, the line is seeded where necessary, and logs, limbs, and brush are dragged into the line to intercept rainfall, slow down erosion and prevent use as unauthorized trails (Table 3). Accelerated erosion related to constructed fire control lines would be minimized by controlling the location and duration of mineral soil exposure.

Mechanical fuel treatments (mowing, cutting or chipping) would be used to protect certain structures on private and Forest property (Figure 1). The build-up of woody material would be treated in these areas (about 25 acres) to create defensible space prior to burn implementation. Other structure protection measures such as mowing tall grass, moving woodpiles or debris, establishing hose-lays or sprinkler systems, or blowing leaves away from outbuildings may be necessary prior to burn implementation.

Design Criteria for the Proposed Action

In order to minimize impacts to other resources, several design criteria were included in the proposed action (Table 3). These design criteria are similar to mitigation measures but have been incorporated into the design of the project rather than as a response to concerns or ongoing effects.

Table 3. Design Criteria for Buttermilk Hill – Talbott Hollow Blowdown Project.		
Resource Area	**Design Criteria**	**Rationale / Effectiveness**
Vegetation Resources	Workers should inspect, remove and properly dispose of plant parts and seeds found on clothing and equipment before entering or leaving the project area.	Minimizes spread of noxious weeds from one site to the next (Guide to Noxious Weed Prevention Practices 2001).
	Avoid ground disturbance at the turk's-cap lily and heartleaf plantain sites to avoid any direct negative impact to these sensitive species.	Both sites would be identified on the ground and activities causing ground disturbance would be avoided in these areas.
Wildlife Resources	Retain all standing dead trees unless necessary to cut for human safety (near trails, firelines or recreation sites) or to accomplish project objectives.	These design criteria are required "terms and conditions" or "reasonable and prudent measures" in December 2005 US Fish & Wildlife Service Biological Opinion for the Forest Plan.
	Suitable summer roost trees cannot be removed April 1 - September. 30 unless documented non-use.	
	Burning near known timber rattlesnake den locations would be done only during hibernation seasons when individuals are in dens (November 1- March 31).	Den sites are extremely important to the maintenance of populations (Brandon 2005).
	Rock outcroppings and cave entrances would not be intentionally ignited. No fire-lines would be constructed in or immediately adjacent to cave habitat.	These habitats require additional protection for Eastern small-footed bats (Bat Conservation International 2001).
Soil and Watershed Resources	Use erosion control measures (water bars, seeding, and replacing cut brush) to minimize erosion from fire lines. Where possible, locate firelines on the contour.	Illinois Best Management Practices were designed to ensure that fire operations protect site integrity and water quality (IDNR et al 2007). We have monitored effectiveness on several past fire projects and found the measures were effective in minimizing soil erosion and sedimentation (Forest Monitoring Reports (USDA-FS 1995-2002)).
	Operate equipment in a manner that does not cause excessive soil displacement, rutting, or compaction.	
Air Quality	Manage smoke to limit impacts to human health, visibility and public safety.	Prior experience has shown smoke management to be effective. Forest Plan FW25.8, page 41.
Recreation and Visual Resources	To ensure visitor safety, burn areas would be signed and closed to the public.	Forest Plan, FW23.2 and FW23.3, p. 33
	Protect existing recreational improvements (campgrounds, trailheads and trail signing).	Forest Plan, FW23.2 p. 33
	Constructed firelines would be rehabilitated and closed (brushing and waterbars) after use to prevent unauthorized recreational use (ATVs, horses, etc.)	Prior experience has shown this to be successful in preventing non-system trail development and unauthorized use.
Heritage Resources	The Area of Potential Effects has been inventoried to ensure that all heritage resources are adequately protected from project-related impacts.	Project monitoring from 1991-2005 has indicated that few sites have been missed using our inventory methods and protection measures have been successful (McCorvie: A Decade of Monitoring and USDA FS 2008).
	Fire sensitive sites would be protected by removing fuel, excluding fire, reducing heat, reducing fireline impact, or a combination of these techniques. Closing roads/firelines would reduce access to sites and the potential for looting or collecting.	
Socio-economics	Private land near burn operations would be protected.	Potential for economic loss from burned structures.

Monitoring for the Proposed Action

Monitoring would demonstrate whether or not the management has been implemented as specified and if the design criteria were effective (Table 4). If monitoring indicates project objectives are not being met, appropriate measures would be taken. If these measures require minor modifications within the scope of this analysis, implementation activities (such as changing allowable weather parameters for burning) would be changed accordingly. This approach is called adaptive management. Since some units would be burned before others, the preliminary results from the initial burns would be available to guide later burn implementation. If monitoring exposes unacceptable resource damage, appropriate measures would be implemented to correct problems.

Table 4. Monitoring for the Proposed Action.

Resource Area	Monitoring Activity Description	Location and Timing
Vegetation Resources	The project area would be monitored for establishment and spread of invasive species.	Firelines and known populations would be monitored and the need for control measures would be evaluated.
	Monitor the effects to known turk's cap-lily and heartleaf plantain populations.	Periodically before and after burning activities.
	Monitoring plots have been established to determine vegetative changes and fuel reduction.	Post-burn monitoring would determine effectiveness in meeting the purpose and need.
	Monitoring would be accomplished at established plots to determine fuel reduction	Post-burn monitoring would determine effectiveness in meeting the purpose and need.
Wildlife Resources	Determine the balance between early, mid- and late-successional habitat conditions.	GIS analysis of the project area, post-treatment.
Soil and Water Resources	BMP compliance checks (Dissemeyer, 1994).	During and after burning activities.
	Visual inspection of firelines erosion.	Before and after burning activities.
Air Quality	Smoke column height, color, direction and visibility would be monitored during burn activities.	Visual estimates done by Burn Boss, Fire Effects Monitor(s), or designated person(s).
Recreation Resources	Fireline brushing would be evaluated to ensure that these lines are not being used as non-system trails.	After burning activities, each year until project is complete.
Heritage Resources	Ensure that heritage resources are protected and preserved during and after project implementation.	This project would be included in the Forest Monitoring Plan to assess the thoroughness of inventory methods and protection measures.

Comparison of Alternatives

This section provides a summary of the effects of implementing the alternatives.

Table 5. Effects of the Alternatives on the Key Issues.

Issue Statement: The increased fuel loading has increased the probability of a severe wildfire.

Indicator – Total Dead Fuel Loading	No Action	Proposed Action
Heavy Damage – Hardwood Stands	28 (tons/acre)	12 (tons/acre)
Heavy Damage – Pine Stands	78 (tons/acre)	26 (tons/acre)
Light Damage – All Stands	19 (tons/acre)	4 (tons/acre)
No Damage Oak Stands	14 (tons/acre)	4 (tons/acre)
No Damage Mesophytic Stands	14 (tons/acre)	4 (tons/acre)

Issue Statement: The project area needs restoration of native plant communities and species.

Indicator – Portion of Project Area by Condition Class	No Action	Proposed Action
Condition Class 1	2%	2%
Condition Class 2	1%	45%
Condition Class 3	97%	53%
Condition Class refers to the degree of departure from the historic range of variability in terms of fire regime and vegetation composition and structure. Condition Class 1 means the area is within the historic range of variability. Condition Class 2 indicates a moderate degree of departure with moderate risk of losing one or more key ecosystem components, and Condition Class 3 indicates a high degree of departure from historic conditions with a high risk of losing one or more key ecosystem components.		
Indicator – Relative Abundance of Native and Non-native Plant Species	**No Action**	**Proposed Action**
Changes in the numbers and frequency of native and non-native plant species.	A general increase in invasive species over time. Decrease in native species diversity.	Repeated burning would have a detrimental effect on invasive species. Native plant diversity would increase.

Chapter 3 - Affected Environment and Environmental Consequences

This chapter describes by resource area the physical, biological and social/economic environments that may be affected by the alternatives and the potential changes due to implementation of the 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.

Effects Analysis

Resource specialists analyzed the direct, indirect, and cumulative effects of implementing the proposed action on their respective resource area. These effects analyses are displayed under each resource section presented in this chapter. The spatial and temporal boundaries for the cumulative effects analysis differ for each respective resource area. The analysis of cumulative effects considers all known past, present and reasonably foreseeable future actions. The June 24, 2005 CEQ guidance on cumulative effects was considered in the development of this environmental analysis. Past, present, and reasonably foreseeable future actions occurring on National Forest and private lands in the project area are listed in Table 6.

It is difficult to quantify the effects of certain future activities such as wildfires, insect and disease outbreaks, unauthorized all-terrain vehicle (ATV) use, or cross-country horse riding because of their random and unpredictable nature. We have examined this incomplete information using the procedure outlined in 40 CFR 1502.22. It is impossible to quantify how many plants, plant populations, or other resources could be affected.

Table 6. Past (last ten years), present and reasonably foreseeable future actions, with potential for cumulative effects, within the three project area watersheds.

Action	Scope of Action
Agriculture (row-cropping)	About 27,500 acres (past, present and future).
Agriculture (pastureland)	About 9,000 acres (past, present and future).
Wildfires	About 10 acres per year (past, present and future).
Prescribed Burning	About 85 acres per year (past). About 900 acres per year (future).
Timber Harvest/Firewood Cutting	About 100 acres per year (past, present and future).
Timber Stand Improvement	About 80 acres per year (future).
ATV Use	Variable use in the watershed (past, present and future).
Road Maintenance	About 20 miles maintained per year (past, present and future).
Road Right of Way Maintenance	About 10 acres maintained per year (past, present and future).
Tree Planting	About 10 acres per year (past, present and future).
Utility Right of Way Maintenance	About 25 miles per year maintained (past, present and future).
Trail Maintenance	About 10 miles maintained per year (past, present and future).
Horseback Riding	Variable use in the watershed (past, present and future).
Non-system Trails	Estimate less than 25 miles of trail (past, present and future).
Special-use Permits (telephone, electric, water and driveways).	Estimate less than 2 acres per year (past, present and future).
Invasive Species Control	About 10 acres manual treatment per year (past and present). About 100 acres herbicide treatment (future).
Wildlife Brush Pile Creation	About 120 acres (past) and 50 acres (future).

Table 6. Past (last ten years), present and reasonably foreseeable future actions, with potential for cumulative effects, within the three project area watersheds.	
Action	**Scope of Action**
Openlands Management	Disking and planting of food plots on about 40 acres (past) and 230 acres (future).
Trail Construction	About 0.5 miles of trail reroute of an existing trail (future).
Shoreline Stabilization	About 6 miles along Kinkaid Lake (past and future).
Gully Stabilization	About 900 feet near Kinkaid Lake (past and future).
Residential Development	About 200 houses per decade (numbers are for three project area townships: Kinkaid, Levan, and Sand Ridge)

Vegetation Resources

This section discusses the vegetation resources within the project area and the effects of the alternatives on these resources. The focus of the analysis is on the key issues identified in Chapter 1; increased fuel loading and increased potential wildfire intensity, and altered vegetation composition and structure, including relative abundance of native and non-native plants. This section is a summary of the Forest Resources and the Fire and Fuels Working Papers, and the Botany Biological Evaluation that were prepared for this project. More detail can be found in those papers (Project Record).

Affected Environment

Fuels

In the moderate and severely damaged areas, much of the timber is either downed or standing with structural defects such as broken tops or twisted, fractured boles. Heavily damaged pine stands within these areas have high fuel loadings (78 tons/acre) and nearly continuous broken branches and needles. In the lightly damaged areas, downed trees and limbs were scattered and discontinuous among most hardwood stands, though there are isolated heavy concentrations of fuels. Most of the windthrown trees were larger trees, often of oak species. Fire hazard is elevated in these damaged areas. Ice storms in the winter and spring of 2008 did not result in substantially greater fuel loading in the project area unlike other parts of the Forest south of the project area.

Forest Stands

The project area is located in the Greater Shawnee Hills subsection of the Interior Low Plateau, Shawnee Hills Ecological Section (Keys et al 1995). The State of Illinois has classified this area as the Shawnee Hills Natural Division. The topography is characterized by broad ridgetops with deep soil dissected by moderately steep side slopes opening onto broad flat valleys. Originally, the Shawnee Hills were mostly forested, and is presently the most heavily forested of Illinois' Natural Divisions. The Shawnee Hills host outstanding biodiversity (http://www.dnr.state.il.us/ORC/WildlifeResources/theplan/mapfiles/divisions.htm).

Most upland forests of the Shawnee Hills were dry sites dominated by white oak, black oak, post oak, blackjack oak, scarlet oak, shagbark hickory and pignut hickory. The ravines and coves harbored a forest community of red oak, beech, yellow poplar, bitternut hickory, sugar maple and white ash with other associated hardwoods. The floodplain forests also contain sycamore, Kentucky coffeetree, sugarberry and honeylocust (Mohlenbrock 2002).

Fire, ice and wind caused surface and canopy disturbance that permitted sunlight to reach the forest floor and sustain the successful regeneration of oak and hickories for several thousand years (Lorimer

1985). Fires, cutting and clearing increased following settlement but the use of fire as a management tool was replaced by fire suppression in the early 1900's. The reduction in disturbance resulted in a well-documented increase in shade-loving species (maple, elm, beech and others) in the understory and midstory (Shotola et al 1991, Brose et al 1998, Abrams 2005, Abrams 2006).

The project area forests followed a similar pattern. Currently, oak-hickory stands make up about 82 percent of project area National Forest lands. The remaining areas consist of nonnative pine stands (7 percent), poplar, locust and maple-beech stands (9 percent) and old fields-openlands (2 percent). Shade-loving species are a minority in the canopy but are dominant in the understory and midstory (Haugen 2003, Ozier et al 2006, Tikusis 2008). There is a lack of successful oak reproduction and almost no advanced oak regeneration, considered a requirement for maintaining oak stands (Brose 2005).

Fire Regime Condition Class

Fire Regime Condition Class is method of describing degree of departure from the historical range of variability (reference conditions). A natural fire regime is the general role fire would play (i.e. the frequency, severity and extent) across a landscape in the absence of modern human intervention, but including the influence of aboriginal burning. Fire regime changes and the resultant changes in vegetative composition and structure are collectively used to diagnose departure from reference conditions. This can be done at the stand or the landscape level. The degree of departure from the reference condition is used to classify the land into one of three condition classes:

1) Condition Class 1 - landscape with vegetation, fuels and disturbance like the natural regime.
2) Condition Class 2 - moderate departure and a moderate risk of losing key ecosystem components.
3) Condition Class 3 - high departure and a high risk of losing one or more ecosystem components.

In southern Illinois, frequent fire played a role in maintaining the composition and structure of the vegetation in many vegetation types. Changes in disturbance history and land use have greatly changed the vegetative composition and structure of today's forest relative to the presettlement condition found in the early 1800's. The density of trees is roughly three times greater with the overall volume remaining about the same. There are many more trees now than in the early 1800's but on average they are much smaller (Fralish et al 2002, Tikusis 2008). Fire today has a much-reduced role in ecosystem maintenance. Most of the project area is in Condition Class 3 (97 percent) because of the high degree of departure of vegetative composition and structure and lack of recurring fire. A few areas have experienced wildfires or other vegetation disturbance sufficient to slow the departure from the reference conditions above. These areas are considered Condition Class 2 and comprise 2 percent of the project area. The remaining areas (1 percent) are deep, moist coves where fire currently plays an infrequent role similar to the historic regime and are so considered Condition Class 1. More detailed analysis can be found in the Fire and Fuels Working Paper (Project Record).

Botanical Resources

There are no known federally listed endangered, threatened or proposed plant species found within the project area. Two Regional Forester sensitive species are reported to occur within the project area: *Lilium superbum* (turk's-cap lily) and *Plantago cordata* (heartleaf plantain). Field reconnaissance of the project area was conducted on several occasions. Floristic surveys were conducted within the project area on 5/23-25/07 (Shimp 2008).

In Illinois, the turk's-cap lily grows in low, moist woodlands and stream banks in the southern portion of the state (Mohlenbrock 2002). The population reported within the project area occurs on the banks of an intermittent stream. The surrounding area is forested, allowing dappled light to reach the

population. Indications are that the population could benefit from increased sunlight to the site because only a small percentage of the plants flower.

Heartleaf plantain grows mainly in level, wet, clear-running streambeds especially in areas of limestone, running through heavily wooded areas. The streambeds at sites in Illinois are composed of neutral to basic gravelly outwash, sandstone rubble, or they are sandy-bottomed (Hill 2007b).

No Action Alternative

Direct and Indirect Effects

Fuels

No immediate change would be noted to fuels properties or resulting fire behavior. Over the next fifteen years, much excess fuel would have begun to decay. This reduction would be partially offset by the creation of new snags and coarse woody debris as currently standing tornado-damaged trees and branches fall. Since fuel loads (especially large fuels) would remain high and in a continuous arrangement in heavily damaged areas, fire risk would remain elevated throughout the analysis period. If a wildfire were to happen, the presence of large fuels could contribute to higher heat outputs, longer flame lengths, greater spotting potential, and in general pose more resistance to control (Fire and Fuels Working Paper). Gradually wildfire risk would decrease as excess fuels decompose and hold more moisture.

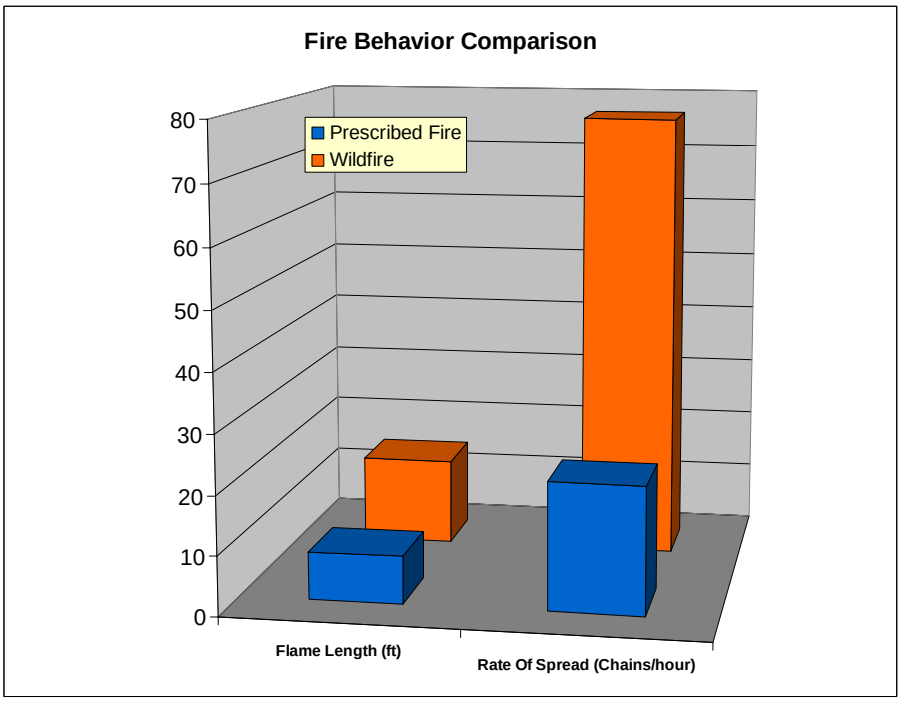


Figure 4. Comparison of predicted fire behavior characteristics of heavily damaged hardwood stands.

In areas with severe canopy damage, fuels are dominated by downed wood interspersed with herbaceous plants, vines and wind blown leaves that serve as carrying fuels. In these exposed sites, growth of carrying fuels would be greater, large fuels will be slower to decay and the surface microclimate would be warmer and drier. They will be available to burn more frequently than in adjacent closed canopy sites.

In lightly damaged or undamaged areas, there would also be gradual changes to fuel properties. Litter depth and loading is currently in an equilibrium state, fluctuating about an annual average, as litter fall and decomposition are balanced. In undamaged areas, fuel-bed flammability would slightly decrease, as mesophytic leaf litter becomes an incrementally higher portion of the total litter layer. Leaves of these trees are thinner, more compact, retain more moisture, and decompose faster than those of oaks. The increased shade results in an understory microclimate that has become cooler and more humid, and often there is reduced vegetation under maple-beech canopies (Fire and Fuels Working Papers). If a fire were to start in undamaged areas, it would likely have a lower intensity and less complete spatial coverage of the landscape.

Forest Stands

Forest stands would continue their conversion toward shade-tolerant, late successional forest types. The understory would become increasingly shaded, preventing oaks and other sun-loving species from germinating and growing. Stem density and average tree size would increase. As dominant canopy trees die, they would be replaced by shade-tolerant trees that have grown into the midstory. The increased fuel loadings would keep the risk of a high-intensity wildfire elevated through the analysis period, though the risk would gradually decrease as fuels decay (Fire and Fuels Working Paper). A high intensity wildfire would damage some trees of all species, scarring boles and inducing mortality.

Fire Regime Condition Class

The dense coves and ravines found in the deeper valleys (Condition Class 1) would not change class within the next 15 years because of the moist conditions; these areas would remain a climax forest. The drier, thin-soiled sloped areas (Condition Class 2) would continue to trend toward Condition Class 3 as maples and other species continue to encroach in these areas. The majority of the project area would continue to depart from reference conditions and restoration would become more difficult because the forest would become harder to burn (Figure 5a).

Botanical Resources

Under the no action alternative, changes in forest type due to succession and lack of fire would continue to cause an increase in shade tolerant species at the expense of the oak-hickory type and associated understory species. Plant species that depend on open forest, natural openings or dry environments would likely decline due to the increase in canopy cover. A reduction in the diversity of vegetation would likely result from the absence of fire on the landscape. The lily and plantain would probably continue to have trouble flowering due to the increasing shade at these sites.

Additionally, invasive species are likely to increase over time under the no action alternative. Many vectors exist to bring invasive species into the project area and many activities could create favorable seedbeds. We are currently experiencing a spread of garlic mustard near Buttermilk Hill in the project area. Without active management, the current spread of invasive species would be expected to continue. Invasive species can cause changes in fuel characteristics and moisture as well as the chemical composition of the soil through allelopathic compounds. These changes could have a negative impact on sensitive plant species and their habitats.

The no action alternative would also maintain higher fuel loads, increasing the threat of high-intensity wildfires. A wildfire could cause changes to non-native invasive plant populations. Because fire generally repulses invasives, there could be a short-term decrease in non-native invasive plants. However, a hot fire would probably create more favorable conditions for the establishment of new invasive species populations and the spread of existing populations resulting in an increase in invasive

plants. One of the benefits afforded under the proposed action would be the repeated burning that would continue to reduce invasive species. Under the wildfire scenario, the project area would not reap the benefits of repeated fires. An increase in invasive species could be expected with a single high intensity wildfire, which could have a negative effect on the turk's-cap lily and heartleaf plantain.

Proposed Action

Direct and Indirect Effects

Fuels

Project area fuels would be reduced by prescribed burning within the proposed burn units and mowing, chipping and scattering fuels near selected structures. The combustion of leaf litter and woody debris would reduce the loading, depth and continuity of the fuel bed, rendering it temporarily with very low risk for further burning. Leaf litter, pine needles, grass and fine woody debris would likely be greatly reduced in the places where it burns regardless of moisture conditions. There would be a mosaic of burned and unburned patches within the burn perimeter, covering an estimated 50-90 percent. Such a burn would reduce the future wildfire potential even if it does not consume large fuels. Total consumption of 1000-hour fuels is rare under normal prescribed burning conditions. Given the somewhat random nature of the downed wood within the tornado-damaged areas, flame length and reaction intensity would be quite variable. Some of these piles of heavy fuels could produce flame lengths in excess of 20 feet, whereas some adjacent areas with only litter fuel to burn may produce flame lengths under two feet. Mowing, chipping and cutting are only prescribed for 25 acres in the project area. Changing the fuel arrangement in this way would lead to lowered intensities and flame lengths (and hence improved structure protection) during either a prescribed fire or a wildfire.

Forest Stands

The prescribed fire would kill many seedlings, saplings and vines opening the understory and increasing sunlight to the forest floor (Figure 4). The sunlight would stimulate oak seedlings to sprout even if top killed during the prescribed fire. Because subsequent prescribed fire may kill a higher proportion of shade-tolerant stems, oak relative abundance would likely increase (Brose 2006, Thake 2008). The expected mortality would not likely be enough in undamaged and lightly damaged areas to allow sufficient light for oak seedlings to immediately grow into saplings, since midstory and canopy trees would be largely unaffected (Huddle and Pallardy 1996, Alexander et al 2008). Prescribed fire would allow existing oak seedlings to compete when a new canopy gap is created through fire-induced mortality, windthrow, or other means. Young oak trees in heavily damaged areas have already been released from overhead competition. Prescribed fire in these areas would give oaks a better chance to germinate and grow into the vacated canopy gaps. In unburned parts of these areas, fast-growing species like yellow poplar would take over.

There is potential for damage to residual trees. About 2680 acres of Forest Service land in the project area (49 percent) are in the EH management area, which is managed in part for the production of high quality hardwoods. While no timber harvest is planned on National Forest land in the area, some private landowners are considering it. Previous experience has shown that while mortality is typically limited to trees less than 3-4 inches diameter-at-breast-height (dbh), or 4.5 feet above the ground, occasional overstory mortality is possible. Factors affecting mortality include fire intensity, residence time and bark thickness (a function of tree size and species). Oaks, and to a lesser extent hickories, have relatively thick bark, enabling them to withstand fires better than mesophytic species such as maple and beech. Some timber value loss can be sustained from tree scarring even without mortality, especially for

veneer quality logs. Areas with higher fuel loadings would experience higher burn intensities, so greater damage to residual trees is expected in these areas. Pine stands have the highest average fuel loading (Fuels Working Paper), but are not considered highly desirable in this management area. Most are heavily damaged, and pine mortality would help establish native hardwoods.

Unburned stand with a many small understory trees, deep shade, and limited herbaceous growth.

Low-intensity prescribed fire in a southern Illinois oak stand with a maple midstory.

After three burns, this oak stand has an increase in light and herbaceous cover.

After three burns, this stand has more light on the forest floor and numerous oak seedlings.

Figure 4. Expected differences based on past prescribed fire experience in southern Illinois.

The consumption of leaf litter and some larger fuels would decrease shading for seedlings and saplings, and prepare a better seedbed for native plant seed germination. Computer modeling using the First Order Fire Effects Model, version 5.2.1 (FOFEM) suggests a maximum of nine percent mineral soil would be exposed during very dry conditions in heavily damaged pine stands, and none in any hardwood stands under any moisture scenario. Prior experience on the Forest indicates that frequently the lower litter layers retain enough moisture to resist burning (Fire and Fuels Working Paper). Prescribed burning can also release nutrients and increase their availability for plants in the short term (Soil and Water Resources Working Paper).

Fireline construction may affect timber resources by creating small openings and increase light to the forest floor, but this effect would be minimal. Line construction, especially with heavy equipment, may cause damage to residual trees by disturbing roots, scarring trunks, or by direct, intentional removal.

Fire Regime Condition Class

Many of the vegetative composition and structure changes currently underway would be halted, and potentially reversed. In treated forest communities, the transition towards a climax maple-beech forest would slow. Areas with both heavy canopy damage and multiple burns would improve to Condition Class 2 or even 1. Areas of light damage and no damage would improve to a "better" Condition Class 3 in wetter stands or to a Condition Class 2 where oak stands still dominate (Figure 5b).

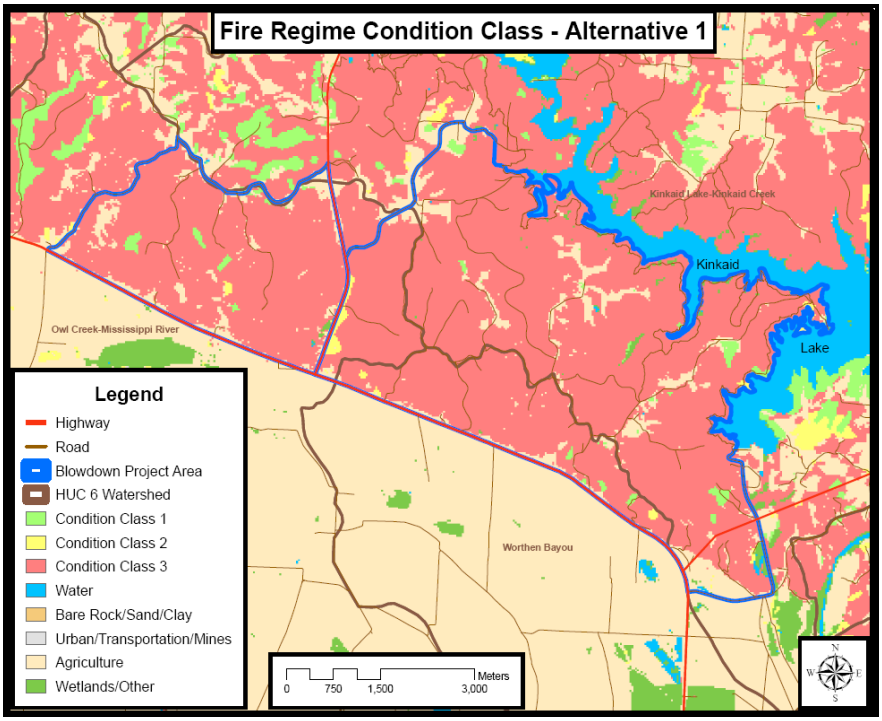


Figure 5a. Predicted project area Fire Regime Condition Class for Alternative 1.

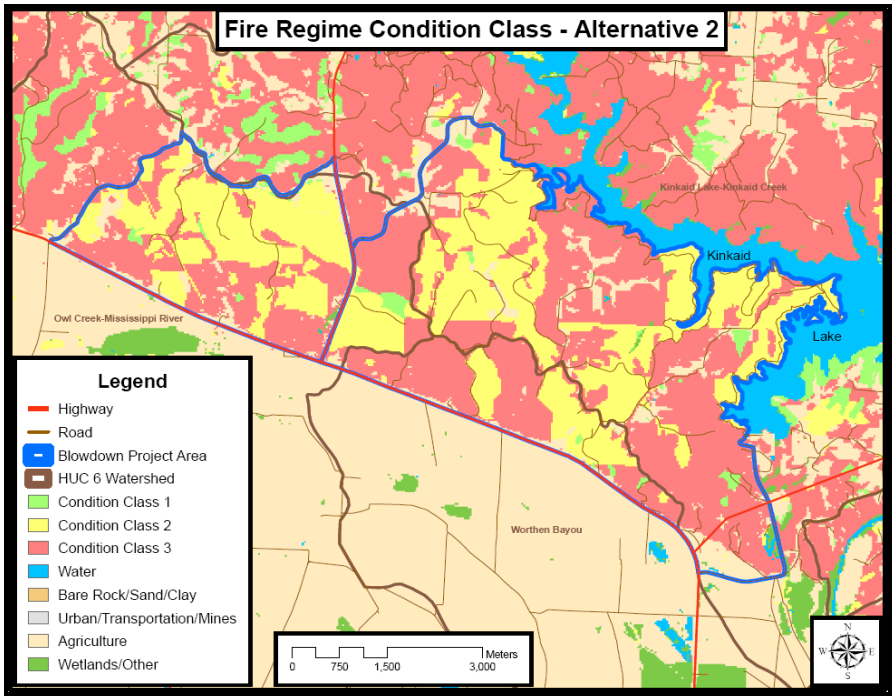


Figure 5b. Predicted project area Fire Regime Condition Class for Alternative 2.

Botanical Resources
Effects of the proposed action would include the beginning of a shift in forest type resulting from prescribed fire. The fire-intolerant, shade tolerant species in the understory would suffer higher mortality rates than the fire tolerant oak-hickory type, creating a competitive edge for oak-hickory. Additionally, more sunlight would reach the forest floor improving growth conditions for shade-intolerant species. Prescribed fire will likely stimulate and favor native vegetation and help reduce invasive species. Other plant species that depend on open forest, natural openings, or dry environments would likely benefit from fire due to the resultant decrease in canopy cover in forested areas and a decrease of woody shrub and tree species encroachment on open areas. Burning would move ridge top and dry forest habitats towards a more open condition stimulating dry ridge and open forest species. Overall, an enhancement of vegetation diversity would likely result from the presence of fire on the landscape. The increased sunlight would also likely benefit the turk's-cap lily and heartleaf plantain.

Effects of the proposed action also include changes in invasive plant species populations. Disturbance of soil may negatively affect areas of suitable sensitive plant habitat. Activities connected to burning (fire line preparation, foot and vehicle travel) could spread these species to other parts of the project area. Conversely, prescribed fire would contribute to a reduction of current infestations. With repeated applications, burning is expected to have a detrimental effect on invasive plant species. Overall, native plant species diversity would be expected to benefit over invasive plant species. This would also benefit the turk's-cap lily and heartleaf plantain.

The proposed action is expected to have an overall positive effect on Regional Forester's Sensitive Plant Species known to occur in the project area. Implementation of the proposed action would not result in a loss of range-wide viability or a trend towards federal listing of any Regional Forester's Sensitive Plant Species.

Cumulative Effects
The spatial boundary used to evaluate cumulative effects was the project area. All activities that may affect the vegetation and fuel loading are confined to the project area. Activities occurring in the last ten years are analyzed for cumulative effects. Actions occurring earlier than this are more obscure and harder to differentiate from other influencing factors. Future activities are analyzed looking forward 15 years, since the proposed action and the resulting effects would be largely complete. This analysis will examine the cumulative effects of past, present and reasonably foreseeable future actions from 1998 to 2023.

Several past, present, and reasonably foreseeable actions within the analysis area may contribute cumulative impacts to vegetation resources. These actions include ATV use (authorized and unauthorized), road maintenance, right of way maintenance, tree planting, timber harvest, agricultural production, utility right of way maintenance, trail maintenance and construction, hiking, horseback riding, trail creation and use, invasive species control, and issuance of special use permits.

All of the above actions could potentially contribute to the introduction and spread of invasive plant species by transporting seeds and plant parts and by disturbing the ground. These changes could translate into negative impacts on the turk's-cap lily and heartleaf plantain.

Few acres have been harvested in the past ten years in areas proposed for burning. Harvested areas have more light reaching the forest floor, resulting in better germination and accelerated growth of residual

trees of all species. Prescribed fire should top kill those trees less than about three inches in diameter. Most trees would resprout, but oak sprouts would probably be more vigorous than other species. Subsequent burns would reinforce these changes as fewer shade-tolerant species resprout (Huddle and Pallardy 1996). Residual overstory and mid-story trees already large enough to withstand fire would mostly survive, though a few trees may be killed. The areas receiving both harvest and prescribed burning should see better oak regeneration and growth, assuming some acorn source remained.

Wildfires in the past ten years have been very few and very small and have had a negligible effect to forest resources. Depending on size, severity and timing, a wildfire could affect forest resources in the project area. The proposed burns would reduce the intensity and severity of a subsequent wildfire and allow wildfires to be suppressed at smaller sizes. Wildfires prior to burn implementation (in the next two to three years) could be severe in places and lead to higher mortality of forest resources, including overstory trees as in the no action alternative. Wildfires occurring under moister conditions would have less severe effects. In these cases wildfire intensity may approach prescribed fire intensity and may have similar effects.

Invasive species control combined with prescribed fire would benefit forest resources by removing herbaceous and woody competitors of native shade-intolerant species. Invasive species control efforts may mitigate the beneficial effect to sun- and disturbance-loving invasive species. Design criteria in Table 3 would also help prevent accidental introduction of invasive species to the project area. Additionally, some beneficial cumulative effects would be expected from non-native invasive plant treatments. These treatments are expected to have a net beneficial effect on turk's-cap lily and heartleaf plantain in the project area.

When considering the effects of the proposed action together with the effects of past, present and future actions, we anticipate a positive effect on oak-hickory forest stands and reduced fuel loading in the project area. Combined with the effect of the proposed action it is difficult to predict a net beneficial or net negative effect to botanical resources from the introduction, spread and treatment of invasive plant species.

Wildlife Resources

This section discusses the wildlife resources that exist within the Buttermilk Hill-Talbott Hollow Blowdown project area and the effects of the alternatives on these resources. The focus of the analysis is on wildlife topics brought forth during the scoping process, including threatened, endangered, and sensitive species, species with viability concerns, game species, non-target non-game species, and overall biodiversity. One federally listed species is known from the project area, the Indiana bat. Two Regional Forester Sensitive (RFSS) wildlife species, six wildlife Species of Viability Concern (SVC), and four Management Indicator Species (MIS) are known from the project area. This section is a summary of the Wildlife Working Paper and Biological Evaluations that were prepared for this project. More detail can be found in those documents (project record).

Affected Environment

A Forest wildlife biologist conducted habitat surveys of the analysis area in October and November of 2007 and has surveyed the area many times for other district projects. The surveys consisted of examining habitats and existing conditions within the project areas. Additionally, Ava Cave (located north and west of the project area) was surveyed for bats in early October 2007 and mist net surveys were completed for bats within the blowdown area June 4-5, 2008 to determine bat use in the analysis area. The cave survey was conducted during the normal autumn bat-swarming periods at southern

Illinois caves. The mist net surveys were conducted during the summer tree roosting seasons in an area that included many large, dead hardwoods with exfoliating bark. No bats of any species were caught or seen during the cave survey. Only the common red bat was caught during mist netting surveys.

The project area includes many different types of wildlife habitat including but not limited to the following:

- upland hardwood forests
- pockets of bottomland and riparian hardwoods
- forested lakeshores
- hardwood plantations of tulip popular, white oak, red oak, black locust and black walnut
- non-native pine plantations
- regenerating, former wildlife openings on some of the ridges
- karst habitats
    - sinkholes
    - small caves on slopes adjoining the Mississippi River floodplains

A thorough inventory of aquatic biota and physical habitat was conducted in all streams within the project area during the summer of 2007. The inventory revealed that there were no aquatic sensitive species present, nor was suitable habitat available.

The geographic boundary of effects for terrestrial species is the area comprising the western Shawnee Hills, the watershed for Kinkaid Lake, and the Big Muddy River and its floodplain south of Kinkaid Lake. These are the geographic areas where most terrestrial animal populations from the project area interact and where animals that use the project area are affected by habitat changes. Wildlife resources farther downstream in the Big Muddy and Mississippi Rivers were excluded from consideration because the resources are beyond the measurable effects of the proposed activities. Additionally, the large amounts of agricultural land south and west of the project area present barriers to most forest wildlife.

The temporal boundary for the effects analysis is the estimated 15 year life of the Forest Plan for present and future actions. Actions on non-federal land in the project area vicinity are anticipated to be similar to present actions on these areas during this timeframe. The temporal boundary for past actions is the last ten years. Any projects beyond ten years in the past are considered part of the baseline.

Federally Listed Animal Species

The project area contains unoccupied, suitable habitat for the Indiana bat (*Myotis sodalis*), listed as endangered under the Endangered Species Act of 1972. Indiana bats have been documented in Jackson County but not specifically in the project area and currently or historically in most counties in southern Illinois (Carter 2005; Herkert, ed. 1992). Indiana bats hibernate in caves and mines during the winter. A hibernacula cavern for the species is located in Toothless Cave, about eight miles from the project area. Summer maternity colonies are found primarily beneath loose tree bark on dead or dying trees. In the Midwest, including within the Forest, most maternity colonies of Indiana bats are located in bottomland or riparian type habitats. Summer maternity colonies have been extensively studied at Oakwood Bottoms near Grand Tower, about eight miles from the project area. Most foraging activity was recorded from the surrounding bottomland and floodplain forests. Limited foraging was recorded in the upland forest; this was the least preferred habitat (Feldhamer and Carter 2005).

Male Indiana bats have been documented roosting in a variety of structures including loose tree bark and abandoned mines (Menzel et al 2001). When roosting within the forest, males are usually found solitarily. Males and non-reproductively active females have been found gathering in large numbers in abandoned mines and caves during the summer months, often called bachelor colonies (Carter 2002). Some roosts have been located in upland habitats. However, these are rare and are usually in close proximity to bottomland or riparian areas where the majority of the colonies' roosts are located.

Game Species and Hunting
Two wildlife species that are hunted most in the blowdown area are white-tailed deer (*Odocoileus virginianus*) and Eastern wild turkey (*Melagris gallapavo*). Populations of white-tailed deer and Eastern wild turkey generally determine the hunting success for these species in a particular area. Based upon observations and sign, populations of both species are moderate-high in the project area and vicinity (Widowski, personal observations 2007).

No Action Alternative

Direct and Indirect Effects

Federally Listed Animal Species
The no action alternative would have a long-term, negative, indirect effect on Indiana bat habitat in the project area as forests succeed to communities dominated by thin-barked trees in the absence of fire. Unoccupied, suitable Indiana bat roosting and foraging habitats such as oak/hickory forests would be replaced by beech/maple forests. Both suitable roosting and foraging habitats for the species would be reduced within the project area and in southern Illinois. Since there would be no action, there would be no cumulative effects.

Regional Forester Sensitive Species and Species with Viability Concern
Because these categories contain numerous disparate species, the effects of both alternatives to these groups of animals are reviewed in Tables 7 and 8 in the Proposed Action Section below.

Game Species and Hunting
Effects of this alternative would be similar to current conditions for game species in the project area.

Non-target Organisms
Populations of these animals would follow current levels and trends. Effects would be comparable to those of similar species listed in the Regional Forester Sensitive Species and Species with Viability Concern section.

Biodiversity
There would be no discernable effects to biodiversity in the short term. However, the long term effect may prove different. As oak-hickory forests convert to maple-beech communities, there would be a loss of species associated with oak-hickory forests and woodlands. As habitats around the landscape continue to become more homogenous under this alternative, there would be a loss of landscape diversity as well.

Proposed Action

Direct and Indirect Effects

Federally Listed Animal Species

Research on the effects of fire on bats suggests that they behave similarly to other flying animals. Birds are often observed leaving areas currently being burned with little or no mortality to adult animals. Many often return shortly after the fire has passed through (Dickson 2000). Even when exposed to possibly higher predation pressures, it is unlikely that bats would remain in the roost if faced with fire or smoke. While many bats are faithful to roosts, Indiana bats are quick to abandon them when faced with minimal disturbance, even during daylight hours (Carter 2005). The greatest threat to bats would be during the time when the young cannot fly. However, unlike birds, bats are able to carry their young while flying (Davis 1970) which minimizes this threat.

While fire has the ability to consume snags (roosting sites), often snags are not consumed or are not consumed entirely. Additionally, many new snags are created as trees are injured or killed by the heat of the fire. While there may be a short-term direct loss of snag resources, ultimately the creation of new snags should offset any loss because of the fire. Burning can also affect insect communities, which in turn can affect food resources for bats. However, typical burns leave pockets of unburned habitat that act as refuges and sources for insect recolonization. Given the very high reproductive potential of insects, populations return to pre-burn levels quickly. The resulting improved habitat further allows insect populations to increase (Lyon et al 2000b and 2000c). Jackson (2005) found that insect density and diversity dramatically increased within thinned and burned stands. Thinned and burned stands had canopies that were more open and an increase in ground cover. The increased ground cover led to increased food resources for insects, ultimately increasing the insects for bats (Jackson 2005).

Collins (2005) identified the effects of prescribed burning on Indiana bats. Fire-line construction, smoke from burns, and the actual prescribed burning, that include implementation of Indiana bat standards and guidelines that identify seasonal cutting and burning periods to avoid affects on roosting and hibernating bats, would result in little if any real effects on individuals or populations of Indiana bats in the project area. These standards would reduce the magnitude and possibility of negative effects of prescribed fire on individuals and the overall population of Indiana bats in the project area. It is anticipated that the prescribed burning should result in a net increase in the foraging and roosting habitats for Indiana bats (Collins 2005).

The proposed action would result in no measurable changes in Indiana bat populations in the project areas in the short term and a predicted increase in habitat and subsequently an increase in populations in the long term as oak-hickory forest is improved. Improvements in the structure and composition of the forest should result in positive effects on bat foraging and roosting habitats and no negative effects on hibernation habitats.

The predicted increase in bat populations could change and there could be possible declines in populations in the future if white-nose syndrome disease spreads to native bats that hibernate and/or roost in mines and caves in Illinois regardless of the vegetation management. However, no declines associated with this disease are predicted to date for the project area vicinities.

Regional Forester's Sensitive Species

The proposed action would have an overall positive effect on the habitat available to Regional Forester's Sensitive Species. The proposed action would not result in a loss of range-wide viability or a trend towards federal listing of any Regional Forester's Sensitive Species.

Table 7. Summary of Effects on Regional Forester's Sensitive Species Terrestrial Animals for the Proposed Buttermilk Hill/Talbott Hollow Blowdown Project.

Scientific Name	No Action	Proposed Action
Timber rattlesnake	Continued loss of habitat, downward trending of population in project area as oak/hickory forests are replaced by beech/maple forests.	Potential minor, direct, negative effects on individuals. Increases in quantity and/or quality of denning and foraging habitat. Net improvement of habitats and populations in the project area. There would be a net benefit to rattlesnakes.
Bald eagle	No effects on existing populations or habitats.	No effects on existing populations or habitats.

Species of Viability Concern and Management Indicator Species

The proposed project may cause minimal negative effects on the Management Indicator Species and Species of Viability Concern (Table 8). The proposed action would promote early successional habitat, control shade tolerant competing species and promote hardwood regeneration. It would result in a more diverse mixed hardwood forest that would provide better habitat on and near the forest floor.

Table 8. Summary of Effects of the Proposed Buttermilk Hill/Talbott Hollow Blowdown Project, on Management Indicator Species (MIS) and Species of Viability Concern (SVC).

Scientific Name	No Action	Proposed Action
Northern bobwhite (MIS and SVC)	Continued loss of habitat, downward trending population.	Improvement of habitat, herbaceous ground cover, seed production, plant diversity, increase in oak/hickory forests and more early successional forest and field habitats. Increase in population.
Wood thrush (MIS and SVC)	No effects on habitats or populations.	No direct effects. Net indirect effects resulting in small, short term, decrease in populations. No change in long-term populations.
Yellow-breasted chat (MIS and SVC)	Continued loss of habitat, downward trending of population.	Improvement in woodland class size, stem densities and cover. Increase in population.
Scarlet Tanager (MIS)	No direct effects on habitat (mature forests).	No direct effects on habitat (mature forests). Positive indirect effect by maintaining nesting habitat (oaks).
Gray treefrog (SVC)	No effect on habitats or populations.	Slight negative, direct effect on few individuals. No net effects on populations. Cumulatively, habitat would improve though some individuals would be killed.
American woodcock (SVC)	Continued loss of habitat, downward trending population.	Improvement of habitat by maintaining old fields as early successional forests. Improvements in populations. Cumulatively, populations of the species being maintained or improved in the short term and increasing slightly in the long term in the project area.
Northern river otter (SVC)	No effects.	Some slight, short-term positive effects on riparian foraging habitats. No effect on populations. Overall no net, measurable cumulative effects to river otters.

Game Species and Hunting

Spring fires may destroy turkey nests because turkeys are ground nesters. Burning after April 1 would have a chance to burn some turkey nests. The species is known to re-nest in some cases following fires. In the proposed action, most burning would be done prior to April 1 but in some years, burning

could occur into Mid-April. Fast-moving fires may kill newly hatched poults, but once wild turkeys can fly, fires pose lesser risk and losses to the population are negligible. Burning in this project would not be done when poults would be present.

Prescribed fire can stimulate the growth of food plants and promote early spring green up of grasses (Schroeder 1985), reduce litter, expose seeds and insects, and reduce brush so that turkeys can be wary of predators (Hurst 1978 and Campo 1989). Fire can create edges to increase nesting habitat and it can reduce parasites such as ticks and lice (Jacobson and Hurst 1979). Fire is an important ecological disturbance for the maintenance of oak forests that are preferred wild turkey foraging and roosting areas. Overall, wild turkey populations should increase and turkey hunting success should improve.

Fast-moving fires can confuse, trap and kill some deer (Blendell 1974). This has not occurred to date in any prescribed burning on the Forest (Widowski, personal observations following burns 1987-2007). Prescribed burning would occur well before fawning seasons when young deer are most vulnerable. Prescribed burning is done across the country to improve habitats for white-tailed deer. Patchy burns that create a mosaic of browse and cover are usually beneficial to whitetail populations (Dill 1970). Fire improves the quality and quantity of deer foods in fields and forests. Fire improves the quantity and quality of oak forests, an extremely important deer-feeding habitat. Fire also removes woody obstacles to deer movement that result from excessive woody debris such as in the Blowdown area. Overall, deer populations should increase and deer hunting success should improve.

Non-target Organisms

The discussions of the effects on many non-target, native animals are discussed in the wildlife working papers (Project Record). The patchy nature of prescribed burns would provide many unburned refugia for animals not well-adapted to prescribed fires. Some short-term declines in populations of some species in the immediate project area immediately following the fires are anticipated. Conversely, some increases in populations of other species are expected due to both short- and long-term changes in habitats resulting from the proposed actions. Unburned areas within and immediately adjacent to the project area would provide refuges for terrapins, snails, certain ground snakes and duff and surface dwelling insects. There are also numerous underground sites and borrows easily available to many of the above species that they could also use to avoid any short term, negative effects on individuals due to prescribed fire. Overall, studies have shown that there is little negative effect on populations of these species following prescribed fires (Ford et al 1999, Renken 2005, Russel et al 1999, Strayer et al 1986, Jackson 2004). Cumulative effects on the above species were considered in the cumulative effects for RFSS and animals with species viability concerns that occupy similar habitats and therefore represent the above animal groups.

Biodiversity

Overall, we do not anticipate any loss of species diversity, ecosystem diversity, or landscape diversity from the proposed action since fire disturbances would maintain both common and rare ecological conditions and processes. Rather, we anticipate some gains in diversity. Some common ecological conditions that have persisted and increased in the absence of fire since the early 1900's would be maintained in unburned areas within the burning units and in many unburned areas adjacent to burn units. These unburned areas within close proximity to burned areas would be the sources of refuge and recolonization for species that are less tolerant of fire. This is a normal result of all prescribed burns done on the Forest in the past especially the larger ones. We anticipate relatively short declines in some species of plants and animals and increases in others following burns due to differing habitat requirements. All native plants and animals had evolved with burning as a forest disturbance over at

least the last 10,000 years and possibly longer than that as long as natural and man-induced fires were part of the eastern hardwood forest ecosystems.

Cumulative Effects

There would be some cumulative effects associated with implementation of the proposed action. Residential developments and private land timber harvest have the potential to reduce the quality and quantity of suitable roosting habitats for some forest bat species. The scope of these impacts is difficult to predict but should be relatively minor, as the area seems to develop slowly. Future additional prescribed burning would improve bat foraging habitat but may have a minor negative effect on a few individual bats that emerge early in the spring. Together with the proposed action, the potential for negative effects is small and overall the habitat should improve.

Soil and Water Resources

This section discusses the soil and water resources within the project area and the effects of the alternatives on these resources. Analysis is focused on those components of soil and watershed resources identified in the scoping process, including soil erosion and sedimentation, soil productivity and nutrient cycling, and effects to floodplains, wetlands, and water quality. This section is a summary of the Soil and Water Working Paper that was prepared for this project. More detail can be found in that paper (Project Record).

Affected Environment

Watershed Descriptions

The project area lies in portions of three different 6th Level Hydrologic Unit Code (HUC) watersheds: Kinkaid Lake-Kinkaid Creek, Worthen Bayou and Owl Creek-Mississippi River. All three have a large percentage in agricultural use and some karst (cave) topography. In all three watersheds public land (including the project area) comprises the most heavily forested portions of the watershed.

The Kinkaid Lake-Kinkaid Creek watershed is characterized by steep slopes and incised streams among a primarily forested landscape. Within this watershed is Kinkaid Lake, which is a municipal water-supply reservoir. Recreation is a primary use in this watershed with about 500 acres of recreation areas and miles of trails in proximity to the lake. Some agriculture occurs north of the lake, and other agricultural areas are dispersed among the Forest Service proclamation boundary within this watershed. Forest Service land makes up nearly one-third of this watershed.

The Worthen Bayou and Owl Creek-Mississippi River watersheds are very similar in their position on the landscape. Within the project area, the topography is steep with high stream gradients and some cave and karst topography interspersed. Downstream of the Forest, agriculture is the dominant land use in these watersheds and the terrain is mostly much flatter. The Worthen Bayou watershed drains the floodplain of the Big Muddy River, while the Owl Creek-Mississippi River watershed drains the Mississippi River floodplain. Forest Service land makes up about 13 percent of each of these watersheds.

Soil Erosion and Sedimentation

About 28 percent of the project area with moderate to severe canopy damage occurs on areas of slight to moderate erosion potential (slight off roads and trails and moderate on roads and trails). Areas of moderate to severe erosion potential (moderate off roads and trails and severe on roads and trails) make up about 63 percent of the project area on moderate to severe canopy damage. Soil mapping

units with severe erosion potential occur on about 3 percent of the project areas on moderate to severe canopy damage. Nearly every soil-mapping unit has a severe potential for compaction. About 95 percent of the area occurs on soil mapping units with slight limitations affecting prescribed burning and moderate potential of damage to soils from fire due to texture and slope. About 3 percent of the area occurs on soil mapping units having possible moderate effects from prescribed burning due to slope (USDA NRCS 2006b).

Soil Productivity and Nutrient Cycling
Reduction in canopy cover has increased soil temperature and reduced transpiration in heavy damage areas. The remaining canopy and ground cover, however, absorbs solar radiation and moderates temperature and moisture content of the soil surface. Vigorous vegetation growth indicates good site productivity through most of the analysis area.

Floodplains, Wetlands, and Water Quality
The Forest Plan defines floodplains as areas subject to a one percent or greater chance of flooding in any given year. Soil mapping units designated as occasionally flooded may be seen as meeting this designation. These riparian soils make up about four percent of the project area soils. Wakeland silt loam, a wetland soil occurring on 0–2 % slope, and Burnside, a riparian, non-wetland soil occurring on 1–4% slope, are the two soil mapping units occurring on the areas of moderate to severe canopy damage (labeled in Figure 1 as "Heavy Storm Damage") where fire intensity would be greatest during either a wildfire or a prescribed fire.

The National Wetlands Inventory (NWI) noted freshwater forested/shrub wetlands and freshwater emergent wetlands along Kinkaid Creek south to Highway 3. Freshwater ponds were dotted throughout the project area.

Water quality has been evaluated for major streams in or associated with the project and cumulative effects analysis area and Kinkaid Lake. The water quality in the watershed was listed as degraded. The primary source for less than full support was identified as toxics from atmospheric deposition. Runoff from forests was not identified as a water quality degradation source (Illinois Environmental Protection Agency 2007).

No Action Alternative

Direct and Indirect Effects

Soil Erosion and Sedimentation
Soils would be impacted by planned and ongoing natural resource management activities such as road use and maintenance but not by project activities. The stands where wildfire does not occur would maintain current runoff and erosion patterns. An upland erosion rate of less than one ton per acre per year is predicted by Forest Service Water Erosion Prediction Project (FSWEPP) for stands on steeper slopes if fire were excluded. Some of this sediment could be expected to enter the streams. This alternative would likely result in less soil erosion, compaction, sediment load, and percentage of bare ground than the proposed action. There would be no increased sedimentation resulting from the no action alternative.

Since biomass (fuels) would not be removed by prescribed burning, the probability of high intensity wildfires would remain elevated above pre-tornado levels. Wildfires that occur under conditions of

increased fuel loading and drier fuel and soil moisture values could burn at a higher intensity and over a larger area than would have occurred before the blowdown event. Fire ignitions may increase relative to recent wildfire frequency because project area fuels are more exposed to sun and wind and may be in a readily combustible state more often. Each occurrence would increase the short-term (3-5 years) erosion from the area affected by the wildfire; however, these fires would likely be separated by space and time. Further information on frequency and size of historic wildland fires and predicted intensity of future wildfire is covered in the Fire and Fuels Working Paper. FSWEPP modeling indicates that a high severity fire for conditions similar to those described above would produce a ten to twenty fold increase in erosion (depending on slope) and a like increase in sedimentation compared to prescribed fires. Predicted erosion and sediment quantities are listed in the Appendix (Table 2b) of the Soil and Water Resources Working Paper.

Soil Productivity and Nutrient Cycling
Natural processes and functions would continue to occur. Increased macro and microorganism and fungi populations would speed the decomposition process. Dead trees, branches, leaves, and grass would decay, with some carbon released to the atmosphere and some being incorporated into the organic horizon and surface horizons, leading to increased soil nutrient capital. Actual soil organic matter may increase. No carbon would be removed from the forest from project activities. Site productivity would be maintained at current levels and may even increase in the long-term.

Changes to soil properties are possible during a severe wildfire. Under the driest conditions, the FOFEM model predicts the soil heating above 60° C (the temperature of lethality for plant tissues) down to 1 centimeter depth. A burn of this intensity could reduce soil organic matter and microorganisms, in turn reducing soil productivity.

Floodplains, Wetlands, and Water Quality
Riparian functioning and water quality would be maintained at current levels considering anticipated future actions and assuming the inputs from private land remain stable. Implementation of this alternative is not anticipated to result in any changes to water quality.

Proposed Action

Direct and Indirect Effects

Soil Erosion and Sedimentation
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. 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 fire. The potential of damage to soil from fire is moderate to high for every soil mapping unit except for Wellston and Belknap silt loams. Surface erosion could result in sedimentation in adjacent streams especially in the steeper areas of the project area and those areas within 300 feet of stream areas. However, past experience with prescribed fire on the Shawnee National Forest and predictive modeling has shown that very little erosion is created because the fires rarely expose mineral soil or consume much of the duff layer (FOFEM 5.2.1, USDA Forest Service 1993, Fire and Fuels Working Paper).

The constructed firelines have the potential to result in temporary, minor negative effects of limited extent in the project units. Accelerated rates, above natural rates, of soil erosion on the firelines would

be temporary (1-2 years). Limited areas of displacement and erosion on the fire control lines would not substantially affect site productivity. Over the next ten years of project implementation, the constructed fire lines would be reused, as necessary, for subsequent prescribed fires. No proposed activities would have the potential to compact the soil except bulldozing firelines. However, dozer lines are not expected to be used greatly (less than 2 miles total). Firelines can also become unauthorized trails and result in an increase in soil disturbance. Spreading trees and branches over the firelines at the end of project activities would decrease the probability of an increase in trails and decrease erosion and sedimentation. These measures and others to ensure appropriate dozer use have been included in Design Criteria (Table 3).

The proposed action would result in a slight, temporary, minor increase in sediment in the streams running through the forested floodplains on Kinkaid Creek but this would not affect wetlands further down the watershed. Adhering closely to the Forestry Best Management Practices would "protect water quality from erosion and minimize changes to the surface and subsurface water movement" (Illinois Best Management Practices, Pages 35–40).

Soil Productivity and Nutrient Cycling

Burning has its most pronounced effect on the forest floor where carbon, nitrogen and sulfur are volatilized and calcium, magnesium, potassium, phosphorus, and other elements are left as ash. The ash is leached by rains into the mineral soil that increases its base saturation and pH (Alban 1977). Increased nutrient availability at higher pH may result in positive plant responses following fire (Van Lear and Kapeluck 1989). These coincide with results from a variety of other reviews and studies (DeBano 1998, Liechty et al 2004, Neary et al 2005). High intensity fire can also affect soil physical properties and result in hydrophobicity and increased soil erosion and runoff. Prescribed fire generally results in lower intensity burns and hydrophobicity has not previously been observed in prescribed fire on the Mississippi Bluffs Ranger District. Burning can also have both positive and negative effects on the macro and microbiological communities both inside and outside the soil profile. The possible effects on soil biota are covered in detail in the Soil and Water Working Paper.

Carbon is continually sequestered in the soil and in living biomass through plant growth. It is also continually released into the atmosphere during organism respiration and decay. Prescribed burning converts stored carbon in dead plant material (which was slowly being released by decomposition) into other forms – namely, carbon monoxide, carbon dioxide, and soot. Carbon released into the atmosphere through prescribed burning is offset with additional carbon sequestered in the forest through increased tree and plant growth generally observed after a prescribed fire. Recent research suggests that in fire-prone ecosystems, fuels management including burning may yield the greatest carbon sequestration in the long term (Hurteau and North, 2009). An increase of greenhouse gases has been observed during the past few decades and many (including many scientists) recognize this. There is some debate on the role of trees in relation to this increase. Gerould Wilhem of the Conservation Research Institute, in his article, The Realities of Carbon Dioxide: Seeing Through the Smog of Rhetoric and Politics states:

> "Planting trees or setting forests aside cannot offset the oxidation of fossil fuels because fossil carbon represents stored carbon from another era. Such organic carbon is converted to CO_2 in surplus amounts. Trees and vegetation of this era already are cycling carbon into the atmosphere at a rate and concentration to which contemporary life forms are adapted" (http://www.cdfinc.com/images/download/Realities_of_CO2_revised.pdf).

Prescribed burning would result in a short-term reduction in terrestrial carbon storage and increase in carbon dioxide in the atmosphere. This may be followed by positive plant responses in succeeding years and an increase in sequestration, keeping sequestration levels stable through the analysis period.

The proposed action would result only in the partial combustion of some biota while some fuels would remain on site. In addition, recently burned areas have been shown to have a warmer surface temperature and earlier onset of plant activity in the spring. Biological activity in the soil increases in response to increased soil moisture and temperature (Pritchett and Wells, 1978), speeding decomposition of plant tissues. Overall, site productivity would not be impaired by implementation of this alternative.

Floodplains, Wetlands, and Water Quality
Although the project has potential to contribute minor amounts of sediment to Kinkaid Lake, adherence to Best Management Practices would result in little or no sediment entering the Municipal Water Supply. Thus, there would be little to no effect on water quality in Kinkaid Lake from the proposed action. Riparian and wetland functioning would not be affected by implementation of this alternative.

Cumulative Effects
The period considered for the cumulative effects analysis is 15 years because this period provides a significant basis for measuring changes in soil properties due to the project. The project would span 10 years, and subsequent increases in soil erosion from project and associated activities usually return to pre-project levels within three to five years. Soil compaction effects are variable and there is no information as to the time length for compacted soil to return to pre-project conditions in Illinois or in the Shawnee Hills. Some information from the southeast U.S. indicates 10-15 years is the average time for restoration of compacted areas through natural processes (Miller et al 2004).

The area considered for cumulative effects is three watersheds partially within the project area. The total acreage for the analysis area is 60,628 acres, including about 12,993 acres of federal land (about 21 percent). The remainder of the analysis area is private land under different land uses and ownerships. No other watersheds were included as erosion and sedimentation would not be supplied across watershed boundaries. The baseline for the cumulative effects analysis is the current soil conditions of the project area and the existing water quality in adjacent streams.

Soil Erosion and Sedimentation
Road and utility right of way maintenance and use, wildfires, special-use permitting, recreational uses (hiking, horseback riding, rock climbing, hunting and authorized/unauthorized ATV use) all create accelerated erosion and sedimentation to streams. These activities can all expose bare soil, which is evident at several of the small concentrated use areas scattered throughout the analysis area. The effects of these activities are mainly concentrated in localized areas and have small zones of impact. Agricultural use occurs on a much broader scale within the cumulative effects analysis area. The delivery of sediment to streams and lakes in the analysis area is thought to dwarf that produced by all project area activities combined. However, these activities have occurred in the past, are currently happening and contribute to the existing conditions in the watersheds. We expect these activities to continue at about the same rate in the future.

Soil Productivity and Nutrient Cycling
Three brands of herbicides may be used to control/eradicate garlic mustard as part of the invasive species control project. Degradation for all three herbicides occurs primarily through microbial degradation in the soil though degradation can also occur by light and hydrolysis for triclopyr and imazapic in water. When herbicides are used as directed by label specifications, no long term impacts to soil or hydrologic

resources are expected. Herbicides are used on some of the private lands in the watersheds. We assume that these activities are ongoing today and would continue in the future at the same rates and acreages as they are today. Herbicides currently used and predicted to be used for row cropping and pastureland would have a much greater impact than the estimated 100 acres in the project area.

Floodplains, Wetlands, and Water Quality
The water chemistry of stream bodies in the Kinkaid and Big Muddy areas was covered in the Soil and Water Working Paper (pages 30, 31) for this project. The IEPA has detailed water bodies that are non-supporting of beneficial uses and the probable causes. Some of these causes include but not limited to crop production, surface mining, municipal point discharge, and atmospheric deposition. The IEPA has been active in these areas monitoring the water quality and many TMDL plans have been approved. Wildland natural resource management and associated activities was not cited as a cause for non-support of beneficial uses in these streams. Although the project has potential to contribute minor amounts of sediment to Kinkaid Lake, there would be little to no cumulative effect on water quality in Kinkaid Lake from the proposed action or other activities. The sediment that is added by this project would not be measurable compared to upstream agriculture runoff.

Air Quality

This section describes the air quality of the area that would be affected by the proposed action. The focus is on smoke production from prescribed fires and wildfires and the relationship between project effects and current ambient air quality. Emphasis is placed on those components of the smoke and other pollutants that most affect human health and safety. This section is a summary of the Air Quality Working Paper that was prepared for this project. More detail can be found in that paper (Project Record).

Affected Environment

In general, southern Illinois has good air quality and meets the National Ambient Air Quality Standards (NAAQS) in each of the counties the Shawnee National Forest occupies (USDA Forest Service 2006). The entire southern Illinois region is in a Class II airshed (USEPA 2008). The Carbondale Monitoring Station had the lowest annual average particulate matter less than 10 microns in diameter in the state in 2003, and was among the lowest in other years (IEPA 2007). Background concentrations of particulate matter and other pollutants are thought to chiefly arise from agricultural, industrial, commercial, and residential sources (USEPA 2008). Burning would likely occur fall through early spring (October – April). Mixing heights average around 4000 feet above ground level in these months, helping disperse smoke away from ground level according to the Ventilation Climate Information System (VCIS). Frontal systems tend to pass the area frequently during these months, helping to “scour out” residual smoke. These months are also the time of reduced ground-level ozone and lower visitor use to local campgrounds, except for firearm hunting seasons.

No Action Alternative

Direct and Indirect Effects

Under this alternative there would be no likely effects to air quality since no proposed activities would take place. Current use and activities that do produce some pollutants would continue, but in the past these have not contributed to overly degraded air quality and are not expected to do so in the future. A wildfire in the tornado-damaged area would produce higher emissions than a prescribed fire in the same area (Table 4 in the Air Quality Working Paper).

Proposed Action

Direct and Indirect Effects

Prescribed fires emit particulate matter that could temporarily impact air quality and would be the pollutant of most concern to public health and safety. Computer modeling suggests that smoke concentration levels may reach unhealthy levels near the burn at the time of greatest impact, but detectable smoke may be transported much farther. However, at those distances it is expected that most impacts would be in the form of "nuisance" smoke and/or smell, but all the ambient air quality standards would still be met. Past experience suggests these effects are greatly diminished with increasing distance from the burn, and that actual emissions and impact are much lower than those modeled. Most emissions would occur during active ignition phases of the burn, which would likely last 4-6 hours, depending on burn unit size, complexity, and weather and fuel characteristics during the burn. Smoldering may occur for another day or two. In prior prescribed burns on the Shawnee National Forest, the residual smoke has typically been light. Higher moisture in duff and large logs probably limit combustion of these fuels more than during wildfires or when compared to fires in other parts of the country. Smoke may settle into lower areas at night.

Several sensitive receptors (e.g. schools, hospitals, airports, highways) are potentially affected by these emissions. Computer modeling of downwind smoke concentration from large burn units during typical fuel and weather conditions suggests that residents within 7.92 miles may experience a few hours of elevated concentrations (greater than 175 $\mu g/m^3$) but overall 24-hour averaged concentrations should still be within the National Ambient Air Quality Standard for particulate matter 2.5 microns in diameter ($PM_{2.5}$). Within 19.65 miles, those sensitive to smoke (children, the elderly, or persons with decreased heart and lung function) may be affected during the hour of greatest acreage burned as concentrations are predicted to be 81-175 $\mu g/m^3$. The greatest concentrations of these individuals are in Murphysboro (approximately 10 miles east-southeast of the project) and Carbondale (approximately 15 miles east-southeast of the project), though smaller towns such as Ava, Vergennes, and De Soto may also have sensitive receptors.

Visibility may be reduced at the Southern Illinois Airport but not to the level of impacting aviation operations. Cross-plume visibility is predicted to be at least .25 miles at all distances greater than .25 miles from the fire. The greatest potential for visibility reductions is in the Kinkaid Lake basin and larger valleys such as Logan and Austin Hollow and the Mississippi River floodplain as smoke settles into low spots at night. Such surface inversions are more likely to occur with light winds, clear skies, and low mixing heights. These are of particular concern since State Highways 3 and 151 run through these areas.

Design criteria such as timing burns to coincide with good smoke dispersion, public notification, and highway signing have been included in the project to alleviate most of these impacts (Air Quality Working Paper).

Cumulative Effects

Smoke from fires may travel long distances, and direction is determined by transport winds. Maximum detectable smoke transport from the project may be greater than 30 miles. Most burning is done with south, southwest, west, northwest, and north winds, so areas downwind of the project to the south, southeast, east, northeast, and north within this distance are considered for potential cumulative effects. Since air quality data is readily available for counties, the spatial boundary of analysis is the southern Illinois counties of Perry, Franklin, Jackson, Williamson, Union, and Johnson.

Emissions from prescribed fires are predicted to occur over approximately 20 days per year, in the spring and fall, for 10 years. Each burn (a single unit or combined units) would likely take 1-2 days to ignite, and smoldering emissions may continue for another 1-3 days. About 6-10 units would likely be burned each year, and some of the emissions from these units may temporally overlap. Since county emissions data is listed per year, yearly burn totals will be used for the comparative analysis. The temporal boundary for effects to air quality is the year in which the smoke is produced. Instantaneous emissions maxima for various scenarios are estimated in Appendix A of the Air Quality Working Paper. Fireline construction, transport to and from the site, and other activities involving internal combustion engines may produce some pollutants, but the amount is negligible so the timing of these activities is not considered.

Many other activities would occur in the analysis area in the analysis timeframe (see Table 6 of the EA and pages 9-11 of the Air Quality Working Paper), but only the most important sources were considered for cumulative effects analysis. These were separated into Agricultural, Industrial/Commercial, Other, and Other Rx Burns. The "Industrial/Commercial" category includes fuel combustion and various industrial processes, while the "Other Uses" category is mostly comprised of vehicle use, fugitive dust, but also includes transport and storage, waste disposal/recycling, and all other sources. All data comes from the USEPA AirData website for year 2001 except for prescribed burn emissions, which were predicted separately (pages 9-11 in the Air Quality Working Paper).

Farm production activities in dry soil can release substantial dust and other particulate matter into the atmosphere and reduce visibility. There would be overlap in time as farming may occur during both spring and fall burn seasons. Agriculture produces about 1447 tons of $PM_{2.5}$ per year in the analysis area. Point and non-point source emissions for industrial/commercial and other uses total 2131 tons and 3520 tons, respectively, for the analysis area. Past wildfire amounts have been variable in the analysis area but have only contributed temporarily to decreased air quality and are not considered further. Future wildfire occurrence is difficult to predict but may have a higher potential to produce large volumes of emissions. It is possible that this action would overlap with prescribed burning activities, but is not included in the analysis because of its indefinite nature. Other prescribed fires on Forest Service lands and other ownerships are likely in these counties. Further, several of these burns may occur simultaneously since many people may choose to burn on the same day. Rationale for predicting prescribed fire emissions can be found in the Air Quality Working Paper. Past prescribed fires in southern Illinois have not produced many negative impacts. All of these effects are temporary, however, so that negative impacts last only a few hours to a few days. The combined effects of these burns are still expected to be far outweighed by the effects of agriculture, industry, commercial activities, and widespread automobile use, and are not expected to collectively diminish air quality. These burns combined would comprise only 12 percent of the total $PM_{2.5}$ emissions (8043 Tons) for the analysis area for the year.

Table 9. Particulate Matter ($PM_{2.5}$) Emissions Analysis (Tons)

	Particulate Source					
County	**Agriculture**	**Industrial/ Commercial**	**Other**	**Other Rx Fires**	**Blowdown Rx**	**Total**
Jackson	417	910	848	354	382	**2868**
Perry	284	75	382	0	0	**741**
Franklin	286	164	635	0	0	**1085**
Williamson	224	875	835	28	0	**1962**
Johnson	119	57	371	56	0	**603**
Union	117	50	449	125	0	**741**
Totals	**1447**	**2131**	**3520**	**563**	**382**	**8043**
% of Total	**18%**	**27%**	**44%**	**7%**	**5%**	**100%**

The upper estimate of $PM_{2.5}$ produced in the any year of the Buttermilk Hill – Talbott Hollow Blowdown Project is 382 Tons. This represents approximately 5 percent of the total yearly $PM_{2.5}$ emissions predicted for the analysis area. Past experience suggests that actual emissions would be much lower. In future years there would likely be less particulate matter produced as fuel loads diminish and fewer acres are burned per year, so this percentage would decrease even further.

The combined impact of all activities has been small enough to be acceptable for all criteria pollutants and visibility in the past. The temporary production of smoke would yield a short term increase in some pollutants, especially near the fire, but would not be enough to negatively impact air quality as a whole.

Recreation and Visual Resources

This section discusses the recreation and visual resources of the project area and the effects to them from implementation of the alternatives. A complete discussion of the effects to recreation and visual resources can be found in the Recreation Working Paper.

Affected Environment

The Buttermilk Hill - Talbott Hollow Blowdown Project includes most of the Kinkaid Lake trail system. A total of about 30 miles of trail are maintained within the project area. Three trailheads accessing the Kinkaid Lake trail system are within the project boundary – the Hidden Cove Trailhead, the Buttermilk Hill Trailhead, and an unofficial trailhead at the Crisenberry Dam in the southeastern portion of the project area. Trailhead infrastructure includes small graveled parking areas with an information board, trail directional signs and some split rail fencing. Portions of the Kinkaid Lake trail system were buried under considerable slash as a result of the tornado blowdown; one 2.5 mile segment of the trail is still closed due to the inability to safely clear the blowdown debris. The Buttermilk Hill Picnic Area lies within the project boundary at the eastern edge of the Kinkaid Lake trail system and includes restroom facilities, picnic tables and boat docks. The main access to the area is by boat from Kinkaid Lake.

Johnson Creek Recreation Area is less than two miles north of the project. A group campground caters to equestrian users. There is a dump station and water facilities for campground use. Johnson Creek has several day-use facilities – a beach, picnic area with shelters, grills, beach house, boat launch, fishing pier, and a two-lane boat launch with a trailer parking area are located in the day-use area. Kinkaid Lake is a popular location for fishing, water skiing, boating, canoeing, kayaking and waterfowl hunting. The project area is a popular hunting destination with many hunters using Johnson Creek for camp. There is a trailhead at Johnson Creek that accesses the Kinkaid Lake trail system. Across the lake from Buttermilk Hill Picnic Area is a privately administered marina with associated developed recreation area and full-service campground. Lake Murphysboro State Park is about five miles east of the project area.

No Action Alternative

Direct and Indirect Effects

Under the no action alternative, no management actions would be applied that would affect recreation or visual-resources. There would be continued reduction in visual quality in an increasingly thick understory with fewer vistas. There would continue to be impeded use of trails covered by downed wood. No cumulative effects are anticipated.

Proposed Action

Direct and Indirect Effects
Under the proposed action, there would be some actions applied that would affect recreation or visual-resources. There would be an improvement in visual quality by increasing sight distance into the forest. The project would assist the maintenance of the trail system by consuming some larger logs and branches, and settling overhead hazards either manually prior to, or by direct result of, the burn. Additionally, the burn project would clear some smaller debris from the system trails, facilitating routine maintenance of the trail system. Trails that are used as firebreaks and access trails during the project would be returned to pre-burn condition. Constructed firelines would be closed post-burn to discourage use as non-system trails (Table 3).

In addition, there would be short-term impacts to visual resources following burn activities such as bark char and blackened leaves. This would last until the next growing season. The proposed multiple burn entries would produce the same short-term effects with each entry. In the long term, users would see more oak and hickory regeneration and grasses and forbs in the understory, as well as improved visual quality as a result a reduction in underbrush. Effects of the burn activity to the visual resources from Kinkaid Lake, if any, should be short term.

During prescribed burn activities, hunters, equestrians and other users may temporarily be displaced. Scenery would be altered in the short-term. Long-term effects would create more diversity and resiliency for the surrounding forest while also providing improved conditions for activities such as hunting, bird-watching, hiking, and mushroom gathering.

Cumulative Effects
The spatial boundary used to address cumulative impacts was the project area and surrounding areas in western Jackson County that host high volumes of recreational use (Forest, State of Illinois and privately administered recreational areas, Kinkaid Lake). This spatial area gives a picture of the cumulative impacts for recreational users and visual resources. Past activities completed within the last ten years were analyzed for cumulative effects. Future activities were analyzed looking forward 15 years since the proposed action would be completed and the resulting effects to both recreation and visual resources would be complete. Thus, analysis for cumulative effects examined from 1998 to 2023.

Illegal ATV use has been decreasing in the project area and there is no reason to expect a change in illegal use or creation of new trails under either alternative. Visual impacts of ATV use are likely but not at a scale that would have an effect on the numbers or experience of visitors. Openland management would have a minor positive impact on recreation and visual resources by improving the viewscape and recreational opportunities. When considered with the expected effects of the project, there would not be a substantial impact from ATV use on either recreation or visual resources.

Heritage Resources

This section describes the heritage resource impacts in the 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 alternatives.

The primary heritage resource issue in this analysis is the preservation and protection of heritage resources 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 would be confined to the project area, the area under consideration is the project area itself.

Affected Environment

The project area was inventoried during 2007. There are 57 archaeological sites recorded within or near the project area. Of these, 24 were previously recorded sites: 8 prehistoric, 11 historic and 5 with multiple components. Thirty-three new heritage resources (previously unrecorded) were discovered during the inventory, including 12 prehistoric, 13 historic, and 8 multi-component sites. Of the 57 heritage resources inventoried for this survey, 28 are not eligible for inclusion on the National Register of Historic Places (National Register); recording their location exhausts their research potential. The remaining 29 sites are considered to be potentially eligible for inclusion on the National Register.

No Action Alternative

Direct and Indirect Effects

There would be no direct, indirect or cumulative effects to heritage resources resulting from the implementation of this alternative because no prescribed fire, fireline construction, or mechanical fuel reduction activities would occur, and therefore, earth-disturbing activities would not take place.

Proposed Action

Direct and Indirect Effects

There would be no direct effects to heritage resources resulting from the selection of the proposed action. Prescribed fire, in the absence of earth-disturbing activities, would not have an adverse effect on heritage resources in the eastern woodlands (Cultural Resource Report No. 09-08-04-119 and USDA-FS 2008). However, other activities associated with prescribed fire, such as fire line, water bar construction and mechanical removal of trees and shrubs may affect heritage resources. Twenty-nine sites, which are potentially eligible for inclusion on the NRHP, are included within the project area. Seventeen of these sites would not be impacted by earth-disturbing activities. All 17 are included within the area of potential effects, but either (1) would not have any direct application of prescribed fire, or (2) would only have prescribed fire with no fire lines or other earth-disturbing activity.

The remaining 12 sites would not be impacted by earth-disturbing activities because design criteria are in place to protect them during project implementation. Design criteria include: (1) redesigning the activity in order to avoid the site; (2) fire line construction around the site to protect it from harm; (3) clearing downed fuels away from the site, (4) conducting the prescribed burn only when the humidity, soil moisture and temperature are such as to prevent the fire from burning too hot, or (5) a combination of the measures. In sum, potentially eligible sites would not be adversely affected by the proposed action.

Additionally, project activities associated with prescribed fire have the potential to indirectly affect heritage resources by opening up areas of the forest in which heritage resources are located. Fire lines and road improvement areas may be subject to increased off road vehicle use, visitor use and connected damage. Increased visitor use of an area in which archaeological sites are located can render the sites vulnerable to both intentional vandalism as well as unintentional damage. Intentional damage can occur through unauthorized digging in archaeological sites and unauthorized collection of artifacts from historic properties. Unintentional damage can result from activities such as driving motorized vehicles across archaeological sites, as well as from other activities that disturb the ground during dispersed recreational use.

Because the firelines in the project area are only temporary and no permanent travelways are being constructed (Table 3) it is expected that sites located in the project area would not be more vulnerable to either intentional or unintentional damage. There would not be indirect effects from the implementation of any alternative.

Cumulative Effects

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: agriculture, utility corridor maintenance and other special uses, vegetation management, recreation use, prescribed and wildland fire, and road maintenance. 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. The State Historic Preservation Agency has agreed with these findings (IHPA Log #00713008 and #001110808).

Socioeconomics

This section describes the socioeconomic environment and the effects to it from implementation of the alternatives. The focus is on the socioeconomic relationship between project implementation and the local and regional economy. Emphasis is placed on those components of the economy identified in the scoping process, specifically concern about the impacts of the project on the private land values in the area.

Affected Environment

The Buttermilk Hill-Talbott Hollow Blowdown project area lies in Jackson County in the southwestern corner of Illinois. The area is largely rural with the town of Murphysboro, the county seat, being located about 11 miles southeast of the project area. National Forest ownership in Jackson County is 47,300 acres, or about 12.6 percent of the total land base of the county (376,400 acres). The county is affected by management activities on the Shawnee National Forest through direct employment, as well as purchasing activities. Indirectly, income is derived from recreation activities primarily related to hunting and fishing, but also includes camping, wildlife viewing, etc.

Costs such as general administration and program management are fixed and do not change between the alternatives and are not included in this analysis. It is also important to recognize that many values generated by many Forest Service activities, both positive and negative, involve goods and services that are not priced in the market place and therefore can not be included in this analysis. These values would include such things as the value of a hunting experience, a hike in the woods, wildlife viewing or the water quality of streams and lakes. Social Scientists have spent considerable time and effort in determining the dollar value on a hunting day or trip, but this analysis is confined to the costs and benefits of the proposed project.

Other goods and services do have monetary values, including personal safety and the preservation of farms and livelihoods from wildfires. During 2002 and 2003 Congress recognized the catastrophic costs to individuals and communities located in the vicinity of federal lands as a result of wildfire, and passed the Healthy Forest Restoration Act of 2003 (P.L. 108-148). Thousands of individuals and families had been forced to flee their homes, and thousands of homes and other structures had been destroyed because of wildland fire. The Healthy Forest Restoration Act was signed into law to lessen wildfire risk to communities, municipal water supplies and adjacent Federal lands.

No Action Alternative

Direct and Indirect Effects
Under the no action alternative, there may be a decrease in area land values and recreation-based tourism income in the project area as diminished trail access and aesthetic values may discourage visitation, though this effect may be masked by larger driving forces, such as fuel prices, employment levels and amounts of disposable income. The continued presence of blown-down trees would increase the risk of a high-intensity wildfire, which could result in the loss of private property and agricultural production and adversely affect the local natural ecosystems present within the project area.

Proposed Action

Direct and Indirect Effects
This alternative would reduce the risk of wildland fire. Prescribed fires would have a short term affect on visitation of the immediate area, but soot and smoke from the prescribed fires would be short-lived. Indirect effects include the preservation of homes and farms, as well as contributing to the conservation of the integrity of the forested areas within and around the project area, and associated flora and fauna. Managed prescribed fire would restore and maintain healthy forest and woodland ecosystems, enhance wildlife habitat by encouraging native species growth (e.g. oak seedlings), and maintain and/or improve natural community diversity and species richness, as well as reduce non-native invasive species. This may in turn enhance economic opportunity and area land values by increasing nature-based tourism such as hiking and hunting.

Cumulative Effects
The area of consideration is Jackson County, since the project lies entirely within this county and counties are the smallest areas for which substantial and consistent economic information is available. The temporal boundary of ten years was selected because that is the length of the expected life of the effects of the Buttermilk Hill-Talbott Hollow Blowdown project activities as well as the extent of which these effects are measurable and meaningful. In addition, beyond that timeframe any impacts from these activities would be difficult to discern from other activities. Five years was chosen to look back at these specific actions because their effects would be negligible beyond a five-year timeframe.

A number of activities are not affected by the proposed action and would have no impact to social or economic values. There has been and would be no change in regard to cultivated or pastureland acres, timber harvest and timber stand improvement, road right-of-way or utility corridor maintenance, special use permits, and non-system trail or equestrian use. These activities would not have a cumulative effect on the tangible and intangible values of the socioeconomic landscape of Jackson County.

A number of projects, management activities, and other developments may have cumulative effects on the socioeconomic values of the region. The majority of the effects are beneficial to the private land values in the area. The risk of wildfire would be reduced through the selection of the proposed action. Past, present and future tree planting, invasive species management, brush pile accumulation and openland management have had and would have beneficial effects on wildlife and therefore would enhance the recreation opportunities in the analysis area (e.g. hunting and bird watching). Trail construction and maintenance may also have a cumulative effect with the proposal by enhancing hiking and horseback riding opportunities to Forest visitors. Shoreline and gully stabilization may have a beneficial aesthetic effect on recreation on Kinkaid Lake and improve water quality, possibly providing a beneficial effect to land values.

In short, the cumulative effects of the proposed action would contribute to the local economy though in indirect ways that are difficult to quantify. The proposed action provides for prescribed fire management activities that would begin to restore altered native ecosystems, increasing the probability of preserving both its natural and rural character.

Disclosures

Clean Water Act - Activities identified in the action alternative 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 (BMPs), 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 have be used to guide all action alternatives (Project Record).

Air Quality - The air quality of the Forest meets EPA standards (USDA Forest Service 2005, IEPA Annual Monitoring Report, 2007). Implementation of the proposed action would result in an increase of a few hundred to a few thousand hours of vehicle use and light and heavy equipment use over the next 10 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 airshed during periods of prescribed burning. This could result in short-term, negligible, direct effects to the air quality of the Forest and surrounding region.

Prime Farmland, Timberland and Rangeland - Some prime farmland occurs in the project area. These areas are mainly on the silt loam textured soils located on the ridge with less than 5 percent slope, and the narrow floodplain soils with less than 4 percent slope. 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 both alternatives.

Floodplains and Wetlands – Floodplain site productivity and riparian function would be maintained in the project area in both alternatives. Neither of the alternatives would have an adverse effect on the site productivity or function of any wetlands sites in the project area.

Adverse Consequences, Which Cannot be Avoided

- Slight, temporary accelerated rates of soil erosion would occur as a result of the proposed action even though Illinois Forestry Best Management Practices guidelines, Forest Plan Standards and Guidelines, and soil suitability and limitation interpretation identified by the NRCS would be used to guide activities.
- Temporary, minor increases in turbidity in adjacent streams after storm runoff events.
- Temporary, minor soil compaction would occur from mechanized equipment use**.**

Irreversible or Irretrievable Commitment on Resources - The proposed action would have no irreversible commitments and one irretrievable commitment on the soil resource in the proposed project area or adjacent analysis area if mitigation measures are followed.

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

Irretrievable Effects - Soil erosion above natural rates is an irretrievable effect. The proposed action would result in a temporary (1-2 years following each burn), slight increase in erosion rates above natural geologic rates.

Environmental Justice - Neither alternative would have disproportionate, direct or indirect negative effects on any minority populations and individuals living below the poverty level. More information on the effects of the alternatives can be found in the Environmental Justice working paper (Project Record).

Consultation and Coordination

The Forest Service consulted the following individuals, organizations, and Federal, State and local agencies during the development of this environmental assessment:

Federal, State, And Local Agencies:	
US Fish and Wildlife Service	Kinkaid Area Watershed Project
Natural Resources Conservation Service	Shawnee Resource Conservation and Development Area
Illinois Department of Natural Resources Natural Heritage Division Forestry Division	Southern Illinois University – Carbondale Department of Anthropology Department of Forestry
Kinkaid – Reeds Creek Conservancy District	Ava Volunteer Fire Department
Illinois Historic Preservation Agency	Jackson County

Interdisciplinary Team Members:	
Name	Contribution
Scott Crist	Project Team Leader/Fire and Fuels/Air Quality
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Matthew Lechner	Forest NEPA Coordinator
Susan Corey	Botanical Resources
Monica Neal	Public Affairs, Project Records
Eva Pontious	Project Records
Jeremy Vaughn	GIS and Mapping

Projects documents including this Environmental Assessment, Working Papers and a list of references are available on-line:

http://www.fs.fed.us/r9/forests/shawnee/projects/ea/2008/buttermilk