SHAWNEE NATIONAL FOREST
BIOLOGICAL EVALUATION OF FEDERAL THREATENED AND ENDANGERED SPECIES
FOR THE
VEGETATION MANAGEMENT IN ATWOOD RIDGE RESEARCH NATURAL AREA, OZARK HILL PRAIRIE RESEARCH NATURAL AREA AND OPOSSUM TROT NATURAL AREAS ON THE MISSISSIPPI BLUFFS RANGER DISTRICT, SHAWNEE NATIONAL FOREST

March 21, 2008

EXECUTIVE SUMMARY

With the proper guidelines and safety measures followed, the use of prescribed fire and some associated tree and shrub removal in barrens, hill prairies, and adjacent dry upland forests will have a beneficial affect on the flora and fauna on the Shawnee National Forest. And the cumulative effects are positive or neutral. The effects of not using prescribed fire (no action) could be a large negative effect on habitats for the federally endangered, Indiana bats especially long term.

The proposed actions further preservation and restoration efforts of natural areas on the Forest and in southern Illinois and are not likely to jeopardize the continued existence of any of these species on the Shawnee National Forest or range wide. Also they should be beneficial to the habitats for the Indiana bats especially in the long term. Not implementing the proposed actions in the three natural areas could result in a loss of both plant and animal diversity and a loss of the unique communities.

The following are Forest standards and guidelines for prescribed fire would be implemented along with the proposed actions to avoid possible negative effects on Indiana bats in the project area as part of the implementation of the proposed actions:

- FW51.1.2.4. For the protection of Indiana bat or gray bat maternity roosts or foraging habitats, no prescribed burns shall be conducted in upland forests between May 1 and September 1 and in bottomland forests between April 1 and September 1.

- FW51.1.2.3 (S) Burns within 0.25 mile of any Indiana bat or gay bat hibernacula shall be conducted under conditions that reduce or eliminate the dispersal of smoke into the hibernacula.

- FW51.1.2.5 (S) For the protection of Indiana bat male roosting-habitat within 2.5 miles around any known hibernacula, no more than 20 percent of the habitat in this zone shall be blackened each year, and within 2.5-5.0 miles around any hibernacula no more than 50 percent shall be burned (blackened) in each year.

- All standing, dead trees would retained unless removal is necessary for human safety or to accomplish project objectives.

- Greater than five miles from known hibernacula or maternity roosting habitats, dead trees that are potential roost trees cannot be removed between April 1-September 30 unless they are evaluated and/or surveyed to confirm non-use by roosting bats and documented in a biological evaluation.

- Greater than five miles from known hibernacula or maternity roosting habitats, potential roost-trees, including live hardwood trees with exfoliating bark, should not be removed during the roosting periods-April 1-September 30-unless necessary for human safety or to accomplish project objectives. Removal of potential roost trees during the roosting period requires evaluation and/or surveys to determine non-use by roosting bats. Surveys would be those identified in Forest Plan standards (USDA Shawnee National Forest Land and Resource Management Plan, 2006; Appendix H-p. 287).

INTRODUCTION

Fire has been a natural force shaping ecosystems for 100s of thousands of years (Lyon et al. 2000a). In recent years fire has been suppressed in eastern forests. This has lead to a change on vegetative species composition in eastern forests including on the Shawnee National Forest. In some areas this has reduced the ability of fire tolerant species such as oaks (Quercus spp.) and hickories (Carya spp.) to regenerate. Additionally these forests are increasingly becoming more cluttered with a dense understory (McKenzie 1999). Most forest dwelling animals evolved with and are well adapted to these historic fire regimes. Highly mobile animals such as birds, large mammals, and bats are able to easily escape from ground fires (Lyon et al. 2000d; Carter et al. 2002). Animals with less mobility such as small mammals and herptiles often escape from fire by seeking refuge underground and also suffer low mortality rates (Ford et al. 1999). The highest mortality is usually suffered by young animals such as bird nestlings that are unable to flee or hide (Lyon et al. 2000d).

Recently there has been a resurgence in the use of fire as a management tool for both wildlife and forest management (Ford et al. 2002 and Kapler Smith 2000). The current paradigm is that when used correctly fire can be a highly beneficial tool for reducing fuel loads and habitat management for forest ecosystems.

LOCATION

The project area includes three Shawnee Forest research natural areas and natural areas, located in two counties. The natural areas, counties, locations and community types proposed for restoration are listed in Table 1.

TABLE 1. Location and community type of natural areas proposed for active management on the Shawnee National Forest.

Natural Area*	County	Location	Acres**	Community Type
Atwood Ridge RNA & EA	Union	T13S R2W sec 4,5,8,9,16,17	1,750	Gravel Barrens
Opossum Trot Trail BA	Alexander	T14S R2E sec 14,15,22,23	384	Loess Barrens
Ozark Hill Prairie RNA	Alexander	T14S R2W sec 5,6,7,8	1,166	Loess & Gravel Barrens
Total Acres			3,280	

* RNA = Research Natural Area, EA = Ecological Area, BA = Botanical Area.
** Acres are an approximate estimation and may vary slightly on the ground.-

PROPOSED ACTION

In the proposed action, the District proposes to actively manage three natural areas on the Westside of the Forest. The management will include prescribed fire and tree and shrub removal where necessary. The objective of the proposed management is to restore the native plant and animal communities to a higher biological quality and to maintain species diversity. Project locations and sizes are found in Table 1 above and delineated on attached maps.

The proposal will assess the ecological needs of each natural area and apply prescribed fire and tree and shrub removal as needed. The tree and shrub removal would involve some cutting of small-sized trees and shrubs and girdling larger sized trees in accordance with Plan standards and guidelines. Tree and shrub removal would involve very few acres in the project areas and be confined to areas within historical barrens and xeric forests near the edges of barrens, generally affecting no more than 10 % of each project area. The management may occur over a multi-year period as staff time is available. Following the initial management, maintenance prescribed burns may be repeated on a cycle of every one to five years. The prescribed burns would be implemented when conditions permit in order to meet management objectives. Burns would be planned and implemented during the most optimal periods, depending on the natural community. Fire control/holding lines (areas cleared of vegetation by hand raking and leaf blowing or a mechanical means in some instances) will be prepared before burning.

CURRENT AND DESIRED FUTURE CONDITION (FOREST PLAN DIRECTION)

The Shawnee National Forest Land and Resource Management Plan (2006) was prepared to meet the requirements of the National Forest Management Act (NFMA) of 1976. All three areas planned for management actions are in the Natural Area (NA) management prescription of the 2006 Plan. This management prescription provides for the preservation, protection and/or enhancement of the unique scientific, educational, or natural values found in these three areas. Management activities that may be part of

landscape management in these areas include prescribed burning, tree and shrub removal, trail construction and maintenance, and non-native, invasive species control (Shawnee National Forest LRMP 2006, p. V-76).

This evaluation is tiered to the Programmatic Biological Opinion for the Shawnee National Forest 2006 Forest Plan. It includes all standards and guidelines in that plan that are applicable to this project and the protection and management of federal threatened and endangered species or their habitats.

CUMULATIVE EFFECTS

The scale of cumulative effects for terrestrial species is set at the next 10-15 years (the life of the current Forest Plan) within the boundary of the Mississippi Bluffs Ranger District (westside of the Shawnee National Forest) and the watershed of the middle Mississippi River in Jackson, Union, and Alexander counties in Illinois for aquatic species. These are the geographic influence areas on animal and plant populations discussed in this evaluation. Cumulative effects analysis takes into account all known past actions, the proposed action, present actions, and reasonably foreseeable future actions, that could or will impact the analyses areas. Past actions in the project area vicinities were farming, grazing, land clearing of forest and old fields for agriculture and residential developments, pine and hardwood plantation establishment, timber harvest, recreational facility construction and maintenance, abandoned well and cistern filling, road construction, maintenance and use, Natural Area (8.2) designation, power line construction and maintenance, Wilderness designation and management, homesteads, user-created equestrian and hiker trails, unauthorized user-created all terrain vehicle (ATV) trails, increased equestrian trail use especially in the last ten years, mining, tree planting and timber stand improvements including tree thinning and use of herbicides to reduce vegetative competition, ATV and off highway vehicle (OHV=4-wheel drive and sport utility vehicles (SUV) and trucks and off-road motorcycles) use, outdoor recreational uses (hunting, fishing, and hiking), wildfires, prescribed burning, fire suppression, wildlife opening construction and maintenance, artifact hunting and collection, pond and waterhole construction, and railroad construction and use.

Present actions or activities in the project area vicinities include trail maintenance, construction and use of existing trails; power line maintenance, ATV (mostly unauthorized on National Forest) and OHV use, timber harvest (predominantly on private lands), agricultural management (row cropping and pasture) on private lands, fires (wild and prescribed) and three westside fuels management projects currently being implemented or in planning stages (Blowdown, Big Muddy and Wildlife Habitat/Urban Interface areas), fire suppression, user-created equestrian trails, road maintenance and use, tree planting, railroad maintenance and use, trail rehabilitation, continued and increasing equestrian use; recreational facility management and maintenance, outdoor recreation use (hiking, hunting and fishing), and white-nose syndrome in native bats in the northeast.

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Reasonably foreseeable future actions in the project area vicinities include all of the above present actions, some repeat of the past actions including residential development

on private lands, and the possible use of herbicides on non-native, invasive species in three other natural areas and in a few other locations of highly, invasive plant species on the Mississippi Bluffs Ranger District.

ALTERNATIVES

Alternative 1: No Action.

Under the no-action alternative, the natural areas would not be managed. Small trees, shrubs and invasive species would be allowed to grow, choking out the unique species adapted to the open grown conditions and fire. Fire would not be used to slow the advance of some non-native, invasive plant species in NA's.

Alternative 2: Proposed Federal Action

See Proposed Action Above.

SCOPING AND SURVEYS

All of the areas that are included in the project have been surveyed many times by numerous researchers from Southern Illinois University (SIU), by IDNR Heritage Staff, and by Shawnee National Forest wildlife biologists and botanists over the last 30 years and especially since the early 1970's. In relation to this project, the areas have been surveyed and observed many times on foot in the last 1-5 years by Stan McTaggart (wildlife biologist), Beth Shimp (botanist), Mike Spanel (wildlife biologist, retired) and Steve Widowski (wildlife biologist) on the Shawnee National Forest.

The current list of Federally-listed Threatened (T), Endangered (E) and Proposed (P) Species in Illinois according to the U.S. Fish and Wildlife Service, Region 3 website (www.fws.gov/midwest/endnagered/lists/illinois-cty) was accessed on 10/11/2007 for this evaluation. This list (revised in September 2007) was reviewed for current listings, habitat and known location information for the project counties. Public scoping on this project was also conducted. Scoping comments, species distribution records and site-specific field surveys in the project areas indicate the following Federal Threatened and Endangered species are thought to occur, or have habitat on the Shawnee National Forest in the project area vicinities.

Table 2. Summary of the effects on federally-listed threatened, endangered, or candidate species

Species	Federal Status of the Species (E=endangered, T=threatened, C=candidate for federal listing)	Alternative 1. No Action	Alternative 2
Least Tern	E	• no direct, indirect, or cumulative effects.	• no direct, indirect, or cumulative effects.
Gray Bat	E	• no direct, indirect, or cumulative effects.	• no direct, indirect, or cumulative effects.
Indiana Bat	E	• no direct, or indirect effects. • Possible negative cumulative effect of lack of forest regeneration = reduced roosting resources.	• no direct effects with mitigation; beneficial indirect effects on roosting habitats. Possible indirect negative effect if roosting resources are consumed and possible beneficial indirect effects as roosting resources are created. • no net cumulative effects.
Pallid Sturgeon	E	• no direct, indirect, or cumulative effects.	• no direct, indirect, or cumulative effects.
Fat pocketbook mussel (*Potamilus capax*)	E	• no direct, indirect, or cumulative effects.	• no direct, indirect, or cumulative effects.
Sheepnose mussel (*Plethobasus cyphyus*)	C	• no direct, indirect, or cumulative effects.	• no direct, indirect, or cumulative effects.

F. IRREVERSIBLE EFFECTS AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in normally forested areas that are kept clear for use as a power-line rights-of-way or a road. Resources analyzed in this assessment are those that could be affected by the proposed

action. Given the mitigation measures planned under the proposed action, no long-term negative impacts to any of these resources are anticipated; therefore, no irretrievable or irreversible commitments of resources are associated with the proposed action.

Vegetation Resources
There are no known irreversible effects on vegetation resources from the selection of the preferred alternative. The natural areas will be monitored for detection and removal of exotic species. Weed prevention practices will also be followed. Overall, the effects on native, xeric and shade intolerant vegetation resources in the project areas would be positive from the proposed action as natural communities and species diversity of the native flora are maintained. There would some negative effects on shade tolerant vegetation species that had invaded more xeric habitats in the absence of fire in the project areas.

There would be negative effects on many native plants and communities that are xeric and fire associated and positive effects on mesic and shade dependent species from the no action alternative. No known, federal threatened or endangered plants species would be affected as none are currently known from the project areas. Some of the project areas are unoccupied, suitable habitat for prairie bush clover, a federal threatened species. These unoccupied, suitable habitats for the species would be improved by the proposed action.

Wildlife Resources
There are no known irreversible effects on wildlife resources from the selection of the preferred alternative. Overall, direct and indirect effects on native wildlife and wildlife habitats would be positive as result of the proposed actions as native habitats are improved and maintained. No action would have some small amounts of negative direct and indirect effects on the native wildlife and existing habitats but none of these would be irreversible result in the loss of viability of any wildlife species during the 10-15 year project planning horizon.

EFFECTS ON FEDERAL THREATENED AND ENDANGERED SPECIES

ANIMALS
Based upon the most current (revised September 2007) distribution list of federally-listed threatened, endangered, and proposed species for Alexander and Union Counties in Illinois, the following Federal Threatened and Endangered animals are known from current and historical records from the project area counties of Alexander and Union, or the project area counties are identified as unoccupied, suitable habitat or historical habitat for them: least tern, pallid sturgeon, gray bat, and Indiana bat (www.fws.gov/midwest/endnagered/lists/illinois-cty).

Least Tern (*Sterna antillarum*) - Federal Endangered
This species is documented as an uncommon migrant and local summer resident in southern Illinois. Habitats for the species in southern Illinois are large river systems

including sandbars and islands. In the late 1970's breeding colonies were reported in Gallatin and Pope counties along the Ohio River and in Madison County along the Mississippi. In 1989, 75 to 100 pairs were nesting on Baumgar and Brown's Bar in the Mississippi River between Cape Girardeau and Cairo (K. Andrew West, pers. comm. with R. Smith). In 1993 the least terns were unable to breed due to flooding. In 1994, only a few dozen have been counted from Grand Tower Island to Cairo (T. Fink, pers. comm. with R. Smith). Illinois Department of Natural Resources and the Missouri Department of Natural Resources have surveyed the sandbars and islands in the Mississippi River and found as few as zero nests and as many as 174 nests along the Mississippi river in Alexander and Jackson Counties from 1992 – 2004 (Lindsay 2005). Least terns nest on sandbars and sandy beaches along coasts and large rivers. They feed on minnows in shallow water near nesting habitat. The most important factors influencing the location of nesting colonies are sandbars, feeding areas, and favorable water levels (Sheviak & Thom 1981).

Cumulative Effects: Although known to occur in Alexander County, neither the species nor its habitat are known to occur adjacent to any of the areas proposed for management. Therefore, Alternatives 1and 2 would not have any effect on least terns. With no effects there are no cumulative effects. No further analysis is needed unless additional information is brought forward prior to or during project implementation. In the case of new information, we will initiate informal consultation with the U.S. Fish and Wildlife Service.

Gray Bat (*Myotis grisescens*) - Federal Endangered
Gray bats roost in caves in both winter and summer. Different caves are used in different seasons, but the same caves are used year after year. These caves are usually located within 1-2 km of foraging habitats. Gray bats are known to forage over rivers, lakes and streams (Gardner and Hoffman l986). In Illinois, gray bats are known to occur in Pope and Hardin Counties. The only known roosts are privately owned and located in Hardin and Pope Counties (Carter 2005). The largest roost is in Hardin County near a limestone quarry. One lone gray bat was observed during winter cave surveys in 2007 in small cave in Pope county. Neither site will be impacted under any of the proposed alternatives. There are some historical records of individual gray bats from silica mines in Union and Alexander counties; however none have been identified in winter and summer bat surveys in these mines since the early 1990’s.

Cumulative Effects: All the locations where this species has been documented in southern Illinois are in areas where no management actions are proposed. All known gray bat locations are > 5 miles from the nearest management area. Alternatives 1-2 will have no effect on the gray bat. With no effects there are no cumulative effects. No further analysis is needed unless additional information is brought forward prior to or during project implementation. In the case of new information, we will initiate informal consultation with the U.S. Fish and Wildlife Service.

Determination: No effect on the species or its habitat.

Indiana Bat (*Myotis sodalis*) - Federal Endangered

Indiana bats have been documented currently or historically in most counties in southern Illinois (Carter 2005; Herkert, ed. 1992) including all of the project area counties. Indiana bats hibernate in caves and mines during the winter. Maternity colonies are found primarily beneath loose tree bark on dead or dying trees during the summer months. Male Indiana bats have been documented roosting in a variety of structures including loose tree bark and abandoned mines (Menzel 2001). When roosting within the forest males are usually found solitarily. In these cases, males have been found roosting in a variety of habitats and can be considered a generalist with regards to forest type. 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 2002a). Hibernacula and bachelor colony caverns are located in Alexander, Hardin, Pope and Union Counties. The largest known, Indiana bat hibernacula in Illinois is found in Alexander County. Eleven additional hibernacula have been documented in Alexander, Jackson, Pope and Union Counties. During the summer months, maternity colonies have been located and extensively studied at Oakwood Bottoms near the town of Grand Tower, Jackson Co., IL and in the Bluff Lake area, Union Co., IL (Carter 2003).

There are no known hibernacula located in any Natural Areas proposed for management. All or portions of the Atwood Ridge and Ozark Hill Prairie RNA's and the Opossum Trot NA are within 2.5 miles of known Indiana bat hibernacula. The Atwood Ridge RNA project area is within 2.5 miles of a known Indiana bat maternity colony, and the Ozark Hill Prairie RNA and LaRue/Pine Hills RNA project areas are within 5 miles of known Indiana bat maternity colonies. Portions or all of the three NA project areas are within 5 miles of one or more known Indiana bat hibernacula.

All 1750 acres within the Atwood Ridge RNA burn area are within 5.0 miles of a known maternity colony. The tree cutting standard time frames of 4/1-11/15 apply to the entire project area (Forest Plan, p. 287). All burning in this area will be between September 2 and April 30 each year as the entire area is upland forest. 636 acres within the Atwood Ridge RNA burn area is within 2.5 miles of the Jason Mine hibernacula. The plan standards would allow burning of up to 987 acres/year within 2.5 miles of this hibernacula (Plan BO 2005, p. 99). All 1750 acres of the Atwood Rdige RNA are within 5.0 miles of the Jason Mine. The plan allows burning of up to 4960 acres/year within 5 miles of this hibernacula (Plan BO 2005, p. 100). 908 acres of the Atwood Ridge RNA burn are within 5 miles of the Barney Grace Mine hibernacula. The plan allows burning of up to 5631/year acres within 5 miles of this hibernacula (Plan BO 2005, p. 100). Therefore all burning within the Atwood Ridge RNA burn area would be within Plan Standards.

260 of the 1166 acres of the Ozark Hill Prairie RNA project area is within 5 miles of a known maternity colony. 516 acres of the Ozark Hill Prairie RNA project area is within 2.5 miles of the Mine 30 hibernacula. The plan standards would allow burning of up to 1519 acres/year within 2.5 miles of this hibernacula (Plan BO 2005, p. 99). That is the only known hibernacula within 2.5 miles of any of the Ozark Hill Prairie RNA project

area. All 1166 acres of the Ozark Hill Prairie project area are within 5 miles of the Barney Grace Mine hibernacula. The plan allows burning of up to 5631 acres/year within 5 miles of this hibernacula (Plan BO 2005, p. 100). All of the Ozark Hills Prairie RNA project area (1166 ac) is within 5 miles of each of the following three hibernacula: Barney Grace mine, Magazine Mine, and Mine 30. The plan allows burning of up to 5631, 5621, 7392 acres/year respectively within 5 miles of each of these three hibernacula (Plan BO 2005, p. 100). The project area also includes 989 acres within 5 miles of the Jason Mine and 668 acres within 5 miles of Mine 26. The plan allows burning of up to 4961 and 4563 acres/year respectively within 5 miles of each of these hibernacula (Plan BO 2005, p. 100). All burning in this area will be between September 2 and April 30 each year as the entire area is upland forest. All of the Ozark Hill Prairie RNA project area is within 5 miles of known roosts or hibernacula and therefore the tree cutting standard time frames of 4/1-11/15 apply to the entire project area (Forest Plan, p 287). Bat foraging habitats near 5 different hibernacula would be affected by burning within the Ozark Hill Prairie RNA project area; however all burning would be within Plan Standards.

All 365 acres within the Opossum Trot NA burn area are within 5.0 miles of a known maternity colony or hibernacula. Therefore, the tree cutting standard time frames of 4/1-11/15 apply to the entire project area (Forest Plan, p. 287). All burning in this area will be between September 2 and April 30 each year as the entire area is upland forest. The entire Opossum Trot NA project area (365 acres) is within 2.5 miles of Mine 26 and 30 hibernacula. 355 of the 364 acres within the Opossum Trot NA burn area is within 2.5 miles of the Magazine Mine hibernacula. The plan standards would allow burning of up to 1,028, 1,519 and 984 acres/year respectively for the above three hibernacula within 2.5 miles of these hibernacula (Plan BO 2005, p. 99). All 365 acres of the Opossum Trot NA are within 5.0 miles of the following hibernacula: Barney Grace and Magazine Mines and Mines 26 and 30. The plan allows burning of up to 5631, 5621, 4563, and 7392 acres/year respectively within 5 miles of these hibernacula (Plan BO 2005, p. 100). 42 acres of the Opossum Trot NA burn are within 5 miles of the Jason Mine hibernacula. The plan allows burning of up to 4961 acres/year within 5 miles of this hibernacula (Plan BO 2005, p. 100). Bat foraging habitats near 5 different hibernacula would be affected by burning Opossum Trot NA burn area; however all burning would be within Plan Standards.

In the Midwest, most maternity colonies of Indiana bats are located in bottomland or riparian type habitats. Some roosts, usually alternate 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. Maternity colonies are known from two locations in the Mississippi River valley. One colony is located in the greentree reservoir and the surrounding forests at Oakwood Bottoms and the other is found in the Bluff Lake area and on Union County Conservation Area. Carter (2003) and Feldhamer and Carter (2005) recorded most roost trees at the Oakwood location within the greentree reservoir west of the Big Muddy Levee. Most foraging activity was recorded from the surrounding bottomland forests. Limited foraging was recorded in the upland forest; this was the least preferred habitat. At the Bluff Lake colony, no roost

trees were located on the Atwood Ridge Natural Area; all roost trees were located within the swamps and bottomland of Bluff Lake Area (Carter 2003). Radio telemetry suggests that female Indiana bats in the Bluff Lake colony may forage in limited amounts in the Atwood Ridge Natural Area. However, the upland forests found in Atwood Ridge Natural Area are the least preferred habitat. The vast majority of forging was done over bottomland forest and water habitats (Feldhamer and Carter 2005). Captures of male Indiana bats near Opossum Trot Trail Natural Area suggests that these bats could be foraging within that Natural Area. Most likely these males were from bachelor colonies located in the nearby abandoned silica mines (Carter 2005).

A good summary of the possible direct effects of burning on bats can be found in Carter et al. (2002b) and Collins (2005). Given the long history of fire in North America (Van Lear and Harlow 2002), bats have most likely evolved to co-exist with the threat of fire. Jackson (2005) examined bat activity before and after prescribed burns and found that burning had no effect on bat species diversity or abundance. He did correlate bat diversity and abundance with forest stand density (tree density). Forest stands with lower stand densities had higher bat diversity and abundance. These stands were typical of areas that had been subject to prescribed burns that resulted in less cluttered habitats with lower tree densities. Jackson (2005) found that bat diversity and abundances were highest at 9.0 m2/ha and decreased as forest stand density increased to 20 m2/ha. In recent work in Arkansas, male Indiana bats were radio tracked to roost sites within recently burned areas. Over 85% of the located roosts were in forests that were either burned or subject to timber harvests (Prescott 2005). In West Virginia, a maternity colony was discovered in an area that had been thinned 4-5 years previously and had a wildfire 3 years earlier. The timber harvest and wildfire decreased the overstory to 25% of its original density (Ford 2005). In central Indiana, an Indiana bat maternity roost tree was found in an area that was burned every 1-2 years. It is unclear if the fire created the snag, however, bats continued to use the tree each summer despite annual burning until the tree feel from natural decomposition (Schneck 2005). When burning, efforts were made to preburn or clear a ring of about 30 feet around the known roost tree to act as a fire break from the regular prescribed burn (Schneck 2005). Female evening bats (*Nycticeius humeralis*) have been radio-tracked to roosts under exfoliating bark in areas in South Carolina that were burned only a few days prior (Carter 2005).

The relatively little research that has examined the effects of fire on bats suggests that bats likely behave in a similar fashion as other highly-mobile 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 pasted through (Dickson 2002). Even when exposed to possibly higher predation pressures, it is highly unlikely that bats will remain in the roost if faced with fire and 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 young are not volant. 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 resources), 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 as a result 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 should return back to preburn levels quickly. The improved habitat should further allow insect populations to increase to densities greater than those found prior to burning (Lyon et al. 2000b and 2000c). Jackson (2005) found that insects dramatically increased both in terms of density and diversity within stands that were thinned and burned. Thinned and burned stands had more open canopies allowing for greater amounts of ground cover to establish which increased the food resources for insects, ultimately increasing the insects and food resources for bats (Jackson 2005). While some recommendations call for the forests around hibernacula and maternity colonies to "not be dramatically altered" and "be maintained in as natural state as possible" (NatureServe 2005), these same recommendations do not incorporate the findings of the most recent research and also that fire was historically a natural event in eastern forest ecosystems (Carter et al. 2002; Jackson 2005; Prescott 2005)

Maternity Colony Habitat:
Burning in areas where maternity roosts are likely to be found should be avoided during times when young are not volant and would be unable to flee. Past work on the Shawnee National Forest suggests this period is from late May through early July (Carter 2005). Additionally, if burning in areas where maternity colonies are located and snags in the area are limited (less than 10 snags/ha), efforts should be made to preserve them by a method that reduces the chance that the snag will be consumed. Efforts should be made when possible to burn during times when bats are not present (e.g. dormant season). If a burn must be conducted during the growing season, it should be planned for after mid summer when the bats are under the lowest physiological demands, the young are mature and independent and females are no longer nursing. While bats have started accumulation of fat reserves for winter their ability to travel vast distances allows them to relocate to alternate areas such as swarming habitat if needed (Kurta and Murry 2002; Carter 2005).

Some tree and shrub removal actions would take place in the Atwood Ridge and Ozark Hill Prairie RNA sites within 5 miles of the known maternity colony in the Upper Bluff Lake vicinity. This action would involve some cutting of small-sized trees and shrubs and girdling larger sized trees in accordance with Plan standards and guidelines. These actions would involve very few acres in the project area Natural Areas and be confined to areas within barrens and xeric forests near the edges of barrens. These actions should not have any negative affect on roosting bats or their habitats. They will have positive, indirect effects on bat foraging habitats by lessening tree densities in these areas.

Summer Male Habitat:

Virtually any forest habitat with some snags present can be considered suitable for male Indiana bats. Therefore, burns within any forested or partially forests habitat have the potential for impacting male Indiana bats. Mist net surveys of the Shawnee National Forest from 1999 through 2004 resulted in a very limited number of male Indiana bats captured on the majority of the forest – none outside of maternity or bachelor colony areas. The densities of male Indiana bats outside of maternity or bachelor colony areas (see below) are likely to be very low. Burning in these areas would likely impact very few animals. Historically fire was a frequent event in these landscapes. It is unlikely that this highly-vagile species has survived for 100's of thousands of years without adapting to co-exist with fire (Carter et al. 2002). Even in the unlikely event that male Indiana bats are killed as a result of management activities, it will have no effect on the reproductive potential of the species and would not decrease genetic diversity. Indiana bats follow a random promiscuous matting pattern that takes place during large gatherings (swarms) prior to hibernation. Males mate with multiple females and visa-versa (Whitaker and Hamilton 1998). Additionally, the large distances that Indiana bats have been recorded migrating prior to mating and hibernation suggests in the unlikely event of a reduction in the number of local males, females would still find plenty of males for reproduction (Kurta and Murry 2002). There is no data to suggest that burning or activities related to burning have a negative effect on male Indiana bats and recent anecdotal data suggests that burning may in fact benefit male Indiana bats. Additionally, opening the mid story, promoting regeneration of the oak/hickory community, and other benefits of burning fair outweigh the possible effects that might happen to a few male Indiana bats. Therefore there should be no restrictions related to Indiana bats placed on areas outside maternity and bachelor colonies (Carter 2005).

Some tree and shrub removal actions would take place in the Atwood Ridge, Ozark Hill Prairie, and Opossum Trot RNA's and NA within 5 miles of the known summer, bachelor colonies in Magazine and Barney Grace mines and Mine 30. This action would involve some cutting of small-sized trees and shrubs and girdling larger sized trees in accordance with Plan standards and guidelines. These actions would involve very few acres in the project area Natural Areas and be confined to areas within barrens and xeric forests near the edges of barrens. These actions should not have any negative affect on roosting bats or their habitats. They will have positive, indirect effects on bat foraging habitats by lessening tree densities in these areas.

Cavern Roosting – Bachelor Colonies and Hibernacula:
Burning between November 15th and April 15th should minimize the direct impact to bats actively foraging and roosting within the forest during the spring, summer and autumn months. However, if burning is conducted outside these dates, efforts should be made to burn only during warmer temperatures (>10oC). This will minimize the differential between torpor body-temperature and active or flying body-temperature, allowing for faster response times (Carter 2005). Burning should be avoided in the immediate vicinity of caves or mines that are known to house hibernating bats. This includes the valleys where entrances are located and the ridge tops immediately above the hibernacula. Dramatic changes in the ground cover or vegetative community may have an affect on the critical internal microclimate of the hibernacula. Wind direction and

other factors should be considered so that smoke is blown away from the entrances of known hibernacula. Recent work done with Indiana bats around hibernacula in Arkansas (Prescott 2005) almost perfectly mirrored the results from MacGregor et al. (1999), where roost trees were on average 2.2-2.4km (max 4.3km) from the hibernacula. Both studies found that Indiana bats preferred to roost in areas that were subject to burning or thinning and burning. However to ensure that the bats have alternate areas for foraging and roosting while burning is conducted and while the forest vegetation and insects are regenerating, efforts should be made to limit the amount of habitat that is burned around known bachelor colonies or hibernacula on an annual basis. Limitations include burning no more than 20% and 50% of an area extending 4km (approximately 2.5 miles) and 8km (approximately 5.0 miles) from the cavern respectively. These are management standards in the Shawnee National Forest Plan (p. V-48) that apply across the Forest and to all or portions of all three project areas and as such are included in the proposed actions for all three areas. This will minimize the chances of directly impacting the spring and autumn roosting and foraging resources and allow bats to easily find alternate areas for these resources if needed. Outside 8km from the cavern, densities are likely to be the same as those found in general male Indiana bat habitat (see above; Carter 2005).

Some tree and shrub removal actions would take place in the Atwood Ridge, Ozark Hill Prairie, and Opossum Trot RNA's and NA within 5 miles of the known hibernacula in Magazine, Jason, and Barney Grace mines and Mines 26 and 30. This action would involve some cutting of small-sized trees and shrubs that are not bat roost trees and girdling larger sized trees that could possibly be bat roost trees in accordance with Plan standards and guidelines. These actions would involve very few acres in the project areas and be confined to areas within historical barrens and xeric forests near the edges of barrens, generally affecting no more than 10 % of each project area. These actions should not have any negative affect on roosting bats or their habitats. They will have positive, indirect effects on bat foraging habitats by lessening tree densities in these areas.

Snag Removal:
In the event that activities related to burning require the removal of snags, management guidelines to protect Indiana bats and other tree roosting bats during tree removals will be followed. These management guidelines are as follows: Greater than 5 miles from known hibernacula or maternity-roosting habitats, dead trees that are potential roost trees (those with exfoliating bark) cannot be removed between April 1 and September 30, unless they are evaluated and/or surveyed to confirm non-use by roosting bats and documented in a biological evaluation. Less than or equal to five miles from known hibernacula or maternity-roosting habitats dead trees that are potential roost trees (those with exfoliating bark) cannot be removed between April 1 and November 15, unless they are evaluated and/or surveyed to confirm non-use by roosting bats and documented in a biological evaluation (Shawnee National Forest Plan 2006, Appendix H, p. 288). If any dead Indiana bats are found, care must taken in handling them and notification must be made to the U.s. Fish and Wildlife Service (Shawnee National Forest Plan 2006, Appendix H, p. 291). Dead bat specimens should be placed in a plastic bag and refrigerated as soon as possible following discovery (Shawnee National Forest Plan 2006, Appendix H, p. 291).

Cumulative Effects:
In southern Illinois, forest acreage had increased from 1985 to 1998 (Schmidt et al. 2000) but oak/hickory forest is being replaced by sugar maple and American beech forests in the Illinois Ozarks (Fralish et. al. 2002 and Parker and Ruffner 2004). Alternative 1 (No Action) will have a long-term negative effect on suitable habitat for the Indiana bat in the project areas as forests succeed to communities dominated by thin-barked trees in the absence of fire. There is an increasing understanding of the role of fire in eastern forests (Van Lear and Harlow 2002). Without fire many forests suffer from poor regeneration and tree species composition dramatically changes (Wade et al. 2000). Suppressing fire allows maples, beech and other thin barked species to establish. This reduces the thick barked species such as oak and hickory. With regards to Indiana bat roosting habitat, tree species is probably not as important as bark characterizes when trees die. Thick barked species such as oaks and hickories commonly become excellent roost trees after death. Thin barked species are not used as often because the bark does not maintain the large sheets needed to shelter Indiana bats. Additionally, understory fires remove much of the lower and mid story vegetation (Wade et al. 2000). This removes clutter and allows bats easier access for foraging (Carter et al. 2002).

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

Biologists from the Illinois Department of Natural Resources examined many of the larger Indiana bat hibernacula in southern Illinois during January and February of 2008, and have thus far found no presence of this new and potential damaging infectious agent (Forest Service email 2008). The Shawnee National Forest has been in communication with the Marion Office of the US Fish and Wildlife Service to discuss the implications of this new disease. The USFWS has indicated that at the present time, there is no evidence that white-nosed syndrome is currently posing a risk to the Indiana bat in southern Illinois. Mortality to Indiana bats appears at this time to be confined to New York, Vermont, and Massachusetts. The mortality that has thus far been documented does not

warrant modifications in “reasonable and prudent measures” issued by the USFWS to the Forest in the December 2005 BO.

Alternative 2 (Proposed Action) may have short-term negative effects on the immediate foraging and roosting resources. However, the amount of area burned will involve only a small portion of the overall bat resources in the vicinity of known roosting and hibernating areas and would be in accordance with Forest Plan standards ((Shawnee National Forest Plan 2006, p. V-48). And timing of the burns in accordance with Plan standards for Indiana bats should result in either no direct effects on any Indiana bats or individuals of the species would be affected at a time that will allow them to relocate to alternate areas for the needed resources. Prescribed fire may temporarily result in a reduction in snag abundance (Lyon et al. 2000a). However, while burns may consume some snags, others are created in the process. Except for immediate snag removal, fire should not have a long-term effect on snag densities.

Research has shown that insect communities change as a result of burning. Insect densities decrease initially after the burn and then increase as new succulent vegetation emerges (Lyon et al. 2000b and 2000c, Jackson 2005). Over the long-term densities of insects remain unchanged or even increased. Insect composition changes with the changes in the vegetation communities (Lyon et al. 2000b and 2000c), but there is no data to suggest that these changes are dramatic enough to have an effect on the foraging ability of Indiana bats.

The proposed action (Alternative 2) would maintain oak/hickory forests, barrens, and hill prairies in the project area vicinities. This should be a corresponding increase in suitable foraging and roosting habitats for the species, and positive cumulative effects on the species in the project areas and in southern Illinois. Additionally, the mortality documented thus far to Indiana bats in New York, Vermont, and Massachusetts, when taking into account all past, present, and foreseeable actions that may affect Indiana bat numbers and habitat on non-Forest Service and Service lands, is not considered to have an adverse cumulative affect on the Indiana bat population.

The no action alternative could have a negative cumulative effect on Indiana bat roosting and foraging habitats as oak/hickory forests are replaced by beech/maple forests and both suitable roosting and foraging habitats for the species would be reduced in the project area and in southern Illinois in relatively close proximity to known roosting habitats and hibernacula. This could result in a loss of both plant and animal diversity and a loss of the unique communities that are the focus of the preservation and restoration efforts. Additionally, the mortality documented thus far to Indiana bats in New York, Vermont, and Massachusetts, when taking into account all past, present, and foreseeable actions that may affect Indiana bat numbers and habitat on non-Forest Service and Service lands, is not considered to have an adverse cumulative affect on the Indiana bat population.

Determination: Implementation of prescribed burning with application of standards and guidelines would have positive direct and indirect effects on habitats and on Indiana bats through the improvement of foraging habitats and therefore would have a MAY

AFFECT, NOT LIKELY TO ADVERSELY AFFECT determination on Indiana bat habitat and populations in the project area and on the Forest.

Some small scale tree and shrub removal that involves cutting of small trees and brush that are not bat habitats and girdling larger trees that could be bat habitats in the vicinity of historical barrens and xeric forests in accordance with Plan standards for tree cutting would have no negative effects on Indiana bat roosting habitat. These same tree and shrub removal actions would have positive improvements of foraging habitats. Therefore these actions would have a MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT determination on Indiana bat habitat and populations in the project area and on the Forest.

Rationale:
No Indiana bat maternity or winter habitat will be negatively affected. There will be improvements to foraging habitat in both the short and long term in Alternative 2. There will generally be no or very minor direct impacts to Indiana bats from these proposed projects with implementation of standards and guidelines. With the overall positive effects on foraging habitats, the proposed actions will not likely adversely affect Indiana bats. No overall negative effects on populations of Indiana bats are predicted from the proposed actions as cumulative effects would be overall positive for the species and its habitat in the project area vicinity.

Pallid Sturgeon (*Scaphirhynchus albus*) – Federal Endangered
The endangered pallid sturgeon is found in the Mississippi River downstream of Melvin Price Locks and Dam. Pallid sturgeon are adapted to large rivers with extensive micro-habitat diversity, turbid water, braided channels, irregular flows and flood cycles. It is suspected that sand/gravel bars and the mouths of major tributaries may be utilized for spawning. Larval sturgeon have been collected in association with the tips of islands in the Mississippi River. This species feeds on aquatic invertebrates and small fish (NatureServe 2005). Although known to occur in the Mississippi River in Union County, neither the species nor its habitat is known to occur in the proposed project areas. None of the proposed management in the natural areas is adjacent to the Mississippi River therefore no direct effects on the Mississippi River habitat of the pallid sturgeon are anticipated from the proposed alternatives.

Most of the three project areas are within watersheds of tributaries to the Mississippi river. However, burns would be conducted under conditions that generally result in low intensity burns. In low intensity burns only ground cover, grasses/sedges, shrubs, and trees less than 2-4 inches in diameter are burned. Root systems are little damaged and soil stability is maintained and rapid re-growth of vegetation follows quickly after the burns. Little if any soil erosion and subsequent increased sedimentation in nearby streams are anticipated from the prescribed burns as little soil is disturbed in both the short or long terms from this type of burning. No measurable, indirect effects on Mississippi River habitats for the Pallid Sturgeon are predicted from the Proposed Action or the No Action alternatives.

Cumulative Effects:

Major changes have occurred to the Mississippi River and its floodplain in Southern Illinois. Levees have been built to control flooding in floodplains and in-stream habitat modifications of the river including low dams and wing dams have occurred to aid navigation. These modifications have been done by the USACE. These have greatly altered the hydrology of the River and its floodplain over hundreds of miles of the river both upstream and downstream of southern Illinois. These have certainly caused major impacts to pallid sturgeon populations and its spawning, nursery and foraging habitats. Past pollution and sedimentation of the rivers from agricultural and residential management and developments over hundreds of miles of the River and its floodplain have also impacted both fish and their foraging habitats in the River including those for the pallid sturgeon.

Most management actions on the Forest including the proposed action and no action alternatives for the three Natural Areas have little or no indirect effects on pallid sturgeon as they will have little measurable effects on on-site or downstream water quality. Management and use of roads and trails on the Forest in the project area vicinities contribute small amounts of excess sedimentation that cannot be mitigated except by removing the roads or trails and their use. However, even these actions will be immeasurable for the species as they add inconsequently to the already huge amounts of sediment in the Mississippi River from upstream uses on thousands of square miles of middle and upper Mississippi River watershed.

The additive effects of all existing management actions on National Forest in the project area vicinities to existing habitat conditions on the River and its floodplain will result in no changes in pallid sturgeon habitats, populations or population trends in the Mississippi River. Finally, alternatives 1-2 will not have any direct or indirect effects on the Pallid sturgeon. With no effects there are no cumulative effects. No further analysis is needed unless additional information is brought forward prior to or during project implementation.

Determination: No effect on the species or its habitat.

Sheepnose mussel (*Plethobasus cyphyus*)

This species is primarily a mussel of large streams. It occurs in shallow shoal habitats with moderate to swift currents over coarse sand and gravel (Oesch 1984). Habitats may also include mud, cobble and boulders. Specimens in larger rivers may occur in deep runs (Parmalee and Bogan 1998). The species is known from the mainstem of the Upper Mississippi River above the Ohio River confluence but not in the project area counties. There is a record for the species from the Whitewater River in Cape Girardeau County, MO from the 1970's (Buchanan 1980). The Whitewater river is a tributary to the Meramec River that is a tributary to the Middle Mississippi River just south of St. Louis. There is no known location for the species in Mississippi River or any of its tributaries in the project area counties. Therefore, alternative 2 will have no direct or indirect effects on the species.

Cumulative effects

Alternatives 1-2 will not have any direct or indirect effects on the sheepnose mussel. With no effects there are no cumulative effects. No further analysis is needed unless additional information is brought forward prior to or during project implementation.

Determination: No effect on the species or its habitat.

PLANTS

No federal endangered or threatened plant species are listed (USFWS revised list of Federal endangered, threatened or candidate species September 2007) or are currently known from the project area counties. Floristic surveys and/or threatened, endangered, and sensitive plant surveys have been performed at many of the proposed project areas at various times over the last several decades by botanists, ecologists and others. Available literature and current information were also reviewed in addition to the field visits. The field visits helped in determining whether or not potential habitat existed at these sites for federal threatened and endangered plant species. One Federal Threatened plant species is known from historical records from the project area county of Union. This species is the Price's potato bean (Apios priceana). However, it is considered extirpated from that one location and no longer listed by the USFWS for that county or location.

Apios priceana, Price's Groundnut - Federal Threatened

Apios priceana is a species that was historically found in floodplain forests and thickets of the Lower Mississippi River in southern Illinois. This species is known to have occurred historically within a bottomland forest of Union County within the LaRue/Pine Hills RNA project area. This population was discovered in 1941 and never rediscovered since. The species is believed to be extirpated from the site. This species was not found during floristic surveys of the proposed project sites.

Alternatives 1-2, will have no known environmental effects to known populations or unoccupied suitable habitat of *Apios priceana*.

Cumulative Effects: Because Alternatives 1-2 will have no direct or indirect environmental effects on known populations or unoccupied, suitable habitat of *Apios priceana*. It is concluded that there will be no cumulative effects. No further analysis is needed unless additional information is brought forward prior to or during project implementation. In the case of new information, we will initiate informal consultation with the U.S. Fish and Wildlife Service.

Determination: No effect on the species or its habitat.

CONCLUSIONS

Alternatives 1-2 would have no effects on any of the above Federal threatened or endangered aquatic animals species since none of the above aquatic animals species or

potential habitat for them would be affected by any of the alternative actions. There is a possibility of indirect positive effects on habitats for some terrestrial animals (Indiana bats). Overall, the proposed actions are not likely to jeopardize the continued existence of any of these species on the Shawnee National Forest or range wide. Additionally, the proposed action is likely to improve forest conditions for some of these animals in the long-term.

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The above Biological Evaluation of Federal Threatened and Endangered Species prepared for the proposed Natural Areas Burn Project has been reviewed by the U.S. Fish and Wildlife Service and their concurrence noted.

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