BIOLOGICAL OPINION

on the

Wayne National Forest Land and Resource Management Plan

for the

Federally-listed Endangered Indiana Bat (*Myotis sodalis*) and Running Buffalo Clover (*Trifolium soloniferum*)

Submitted to the Wayne National Forest

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INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Programmatic Biological Opinion (PBO) based on our review of the implementation of the Wayne National Forest (WNF) Revised Land and Resource Management Plan (Forest Plan) and projects predicated upon it, and its effects on the Indiana bat (*Myotis sodalis*) and running buffalo clover (*Trifolium stoloniferum*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). This biological opinion is based on information provided in the August 31, 2005 Wayne National Forest Programmatic Biological Assessment Land and Resource Management Plan; the Draft Environmental Impact Statement Proposed Land and Resource Management Plan, Wayne National Forest; the Proposed Revised Land and Resource Management Plan, Wayne National Forest, numerous meetings, phone conversations, and e-mail exchanges between the Service and the WNF. A complete administrative record of this consultation is on file at the Service's Reynoldsburg, Ohio Field Office (ROFO).

The Service will implement a tiered programmatic consultation approach to the WNF Revised Forest Plan. Tier I analyzes the Forest Plan as a whole at the program level. No specific projects are analyzed at this level. As individual projects are proposed under the Forest Plan, WNF will provide the Service with project-specific information that describes: 1) a description of the proposed action and the area to be affected including latitude and longitude information, 2) the species that may be affected and their known proximity to the project area, 3) a description of how the action may affect the species, 4) a determination of effects, 5) a cumulative total of incidental take that has occurred to date under the PBO, 6) a description of any additional actions or effects, if any, not considered in the tier I consultation. The Service will review the information provided by the WNF for each proposed project. During the review if it is determined that an individual project is not likely to adversely affect listed species, the Service will complete its documentation with a concurrence letter that refers to the PBO and specifies that the Service concurs that the project is not likely to adversely affect listed species. If it is determined that a project is likely to adversely affect listed species, the Service and Forest Service will engage in formal consultation for the project. Formal consultation culminates with the Service providing a tier II biological opinion with a project-specific incidental take statement if take is reasonably certain to occur.

CONSULTATION HISTORY

The discovery of the Indiana bat on NFS land in 1997, along with reports of other federally listed species occurring near the WNF, prompted the Forest Service to begin amending the Forest Plan. Formal consultation was completed on September 20, 2001, when the Service issued its Programmatic Biological Opinion (PBO). The PBO set up a tiered consultation approach where the effects of the overall Forest Plan goals were analyzed, and the effects of future specific projects would be reviewed and analyzed and tiered back to the PBO (USFWS 2001). Forest Plan Amendment 13 incorporated all of the PBO terms and conditions into the Forest Plan. Since issuance of the PBO forty-two tier II BOs have been issued to the WNF, encompassing the alteration of 1,455.5 acres of potentially suitable habitat for the Indiana bat and the permanent loss of 21.08 acres.

The WNF and Service signed a Consultation Agreement on January 23, 2003 to address early coordination on the revision of the Forest Plan, which tiered to the national *Memorandum of Agreement on Section 7 Programmatic Consultations and Coordination among Forest Service, Bureau of Land Management, Fish and Wildlife Service, and National Marine Fisheries Service* signed August 30, 2000.

On September 19, 2003, the WNF and the Service discussed the draft Species Data Collection Forms (the products of the species viability evaluations) for the Indiana bat, American burying beetle, and bald eagle. Comments about the drafts, as well as conservation approaches, were incorporated into the final Species Data Collection Forms for these three species.

The WNF held three collaborative learning workshops during October and November 2003 in which the public was invited to develop themes for the revision alternatives. The Service attended the Athens workshop and participated in the development of themes.

The WNF and Service conducted their annual coordination meeting on January 6, 2004, at which time the preliminary management areas and alternatives were displayed.

On March 1, 2004, the WNF made a request to reinitiate formal consultation to modify the incidental take statement in the 2001 PBO for the Forest Plan to encapsulate the effects of the 2003 ice storm and other unanticipated forest health improvements on the WNF. The Service amended the 2001 Biological Opinion on March 8, 2004.

The WNF met with the Service on March 23, 2004 to describe in detail alternatives for the revised Forest Plan.

The WNF requested an updated list of species to include in the Forest Plan revision and biological evaluation on February 25, 2004. The Service responded on March 24, 2004 with a list of nine federally endangered or threatened plants and animals that should be addressed in the revision. In addition, the Service recommended that the WNF address the cerulean warbler, sheepnose mussel, and rayed bean mussel in the revision of the Forest Plan. On April 14, 2004, the WNF informed the Service that the rayed bean mussel is found outside the WNF proclamation boundary in the Scioto Brush drainage, and that no NFS lands or any lands within the WNF proclamation boundary drain into this watershed. The Service responded via email that no direct, indirect, or cumulative effects are expected to the rayed bean mussel from management actions on the WNF. The cerulean warbler is a Regional Forester sensitive species and the sheepnose mussel is proposed for Regional Forester sensitive species designation; both were addressed during the revision process.

Several informal reviews of the draft Forest-wide direction occurred between the WNF and Service during April-June 2004.

The Consultation Agreement was amended on May 17, 2004 to reflect new employee contacts and a revised timeline for the Forest Plan revision.

The Service informed the WNF on June 21, 2004 that the agency was working on a candidate assessment for the eastern hellbender, and they recommended the WNF consider this species in the revision. The WNF responded on June 22, 2004 that the eastern hellbender is one the WNF Regional Forester Sensitive Species and was included in the species viability evaluation process, and would be included in the revision.

The draft biological evaluation for the Forest Plan revision was developed by the WNF and reviewed by the Service multiple times between June and November 2004.

The Consultation Agreement was amended on April 18, 2005 to reflect a revised timeline for the Forest Plan revision.

The WNF requested an updated list of federally listed or proposed species to address in the biological assessment on July 7, 2005. The Service responded on July 11, 2005 that the species list was the same as that noted in the March 24, 2004 letter received from the Service. The Service noted in our July 11, 2005 response that the biological assessment would not have to include the sheepnose mussel or the cerulean warbler (as noted in the March 24, 2004 letter) as these species have not been proposed for listing at this time.

A population of running buffalo clover was found on the Ironton Ranger District in June 2005. The Service was notified of the population on August 9, 2005 and verified the finding on August 23, 2005.

The WNF and Service met informally on August 16, 2005 to discuss effects of the Selected Alternative on federally listed species, as well as clarifications of Revised Forest Plan standards and guidelines.

The WNF prepared a Biological Assessment to disclose the effects of the Selected Alternative (Alternative E_{mod}) on the nine federally listed species. It was completed in August 2005.

In their request for formal consultation received by the Service on September 1, 2005,the WNF determined that the Forest Plan is likely to adversely affect the endangered Indiana bat (*Myotis sodalis*) and running buffalo clover (*Trifolium stoloniferum)* and is not likely to adversely affect the endangered American burying beetle (*Nicrophorus americanus*), fanshell mussel (*Cyprogenia stegaria*), pink mucket pearly mussel (*Lampsilis abrupta*), and the threatened bald eagle (*Haliaeetus leucocephalus*), Virginia spiraea (*Spiraea virginiana*), northern monkshood (*Aconitum noveboracense*), and small whorled pogonia (*Isotria medeoloides*).

WNF requested our concurrence on these effect determinations. In a letter dated September 22, 2005, we concurred with WNF's determinations and indicated that the initiation package associated with the request for formal consultation was complete in accordance with 50 CFR §402.14.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **American burying beetle** based on the following: (1) suitable habitat for this species occurs in the action area but no individuals have been detected in the area during past surveys, (2) the Forest Plan will not significantly reduce suitable habitat for the species in the landscape; the

Historic Forest management area was developed, in part, to provide open to semi-open mature woodlands for species like the American burying beetle, and (3) the following standards and guidelines will be applied during project planning and implementation to protect individuals and protect and improve potential habitat.

GFW-**TES-21** – Discourage the use of bug zappers by campers in dispersed or developed recreation sites within 10 air miles of known occupied American burying beetle habitat.

GFW-**TES-22** – Limit ground compaction to the minimum area possible during major earth disturbing activities (including, but not limited to new road and trail construction, mineral resource exploration and development, or new facilities) that occur in suitable American burying beetle habitat within 10 air miles of known occupied American burying beetle habitat.

GFW-**TES-23** – During the American burying beetle activity period, use bait-away methods prior to and during the implementation of major earth disturbing activities that occur in known occupied American burying beetle habitat.

GFW-**TES-24**– In occupied American burying beetle habitat, design new roads with the minimum safe width necessary for planned use of the road.

GFW-**TES-25** – Within 10 air miles of known occupied American burying beetle habitat, keep ground disturbance to a minimum during the reconstruction and maintenance of existing roads. Limit width of road, ditches, and surface materials to the minimum necessary for the planned use.

GFW-**TES-26** – Restrict the use of insecticides within known occupied American burying beetle habitat.

At this time the Forest Plan is not likely to adversely affect the Americana burying beetle due to the beetle's lack of presence. The WNF is working towards reintroducing the American burying beetle on the Forest. Once introduced, potential adverse effects to the American burying beetle from the WNF's Forest Plan, as proposed, will be undetectable or unlikely due to the standards and guidelines above.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **fanshell mussel** based on the following: (1) no individuals occur within the action area, (2) suitable habitat for host fish occur within the action area, but no currently suitable habitat for the fanshell occurs, (3) ground disturbance activities that impact water quality will be minimized by integrating Forest-wide standards and guidelines (USFS 2005), and (4) habitat improvements may occur due to management that emphasizes retaining, restoring, and enhancing riparian corridors and riverine systems. Based upon this information, any potential adverse effects to the fanshell mussel from the WNF's Forest Plan, as proposed, are expected to be beneficial.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **pink mucket pearly mussel** based on the following: (1) no individuals occur within the action area, (2) no currently suitable habitat for the pink mucket pearly mussel occurs, and (3)

habitat improvements may occur due to management that emphasizes retaining, restoring, and enhancing riparian corridors and riverine systems. Based upon this information, potential effects to the fanshell mussel from the WNF's Forest Plan, as proposed, are anticipated to be beneficial, as it may improve habitat for future recolonization.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **bald eagle** based on the following: (1) suitable habitat for this species occurs in the action area, but there are no nesting or summering populations of bald eagles, (2) the Forest Plan will not significantly reduce suitable habitat for the bald eagle on the landscape and will protect and improve nesting and roosting habitat in the long term, and (3) the following forest-wide standards and guidelines will prevent risks to individual eagles and their habitat should they appear.

SFW**-TES-15** – Focus winter bald eagle searches in areas that eagles are known to frequent or where concentrated food sources occur near NFS land. Conduct searches during early-, mid-, and late-winter. Follow search criteria outlined in the Northern States Bald Eagle Recovery Plan.

SFW**-TES-16** – Protect any bald eagle communal night roosts and concentrations (including nests) discovered during winter surveys or during any additional field surveys or proposed project areas, following guidelines outlined in the Northern States Bald Eagle Recovery Plan.

SFW**-TES-17** – Report discovery of bald eagle nests immediately to the U. S. Fish and Wildlife Service and the Ohio Department of Natural Resources, Division of Wildlife.

SFW**-TES-18** – Protect supercanopy trees, or other identified congregation roost trees, along major river corridors and lakes in addition to following Forest-wide riparian area standards and guidelines.

SFW**-TES-19** – Allow no prescribed fire within one-half mile of occupied bald eagle sites. Consider all bald eagle communal night roosts, daytime concentration sites, or occupied breeding territories as occupied sites. To prevent smoke inversion from occurring at occupied bald eagle sites, and to minimize smoke drifting toward them from prescribed fires outside the one-half mile radius of occupied sites, require burn plans to take into account of wind direction, speed, and mixing height as well as transport winds.

SFW**-TES-20** – If the bald eagle is found nesting on the Wayne National Forest, monitor populations according to the recovery plan. At such time as the bald eagle is de-listed, use the de-listing monitoring plan.

The WNF will protect all supercanopy trees or other identified congregation roost trees for bald eagles along major river corridors and lakes and will protect known nests and roosts as described in the Bald Eagle Recovery Plan, or as directed by the Service. The WNF will provide field training for new employees so they will be able to recognize bald eagle signs at night roosts, even when eagles are absent. In addition by June 1 of each year the WNF will provide an annual report to the Service which includes the following:

a. Results of any winter searches for communal bald eagle night roosts and concentrations, including mid-winter bald eagle surveys conducted in cooperation with the Service;

b. Discovery of any bald eagle nesting territories on the WNF. If no surveys have been conducted and no territories discovered on the WNF during an annual reporting period, an annual report should be submitted with a statement to this effect;

c. Documented cases of a prescribed fire that behaved contrary to predicted movement patterns and which resulted in a confirmed adverse impact to bald eagles.

Based upon the above information, potential adverse effects to the bald eagle from the Forest Plan, as proposed, are anticipated to be insignificant and discountable.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **Virginia spiraea** based on the following: (1) suitable habitat exists within the action area but no individuals have been detected, (2) while ground disturbance will occur during management implementation, Forest-wide standards and guidelines are incorporated to minimize erosion, stabilize disturbed areas, and minimize adverse effects from non-native invasive species, (3) Forest-wide standards and guidelines ensure proper pesticide use on the Forest, (4) surveys will be conducted on lands affected by land exchange, surface-disturbing activities and vegetation removal, and (5) the Forest Plan incorporates beneficial management activities that would protect, restore, and create suitable habitat for the species. Based upon the above information, potential adverse effects to Virginia spiraea from the Forest Plan, as proposed, are insignificant and discountable and potentially beneficial.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **northern monkshood** based on the following: (1) suitable habitat exists within the action area but no individuals have been detected, (2) Forest-wide standards and guidelines protect streams and rock shelters, a preferred habitat of northern monkshood, (3) while ground disturbance will occur during management implementation, Forest-wide standards and guidelines are incorporated to minimize erosion, stabilize disturbed areas, and minimize adverse effects from non-native invasive species, (4) Forest-wide standards and guidelines ensure proper pesticide use on the Forest, (5) surveys will be conducted on lands affected by land exchange, surface-disturbing activities and vegetation removal, and (6) the Forest Plan incorporates beneficial management activities that would protect, restore, and create suitable habitat for the species. Based upon the above information, potential adverse effects to northern monkshood from the Forest Plan, as proposed, are discountable and potentially beneficial.

The Service concurred with WNF's effect determination of "not likely to adversely affect" for the **small whorled pogonia** based on the following: (1) suitable habitat for this species occurs in the action area but no individuals have been detected during surveys, (2) while ground disturbance will occur during management implementation, Forest-wide standards and guidelines are incorporated to minimize erosion, stabilize disturbed areas, and minimize adverse effects from non-native invasive species, (3) Forest-wide standards and guidelines ensure proper pesticide use on the Forest, (4) surveys will be conducted on lands affected by land exchange,

surface-disturbing activities and vegetation removal, and (5) the Forest Plan incorporates beneficial management activities that would protect, restore, and create suitable habitat for the species. Based upon the above information, potential adverse effects to small whorled pogonia from the Forest Plan, as proposed, are insignificant and potentially beneficial.

Consultation on the American burying beetle, bald eagle, fanshell mussel, pink mucket pearly mussel, Virginia spiraea, northern monkshood, small whorled pogonia for this project, as proposed, has concluded. These species will not be considered further in this Biological Opinion. Should, during the term of this action, additional information on listed or proposed species or their critical habitat become available, or if new information reveals effects of the action that were not previously considered, the WNF should contact the Service to determine whether these determinations are still valid.

BIOLOGICAL OPINION

This tier I programmatic biological opinion will evaluate the project at two scales: 1) at the program level—how the overall goals of the Forest Plan will affect the species across the landscape and over the long-term, and 2) at the management level – how specific future actions may affect species. For the management level review, we identify the specific elements associated with each management action, identify the environmental consequences associated with each project element, identify the listed species that may be exposed to these environmental consequences, and assess how exposed individuals, populations and species will respond in terms of individual fitness and population and species level viability.

I. DESCRIPTION OF THE PROPOSED ACTION

The WNF proposes to revise the 1988 Forest Land and Resource Management Plan. The 2005 Forest Plan is used to guide all natural resource management activities on the WNF to meet the objectives of federal law, regulations, and policy. No project level decisions have been considered or made during the revision process.

The goals of the Revised Forest Plan are to improve watershed health, provide plant and animal habitat to support viability of all native species, provide a variety of recreation opportunities matched to the capabilities of the Forest and public demand, lease federally-owned oil and gas resources, continue to consolidate National Forest ownership through land acquisition, and contribute to the economies of local communities.

Management Areas (MA) are the foundation of the Forest Plan and provide the framework from which land management decisions are made. To achieve the desired future conditions for each MA and the reach the above stated goals, various management activities will be applied. The MAs for the WNF Forest Plan are listed below with a description of the overall resource goals and desired future conditions they represent and the amount of land allocated to that MA. Following the landscape level discussion is a description of the specific activities/actions needed to reach those management goals, and the standards and guidelines for the Indiana bat and running buffalo clover that apply to each action.

Management Areas

Diverse Continuous Forest (DCF)
Large blocks of mature forest that contain a variety of tree species of diverse ages and sizes characterize this management area. These features provide habitat for interior-forest wildlife species. Shade tolerant/fire intolerant species such as maple and beech are becoming more predominant in the forest understory and canopy on the more mesic sites in this management area. The effects of low-intensity ground fire are evident, generally on ridges and drier slopes where efforts to perpetuate oak and hickory species are emphasized. The goal is to manage these areas to reflect a variety of mature forest conditions maintained over time using predominately uneven-aged timber harvest and occasional prescribed fire. Moderate amounts of dispersed,

non-motorized recreational opportunities are offered in this management area. Examples of dispersed recreational activities that occur in these areas include hiking, mountain bike riding, horseback riding, hunting, fishing, viewing scenery and wildlife, and gathering forest products.

Diverse Continuous Forest with Off-Highway Vehicles (DCFO)
This management area emphasizes trails for motorized recreation and mature forest habitat for conservation of forest interior species. Vegetation conditions and management are similar to the Diverse Continuous Forest MA. Off-highway vehicle trails are developed and maintained to provide safe trail riding. Moderate amounts of non-motorized recreation are also available. Hiking, horse, and mountain bike trails may be created to connect an existing trail system as long as these do not interfere with the ATV/OHM trails.

Historic Forest (HF)
The emphasis of this management area is restoration and maintenance of the mixed oak ecosystem through a combination of mostly uneven-aged timber harvest, frequent prescribed fire and herbicide use (to remove competing maples in the understory). Forest conditions have always varied over space and time, due to natural processes and changes in climate as well as natural and man-made disturbances. Forest ecologists believe current conditions of the central hardwood forests lie outside the historic range of variability. The desired future condition of this management area is a mix of vegetation more nearly resembling the historic range that existed prior to $18^{th}/19^{th}$ century settlement and development.

A variety of wildlife habitat is provided with emphasis on habitat for species dependent on large oak and hickory trees and a near-continuous canopy. The open nature of the forest and the hard mast produced by the oaks and hickories would provide habitat for many animals.
Moderate amounts of non-motorized recreation opportunities are provided. These include viewing wildlife and scenery, hunting, horseback riding, fishing, trapping, and hiking. In some areas, trails may provide access for non-motorized activities.

Historic Forest with Off-Highway Vehicles (HFO)
This management area emphasizes providing trails for motorized recreation and the restoration and maintenance of the mixed oak ecosystem through a combination of mostly uneven-aged timber harvest and frequent prescribed fire. Vegetation conditions and management are similar to the Historic Forest MA. Motorized recreation opportunities are also emphasized. Off-highway vehicle trails are developed and maintained to provide safe trail riding. Moderate amounts of non-motorized recreation are also available. Hiking, horse, and mountain bike trails may be created to connect an existing trail system as long as they do not interfere with the ATV/OHM trails.

Forest and Shrubland Mosaic (FSM)
Early successional habitat patches of various sizes are distributed throughout a forested landscape. Shrub and seedling/sapling forest habitats, along with associated species, flourish and contribute to overall landscape biodiversity and conservation. As shrub and seedling/sapling forest habitats grow into stands of pole-sized trees, new shrub and seedling/sapling forest habitat are created by even-aged timber harvest. The mix of forest communities runs from oak and hickory in the uplands and on drier hillsides to yellow poplar, beech, maples, oaks, hickories and other mesic species on moist slopes and in bottomlands. Native pine communities occur in

portions of this area. The future desired condition of this MA is a combination of early, mid, and late successional forest. Prescribed fire plays a role in the maintenance of some forest communities and species, ensuring the continued presence of fire-adapted ecosystems. Trails for hiking, mountain biking, and horseback riding may be provided. Hiking, mountain biking, horseback riding, hunting, fishing, viewing scenery and wildlife, and gathering forest products are examples of recreational activities that may occur in these areas.

Grassland-Forest Mosaic (GFM)
This management area emphasizes habitat for grassland-dependent wildlife species on reclaimed coalmine lands. Dispersed, non-motorized recreation opportunities are offered in this management area. A mosaic of large grassland areas edged with shrub and various-aged forest habitat is provided. Recurrent application of prescribed fire and mowing retards succession to shrubs and trees, promotes growth of grasses and forbs and a diversity of grassland habitats. This provides habitat for grassland-dependent species such as Henslow's sparrow and bobwhite quail. The forested areas surrounding these grasslands are managed as a mosaic of early successional habitat patches of various sizes that intersperse the predominately forested landscape. To replace areas growing out of this habitat condition, new early successional forest habitat is created using predominately even-age timber management. This provides habitat for shrubland-dependent species such as the prairie warbler and yellow-breasted chat. Hiking, mountain biking, horseback riding, hunting, fishing, viewing scenery and wildlife, and berry picking are examples of the recreational activities that occur in these areas.

Future Old Forest (FOF)
Mostly old forest that changes only as a result of natural disturbances and natural succession characterizes this management area. These areas offer Forest visitors opportunities to experience solitude and closeness to nature. Natural processes will eventually change the forest composition of this management area. Over time, shade tolerant/fire intolerant tree species, such as maple and beech, will dominate the understory and canopy. Conversely, the amount of oaks and hickories will decline. Rare communities and associated species not dependent on disturbances will continue to exist, but disturbance-dependent communities will generally decline across this management area. Terrestrial wildlife associated with this area includes area-sensitive forest interior species such as the worm-eating warbler, Louisiana waterthrush, cerulean warbler, and wood thrush as well as species sensitive to human disturbance, such as black bear. Forest Service roads will be closed and decommissioned where they are no longer needed, except for access to private oil and gas developments or similar specific uses. Use of roads that access privately held sub-surface rights or existing federal leases are restricted to only those users or their agents to access, develop, or maintain their property. In some portions of the area, access for hiking, horseback riding, viewing wildlife and scenery, fishing, and other non-motorized forms of recreation is provided by trails. Interaction among users is low to moderate. There is subtle evidence of other users except in the vicinity of oil and gas developments. The target recreation experience is semi-primitive, non-motorized.

Future Old Forest with Mineral Activity (FOFM)
This management area is located on the Marietta Unit of the Athens Ranger District. Similar to the Future Old Forest (FOF) Management Area, a primarily custodial regime of vegetation management is implemented. This will promote mostly old forest that changes only as a result of natural disturbance and succession, and will provide opportunities for relatively primitive

recreation experiences. Unlike the FOF Management Area, however, surface occupancy of federal oil and gas leases is permitted here. Many oil and gas wells are already present within this management area, both on lands in private surface ownership and on NFS land where the subsurface minerals are privately owned (outstanding and reserved rights).

River Corridor (RC)
This management area emphasizes retaining, restoring, and enhancing the inherent ecological processes and functions associated with riverine systems. Management will protect or enhance the scenic quality of these areas to provide high-quality recreation opportunities. This management area includes linear-shaped corridors along Symmes Creek, the Hocking River, the Little Muskingum River, and the Ohio River. National Forest System land along streams and rivers is predominantly forested; however, some floodplain wetlands or herbaceous-shrub communities may occur. Vegetative conditions are maintained over time using mostly uneven-aged techniques. The floodplains function as storage areas for floodwaters, sources of organic matter for the streams and rivers, and habitat for riparian wildlife species. Aquatic communities are maintained or are returning to their historic compositions and distributions. Aquatic habitat conditions contribute to the conservation of species that reside in these mainstem streams and rivers. Roads within and on the perimeter of this management area are used for a variety of recreation activities. In some areas, boat ramps provide access for motorized and non-motorized boating. Viewing scenery and wildlife, fishing, hunting, trapping, canoeing, hiking, picnicking, and camping are key recreation activities. Trails in this management area are open only to non-motorized use.

Developed Recreation (DR)
This management area emphasizes management of existing recreation facilities and the future needs of the highly developed sites that serve large numbers of people. This management area includes both existing and potential developed recreation sites and vicinities on the Forest. The landscape in and around these developed recreation areas varies from park-like to mature forest. Waterbodies are often associated with these areas. A variety of native wildlife is present, ranging from species accustomed to campgrounds and high human use to those that inhabit mature forest habitats. Ponds and lakes in developed recreation areas generally contain game fish such as largemouth bass, bluegill, and channel catfish. A variety of wildlife and nature viewing opportunities are available within and near developed recreation sites. Roads and trails provide access within the more developed areas. Trails lead to lakesides, riverbanks, and undeveloped areas. Roads and trails accommodate the high-density recreation use and related activities associated with the area. Facilities include campgrounds, picnic areas, boat ramps, interpretive sites, overlooks, swimming areas, and trailheads. Universal access is available to some existing and all newly constructed facilities and structures. Because this is an area of high public use and visibility with major public investments in facilities and structures, priority is given to acquisition of private in-holdings and subsurface mineral rights. Such acquisition consolidates NFS surface and subsurface ownership.

Timbre Ridge Lake (TRL)
This management area is located in eastern Lawrence County on the Ironton Ranger District. Timbre Ridge Lake provides quality fishing opportunities in a natural setting. Boating is limited to small watercraft powered manually or by electric motors. In addition to fishing, visitors may participate in low-impact, dispersed recreational activities, such as hiking, mountain biking, backcountry camping, hunting, wildlife viewing, and picnicking. Water quality in Timbre Ridge Lake and its feeder streams contributes to the recreational fishing experience. Water quality parameters meet or exceed state standards throughout the life of the Forest Plan.
Recreation facilities intended for use by low numbers of people are present but do not diminish the scenic value of the area. Universal access is provided to some existing and all newly constructed facilities and structures. Natural site characteristics dominate the development. Rustic facilities of informal design are available. Road access to the boat launch facility, the dam, and to private land in-holdings is maintained. Secondary emergency road access to the dam is also maintained. The landscape around the lake is mostly a closed-canopy hardwood forest, with especially colorful views in the spring and fall. Over time, the forest will change as a result of natural succession and disturbances (similar to the Future Old Forest Management Area).

Special Areas (SA)
This management area emphasizes the preservation, management, and study of unique natural areas. These areas are regionally or locally significant and have been formally designated upon recommendation by a review committee and approval by the Regional Forester.
These areas meet one or more of the following criteria:

- Be representative of unique geological, ecological, cultural or other scientific values
- Be an appropriate area for scientific research
- Have potential to be a regional or national landmark based on natural or cultural values.

Areas allocated to this management area are scattered throughout the WNF. Sizes vary, ranging from a few acres to several hundred acres. These areas are individually unique and generally not connected to each other. All activities in these areas are to be consistent with the protection or maintenance of the unique characteristics for which an area was designated (e.g., protecting and perpetuating populations of rare plants or communities). Recreation activities are also limited to those consistent with the purpose for which an area was designated. A system of hiking trails may provide access for administrative and recreational purposes.

Research Natural Areas (RNA)
Research Natural Areas are nationally significant areas with unique ecosystems deemed worthy of preservation for scientific purposes. Research is conducted in these areas to better understand their natural processes. An RNA must meet one or more of the following criteria:

- Contributes to the protection of diversity of vegetation communities and wildlife habitat
- Typifies important forest, shrubland, grassland, alpine, aquatic, and geologic types
- Represents special or unique characteristics of scientific interest and importance

- Helps legal requirements, such as providing habitat for endangered species
- Protects or maintains special aquatic, geologic or potential natural vegetation and faunal communities or protects cultural resources.

Candidate Areas (CA)
This management area emphasizes the preservation of potential RNAs and special areas. Management is directed at protecting the potentially unique characteristics of an area until it can be studied for designation as an RNA or Special Area. Management activities are limited to those necessary for maintaining public health and safety or for treating non-native invasive species.

Table 1. Management Area allocation by acres of WNF land

MA	***Acreage***
Candidate Areas	981
Developed Recreation	4,078
Diverse Continuous Forest	55,267
Diverse Continuous Forest with OHVs	22,626
Forest and Shrubland Mosaic	54,580
Future Old Forest	16,478
Future Old Forest with Mineral Activity	10,154
Grassland and Forest Mosaic	5,334
Historic Forest	26,278
Historic Forest with OHVs	21,274
Research Natural Areas	117
River Corridors	12,544
Special Areas	7,546
Timbre Ridge Lake	796
Total	238,053

Management Actions

To help achieve the desired conditions for each MAs, WNF proposes to implement the following types of management actions. In addition to the general description, WNF identified specific standards and guidelines (S&G) to protect listed species. S&Gs that apply to a specific action are listed below the action and fully described in Appendix A.

Even-aged harvest
Even-aged harvests including clearcut, shelterwood, thinning, and two-aged methods result in the removal of most trees in areas 2-30 acres in size. Even-aged prescriptions are on a 120 year rotation. Even-aged management allows for various aged stands across the landscape and is used in the DCF, DCFO, FSM, GFM, and RC management areas. Even-aged harvests can occur any

time of year. The WNF anticipates that the maximum amount of even-aged management to occur within the next ten years to be 1,725 acres of hardwoods and 200 acres of pine. The following S&Gs will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-7, GFW-TES-9, SFW-TES-10, and SFW-TES-12.

Uneven-aged harvest
Uneven-aged management removes individuals or groups of trees and opens a portion of the canopy. Uneven-aged forest stands are those which have three or more age classes. This management activity would occur in the DCF and DCFO management areas, but would also occur to a lesser degree in the FSM, FSMO, GFM, and RC management areas. Uneven-aged timber harvests can occur any time of the year at varying frequencies. Forest stands are entered about every third decade to create an all-aged stand structure. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-8, GFW-TES-9, SFW-TES-10, and SFW-TES-12.

Prescribed fire and fire suppression
Prescribed fire is used on the WNF to control hazardous fuel build-up, to promote oak-hickory regeneration, to maintain barrens and grassland habitats, and to control non-native invasive species. Prescribed fire activities include the creation of fire lines using bulldozers or hand tools and the removal of hazard trees. Prescribed fire management is particularly important in the HF and HFO management areas, but will also be used in DCF, DCFO, and FSM. Prescribed fire occurs frequently across the above management areas, with a rotation schedule of 5-10 years at a given site. Prescribed fire on the WNF and other eastern hardwood forests usually consists of low intensity ground-level fire. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-4, SFW-TES-11, SFW-TES-27, and SFW-TES-28. Fire suppression will take place when a wildfire occurs on the WNF. Suppression actions may include creating fire breaks with bulldozers or hand tools, applying foam, and applying water with hoses or by helicopter.

Hazardous fuels reduction – mechanical methods
Hazardous fuels reduction will occur primarily in stands where fuels are greatest, often in pine stands. The work would involve the lopping and scattering of woody material on the ground. It is possible that a leaning or standing tree would be felled, either as part of the fuels reduction work or to protect workers from a potential hazard tree. The purpose of this management activity is to reduce wildfire in areas damaged by the 2003 ice storm. Frequency and intensity of this activity will be high for the next couple years, and then will reduce once the areas damaged by the ice storm are addressed. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2 and GFW-TES-3.

Crop tree release and grape vine control
Crop tree release and grape vine control involve the manual treatment of individual vines and trees in young, even-aged stands. Trees cut during crop tree release are small in diameter (sapling stage). If feasible, cut trees are not felled, but are left standing through girdling and may provide future snags. These management activities will occur in the DCF, DCFO, FSM, and GFM management areas. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, and SFW-TES-12.

Construction of waterholes, ponds, lakes and restoration of wetlands
Construction of ponds, lakes and waterholes will occur in already disturbed areas in conjunction with other activities (e.g. timber harvest, oil and gas development) for the benefit of fish and wildlife. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, and GFW-TES-14.

Riparian and aquatic habitat restoration
Riparian and aquatic habitat restoration includes activities that decrease the input of sediment into streams and activities that results in direct improvements. These activities include bank stabilization, culvert repairs, tree planting, placement of large woody debris in streams, and reconstruction of the natural dimension, pattern, and profile of streams.

Development of permanent forest openings
Forest openings are generally 1-5 acres in size and on the periphery of larger tracts of forested land. Development of new forest openings primarily would occur by designating existing open land on acquired properties to serve as permanent forest openings. Similarly, development of agreements with utility companies would be pursued to manage utility corridors as quality permanent forest openings. While it could occur, the probability is low that forested area would be converted to a permanent forested opening. For example, log landings have been designated as openings after a timber harvest was completed, and then maintained. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-7, GFW-TES-9, SFW-TES-10, and SFW-TES-12.

Land exchange and acquisition
Land acquisition and exchange is a management action used to consolidate federal ownership. Land acquisition creates larger, more contiguous areas of protected land. High priority is given to exchanges or acquisitions that protect or enhance endangered species habitat.

Road decommissioning
Road decommissioning allows roads to revert back to natural vegetative cover and eliminates unneeded stream crossings.

Permanent roads and trails – construction and reconstruction
Construction of permanent roads occurs in association with timber harvest, while trails are constructed for recreational uses such as OHV, hiking, horseback riding, and mountain biking. Roads and trails vary in size from a clearing width of 30 feet to 5 feet. The majority of roads have a clearing width of 22 feet and a road surface of 12 feet. Silvicultural prescriptions for uneven-aged and even-aged management require multiple entries into the same stand to attain, and then maintain, the desired future habitat conditions. The road system in areas treated with uneven-aged management methods is generally larger than that needed in areas treated with even-aged management methods. While some road construction may be necessary in both situations, existing roads can be reconstructed and used in the future, keeping the road system footprint basically the same over time. To bring roads up to the appropriate standard, trees are removed from the road bed and drainage structures are repaired or improved during reconstruction. Some of these reconstructed roads may be gated and closed to vehicle use, or may be converted to recreational trails until they are needed once again to conduct timber

harvesting or other management activities. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-1, SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, SFW-TES-12, and SFW-TES-30.

Temporary roads, skid trails, and log landings
Temporary roads are necessary to accomplish various projects. The clearing width can be as wide as 22 feet, with a surface width of at least 10 feet. The road is revegetated and after a period of a few years, trees are likely to be present again. The same is true for skid trails and log landings used in timber harvesting operations. These activities may involve soil compaction, erosion and increased susceptibility of areas to non-native plant invasion and establishment. Construction of temporary roads will increase over the next couple years as timber activities are initiated, but over time will decrease as all the necessary roads are constructed. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, SFW-TES-12, and SFW-TES-30.

Oil and gas development and reclamation of orphan wells
Oil and gas exploration and development is on-going throughout the WNF. Activities associated with mineral development include removal of vegetation and topsoil required for the construction of access roads, well pads, and pipeline corridors. Once depleted, the operators are required to restore the disturbed areas. No Surface Occupancy (NSO) restrictions for USA-owned minerals are in place in the FOF, CA, SA, RNA, DR and TRL management areas. Reclamation of depleted or orphan wells have the same initial impacts as mineral development, however these areas are closed and rehabilitated. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, SFW-TES-12, SFW-TES-30, and Forest Plan Appendix H: Notification 3, Stipulation 10, Stipulation 12.

For outstanding private minerals, a minerals operation plan will be negotiated. In the process of reviewing the plan of operation for reserved rights, or when negotiating the terms and conditions of a plan of operation for outstanding minerals, the WNF will request a voluntary adherence to Forest Plan S&G that protect endangered species and their habitat. Outstanding mineral rights and reserved rights are non-discretionary actions that cannot be considered during this programmatic consultation.

Surface coal mining
Surface coal mines would alter and remove surface soils and vegetation. Permanent removal of forested habitat would occur. On the Ironton District, one company holds valid existing rights to strip mine coal on approximately 1,200 acres of land. The company is planning to conduct coal exploration drilling to determine the quality and quantity of the coal with the possibility of strip-mining in the future. Because of legal problems, it is unclear at this point if the company will actually proceed with the coal operations in the next ten years. If they do, it will severely disturb approximately 1,200 acres of NFS lands.

The Forest Service has no control over this projected activity since private mineral rights are involved, however the Forest Service would work closely with the operator to incorporate Forest-wide S&G into the operation plan.

Utility corridors
Utility companies apply for a special use permit to construct corridors for transmission of water, electricity, or other utilities to private lands across NFS lands. Utility corridors are linear and vary in width. Most are narrow and placed in road right of ways, but a few could be larger transmission lines that transverse the forest and leave a permanent linear canopy gap. Vegetation is periodically removed along utility lines and soils may become compacted. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, and GFW-TES-29.

Construction of recreation facilities and parking lots
Construction of recreation facilities and parking lots may involve clearing and grading and the use of heavy machinery. Such sites are usually kept in park-like roadside settings and are small (about 5 acres). The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, and SFW-TES-13.

AMD projects and closure of mine portals
Areas targeted for acid mine drainage (AMD) treatment often have a history of underground and surface mining that has restricted or altered natural water flows. Often these mine drainages result in barren soils unable to support vegetation due to highly acidic soils. AMD treatments consist of active and passive methods including doser systems, construction of wetlands, open limestone channels, and anoxic limestone drains and often involve closing mine portals. AMD projects may involve large amounts of soil movement and disturbance to restore surface drainage. The construction and heavy equipment involved may require some tree removal and soil compaction. Subsidences and mine portals are not only a public safety concern, they are points where surface water can enter underground chambers and recharge acid mine drainage. The WNF proposes to close a portion of the hundreds of subsidences and open portals that currently exist. Closing them could involve backfilling or installation of bat-friendly gates. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-5, GFW-TES-9, SFW-TES-10, and GFW-TES-14.

Installation of bat-friendly gates
Installation of bat friendly gates involves the removal of soils around mine openings in order to sink gates below ground surface. Soils are returned to pre-installation conditions to avoid changing airflows and micro-environments. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-5, GFW-TES-6, GFW-TES-9, and SFW-TES-10.

Reforestation
Reforestation occurs on open lands, such as agricultural fields or reclaimed strip mines. When available, native trees from known seed sources will be planted.

Special use permits for agricultural practices and collection
Issuance of special use permits for agricultural crop production or grazing may include use of pesticides and fertilizers. Issuance of special use permits for collection include stipulations to avoid sensitive habitats and federally listed species. The following standards will protect listed

species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, SFW-TES-13, SFW-VEG-19.

Control of non-native invasive species (NNIS)
Control of NNIS will occur by mechanical, biological (when available) and/or chemical methods. Mechanical methods include pulling, grubbing, grazing, and mowing. Biological methods include the release of *Galerucella* beetles on purple loosestrife. Chemical control through use of herbicides for invasive plants has not historically occurred on the WNF, but will be implemented under the new Forest Plan. In addition to these control measures the WNF implements a program that emphasizes education, early detection, and prevention. These activities include project design features and mitigation in all management areas to limit NNIS introduction and spread. Control of NNIS is an on-going activity that can occur year around and is anticipated to increase in intensity as invasive species encroach the action area. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, and GFW-TES-29.

Herbicide use
Herbicides would be used by WNF to eliminate shade-tolerant tree species to promote oak/hickory forests, to control non-native invasive species, and to control nuisance plants (e.g. poison ivy) around recreation sites. Use of herbicides for these activities will primarily involve selective, spot spraying to avoid affecting non-target vegetation. Although selective vegetation management is preferred for utility or other rights-of-way or easements, broadcast use of herbicides may only be permitted with written Forest Supervisor approval. Aerial spraying of herbicides is conducted on utility corridors that have outstanding rights on the Forest. Herbicides have rarely been used on the WNF in the past, but will play a much larger role in NNIS control under the Revised Forest Plan. The following S&G will protect listed species and their habitats when this activity is conducted: SFW-TES-2, GFW-TES-3, and GFW-TES-29.

Hazard tree removal
An activity that is common to all management areas on the WNF is the management of hazard trees. Periodically, a hazard tree will be present within a work site and will need to be removed to ensure safety. The WNF has a record of trying to plan ahead and remove such trees in the winter, but there is a chance that these trees will not be noticed during the Indiana bat hibernation period. Forest Service directives require that trees, with a crown that is greater than 50% dead, be removed from developed recreation sites. These directives also require such trees to be removed at dispersed recreation concentration points. These areas include trail intersections or sign information areas. Along trail corridors, trees that are leaning over the trail are removed. The following standard will protect listed species and their habitats when this activity is conducted: SFW-TES-10.

Hickory tree removal
The WNF recognizes the importance of hickory trees as potential Indiana bat roost sites by incorporating a Forest-wide guideline to retain all shellbark and shagbark hickories (GFW-TES-9). This differs from existing direction in the 1988 Forest Plan, as amended, that allows the removal of shagbark and shellbark hickory trees during the hibernation season. During the implementation of the projected management activities, many of which would result in long-term benefits to the Indiana bat and its habitat, some hickory trees may need to be removed to enable

the project to proceed without causing adverse effects to other resources important to the Indiana bat. Removal of such trees would be done during the hibernation season, when possible.

Education, awareness, inventory, and monitoring for Federally listed species
The WNF proposes to implement a conservation plan for federally listed species. Parts of the plan are included in Appendix A. This plan emphasizes the WNF's commitment to conserving, protecting, and maintaining habitat for federally listed species. The conservation plan outlines how S&G will protect individuals and their habitat, what education and awareness measures will be implemented for the benefit of the WNF staff, and inventory and monitoring activities that will be conducted.

Table 2. Anticipated outputs for management activities for the first decade

Activity	***Acreage***
Even-aged Hardwood Timber Harvest	1,725
Even-aged Pine Timber Harvest	200
Uneven-aged Timber Harvest	14,556
Thinning	1,460
Crop Tree Release	2,113
Grape Vine Control	2,683
Site Prep for Native Pine	200
Reforestation	500
Prescribed Fire Oak Regeneration NNIS Herbaceous Habitat Hazardous Fuels	 46,215 200 1,500 21,904
Herbicide Application Oak Regeneration NNIS	 10,994 600
Development of Permanent Forest Openings	500
Maintenance of Permanent Forest Openings and other Herbaceous Habitats (Mechanical)	5,000
Control of Non-Native Invasive Species Mechanical Biological	 1,000 100
Wetland Restoration & Enhancement	150
Waterhole Construction	15
Fishing Pond/Lake Construction	15
Restoration & Improvement of Aquatic/Riparian Habitat Lentic Lotic	 150 20 miles
Installation of Bat-Friendly Gates on Mines	20-30 gates

Activity	*Acreage*
OHV Trail Construction	150
Hiking Trail Construction	18
Horse Trail Construction	61
Mountain Bike Trail Construction	36
Recreation Facility Construction & Parking Lots	60
Temporary Road Construction	146
Permanent Road Construction	74
Permanent Road Reconstruction	318
Road Decommissioning	29
Skid Trails and Landings (outside harvest areas)	740
Surface Coal Mining Activities	1,250
Reclamation of Depleted or Orphan Wells	128 wells (70 acres)
Oil & Gas Well Development (federal leases)	80 wells (42acres)
Utility Corridor Development & Maintenance	50
Agricultural Crop Production & Grazing	50
Treatment of AMD	270
Surface Mine Reclamation	20
Closure of Open Mine Portal/Subsidence	232
Stabilization of Disturbed Areas	100
Reduction of Hazardous Fuels - Mechanical	10,181
Land Acquisition	Up to 40,000 acres
Land Exchange	400

Action Area

The action area includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area is defined by measurable or detectable changes in land, air and water or to other measurable factors that will result from the proposed action. The action area is not limited to the "footprint" of the action, but rather encompasses the biotic, chemical, and physical impacts to the environment resulting directly or indirectly from the action.

The action area for the Forest Plan is the area that encapsulates the reach of all the direct and indirect environmental impacts of the project. That is, the area in which the biotic, chemical, and physical impacts to the environment that are anticipated to occur. The action area for the Forest Plan will encompasses the entire WNF proclamation boundary plus lands one mile outside of the proclamation boundary for WNF lands that abut the boundary. A total of 1,108,199 acres in Ohio, Kentucky, and West Virginia encompass the action area.

The area directly affected by the action is the WNF property where all management activities will occur. The WNF is comprised of 238,053 acres within a 853,531 acre proclamation boundary in 12 southeastern Ohio counties: Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Morgan, Noble, Perry, Scioto, Vinton, and Washington.

The area indirectly affected by the action includes the area affected by noise, smoke and sediment transport from upland areas into streams that occur in response to activities on the WNF property. Activities such as timber harvest and road construction will generate noise. The level of noise generated will vary depending upon the methods and equipment being used or operated, but is not expected to reach outside the project boundary. As an example bulldozers and chainsaws run at full throttle are expected to produce low frequency noise, that at a half mile away is detected at the decibel level of normal conversation (de Hoop and Lalonde 2003). Prescribed fire will generate smoke that may drift short distances from the project area. Smoke dissipates into the air column and detectable levels are minimal at a distance of one mile from the fire. Similarly, sediment originating on WNF lands and entering an aquatic system is likely to be deposited a certain distance downstream, depending on velocity and mean particle size (Ritter et al. 1995). Based on channel morphology and velocity of streams on the WNF, sediment particles would be expected to be deposited within one mile of the origination point under normal flow conditions. Thus, the action area encompasses the entire proclamation boundary and extends out 1 mile.

II. STATUS OF THE SPECIES

Indiana bat

The Indiana bat is a species that continues to decline since being listed as an endangered species in 1967. Recovery of this species faces several challenges and there are multiple biological reasons why the outlook for this species may be unfavorable. The well-documented philopatric behavior of Indiana bats suggests that loss of roosting habitat alone can have adverse consequences (Kurta and Murray 2002; Gumbert et al. 2002). Healthy female bats start breeding their first fall and can produce one pup per year for up to 14-15 years (Humphrey et al. 1977). However, this current reproductive capacity has been insufficient to offset mortality rates over the last 40+ years. Indiana bat populations have plummeted.

Description and Distribution

The Indiana bat is a medium-sized bat, closely resembling the little brown bat (*Myotis lucifugus*) but differing in coloration. There are no recognized subspecies. The Indiana bat has been found in 27 states throughout much of the eastern United States (USFWS 1999). More specifically, NatureServe (2004) describes its range as going from eastern Oklahoma, north to Iowa, Wisconsin, and Michigan, east to New England and south to western North Carolina, Virginia, and northern Alabama. It is virtually extirpated in the northeastern United States. The Indiana bat is migratory, and the above described range includes both summer and winter habitat. Major populations of this species hibernate in Indiana, Kentucky, and Missouri, with smaller populations reported in Alabama, Arkansas, Georgia, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. The majority of maternity colonies are located in the glaciated Midwest.

Previous Incidental Take Authorizations

All previously issued Service biological opinions involving the Indiana bat have been non-jeopardy. These formal consultations have involved (a) the Forest Service for activities implemented under various Land and Resource Management Plans on National Forests in the eastern United States (b) the Federal Highway Administration for various transportation projects, (c) the U.S. Army Corps of Engineers (Corps) for various water-related projects, and (d) the Department of Defense for operations at several different military installations. Additionally, an incidental take permit has been issued under section 10 of the Endangered Species Act to an Interagency Taskforce for expansion and related development at the Indianapolis Airport in conjunction with the implementation of a Habitat Conservation Plan.

It is important to note that in many of these consultations, survey information was lacking. As Federal agencies are not required to conduct surveys, often the Service relied on a host of valid factors in helping the Federal agency determine whether Indiana bats may be present. To ensure the Federal agency and the Service met the mandate of the section 7(a)(2), if the best available data indicated that Indiana bats may be present, the assumption was made that a maternity colony (in most instances) occurred within the action area. Although this approach, we believe, fully accords with the intent of Congress and the Endangered Species Act of 1973, it likely resulted in an over-estimate of the number of individuals or colonies that may have been impacted by Federal actions.

National Forests- Within the past several years, nearly all National Forests within the range of the Indiana bat have requested formal consultation at the programmatic level. Consultation under Section 7 of the Act is necessary to ensure agency actions do not jeopardize the continued existence of listed species. These consultations have led to non-jeopardy biological opinions with associated incidental take statements. Although some of these incidental take statements anticipated the take of reproductive females, we have not yet confirmed the loss of a maternity colony on a National Forest. The reasons for this are likely two-fold. First, the conservation measures (i.e., standard and guidelines) and the project-specific reasonable and prudent measures were designed to minimize maternity colony exposure to the environmental impacts of Forest Plan actions. Secondly, these measures ensured an abundance of suitable Indiana bat habitat on the National Forests, and protected all known or newly discovered maternity colonies.

Other Federal Agencies or Non-federal Entities- Several incidental take statements have been issued to other Federal agencies. Unlike those issued for the National Forest Land and Resource Management Plans, some of these projects were certain to impact known occupied habitat. To minimize the effect of these projects, the action agencies agreed to implement various conservation measures. These included: seasonal clearing restrictions to avoid disturbing female Indiana bats and young; protection of all known primary and alternate roost trees with appropriate buffers; retention of adequate roosting and foraging habitat to sustain the maternity colony into the future; and permanent protection of areas and habitat enhancement or creation measures to provide future roosting and foraging habitat opportunities.

With the exception of three (Fort Knox, Great Smoky Mountains National Park, and Laxare East and Black Contour Coal Mining projects), none of these biological opinions and associated incidental take statements anticipated the loss of a maternity colony. Required monitoring for 3

of these consultations (Camp Atterbury, Newport Military Installation, and Indianapolis Airport) has confirmed that the affected colonies persisted through the life of the project and continues to exist today. We recognize that given the philopatric nature of Indiana bats and the long life-span, the full extent of the anticipated impacts may not yet have occurred. Nonetheless, these monitoring results and the lack of data to suggest otherwise for the other projects, indicate that the conservation measures to avoid and minimize the impacts of Federal projects appear to be effective. Only with long-term monitoring will we definitively be able to determine the true effectiveness of our conservation measures.

In summary, we believe the take exempted to date via section 7 consultation has resulted in short-term effects to Indiana bat habitat and, in limited circumstances, on Indiana bat maternity colonies. As many of these consultations necessarily made assumptions about Indiana bat presence, we are confident that the number of maternity colonies actually exposed to the environmental impacts of the Federal actions is far less than we have anticipated. Furthermore, although not definitive, monitoring of several maternity colonies pre- and post-project implementation preliminarily suggests that our standard conservation measures, when employed in concert, appear to be effective in minimizing adverse effects on the affected maternity colonies.

Range-wide Status

Historically and currently, the Indiana bat geographic range encompasses 27 states, with the majority of records from the Midwest. Although there is no administrative record, it is believed that the species was listed because of observed declines in numbers. The data regarding Indiana bat abundance prior to Federal listing are limited, but the information suggests that they were once far more abundant than they were in the 1960s. Tuttle and colleagues, for example, believe the overall abundance of Indiana bats likely rivaled that of the now extinct passenger pigeon (Tuttle et al. 2004). The basis for Tuttle's and others estimates of millions of Indiana bats prior to European settlement is primarily based on historic accounts, extensive staining left on the ceilings of several historic hibernacula, and other paleontological evidence (Toomey et al. 2002). There is also other evidence indicating that Indiana bat numbers were once much higher. Based on a deposit of bones, it is estimated that a minimum of 300,000 Indiana bats were killed by a flood in Bat Cave, Edmonson County, Kentucky in 1937 (Hall 1962). Although we are never likely to know the true historical abundance of Indiana bats, it seems clear from the evidence above that Indiana bats were much more abundant than observed in 1960.

Hibernacula counts at a sample of known hibernacula began in 1960 and were repeated at approximately 10-year intervals. Beginning in the early 1980s, biennial counts at several known hibernacula were conducted, and in 2001, a concerted effort to track numbers at all known and accessible Priority 1 and 2 and most of Priority 3 hibernacula began. In 2002, the recovery team leader, using these data and host of assumptions (e.g., similar methodologies over time and among hibernacula, using current densities to estimate past numbers at newly found caves, assuming unchanged densities at hibernacula no longer accessible, etc.) compiled population estimates at 10-year intervals. Despite the many limitations associated with the dataset, Clawson's (2002) compilation shows a marked decline in estimated numbers over time. Estimated Indiana bat numbers declined each decade since 1960: ~883,300 Indiana bats in 1960/1970; 678,700 in 1980; 473,500 in 1990; and 382,300 in 2000/2001. Upon further analysis, Clawson found that the decline was not evenly distributed across the winter range.

The population in the southern portion of the range decreased an estimated 80% in the 40 years from 1960 to 2001, with the largest declines observed in Kentucky and Missouri hibernacula. In contrast, the population in the northern Midwest and Northeast increased by 30%. Clawson also indicated that the last estimated inter-decadal hibernation count suggests that the rate of decline has slowed. From 1960/1970 to 1980, the estimated population numbers decreased by 23 percent; from 1980 to 1990 by 30 percent; and from 1990 to 2001 by 19 percent.

The results from the 2001 to 2005 biennial counts suggest that at least for this 5-year period, the extreme decreases observed in each previous decade may not occur this decade. From 2001 to 2003 and 2003 to 2005, increases (4.2% and 16.7%, respectively) in the estimated numbers were observed. These are the first calculated increases in the range-wide population estimate since the Indiana bat was listed and monitoring began. Although the observed increases are encouraging, we are uncertain of what the future population trend will be and vulnerability of the current population.

Life History and Population Dynamics

The lifespan for Indiana bats is generally between 5 and 10 years (Thomson 1982), but individuals may live much longer, with the oldest known bat captured 20 years after it was first banded (LaVal and LaVal 1980). Based on a 13-year study, Humphrey and Cope (1977) found that the adult period of life is characterized by two distinct survival phases. The first is a high and apparently constant rate from 1 to 6 years after marking with 76% and 70% annual rates of survival for females and males, respectively. The second phase is a lower, constant rate after 6 years, with annual survival rates of 66% for females up to 10 years and 36% for males. In one study in Indiana, survival of pups was found to be very high at 92% from birth to weaning (Humphrey et al. 1977). Post-weaning to age 1 survival is unknown, but believed to be low.

The key stages in the annual cycle of Indiana bats are: hibernation, spring staging, pregnancy, lactation, volancy/weaning, migration, and swarming. While varying with weather and latitude, generally bats begin winter torpor in mid-September through late October and begin emerging in April. Females depart shortly after emerging and are pregnant when they reach their summer area. Birth of young occurs between mid-June and early July and then nursing continues until weaning, which is shortly after young become volant in mid to late July. Migration back to the hibernacula may begin in August and continue through September. Males depart later from the hibernacula in the spring and begin migrating back earlier than females in the fall.

Hibernation

Generally, Indiana bats hibernate from October through April depending upon local weather conditions. Bats cluster on cave ceilings during hibernation and are capable of clustering in dense groups typically ranging from 300-484 bats per square foot. Hibernation facilitates survival during winter when prey are unavailable. However, the bat must store sufficient fat to support metabolic processes until spring. Substantial risks are posed by events during the winter that interrupt hibernation and increase metabolic rates.

Temperature and relative humidity are important factors in the selection of hibernation sites. During the early autumn, Indiana bats roost in warm sections of caves and move down a temperature gradient as temperatures decrease. A recent study of highly populated hibernacula documented a temperature range of 3-7.2^{o}C (Tuttle and Kennedy 2002). Relative humidity in

Indiana bat hibernacula is usually above 74% but below saturation (Hall 1962; Humphrey 1978; LaVal et al. 1976), although relative humidity as low as 54% has been observed (Myers 1964).

After hibernation ends in late March or early April, most Indiana bats migrate to their traditional summer areas. Female Indiana bats emerge from hibernation in late March or early April, followed by the males. The period after hibernation but, prior to migration, is referred to as staging. Most individuals leave their hibernacula by late April. Migration is stressful for the Indiana bat, particularly in the spring when their fat reserves and food supplies are low. As a result, adult mortality may be the highest in late March and April.

Female Maternity Colony and Summer Habitat

Upon emergence from the hibernacula in the spring, females migrate to their traditional maternity colony areas. Coloniality is a requisite behavior for reproductive success. Females usually start grouping into larger maternity colonies by mid-May and give birth to a single young between late June and early July (Humphrey et al. 1977). These colonies are typically located under the sloughing bark of live, dead and partially dead trees in upland and lowland forest (Humphrey et al. 1977; Gardner et al. 1991). Colony trees are usually large-diameter, standing dead trees with direct exposure to sunlight. The warmer temperature from sunlight exposure helps development of fetal and juvenile young (Racey 1982). A maternity roost may contain 100 or more adult females and their pups.

Roost trees often provide suitable habitat as a maternity roost for only a short period of time. Roost trees are ephemeral in nature; suitable trees fall to the ground or lose important structural characteristics such as bark exfoliation (Gardner et al. 1991; Britzke et al. 2003). Dead trees retain their bark for only a certain period of time (about 2-8 years). Once all bark has fallen off a tree, it is unsuitable to the Indiana bat for roosting. Gardner et al. (1991) found that 31% of Indiana bat occupied roost sites were unavailable the summer following their discovery; 33% of the remaining occupied roost sites were unavailable by the second summer. For this reason, an area must provide a continual supply of suitable roost trees in order to support a colony over the long-term.

Female Indiana bats have shown strong site fidelity to both their summer maternity grounds and specific roost trees, and will use suitable roost trees in consecutive years, if they remain standing and have sloughing bark (Gardner et al. 1991; Callahan et al. 1997; Kurta and Murray 2002). Traditional summer areas are essential to the reproductive success of local populations. It is not known how long or how far female Indiana bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded. If they are required to search for new roosting habitat, it is assumed that this effort places additional stress on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration.

It is unknown how many roosts are critical to the survival of a colony, but the temporary nature of the use of the roost trees dictates that several must be available in an area if the colony is to return to the same area and raise their young successfully. Indiana bats require many roost trees to fulfill their needs during the summer (Callahan et al. 1997). In Michigan, Indiana bats used two to four different roost trees during the course of one season (Kurta and Williams 1992). In Missouri, each colony used between 10-20 roost trees, and these were not widely dispersed (all

within a circle ranging in size from 0.81 to 1.48 km (0.5-.92 miles)) (Miller et al. 2002). The important factor associated with roost trees is their ability to protect individuals from the elements, and to provide thermal regulation of their environment. Maternity colonies have at least one primary roost, which is generally located in an opening or at the edge of a forest stand. Maternity colonies also use multiple alternate roosts which are located in the open or in the interior of forest stands. Exposure to sunlight is important during development of fetal and juvenile young. In Missouri, use of dead trees in the forest interior increased in response to unusually warm weather (i.e., shading provided a cooler thermal environment), and use of live trees and snags in interior forest increased during periods of precipitation (Miller et al. 2002). Maternity colonies in North Carolina and Tennessee used roosts located above the surrounding canopy (Britzke et al. 2003).

Indiana bats have been found roosting in several different species of trees, and it appears that they choose roost trees based on their structural composition. Therefore, it is difficult to determine if one particular species of tree is more important than others. However, 12 tree species have been listed in the Habitat Suitability Index Model as primary species (class 1 trees) (Rommé et al. 1995). These trees include silver maple (*Acer saccharinum*), shagbark hickory (*Carya ovata*), shellbark hickory (*C. laciniosa*), bitternut hickory (*C. cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*F. americana*), eastern cottonwood (*Populus deltoides*), red oak (*Quercus rubra*), post oak (*Q. stellata*), white oak (*Q. alba*) slippery elm (*Ulmus rubra*), and American elm (*Ulmus americana*). In addition to these species, sugar maple (*A. saccharum*), shingle oak (*Q. imbricaria*), and sassafras (*Sassafras albidum*) are listed as class 2 trees (Rommé et al. 1995). These tree species are favored by the Indiana bat, since as these trees age, their bark will slough.

Male Roosting Habitat

Some adult males use mature forests around and near their hibernacula for roosting and foraging from spring through fall. Others have been found migrating far from their hibernacula area (Hobson and Holland 1995; Timpone 2004). Male Indiana bats also exhibit summer habitat philopatry.

Roosting habitat for male Indiana bats appears similar to female bats, and males and females have been caught using the same general area (e.g., Fishhook Creek, Illinois, Gardner et al. 1991). However, there are often notable gender differences in roost tree size and the juxtapositioning of roosting and foraging areas. Male Indiana bats have been found roosting in trees as small as 6.4 cm (2.5 inch) dbh (Gumbert 2001), although the average diameters reported in literature are much larger: 38.1 cm (15 inches) in Indiana (n=14, Brack et al. 2004) and 28.6 cm (11.26 inches) in Kentucky (n=41, Gumbert 2001). As male bats roost solitarily or in small groups, the size of the roost tree in terms of its available roosting space, is not likely a limiting factor. Male bats must thermoregulate, thus roost tree size and other characteristics affecting the microclimate of the roost site are still germane. The connectivity between roosting and foraging sites may not be as critical for males as it is for maternity colonies because the latter must have prey close to their roost trees for nursing females and newly volant bats.

During a 1999 radio telemetry survey on the Athens District of the WNF, males were found roosting in American elm, red maple, shagbark hickory, and sugar maple trees. The average dbh of these trees was 11.8 inches and the average length of time within one year each tree was used

was 2.3 days (Schultes 2002). In 2000, two male Indiana bats were found roosting in American elm, red maple, black oak (*Quercus velutina*), white oak, pignut hickory and shagbark hickory. The average dbh of these trees was 11.9 inches and the average length of time each tree was used was 1.9 days (Schultes 2002).

Foraging

Indiana bats feed exclusively on flying aquatic and terrestrial insects. Although there are no consistent trends, diet appears to vary across their range, as well as seasonally and with age, sex and reproductive-status (Murray and Kurta 2002; Belwood 1979). Murray and Kurta (2002) found that diet is somewhat flexible across the range and that prey consumed is potentially affected by regional and local differences in bat assemblages and/or availability of foraging habitats and prey. For example, Lee and McCracken (2004) and Murray and Kurta (2002) found that adult aquatic insects (Trichoptera and Diptera) made up 25-81% of Indiana bat diets in northern Indiana and Michigan, respectively. However, in the southern part of the species range terrestrial insects (Lepidoptera) were the most abundant prey items (as high as 85%) (Brack and LaVal 1985; LaVal and LaVal 1980; Belwood 1979). Kiser and Elliot (1996) found that Lepidopterans (moths), Coleopterans (beetles), Dipterans (true flies) and Homopterans (leafhoppers) accounted for the majority of prey items (87.9% and 93.5% combined for 1994 and 1995, respectively) consumed by male Indiana bats in their study in Kentucky. Diptera, Trichoptera, Lepidoptera, and Coleopterans also comprised the main prey of Indiana bats in Michigan (Murray and Kurta 2002), however, Hymenopterans (alate ants) were also taken when abundant.

The function of foraging habitat is to provide a source of food, but it also provides night roosts for resting and digesting meals between forays and shelter from predators. The few studies conducted to date indicate that (1) Indiana bats appear to be solitary foragers (2) individuals establish several foraging areas, likely in response to varying insect densities, and (3) individuals are faithful to their foraging areas (Kiser and Elliot 1996, Murray and Kurta 2004). Foraging areas may or may not overlap with day or night roosting areas, but individual foraging ranges commonly overlap (Menzel et al. 2001). Indiana bats generally prefer foraging in wooded areas (LaVal et al. 1976, Brack 1983, Gardner et al. 1991, Butchkoski and Hassinger 2002, and Murray and Kurta 2002), and are frequently associated with streams, floodplain forests, forested wetlands, and impounded water bodies (Garner and Gardner 1992, Murray and Kurta 2002). Woody vegetation with a width of at least 100 ft (30 m) on both sides of a stream has been characterized as excellent foraging habitat (Cope et al. 1974). Indiana bats forage and fly within air space from 6 to 100 ft (2-30 m) above ground level (Humphrey et al. 1977), typically in and around tree canopy and in openings (Humphrey et al. 1977, LaVal et al. 1976, Brack 1983, Gardner and Gardner 1992, Gardner et al. 1996, Murray 1999).

Indiana bats will forage in small openings, but generally appear to avoid foraging over large open expanses and prefer forested areas (Humphrey et al. 1977, Brack 1983, Brack & LaVal 1985, Gardner and Gardner 1992, Murray and Kurta 2004). In Michigan, Murray and Kurta (2004) found that Indiana bats used wooded corridors for traveling and foraging, even when this required them to significantly increase their nightly commuting distance.

Another important aspect of Indiana bat habitat is mid-story cover. It is important to discuss forest clutter for two reasons. First, when foraging in clutter, bats must detect targets amid the

echoes from non-target objects (Fenton 1990). The greater the density of non-target items the more noise bats must decipher. Second, the greater the physical and acoustical clutter, the more difficult it is for Indiana bats to maneuver to avoid collisions. Indiana bats navigate and forage on the wing. Foraging in less spatially complex habitats is likely to be less energetically expensive. Hence, it is acknowledged that a relatively open mid-story (<40% of trees are 2-4.7 in (5-12 cm) dbh) (Rommé et al. 1995) is an important feature of high quality Indiana bat foraging habitat.

Connectivity of the foraging area to the roosting area is also an important feature. Murray and Kurta (2002) suggested that within a home area, bats appear to be faithful to their travel corridors as they observed Indiana bats using the same corridors for more than 5 years. There have been reports of bats traveling through relatively open areas (e.g., bats documented crossing over or under bridges on I-70 in Indiana) to reach foraging habitat (USFWS 2002; Butchkoski and Hassinger 2002). As explained previously it is unknown whether bats in these instances are specifically choosing to use the open areas or whether they have no other option. For lactating females and newly volant pups, the distance between foraging and roosting sites should be minimized to the extent possible. Murray and Kurta (2004) found that lactating females returned 2-4 times/night to their day roosts, presumably to nurse their young, while non-lactating females did not return to their day roosts. Barclay (1991) and MacGregor (1999) have found that female bats chose roost sites based on high insect abundance in the area (along with other roost suitability criteria), so that foraging doesn't come at too high an energetic cost.

The maximum distance that Indiana bats will travel to forage is unknown and studies have revealed a considerable range of movement capabilities. Foraging distances reported range between 1 and 7.8 km (0.62-4.85 miles) for females and 1 and 3 km (0.62-1.87 miles) for males (Gardner et al. 1991., Garner and Gardner 1992; Kiser and Elliot 1996). This great variability likely reflects differences in habitat quality and/or prey availability. Although the ideal configuration of a colony's or individual bat's home-range is unknown, it is reasonable to assume the closer the essential habitat elements are located, the better. Contiguous habitat elements reduce the travel time between foraging and day roosting areas, which will decrease exposure time to predation and reduce energetic costs of foraging.

Fall Swarming and Mating

From late-August to mid-October, prior to entering the hibernacula, large numbers of Indiana bats fly in and out of cave or mine openings from dusk till dawn in a behavior called swarming. Swarming usually lasts for several weeks and mating occurs toward the end of this period. Male Indiana bats tend to be active for a longer period of time than females during swarming and will enter the hibernacula later than the females (LaVal and LaVal 1980). Adult females store sperm through the winter thus delaying fertilization until early May.

Threats to the Species

The causes for the population decline of the Indiana bat have not yet been definitively determined. However, the documented and suspected reasons for decline include disturbance and vandalism; improper cave gates and structures; natural hazards; microclimate changes; adverse land use practices; and chemical contamination.

Human disturbance of hibernating bats led to a decline in Indiana bat populations from the 1960s to the 1980s (USFWS 1999). Disturbance from recreational cavers and researchers entering hibernacula can cause bats to expend crucial fat reserves before they are able to forage in the spring. If disturbance occurs too often, fat reserves can be depleted before the species can begin foraging in the spring.

Changes in the microclimate of a cave or mine can affect temperature and moisture level, thereby affecting suitability of the hibernaculum or affecting bat physiology (Richter et al. 1993; Tuttle and Kennedy 2002). Blockage of entry points can alter airflow in a cave or mine. This poses serious consequences when a hibernaculum is on the warm edge of the species hibernating tolerance, or has less stable temperatures. In northern areas, changes in airflow could lead to areas of the mine or cave being too cold for the bat. In either case, changes in airflow and the microclimate could result in individuals having to use less optimal locations in the hibernaculum. This could leave them vulnerable to predation, freezing, or exhaustion of fat reserves. Improper gates have either rendered hibernacula unavailable to the Indiana bat, or have altered air flow causing hibernacula temperatures to be too high for bats to retain fat reserves through the winter (Richter et al. 1993). Cave entrances essential to proper cooling of key hibernating sites must be identified and protected from inadvertent closures, including those that may occur naturally (Tuttle and Kennedy 2002).

Land use practices, fire suppression, and agricultural development have reduced available roosting and foraging habitat as well as reduced the abundance of insects for bat prey across its range. Ongoing research and monitoring is helping to enhance the understanding of habitat use and characteristics. When done properly, experts consider forestry practices to be compatible with Indiana bat conservation; however silvicultural methods need to maintain structural features important for roosting and foraging (BCI 2001).

Bioaccumulation of environmental contaminants is suspected as a potential factor in the decline of the Indiana bat. Organochlorine insecticides became widely used after World War II; they are neurotoxic, synthetic chemicals of which many are resistant to metabolism in mammals (O'Shea and Clark 2002). Organochlorine insecticides may have resulted in chronic mortality of Indiana bats (O'Shea and Clark 2002). For example, guano collected from an Indiana bat roost in Indiana, in the 1970s, had concentrations of dieldrin in their guano comparable to the levels found in colonies of gray bats that suffered mortality from dieldrin poisoning (O'Shea and Clark 2002). Schmidt et al. (2002) measured levels of Polycyclic Aromatic Hydrocarbons (PAH) and organochlorine pesticides in surrogate bat species to ascertain potential affects to the Indiana bat. At low concentrations, these chemicals cause cancer and cellular mutations in mammals, and may affect reproductive success by reducing viability of gametes or offspring.

Running buffalo clover

Running buffalo clover is a species that has shown great recovery potential if habitat is protected and managed. Listed in 1987 when only one population was known, today 120 populations of running buffalo clover exist. Many of these populations are very small and vulnerable and display a cyclic pattern of decline and increase over time. The Recovery Team for this species has indicated that even small populations are valuable for the continued existence of running buffalo clover due to high genetic diversity.

Distribution

Running buffalo clover occurs in mesic habitats with partial to filtered sunlight, where there is a prolonged pattern of moderate, periodic disturbance, such as mowing, trampling, or grazing. It is most often found in regions underlain with limestone or other calcareous bedrock, but not exclusively. It has been reported from a variety of habitats, including mesic woodlands, savannahs, floodplains, stream banks, sandbars (especially where old trails cross or parallel intermittent streams), grazed woodlots, mowed paths (e.g. in cemeteries, parks, and lawns), old logging roads, jeep trails, skidder trails, mowed wildlife openings within mature forest, and steep ravines.

Running buffalo clover has been collected historically from Arkansas, Illinois, Indiana, Kansas, Kentucky, Missouri, Ohio and West Virginia. There were very few reports rangewide between 1910 and 1983. Prior to 1983, the most recent collection had been made in 1940 in Webster County, West Virginia (Brooks 1983). Although thought to be extinct (Brooks 1983), running buffalo clover was rediscovered in 1983 in West Virginia. At the time of listing only one population was known to exist. Soon after being listed in 1987, several additional populations were discovered in Indiana, Ohio, Kentucky, and West Virginia. Populations were not rediscovered in the wild in Missouri until 1994.

Rangewide Status

Extant populations of running buffalo clover are known from 120 populations in three eco-regions: Hot Continental, Hot Continental Mountainous, and Prairie Division (Bailey 1998). For recovery purposes, the populations are divided into three regions based on proximity to each other and overall habitat similarities. These regions are Appalachian (West Virginia, and southeastern Ohio), Bluegrass (southwestern Ohio, central Kentucky and Indiana), and Ozark (Missouri). The majority of populations occur within the Appalachian and Bluegrass regions. Kentucky has the most populations of running buffalo clover, followed by West Virginia, Ohio, Indiana and Missouri. The largest populations of running buffalo clover occur on the Monogahela National Forest in West Virginia. In 2005, the total number of ranked populations included: 10 A-ranked, 23 B-ranked, 31 C-ranked, and 58 D-ranked (USFWS 2005a). A-ranked populations are the largest (over a 1,000 individuals) and occur in highly suitable habitat, while D-ranked populations are small (less than 30 individuals) and may occur in somewhat marginal habitat (see Draft Revised Recovery Plan for full discussion of EO rankings).

As of 2005, 17 extant populations are known from Ohio plus an additional seven extirpated populations. Populations have been found primarily in mesic forest and lawn habitats in Hamilton, Clermont, Brown, and Lawrence counties. An estimated 3,138 plants were documented in Ohio during 2005.

Population dynamics

Running buffalo clover usually acts as a perennial species, forming long stolons that root at the nodes. Plants produce erect flowering stems, 10-30 cm tall that send out long basal runners (stolons). The flowering stems have 2 large trifoliolate leaves below a 9-12 mm round white flower head (Gleason and Cronquist 1991). Running buffalo clover flowers from mid-April to June; fruiting occurs from May to July (Brooks 1983).

Running buffalo clover is reported to be visited by bees (*Apis* sp. and *Bombis* sp.) and is cross-pollinated under field conditions (Taylor *et al.* 1994). Franklin (1998) documented that although running buffalo clover is genetically self-compatible, it cannot self-pollinate. Self-compatibility provides plants reproductive assurance when outcrossing opportunities are limited (such as in small populations).

Genetic studies of running buffalo clover suggested that to conserve maximum levels of diversity in running buffalo clover, as many populations as possible should be preserved across its range because much of the total diversity resides among populations (Crawford et al. 1998). Small populations of running buffalo clover contribute as much genetic diversity as large populations and exhibit unique banding patterns, which is important for the species adaptability and genetic stability.

Long-term monitoring data indicates that running buffalo clover populations often display widely fluctuating population sizes. The cause for changes in population size may be due to disturbance, weather patterns, management strategy, or other unknown factors. Ohio's population data indicate that the numbers of rooted crowns in a given sub-population may vary widely over time, including variation within a given growing season (Becus 1993). One population in Ohio had 235 rooted crowns in 1992 and then disappeared for the next 3 years; in 2003, this same population had 1,157 plants. Similarly, a West Virginia sub-population consisting of 31 rooted crowns in 1990 and 1991, disappeared in 1992, and returned the next year. Running buffalo clover has not been observed at this location since 1993 and is now considered extirpated at this site.

Threats

The primary threat to running buffalo clover is habitat alteration. Factors that contribute to this threat include forest succession, and subsequent canopy closure, competition by invasive plant species, catastrophic disturbance such as development or road construction, and may include the elimination of bison and other large herbivores. Without some level of disturbance, an area will become too shaded to provide enough sunlight for the species (Cusick 1989, Homoya et al. 1989).

Various researchers have supported the hypothesis that during pre-settlement time running buffalo clover habitat was likely produced through canopy gaps created by the felling of large, old-growth trees (Madarish and Schuler 2002). Current logging practices may also benefit running buffalo clover. At the Fernow Experimental Forest in north-central West Virginia, running buffalo clover is most often associated with skid roads in uneven-aged silvicultural areas (Madarish and Schuler 2002). A study examining running buffalo clover abundance before and after logging suggests that populations may initially decrease after disturbance, but then rebound to higher than pre-disturbance levels (Madarish and Schuler 2002).

Land development and the consequential loss of habitat is also a serious threat to running buffalo clover. Cusick (1989) notes that running buffalo clover was formerly relatively frequent in central and southwestern Ohio, particularly in the vicinity of Cincinnati prior to urban sprawl. Remnant populations have become even more isolated, persisting in areas maintained by appropriate disturbance. Remnant habitats may lead to small population sizes, inadequate seed dispersal, and poor seed quality. It has been suggested that running buffalo clover has a limited

seed dispersal mechanism (Cusick 1989). Deforestation, farming, and other human activities created many new habitats for the species, but with the loss of bison after European settlement, Cusick (1989) suggested that there were no effective means of dispersal remaining for the species.

Jacobs and Bartgis (1987) suggested that along with the destruction of habitat, the introduction of non-native species may have contributed to the decline of running buffalo clover. Non-native white clover (*Trifolium repens*) may have invaded the habitat of running buffalo clover, out-competing it for available resources (Jacobs and Bartgis 1987). Other invasive plants that currently threaten with running buffalo clover include Japanese stilt grass (*Microstegium vimineum*), garlic mustard (*Alliaria petiolata*), Japanese honeysuckle (*Lonicera japonica*), Amur honeysuckle (*Lonicera maackii*), wintercreeper (*Euonymus fortunei*), and periwinkle (*Vinca minor*). Management of invasive species through manual methods (pulling and mowing) have shown to be effective in minimizing competition with running buffalo clover.

III. ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in an action, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process (50 CFR 402.02).

The WNF is located in the Southern Unglaciated Allegheny Plateau and is part of the mixed mesophytic forest region. Approximately 80% of all lands within the WNF proclamation boundary are forested (Ohio Land Use Cover, based on Landsat TM 1994). Just over 94% of WNF lands are forested with the remaining 6% covered by non-forest lands such as roads, water, grasslands and other openland. WNF lands are dominated by hardwood forest types, however some pine is present (Table 3).

Of the forested WNF lands, oak-hickory is the major forest type, comprising 47% of all forested stands. The majority of the WNF has been harvested one or more times since the late 1700s. Cultivation or grazing followed the harvest of many forest stands. Today, many of the forest communities were established after timber harvesting that occurred about 80-140 years ago.

There has been an increasing trend for the amount of older hardwood stands on the WNF since 1985 (Table 4). Hardwood stands greater than 80 years old increased by almost 5% during the time period when the 1988 Forest Plan was being developed.

Table 3. Acres of forest types by age class on WNF lands*.

Age (years)	Pine	Pine - Hardwood	Oak - Hickory	Yellow Poplar	Lowland Hardwood	Maple-Beech	Upland Hardwood	Total
No Age	52	23	138		74		34	321
0-9	55	279	110	13	275		312	1,044
10-19	953	640	4,632	93	349	74	4,974	11,715
20-29	1,217	532	4,343	614	747	196	4,725	12,374
30-39	4,470	1,811	4,417	1,088	2,297	274	6,962	21,319
40-49	3,539	3,157	3,024	2,129	1,844	189	7,427	21,309
50-59	2,233	3,093	5,724	3,019	1,281	596	9,239	25,185
60-69	1,405	1,986	10,493	2,792	720	443	8,221	26,060
70-79	364	650	13,120	1,691	505	675	6,254	23,259
80-89	85	297	13,722	899	257	755	3,179	19,194
90-99		352	13,628	347	69	347	2,021	16,764
100-109		34	14,131	125	63	360	1,073	15,786
110-119			10,524	93	17	148	574	11,356
120-129			6,625	12		117	172	6,926
130-139		22	1,859		34	70	51	2,036
140-149			988			20	78	1,086
150+			197			15	28	240
Total	**14,373**	**12,876**	**107,675**	**12,915**	**8,532**	**4,279**	**55,324**	**215,974**

**Data in this table do not include the approximately 9,300 acres of WNF lands where a silvicultural examination has yet to be conducted.*

Table 4. Comparison of mature hardwood forest age classes in 1985 and in 2003 on WNF lands

Habitat Component	1985 (%)	2003 (%)	Percent Change (1985-2003)
Hardwood-Mast Producing			
(40-79 years)	33.0	35.8	+2.8
(80-99 years)	18.0	15.9	-2.1
(100+ years)	8.7	15.7	+7.0

All streams in the WNF proclamation boundary flow towards the Ohio River. There are more than 280 miles of perennial warm-water streams running through the WNF. Riparian areas, wetlands and floodplains have been affected by extensive disturbance and modifications. Nearly all floodplains and riparian areas, and most of the wetlands on NFS lands were cleared, drained, and farmed in the past. Transportation corridors, including roads and railroads, were developed through these areas by early settlers. Riparian and aquatic resources have also been affected by stream channel alteration (typically by straightening stream channels and the filling in of oxbows), streamside forest clearing, livestock access to streams, cultivation of fields up to the edge of the channel, and more recently from increased development of residential sites in the floodplain on private lands. Such activities have resulted in altered hydrologic regimes, increased erosion and sedimentation within stream channels, degraded water quality and aquatic habitat.

The percent composition of ponds and lakes increased by 0.1 percent between 1985 and 2003. While the Forest Service only constructed 7 new acres of ponds and lakes during this time period, it purchased over 200 acres of waterbodies through its land acquisition program (USFS 2005). Numerous small lakes have been acquired through purchases of extensive tracts of mine lands. Some of these lakes are coal mine strip pits, limestone quarry ponds, or reclaimed coal mine impoundments.

The percent composition of wetlands increased by 0.18 percent between 1985 and 2003 (USFS 2005). The Forest Service acquired several bottomland fields along Pine Creek, Symmes Creek, Monday Creek, Little Muskingum River and the Hocking River between 1988 and 2003. In cooperation with partners, 103 acres of previously tiled and ditched floodplain wetlands have been restored or enhanced since 1994.

The landscape of the Forest, including WNF lands and other ownerships, is fragmented by residences, farms, mines and quarries, industrial developments, and towns. The scattered pattern of WNF lands, including subsurface ownership of minerals, has resulted in the construction of roads and utility corridors across WNF lands to access these private inholdings.

Status of the Species Within the Action Area

Indiana bat

The Indiana bat is present year round within the action area. Indiana bat presence in the action area is well documented as numerous nights of mist netting have been completed over the years to ascertain the species distribution across the WNF (see Appendix B).

Winter Habitat on the WNF

There is one documented hibernaculum within the action area. This site is an abandoned limestone mine and serves as a Priority III winter hibernaculum (containing 333 Indiana bats). Four limestone mines have been closed with bat friendly gates (including the one currently being used as a hibernacula for Indiana bats). Numerous mines are located on Federal and non-Federal lands in the Athens Unit and the Ironton Ranger District as a result of past underground coal and limestone mining, however the majority of limestone mines are found in the Ironton Ranger District. These limestone mines may provide additional hibernacula for Indiana bats; however, surveys have not yet ascertained whether bats are using these limestone mines. Given the large number of abandoned limestone mines (some of which are protected), it can reasonably be assumed that more than one Priority III hibernacula occurs in limestone mines on the Ironton District.

Less is known in general, about the use of abandoned coal mines as bat hibernacula (versus other mines). Biologists continue to conduct fall swarming surveys, and Indiana bats have been captured at three portals leading to abandoned underground coal mines. Entry into underground coal mines is not permitted because of safety concerns; however, we believe small numbers of Indiana bats may be using these mines as hibernacula. The majority of these mines were abandoned in the mid-1900s as the coal ran out; therefore, an assumption can be made that Indiana bats are likely expanding their winter distribution into the WNF by using some of these mines. It is reasonable to assume at least three Priority III hibernacula occur in the Athens District.

Summer Habitat on the WNF

Female and male Indiana bats use the WNF during the summer, and likely use non-Federal lands in the action area as well. Specific maternity colony roost trees have not been found on WNF lands during telemetry surveys, however, lactating and post-lactating females have been captured during summer surveys. Capture of reproductive females indicate that a maternity colony is likely within 2.5 miles of the capture site. Thus, it is likely that female bats are using the forest for foraging and roosting. Adult males have been captured and radio-tracked to summer roosts within and/or near the WNF.

Range-wide, the majority of recorded Indiana bat roost trees are hardwood species; however, individuals have also been found roosting in pine species (Rommé et al. 1995; Britzke et al. 2003). Ninety-four percent of the WNF is forested, and 93% of these forested lands are comprised of hardwood or hardwood-pine forest communities. Seventy-nine percent of the action area is forested (LandSat 1994). While individual Indiana bats will use smaller diameter trees for roosts, the larger diameter trees (> 8 inches dbh) provide more optimal habitat for maternity colonies. Although dependent on site capability, trees generally increase in diameter as they age. As trees age, they are also more likely to begin exhibiting characteristics of known Indiana bat roost trees, such as broken tops, cavities and areas of sloughing bark.

The tree species found in the hardwood and hardwood-pine communities on the WNF reach physiological maturity at different ages (USFS 2005). For example, scarlet oak, red maple, sassafras, shortleaf pine, and Virginia pine reach physiological maturity as early as 70 years of age, whereas hickory, sugar maple, and white oak are longer-lived species that may not reach physiological maturity until after 120 years or more. A general assumption can be made, based on the physical maturity of trees and experiences in the field by WNF foresters and biologists, that hardwood stands greater than 80 years old, and pine or pine-hardwood stands greater than 60 years old, contain larger trees with suitable roost characteristics.

An analysis of vegetation data for WNF land showed that nearly 40% of all hardwood stands were greater than 80 years old, with another 25% about to recruit into this older age class from the 60-80 year old classes. Pine and pine-hardwood communities are generally younger in age, but 38% of these communities were greater than 60 years old; almost 45% of the pine and pine-hardwood communities are between 40 and 60 years of age and are about to recruit into the older age class. Thus, currently we believe that 40% of the forest provides suitable summer habitat for Indiana bat.

In February 2003, a severe ice storm occurred in southern Ohio and northern Kentucky, including portions of the Ironton Ranger District. In its aftermath, approximately 132,675 forested acres within the Ironton Ranger District boundary were affected. Approximately 71,650 acres were affected on WNF lands. Individual or groups of trees were broken or toppled in these areas, with the severity depending generally on elevation and aspect. This natural disturbance resulted in an increase in potentially suitable Indiana bat roost trees across the western two-thirds of the Ironton Ranger District.

Aquatic habitat is important to the Indiana bat because it provides drinking opportunities and the production of desirable insect prey. Intermittent and perennial streams that provide habitat for aquatic insect production are numerous within the Action Area. Of the 200 miles of perennial

stream that is in contact with WNF lands, 11 percent of those miles met Ohio water quality standards in 1998. About 41 percent of those miles were impaired and 48 percent had not been inventoried. Impairment of streams in this area is due to agriculture and abandoned mine lands (Ohio EPA, 2004). Watershed improvement activities targeting acid mine drainage is helping to improve downstream aquatic production areas. Private lands programs run through the Natural Resources Conservation Service are helping to reduce nutrient and sediment runoff into streams.

Summary
While suitable habitat for the Indiana bat is scattered across the action area, to date survey efforts suggest its distribution may not be random, but instead focused in two parts of the action area. One area is located on the Ironton Ranger District where past limestone mining and quarrying occurred, along with some underground coal mining. This area, nicknamed the Bear Run area, contains a Priority III hibernaculum. In 2005, 333 Indiana bats were censused in this hibernaculum (Schultes 2005). Summer surveys around the hibernacula have detected male and female bats using the area. Although no maternity colony trees have been discovered, a post-lactating female was captured during a summer mist net survey in Bear Run. Capture of a reproductive female indicates a maternity colony is within 2.5 miles of the capture site. A total of 7 Indiana bats (6 males and 1 female) have been captured in summer studies in the Bear Run area of the Ironton District.

The second concentration is in the southwest part of the Athens Unit near the city of Nelsonville, in an area heavily impacted by underground clay and coal mining. Four lactating females and 3 adult males have been detected during summer mist net surveys and 2 adult females and 1 male were captured during fall swarming surveys in the Nelsonville Area of the Athens District (3 different openings). As these 3 Indiana bats were captured at entrances to abandoned coal mines, it is impossible to safely enter these features and it is impossible to know if they are used as hibernacula. The Service assumes that Indiana bats may be hibernating in this area in low numbers. Outside these two concentration areas only two Indiana bats have been captured in the action area, both adult males; one on each District of the WNF.

We have one Priority III hibernacula confirmed in the action area but reason to believe that several more may occur. There are data to support the hypothesis that some Indiana bats will summer near their hibernacula and others will travel far distances to summer roost (Whitaker and Brack 2002, Timpone 2004). We have summer records of 13 males and evidence of at least 2 maternity colonies using the action area.

Running buffalo clover
Running buffalo clover occurs in mesic habitats in partial to filtered sunlight, where there is a pattern of moderate periodic disturbance for a prolonged period, such as mowing, trampling or grazing, and is often found in areas underlain by limestone or other calcareous bedrock (USFWS 2005a). The plant is not found in mature habitats or in areas of severe disturbance (Cusick, 1989). Ohio populations are found in mesic wooded sites and lawn sites (USFWS 2005a). Suitable habitat for running buffalo clover occurs in both the Athens and Ironton Ranger Districts.

A survey for running buffalo clover was conducted in May 1996 on the Ironton Ranger District of the Forest, specifically in Lawrence County, Ohio. A total of 320 acres were surveyed.

Approximately 1,500 acres were surveyed in 2003, in Lawrence, Scioto and Gallia counties. In 2004, approximately 3,500 acres were surveyed in Lawrence County in preparation for ice storm hazardous fuel treatments. About 1,980 acres were surveyed for this species in 2005. The project driven surveys have not resulted in the discovery of running buffalo clover on the WNF (USFS 2005).

Although suitable habitat occurs throughout the action area, no populations of running buffalo clover were known to occur within the action area until this year. Running buffalo clover was first discovered on the WNF (Lawrence County) in June 2005. The population is located along a 20 foot section of an old ATV/skid trail. There are 34 rooted plants (ramets) in this area. Of the 34 individuals, 27 are located on the old road, and 7 are located on the edge of the old road. The total population may be higher or lower based on the fact that it was censused late in the growing season (August). Viability of this population is currently unknown, but will investigated in the coming years through annual monitoring during the flowering period.

The habitat on the WNF where the species occurs is fairly open with scattered trees. Two large trees, an American elm and bitternut hickory, provide dappled shading. Canopy cover above this old road section averaged 47±% (measured with a spherical densitometer at four points and in the cardinal directions at each point). Japanese stiltgrass is by far the most dominant species at this site, covering over 75% of the running buffalo clover population. Competition by invasive species is a major threat to running buffalo clover and its habitat rangewide (USFWS 2005a) could be a serious concern for this population.

The old road was recently disturbed during a spring 2005 fire suppression operation, but has since received little traffic. It appears that this trail has not received much illegal OHV traffic in recent years. The fire burned on either side of the old road and may have lightly burned over the road, but there was no direct fire evidence four months after the fire occurred. Invasive plant control is proposed for this site to begin in the fall of 2005.

There is a second population of running buffalo clover in Lawrence County, but it is about 8 miles outside the action area north-northeast of the city of Proctorville, Ohio. The potential for other populations to occur within the action area is high as suitable habitat for the species is abundant.

Factors Affecting the Species in the Action Area

Indiana bat

Mining

The WNF is located in the heart of Ohio's oil, gas and coal deposits. Industrial minerals such as sand, gravel, limestone, clay, shale, sandstone, and salt are also found within the action area. About 40% of the WNF is currently underlain by federally owned minerals, including oil and gas. Reserved and/or outstanding minerals wholly or partially encumber the remaining 60% of the National Forest.

Extraction of coal, clay, limestone and iron ore have occurred in southeastern Ohio during the last 150 years. Today, remnants of this industrial era are present on the WNF in the form of abandoned surface and underground mines. Features associated with these abandoned mine lands affect riparian and water quality.

Acid Mine Drainage (AMD) is water that is affected by passage through, or alteration by, coal or abandoned coal mine environments. The products of AMD formation, acidity and iron, can devastate water resources by lowering the pH and coating stream bottoms with iron hydroxide. Streams in the action area that are impacted from AMD may have a lowered productivity of aquatic biota, including insects that Indiana bats prey upon. Furthermore, waterways severely impacted by AMD may not provide suitable drinking water sources for Indiana bats. Despite the past impacts to surface water within the action area, the area supports a high density of bats including Indiana bats and 7 other species. This indicates that the action area currently provides ample foraging and drinking sources for bats.

Land Ownership and Management

Mature forest with canopy gaps and open understories is important to this species, both during the summer and during the swarming period; however forest structure has changed over time. Researchers believe that the action area was primarily forested, but about 10 percent of the area was disturbed each decade by weather-related events or by forest pests and diseases (Runkle 1982). These disturbances ranged in size from canopy gaps to larger blowdowns, and were scattered across the landscape. In the central hardwood forest, the climate warmed and became drier 5,000 to 8,000 years ago, and an increase in fire occurred. Native American people utilized fire to clear forest from around their camps, clear brush for improved hunting and for better visibility for protection against enemy attacks (Fralish 2004). The action area was a mosaic of early-, mid-, and late-successional forest habitats. As European immigrants moved into the action area in the late-1700s, the forest was cleared for home sites, agriculture, lumber and mining. By 1940, only about 15% of the forest cover was still present in Ohio, and this trend was likely similar for the action area (Ohio Division of Forestry 2004). Active fire suppression began in the 1920s.

Today, the Ohio Division of Forestry estimates that almost 30% of Ohio is now covered by forest once again, and the trend is similar for areas of Kentucky and West Virginia within the Southern Unglaciated Allegheny Plateau. An estimated 79 percent of the lands within the action area are forested today, based on Landsat TM (1994).

While forest cover has increased, it has a different structure and composition than what occurred here before Europeans first started moving into the area. Based on written accounts of early settlers and travelers in the Ohio Valley, forests were described as being park-like with large, widely spaced overstory trees and relatively little undergrowth of woody vegetation. Chestnut-oak forests dominated the landscape until the early 1900s, but these changed to oak-hickory forests after the chestnut blight occurred. An analysis of the structure, composition and condition of overstory trees in research plots located in southeastern Ohio suggests that the today's forest is denser than that reported for old growth oak-hickory forests and for presettlement forests (Sutherland et al. 2003; Yaussy et al. 2003). Changes in disturbance patterns over the past 75 years have been suggested as reasons why an increase in shade tolerant species (e.g., red maple) is occurring in greater abundance in the forest understory and midstory (Abrams 1992; Abrams

1998). There is no scientific information available at this time to know whether the increasing density of forest communities is a contributing factor to the Indiana bat's decline. Forested lands within the action area are managed in a variety of ways, creating a mosaic of habitat conditions across the action area.

Non-Federal Actions

About 130,000 acres of New Page and Escanaba Timber Lands (i.e., used to be Mead Westvaco) are scattered across southern Ohio, and a paper mill is located in Chillicothe, Ohio. There are about 5,700 acres of New Page/Escanaba lands in the action area, the primary purpose of which is to ensure a long-term supply of fiber for the paper mill. On lands managed for hardwoods, New Page/Escanaba is testing ways to increase the oak component on the lands it will be harvesting, but no operational procedures are in place. The company is increasing the pine component on its lands with a target of approximately 23 percent of the corporate lands in pine. They are also encouraging private land owners to plant pine which could affect the amount of suitable roosting habitat for the Indiana bat. Road construction and reconstruction occur in association with the timber harvesting.

About 25,450 acres of state-owned property is located within the action area. These properties include at least a portion of various state forests (Dean and Zaleski), wildlife management areas (Crown City, Trimble, and Waterloo), and state parks (Strouds Run, Burr Oak, and Jackson Lake). State forests and wildlife areas are generally managed for game and nongame species. To manage these areas, some timber is harvested and some silvicultural work may be conducted (e.g., prescribed fire). In 2003, the Ohio Division of Wildlife completed its *Indiana Bat Management Strategy*, and its guidance is incorporated into forest management on state properties (ODNR 2003). In wildlife areas and state forests suitable roost trees are only cut in the hibernation period. In state parks, vegetation management occurs only in and around recreation facilities for public safety and scenery. Most of the lands in the state park system will continue to grow older. The only record on state lands near the action area is a single male Indiana bat that was detected in a summer mist net survey at Waterloo Wildlife Area.

The Nature Conservancy has recently acquired some land within the Ironton Ranger District. The organization would like to see the land added to the WNF in the future, but for now has entered into a partnership agreement with the Ohio Division of Wildlife to cooperate in management of wildlife populations on their property. About half of their land consists of open reclaimed coal mine land, while the other half consists of hardwoods. At this time, the Nature Conservancy is not actively managing this property, with the exception of trying to reduce trash dumping.

Other private lands in and around the WNF are managed for a wide variety of purposes. Some timber harvesting is occurring on private lands, and these primarily involve high grading. In Ohio, timber harvest on private land is not regulated. Some landowners in the action area may be performing logging operations at any time of the year. Based on knowledge gained by WNF staff, about 50% of the private lands in the Ironton District have been logged over the past 20 years. About 95 percent of the treatments were considered high-grading or diameter-limit cutting. These private lands are now in various stages of regeneration, from sapling to pole sized trees. This scenario is most likely similar for the Athens District. Forest land is being cleared for new home sites and associated improvements. For example, the Pine Creek Watershed

Assessment showed an increase in urbanization of rural areas around Wheelersburg, Ohio that has occurred in recent times (USFS 2001). The same is occurring around other areas of the WNF. Past forestry actions on private land may have impacted the Indiana bat by reducing suitable roosting and foraging habitat.

Federal Actions

FHA – On April 15, 2005 the Federal Highways Administration completed formal consultation on the Nelsonville Bypass (USFWS 2005b). Construction is not expected to start until 2007 on the 8.5 mile bypass. According to the non-jeopardy Biological Opinion for this project, a 768 acre linear corridor could be impacted, including all staging, waste, and borrow areas, and ancillary connector roads. About 275 acres of this disturbance could occur on WNF lands.

APHIS - The emerald ash borer is an exotic pest that has been introduced to the United States, and several infestations have been reported in Ohio. This insect has the potential to affect the composition of thousands of acres of forest land in the Midwest; the current treatment is to cut down all ash trees within a half mile of an infected tree. Green ash is considered a Class I Indiana bat preferred roost tree. Ash trees are scattered in stands on WNF lands, but are not a predominant species. The USDA (APHIS) is working on an EIS and programmatic Biological Assessment for treatment of emerald ash borer infestations.

A Final EIS was issued for gypsy moth management in 1995. Mating disruption is an ongoing effort on the WNF where pheromone flakes are aerially applied over targeted forest areas. Gypsy moth outbreaks have the potential to defoliate trees (oaks especially) and can kill them.

USFWS - The Service manages the Ohio River Islands National Wildlife Refuge. Six islands within the action area are in the refuge system (Williamson, Wells, Grandview, Grape/Bat, Middle, and Broadback). The Service has developed a management plan for the refuge, and it contains activities that are beneficial to the Indiana bat. These include the reforestation of bottomland hardwoods and wetlands, creating snag habitat, and conducting summer mist net surveys. Implementing the management plan is an ongoing effort.

Forest Service - Since receiving the 2001 Programmatic Biological Opinion, as amended in 2004, for the 1988 WNF Land and Resource Management Plan, the WNF and Service have implemented a tiered consultation approach. The WNF has tracked management activities that have the potential to adversely affect the Indiana bat through permanent loss of habitat or alteration of habitat.

Since 2001, a total of 1455.5 acres of potentially suitable Indiana bat habitat has been altered, while 21.08 acres of potentially suitable Indiana bat habitat has been permanently lost. Some projects that have gone through this consultation process have not been implemented to date (August 2005). For example, projects that could result in the loss of 74.46 acres of potentially suitable habitat have been planned, but projects amounting to only 21.08 acres have been implemented on the ground. Similarly, projects that could alter 7,739.95 acres of potentially suitable habitat have been planned, but only 1,455.50 acres have been affected on the ground. Although the WNF has implemented projects that may have adversely affected the Indiana bat, those actions have been infrequent and spread broadly across the landscape. Less than 5% of the forest on WNF has been impacted since consultation in 2001.

Running buffalo clover

Please refer to **Factors Affecting Species In the Action Area** for the Indiana bat for a description of ongoing activities in the action area that affect forest conditions. Running buffalo clover responds favorably to forest management activities that introduce small canopy gaps. Without a periodic moderate level of disturbance, a site will become too shaded to provide enough sunlight for the species.

For the most part, state and local governments conduct some form of field review prior to implementing projects, but private landowners generally do not. Some activities occurring on private lands could adversely affect potentially suitable habitat or undiscovered populations of running buffalo clover, such as forest conversion, even-aged timber harvesting, road construction, illegal OHV riding, and energy minerals development. These activities are ongoing within the action area.

Within the action area beneficial activities are occurring and will likely continue to occur as the new Forest Plan is implemented. These include plant surveys on WNF lands, state properties and lands administered by The Nature Conservancy; reforestation activities on WNF lands, state properties and on private lands; and watershed improvement activities on WNF lands, state properties and on private lands.

Comparison of 1988 Forest Plan to Revised Forest Plan

The goals of the Revised Forest Plan are to improve watershed health, provide plant and animal habitat to support viability of all native species, provide a variety of recreation opportunities matched to the capabilities of the Forest and public demand, lease federally-owned oil and gas resources, continue to consolidate National Forest ownership through land acquisition, and contribute to the economies of local communities. These goals were identified by the public during the revision process as areas of principle concern. Key changes between the 1988 Forest Plan and the revised Forest Plan for each of these areas is summarized below. Many of the 2001 PBO terms and conditions and conservation measures for the Indiana bat have been incorporated in the Revised Forest Plan as S&G.

Watershed Health

Current direction for management of streams, riparian areas, and floodplains focuses primarily on protecting water quality from earth disturbing activities. Forest-wide direction on the reclamation of mined areas and revegetation of other disturbed areas is also included.

The revised Forest Plan has placed more emphasis on restoration of watershed integrity, including restoration and maintenance of healthy aquatic and riparian ecosystems. From a coarse scale perspective, the River Corridor MA was developed to retain, restore, and enhance the inherent ecological processes and functions associated with riverine systems. This MA has been placed along the Hocking River, Little Muskingum River, Ohio River and Symmes Creek - streams that provide habitat for a diverse assemblage of aquatic and semi-aquatic species.

The revised Forest Plan includes a goal to maintain and restore water quality and soil productivity by restoring stream morphology where it has been altered and by enhancing water quality in watersheds affected by acid mine drainage and sedimentation. Forest-wide direction on management of disturbed areas, old water wells and cisterns, soil resources, and abandoned mine lands has been updated or added. A second goal promotes healthy riparian and aquatic ecosystems that sustain ecological processes and functions and a variety of plant and animal communities by restoring wetland and streamside habitat, improving passage for aquatic and semi-aquatic organisms at road-stream crossings, and improving aquatic habitat in lakes and ponds. The revised Forest Plan provides clearer definitions and delineation methods for riparian areas and riparian corridors, and gives direction on the use and application of filterstrips. Forest-wide direction for the design and maintenance of road-stream crossings, oil and gas pipeline stream crossings, wetland restoration, and protection of springs, ephemeral wetlands, ponds and lakes has been updated or added.

Vegetation Management

The current Forest Plan, when signed in 1988, emphasized the use of even-aged management (clearcutting) on over 67% of the WNF to produce early successional habitat and timber volume. Emphasis on clearcutting was substantially curtailed after 1990 and no clearcutting at all has occurred on the Wayne since 1994. Consultation with the Service on protection of threatened and endangered species resulted in a 2001 Biological Opinion, and subsequently Forest Plan Amendment 13, each of which were based on continuation of Amendment 11 (i.e. annual average of 500 acres of only thinning and selection harvests); the current Forest Plan has no provisions for creating early-successional habitat. Little direction is provided in the form of desired future condition, objectives, S&G, or monitoring for the maintenance and restoration of the mixed-oak ecosystem, or the control of non-native invasive species. Use of herbicides and prescribed fire are permitted, if necessary to accomplish Forest Plan objectives, but specific objectives for such use are not spelled out.

At the coarse scale, management area prescriptions have been developed for the revised Forest Plan that will provide for a mix of habitats in which late-successional forest predominates (77% of the WNF), while 23% of the WNF is allocated to management areas with an emphasis on early-successional and grassland habitats. The revised Forest Plan incorporates a large increase in the use of prescribed fire for restoration of the oak-hickory ecosystem.

The revised Forest Plan includes goals to promote healthy terrestrial ecosystems that sustain a variety of plant and animal communities, and to use vegetation management methodologies to provide vegetation characteristics that meet the needs of native and desired non-native plant and animal species. Forest-wide direction includes goals, objectives, S&G to further the recovery of federally listed species in the current and revised Forest Plans. However, direction has been added in the revised Forest Plan to retain and develop Indiana bat summer roosting habitat when using timber harvesting methods other than selection or thinning, and for protection of running buffalo clover populations.

Recreation

The current Forest Plan provides direction on dispersed (trails) and developed (campgrounds, picnic areas) recreation management, however the introduction of Off-Highway Vehicle (OHV) management was one of the most important decisions made in the 1988 Forest Plan. OHV use is

restricted to designated trails within specific management areas. Prior to 1988, OHV use was not restricted to designated trails or specific areas of the Wayne National Forest. The 1988 Forest Plan projected that 250 miles of OHV trails would be created by the end of 1995, with 285 miles of trails in existence by 2002. Currently, there are 116 miles of designated OHV trails on the WNF. Direction for development and maintenance of hiking and horseback riding trails is included in the 1988 Plan, but mountain biking is not mentioned. Interpretation and education direction for heritage resources, such as the iron furnaces, the Underground Railroad, and pre-historic sites, received minimal mention in the 1988 Plan.

The revised Forest Plan retains the OHV management direction found in the current Forest Plan, limiting OHV use to designated trails within specific management areas. The footprint of the OHV management areas has remained essentially the same (slight changes in the boundary to make it easier to identify on-the-ground). The capacity to provide semi-primitive non-motorized recreation experiences is limited by its fractured ownership pattern and dense network of roads. Areas managed for semi-primitive non-motorized recreation will increase from the current 8% of the WNF to 11% under the revised Forest Plan. It also provides for modest increases in objectives for construction of hiking, equestrian and biking trails, compared to current objectives. Goals, objectives and Forest-wide direction for heritage resources have been enhanced.

Minerals Management

Oil and gas exploration and development is recognized as a suitable use of the WNF in the current Forest Plan; the entire federally owned oil and gas mineral estate is administratively available for leasing. This is consistent with law and regulation that direct that federally owned minerals should generally be available for leasing and that administrative availability is to be withdrawn only under special circumstances, such as in designated wilderness. The key stipulation addressed in the Forest Plan is the No Surface Occupancy (NSO) stipulation, which prohibits use or occupancy of the land surface for oil and gas exploration and development. The current Forest Plan uses a three-step process for leasing federally owned oil and gas rights: (Step 1) the Forest Plan, its associated environmental impact statement, and the record of decision – specifically decisions regarding mineral rights availability and surface occupancy permissibility by management area; (Step 2) decisions to authorize leasing of specific tracts of federally owned minerals for oil and gas development; and (Step 3) decisions regarding Applications to Drill (APD) wells, build access roads, and install related structures on specific leases.

The revised Forest Plan requires no surface occupancy on 13% of the Forest, compared to the current Forest Plan, which prohibits surface occupancy on 12% of the Forest. However, the revised Forest Plan will now allow surface occupancy on the Marietta Unit, which is one area of the WNF that has the highest potential for continued oil and gas development.

The revised Forest Plan's FEIS is intended to provide sufficient NEPA analysis to support future consent to lease decisions, moving from the current three-step process to a two-step process. The FEIS/ROD for the revised Forest Plan decides on availability, and which stipulations would be attached to leases, on which parts of the Forest; site-specific NEPA would still occur when the operator presents a plan of operations/application to drill for a specific lease.

Land Ownership
The 1988 Forest Plan decision set an ultimate goal of 322,000 acres in National Forest ownership and estimated that the WNF would contain approximately 250,000 acres by the year 2000. As of March 31, 2003, National Forest System ownership on the Wayne was approximately 233,000 acres. The revised Forest Plan includes Forest-wide goals and objectives to consolidate ownership, but does not alter the goal for the size of the Wayne National Forest.

IV. EFFECTS OF THE ACTION

This programmatic Forest Plan consultation requires two levels of analysis. The first level of the analysis considers how the overall Forest Plan goals and desired conditions will affect listed species. The second level of the analysis will consider how the specific management actions that implement the Forest Plan will affect listed species.

Effects of the Forest Plan Goals on Indiana bat and running buffalo clover
The goals of the Revised Forest Plan are to improve watershed health, provide plant and animal habitat to support viability of all native species, provide a variety of recreation opportunities matched to the capabilities of the Forest and public demand, lease federally-owned oil and gas resources, continue to consolidate National Forest ownership through land acquisition, and contribute to the economies of local communities.

Improving watershed health on the WNF is emphasized through the implementation of the River Corridor MA. This MA was developed to retain, restore, and enhance the inherent ecological processes and functions associated with riverine systems and will provide habitat for a diverse assemblage of aquatic and semi-aquatic species. In addition to this MA, goals, objectives, and S&G that maintain and restore water quality and soil productivity by restoring stream morphology where it has been altered and by enhancing water quality in watersheds affected by acid mine drainage and sedimentation will be implemented forest-wide. Improving watersheds will benefit the Indiana bat by providing clean drinking water, an increased insect prey base, and more intact forested stream corridors. Watershed activities will also be beneficial for running buffalo clover habitat by reducing sedimentation and runoff.

Providing plant and animal habitat to support all native species on the WNF will be accomplished by implementing a diverse array of management areas. Vegetation goals provide for a mix of habitats in which late-successional forest predominates (77% of the WNF), while 23% of the WNF is allocated to management areas with an emphasis on early-successional and grassland habitats. The revised Forest Plan incorporates a large increase in the use of prescribed fire for restoration of the oak-hickory ecosystem. Goals, objectives, S&G are provided to minimize impacts to and further the recovery of federally listed species forest-wide. The WNF will retain and develop Indiana bat summer roosting and foraging habitat, protect hibernacula and swarming sites, and protect running buffalo clover populations. Diverse Continuous Forest, Historic Forest, Future Old Forest, and River Corridor management areas will increase habitats suitable on the WNF for both Indiana bat and running buffalo clover. In particular, detection of Indiana bats in Appalachian forests, such as the WNF, may be higher where canopy cover is greater (Ford et. al 2005), such as is found in older forests. It is estimated that after 100 years of

achieving the proposed MAs, the WNF will have an increase of mature hardwood forest by more than 119,000 acres (USFS 2005), which will likely benefit the Indiana bat and running buffalo clover populations by increasing the quality and quality of suitable habitat for each species.

Providing recreational opportunities on the WNF includes developed (e.g. campgrounds, lakes) and dispersed (e.g. trails) recreation areas. Although these activities are not usually beneficial for Indiana bat and running buffalo clover, the S&G for maintaining and developing recreation on the forest will avoid or minimize effects to these species. Specifically, the S&G will protect known population concentration sites (hibernacula, swarming areas) and maintain potential suitable habitat (snag retention). Thus, the recreational goals of the proposed action are not likely to cause adverse effects to either the Indiana bat or running buffalo clover populations found within the action area.

Leasing federally-owned oil and gas on the WNF allows for development of energy reserves while maintaining suitable habitat for Indiana bat and running buffalo clover. A no-surface-occupancy rule exists on 13% on the WNF. These areas of scenic, recreational, or wildlife habitat have been identified as having important qualities that will not be disturbed during oil and gas activities. For the rest of the oil and gas development sites, S&G are in place to avoid or minimize habitat loss for the Indiana bat and running buffalo clover.

Land acquisition and exchange are goals in the Forest Plan that allow for consolidation of Federal lands. This goal may provide for more contiguous protected property that is managed with consideration of the Indiana bat and running buffalo clover's habitat requirements.

In totality, the overall goals and objectives of the Revised Forest Plan for the WNF are consistent with the ecological needs of the Indiana bat and running buffalo clover. Suitable foraging, roosting, swarming, and hibernation opportunities will likely be maintained for the Indiana bat across the WNF with the implementation of this plan and protection of running buffalo populations will be protected and managed for viability. After ten years of implementing the Forest Plan, mature forest habitat suitable for the Indiana bat will have increased from 77,793 acres to 108,413 acres (R. Ewing pers.com). Currently, about 40% of the forest stands on the WNF offer suitable habitat for the Indiana bat, implementation of the Forest Plan goals would increase that habitat to 81% of the WNF after 100 years (USFS 2005). Similarly, an increase in forested habitat will also benefit running buffalo clover.

Effects of Management Activities on Indiana bat

Although the overall goals of the proposed action are expected to have beneficial effects for both the Indiana bat and running buffalo clover, the means by which the Forest Service will achieve their goals may unavoidably cause adverse effects to these species. Thus, this section assesses the likelihood and magnitude of impacts that may result directly or indirectly from the management actions proposed. Specifically, we assess the measurable and detectable responses of Indiana bats exposed to the proposed management actions, the environmental impacts associated with the actions, and the likelihoods of the exposure and the consequent responses occurring. To determine if a management action will affect Indiana bats, we first look at whether Indiana bats will be exposed temporally and spatially to the action itself or any environmental consequence of the action. If exposure is likely, we then assess how bats will respond to that exposure. We rely on both Indiana bat-specific, as well as, general bat literature

to make these predictions. Once we anticipate the individual fitness responses, we then look at how these individual responses affect the population or colony in which these individuals belong. Lastly, we assess how the anticipated changes, if any, at the population or colony level will affect the fitness of the species rangewide.

In general, the environmental consequences associated with all management actions proposed include: disturbance from human presence, reduction in foraging habitat, and loss of roost trees. The responses of individuals exposed directly to the management action or these associated environmental consequences will vary depending on the timing and scale of the management action. The analyses below describe how each management activity is expected to affect Indiana bats. Table 5 identifies the proposed management actions and their associated project elements, the environmental impacts resulting from these project elements, and the likely responses of individuals exposed to these environmental impacts. It also describes the anticipated effects to the affected population in terms of reproduction, numbers, and distribution.

The S&G that reduce exposure and responses are described in more detail in Appendix A. It is important to emphasize that this effects analysis is predicated on the fact that all S&G in the Conservation Plan will be fully implemented. If not, this analysis may no longer be valid.

Agriculture

Special use permits for agricultural activities (see Table 5) could occur on 50 acres of the WNF. Although all life stages could be exposed to these activities, it is not anticipated that the Indiana bat will show a response to these minor actions as they are not likely to affect or reduce roosting or foraging habitat, nor are they likely to disturb individuals.

Timber Management

Over the next ten years, timber management activities are anticipated to occur on 20,054 acres on the WNF (see Table 2 for breakdown of type). Even-aged harvests will occur on a 120 year rotation, and uneven-aged treatments will occur about every 30 years. No one site will be entered multiple times within the scope of this consultation. For purposes of this effects analysis, timber management is separated into actual timber harvest and other timber management elements (see table 5) that involve construction and maintenance of roads, log landings, and skid trails.

Many S&G are in place to avoid or minimize impacts to Indiana bats during timber harvest activities. The following S&G place buffers around hibernacula and swarming sites and limit human access to these areas (SFW-TES-1, SFW-TES-2, and GFW-TES-3). The following S&G provide protection of roosting and foraging habitat now and into the future (SFW-TES-7, SFW-TES-8, GFW-TES-9, SFW-TES-10, and SFW-TES-12). During all timber prescriptions, hickories, snags, travel corridors, and future roost trees will be retained, unless they are considered a safety hazard. Because all snags and hickories will be marked and avoided, it is extremely unlikely that a roost tree would be removed during actual timber harvesting. The environmental consequences of timber harvest include alteration of foraging habitat and disturbance from noise/human presence.

Timber harvesting can reduce a traditional foraging area used by a colony or male bat. If this occurs, bats respond by searching for a new foraging area if the character of the area has been substantially altered or a substantial portion of the area is cut. The implications of finding a new

site will depend upon the availability of foraging areas nearby. We anticipate if a foraging area is altered, those individuals exposed will be able to locate a new foraging area within their traditional home range or nearby. Although searching for a new foraging area can lead to increased energy expenditure, which if prolonged and severe could lead to lower reproductive success, we do not anticipate the impact to rise to the level of injury or mortality. The S&G require foraging elements to be retained (forested corridors, canopy cover, etc.), and thus, Indiana bats will have additional foraging habitat readily available to them.

Adverse effects to the Indiana bat may occur during timber harvesting due to disturbance from noise/human presence. Indiana bats may elicit a behavioral response to this exposure through temporarily abandoning roost sites. Although they may flee a specific roost during the activity, we anticipate the disturbance will be temporary, and bats will not need to abandon and search for a new roost site.

In addition to the potential adverse effects, we also anticipate beneficial effects to the Indiana bat such as oak regeneration, increased solar exposure, and reduced understory clutter. Indiana bats may respond to these impacts by having increased roosting success (via increase in the diversity of thermal roosting opportunities), improved foraging success, less torpor, and ultimately increased pup and adult fitness. Oak regeneration will improve roosting habitat in the long term for the Indiana bat by providing ample suitable roosts, while reduced understory clutter will improve travel corridors and foraging opportunities. As discussed in the Status of the Species section, maternity roost trees with solar exposure reduce the amount of time a pup needs to develop and reduces the amount of heat energy needed to keep a colony warm. This thermoregulatory benefit can increase survival of adults and pups due to lower energy demands. All of these beneficial effects help offset, in the long-term, any potential population level adverse effects due to loss of potential roost trees, reduction in traditional foraging areas, and disturbance due to noise/human presence.

The other project elements of timber management--road construction, and construction of skid trails and log landings--may adversely affect Indiana bats. These elements can be implemented any time of year but do require avoidance of hickories year around and snags in the summer (GFW-TES-9, SFW-TES-10) when direct impacts to Indiana bats could occur. Up to 392 acres of permanent roads, 146 acres of temporary roads, and 740 acres of skid trails and log landings are possible on the WNF over the next ten years. The environmental consequences of roads, skids, and landings include loss of an undetected roost tree, alteration of foraging habitat, and disturbance from noise/human presence.

Loss of roost trees can have direct and indirect implications for reproductive females. As explained previously in the Status of Species section, female and young Indiana bats depend on specific roost trees for their reproductive success and survival. If their primary roost tree or several potential roost trees are removed, the exposed individuals will need to search for new roosting sites. This can lead to increased energy expenditure, torpor, and possibly loss of young if the expenditure is sufficiently severe and prolonged. Individual males can also be impacted by loss of an undetected roost tree if cut while occupying the tree. For the proposed action, we do not anticipate direct impacts due to loss of primary maternity roost trees as S&G are in place to avoid taking snags and hickories in the summer. This S&G is anticipated to eliminate the likelihood of taking a unknown primary roost tree. Thus, direct impacts will occur only if an

undetected secondary or a less important roost tree is cut while occupied by individuals. Indirect impacts may occur if a substantial portion of a colony's summer area or a primary maternity roost is cut in the winter. We do not anticipate that either of these scenarios is likely, however. These management actions are typically linear (roads and skids) or small in size (landings) within a landscape which is heavily forested. As such, we do not expect that these activities would ever lead to removal of all or a significant portion of an individual's home range. If a traditional primary roost tree is cut, we fully expect that the individuals will be able to readily locate a new roost within or nearby its traditional roosting area. Thus, although the exposed individuals will need to locate a new primary roost, we do not anticipate the physiological response of these individuals will negatively affect their overall fitness.

Similarly, alteration to a traditional foraging area can cause direct and indirect impacts. If construction of roads, skids or log landings results in a loss of a foraging area, bats will respond by searching for a new foraging area. The implications of finding a new site will depend upon the availability of foraging areas nearby. As with roosting habitat, we anticipate if a foraging area is altered, those individuals exposed will be able to readily locate a new foraging area within their traditional home range or nearby. Although this can lead to increased energy expenditure, we do not anticipate injury or mortality occurring. The reason for this is that these timber management elements are typically linear (roads and skids) or small in size (landings) within a landscape which is heavily forested. As such, these actions are unlikely to take all or a substantial portion of a traditional foraging area for either an individual or a colony.

In addition to roosting and foraging impacts, adverse effects to the Indiana bat may occur during road, landing, and skid construction due to disturbance from noise/human presence. Indiana bats may respond to this exposure by temporarily abandoning roost sites. Although they may flee a specific roost, Indiana bats are expected to remain within their traditional homerange when this short term disturbance occurs.

In summary, we anticipate that adverse effects to exposed individuals could occur as a result of road, skid or log land construction if an undetected secondary or lesser important roost tree is cut during the summer. Although it is difficult to predict given the linear nature of the loss and S&G to avoid hickories and snags in the summer, it is likely that one occupied roost tree could be unknowingly cut during the 10-year period for both road construction and skid and landing construction. As this is likely to be a secondary or less important roost tree, we anticipate only a few individuals would be exposed to this threat.

Recreation

Recreation actions including OHV, hiking, horse, and mountain bike trail construction and maintenance, and lake and pond construction may occur all year around. New trail construction is anticipated to reach 265 acres (see Table 2 for a breakdown of type). Several S&G are in place to avoid impacts to Indiana bat hibernacula and swarming sites by avoiding trail placement near these features (SFW-TES-1, SFW-TES-2, and GFW-TES-3). Environmental consequences of recreation activities include loss of undetected roost trees, alteration of foraging habitat, and disturbance from noise/human presence. The impacts of altering foraging habitat and disturbance from noise/human presence are similar to those that occur during timber management activities discussed above.

As protection of roost trees will occur during construction and maintenance of recreation sites and canopy cover will be maintained over new trails (SFW-TES-7, SFW-TES-8, GFW-TES-9, SFW-TES-10, SFW-TES-12), direct impacts to Indiana bats will only occur if an undetected secondary or less important roost is taken in the summer. Indirect impacts will occur if a primary roost or a substantial portion of an individual's or colony's home-range is removed in the winter. The Forest Service maintains great flexibility in choosing the placements of new trails to minimize exposure of Indiana bats to recreation activities. Further, recreation actions are typically linear (trails) or small in size (parking lot) within a landscape which is heavily forested. For these reasons, these direct and indirect effects are unlikely to result in the loss of a primary maternity roost tree or important secondary roost.

Loss of an unknown secondary or less important roost could occur. Indiana bats are expected to respond much the same way as described above for timber management except on a smaller scale. The frequency and intensity of Indiana bats' exposure to recreational activities is extremely low. While the overall acreage may appear substantial if it was all in one area, each individual project is typically small, linear, and would only remove a small portion of a forested landscape. As with timber management, we only expect adverse effects to occur if an undetected roost tree is cut during summer. If this occurs, we anticipate a few individuals would be exposed and their responses would be temporary and non-injurious and non-lethal.

We also anticipate beneficial effects to the Indiana bat, including increased solar exposure and increased quantity of travel corridors. Indiana bats may respond to increased solar exposure as discussed under timber management. Creation of recreational trails with a canopy cover may increase suitable flight corridors for the Indiana bat which in turn may increase foraging success and future fitness. Thus, recreational activities are not likely to incur any negative population level fitness consequences.

Transportation

Transportation actions involving construction and maintenance of temporary or permanent roads usually occurs in association with timber, watershed, and oil and gas activities and may occur year around. Effects associated with these actions are discussed within the sections for which they apply (timber or energy). Decommissioning of roads is anticipated to occur on 29 acres over the next 10 years. This action is beneficial for the Indiana bat as it will allow for reforestation and increased roosting opportunities in previously unsuitable habitat.

Fire Management

Fire management activities involve building fire lines, conducting prescribed burns, lop and scattering hazardous fuels, and suppressing wildfires (see Table 5). Prescribed fire is a valuable management tool for increasing oak regeneration, reducing NNIS, maintaining prairie habitats, and reducing hazardous fuels on the WNF. Several S&G are in place to avoid or minimize impacts to Indiana bats during fire activities and include protection of hibernacula and swarming sites (SFW-TES-2, GFW-TES-3, SFW-TES-4) and protection of roosting and foraging habitat now and into the future (GFW-TES-9, SFW-TES-10, SFW-TES-11). For purposes of this effects analysis, fire management is separated into the actual effects of the burn and construction of fire lines.

Prescribed burning will only occur from August 15 to early spring. No fires will be conducted during the Indiana bat maternity season. Thus, Indiana bats will only be directly exposed to fire while roosting in trees during the late summer. Direct adverse effects due to fire include disturbance from noise, smoke, and heat, loss of a roost tree, and alteration of foraging habitat. Prescribed burns will not occur during the maternity season. As all bats will be volant during a prescribed burn, it is anticipated that they could escape a burning roost tree without injury or mortality.

Responses from direct exposure to noise, smoke, and heat to roosting bats during prescribed burns are expected to be behavioral and include temporary abandonment of roost areas. Loss of roost trees would be similar as to what is described above under timber management. As burning will occur in late summer and beyond, no direct impacts to maternity colonies are anticipated but individual roosting bats could be exposed. Prescribed fires that occur on the WNF are typically low intensity, ground burning fires in which the possibility of burning up a snag is not reasonably certain to occur. Thus, we anticipate direct loss of roost trees and exposure to heat, smoke, and noise are not likely to incur any negative population level fitness consequences.

Direct impacts to foraging habitat may occur if prescribed burns take place while bats are not hibernating. This encompasses a small window during the late summer/early fall burn season. Environmental consequences to alteration of foraging habitat may include short term reduced foraging efficiency due to loss of prey base. We do not anticipate this exposure would cause injury or mortality due to the fact that prescribed fires will be spaced across the landscape and ample foraging areas will likely be maintained within a traditional foraging area for an Indiana bat.

Indirect effects may occur if an unoccupied primary roost tree is burned. In the rare circumstance that a traditional primary or an important secondary roost is lost during a prescribed burn, Indiana bats will have other roosts within their homerange to use the following year, as not all roosts are anticipated to be lost and only a small portion (typically less than 250 acres) of the forest are burned on any given day. Given the forested landscape, Indiana bats are anticipated to know of and locate new roosts easily within their homerange or nearby. Thus, we do not anticipate injurious or lethal responses from indirect exposure to prescribed fires.

Beneficial effects to the Indiana bat from fire include snag creation, reduced understory clutter, and reduced size and intensity of wildfires. Indiana bats may respond to these environmental consequences by having improved foraging success and roosting success (see Table 5).

Fire lines can be constructed and maintained anytime of the year, but loss of potential roost trees will be avoided (GFW-TES-9, SFW-TES-10). It is anticipated that up to 74 miles of fire line could occur on the WNF in the next 10 years. The environmental consequences constructing fire lines include loss of an undetected roost tree, alteration of foraging habitat, and disturbance from noise/human presence. We expect exposure and response to these environmental consequences will be as described above for timber management elements.

Briefly, although it is difficult to predict given the linear nature of the loss and S&G to avoid hickories and snags in the summer, it is likely that an occupied roost tree could be unknowingly

cut during the 10-year period due to fire line construction. For the reasons discussed above, this roost tree is not anticipated to be a primary maternity roost tree or important secondary roost, but an unknown lesser used secondary roost or a roost occupied by a single or few individuals.

In summary, we anticipate that adverse effects to exposed individuals could occur as a result of an undetected secondary or lesser important roost tree being cut during fire line construction. Although it is difficult to predict given the linear nature of the loss and S&G to avoid hickories and snags in the summer, it is likely that one occupied roost tree could be unknowingly cut during the 10-year period. As this is likely to be a secondary or less important roost tree, we anticipate only a few individuals would be exposed to this threat.

Watershed

Watershed activities including wetland restoration, stream/riparian restoration, and acid mine drainage remediation projects may occur any time of the year. Up to 20 miles of stream and riparian restoration and 150 acres of wetland restoration and enhancement could occur over the next ten years. No adverse effects are anticipated from restoration activities. Beneficial effects include increased foraging success due to decreased soil erosion, improved water quality, improved stream flow, and additional water sources as well as increased roost sites due to reforestation in riparian areas in the long term.

Acid mine drainage projects are anticipated to occur on 270 acres over the next 10 years. Actions including construction of dosers, limestone channels, and wetlands to neutralize AMD involve large amounts of soil movement and temporary roads for access to sites. Environmental consequences include loss of unknown roost trees, temporary alteration of foraging habitat, and disturbance from noise/human presence. The impacts of altering foraging habitat and disturbance from noise/human presence are similar to those that occur during timber management activities discussed above.

As protection of roost trees will occur during AMD projects (GFW-TES-9, SFW-TES-10), direct impacts to Indiana bats will only occur if an undetected secondary or less important roost is taken in the summer. Indirect impacts could occur if such roosts are removed in the winter. Much flexibility exists in choosing the placements of temporary roads and channels to minimize exposure of Indiana bats to AMD activities. All AMD projects will have temporary impacts as areas to be disturbed will revegetate over time. Loss of trees during temporary road construction or earthmoving is minor when compared to the heavily forested surrounding landscape. In addition, AMD activities are typically small in size within a landscape which is heavily forested. For these reasons, direct and indirect effects are unlikely to result from a loss of primary or important secondary roost trees. Loss of a lesser important roost tree could be cut, and Indiana bats are expected to respond much the same way as described above for recreational activities. The frequency and intensity of Indiana bats' exposure to AMD projects is extremely low. Although adverse effects may occur due to AMD activities, they are not anticipated to rise to the level of injury or mortality. Further, reduction in AMD will result in improved water quality and may improve Indiana bats' foraging efficiency. Thus, from a population level perspective, we do not anticipate any negative consequences.

AMD projects also involve the closing of subsidences and mine openings. As these features could be used by Indiana bats as hibernacula, several S&G are in place to minimize impacts

(GFW-TES-3, SFW-TES-5, and GFW-TES-6). All potentially suitable mine openings will be evaluated and surveyed before closure. If Indiana bats are detected, the opening will be gated and the surrounding habitat will be protected from alteration. Due to the S&G and commitment of the WNF to protect potential hibernacula, injury or death of an Indiana bat during AMD projects is extremely unlikely to occur. Thus, watershed activities are not likely to incur any negative population level fitness consequences.

Pest Management
Pest management including mechanical, chemical, and biological control of NNIS as well as grape vines and young maple will occur throughout the forest on 15,377 acres over the next 10 years. Indiana bats may directly be exposed to noise and human presence during management periods if conducted in the summer. Indiana bats may respond to noise and human disturbance by temporarily abandoning roost sites. Although they may flee a specific roost, Indiana bats are expected to remain within their traditional homerange when this short term disturbance occurs. We expect beneficial effects, including increased roost sites due to improved health of the oak/hickory forest community and increased foraging efficiency in the long term due to increased biodiversity (fewer invasive monocultures = more insect prey), to occur. Although pest management activities are anticipated to occur on many acres throughout the forest the adverse effects due to disturbance to the Indiana bat are minor and short term and will not rise to the level of injury or mortality.

Wildlife Management
Wildlife management activities include reforestation, establishing and maintaining wildlife openings, and installing bat friendly gates. Trees are not typically removed for these activities. Wildlife openings may be established after trees are cut for other management reasons (e.g. log landings) or in already open areas. Although all life stages could be exposed to these activities, it is not anticipated that the Indiana bat will show a response to these minor actions. Wildlife management activities are not likely to adversely affect or reduce roosting or foraging habitat, nor are they likely to disturb individuals.

Further, there will be beneficial effects including increased solar exposure, increased roost trees, and protected hibernacula sites. Indiana bats may respond to increased solar exposure and increased roosting opportunities as described under timber management. Protection of hibernacula through bat-friendly gates may increase survival of Indiana bats in the winter and lead to increased numbers at the population level.

Land Acquisition & Exchange
Land acquisition and exchange creates larger contiguous areas of public ownership thus reduces the potential exposure to activities on private lands. Although Indiana bats are protected wherever they occur, private landowners do not have a mandate to further the conservation of the species. The WNF will not exchange land if listed species occur on that parcel. For these reasons, no adverse effects are anticipated from these activities.

Energy
Oil and gas development, utility lines, and temporary roads associated with these activities can occur any time of the year throughout the forest. The WNF anticipates leasing 42 acres of oil and gas over the next ten years and will apply S&G to these projects to protect hibernation,

roosting, and foraging habitat (SFW-TES-2, GFW-TES-3, GFW-TES-9, SFW-TES-10, and Appendix H (Notification 10, Stipulation 10, Stipulation 12). Because all snags and hickories will be avoided, it is extremely unlikely that a primary roost tree would be removed during oil and gas development with Federal leases. The environmental consequences of oil and gas development include loss of an undetected secondary or lesser important roost tree, alteration of foraging habitat and disturbance from noise/human presence as discussed under timber harvesting.

In addition, up to 50 acres of utility lines may be granted by a special use permit to private individuals with inholdings. Although the WNF provides Indiana bat protection recommendations to private individuals needing access across or on the forest, S&G are not always enforceable. The environmental consequences anticipated include loss of roost trees, alteration of foraging habitat, and disturbance from noise/human presence.

Loss of roost trees can have substantial implications for reproductive females. As explained previously in Status of Species section, female and young Indiana bats depend on specific roost trees for their reproductive success and survival. If their primary roost tree or several secondary roost trees are removed, the exposed individuals will need to search for new roosting sites. This can lead to increased energy expenditure, torpor, and possibly loss of young if the expenditure is sufficiently severe and prolonged. Individual males can also be impacted by loss of an undetected roost tree if cut while occupying the tree. For the proposed action, we do not anticipate direct impacts due to loss of primary maternity roost trees as S&G are in place to avoid taking snags and hickories in the summer for utility lines (although they may not always be enforceable). Direct impacts will occur only if an undetected secondary or a less important roost is cut while occupied by individuals. Indirect impacts may occur if a primary maternity roost is cut in the winter. However, these actions are typically linear and small within a landscape which is heavily forested. As such, we do not expect that these activities would ever lead to removal of all or a significant portion of an individual's home range. If a traditional roost tree is cut, we fully expect that the individuals will be able to readily locate a new roost within or nearby its traditional roosting area. Thus, a loss of primary roost or other important roost trees during the winter is unlikely to negatively affect the fitness of the individuals exposed. As previously explained, loss of secondary roosts are likely to affect single or a few individuals.

Similarly, utilities can reduce a traditional foraging area used by a colony or male bat. As with roosting habitat, we anticipate if a foraging area is altered, those individuals exposed will be able to readily locate a new foraging area within their traditional home range or nearby. Although this can lead to increased energy expenditure, we do not anticipate the increased energy needs will cause injury or mortality. As indicated, these actions are typically linear and small and will occur within a landscape which is heavily forested. Because of this, these actions are unlikely to take all of the traditional foraging area available for an individual or a colony.

In addition to roosting and foraging impacts, adverse effects to the Indiana bat may occur during utility line construction due to disturbance from noise/human presence. Indiana bats may respond to this exposure by temporarily abandoning roost sites. Although they may flee a specific roost, due to the linear and small scale disturbance of these elements, Indiana bats are expected to remain within their traditional homerange when this short term disturbance occurs.

In summary, we anticipate that given the linear nature of the loss and the fact that S&G to avoid hickories and snags in the summer may not always be applied, it is likely that an occupied roost tree could be unknowingly cut during the 10-year consultation period due to utility construction. For the reasons discussed above, this roost tree is not anticipated to be a primary maternity roost tree or important secondary roost, but an unknown lesser used secondary roost or a roost occupied by a single male.

Surface coal mining is highly unlikely to occur within the next ten years and thus will not be analyzed under this programmatic consultation.

Hazard Tree Removal
Hazard tree removal can occur any time a live or dead tree poses an imminent safety concern on the WNF. Hazard tree removal typically takes place in developed recreation areas, along trails and roads, along utility corridors, and along fire lines. The WNF anticipates that up to 2,550 hazard trees could be removed over the next 10 years. Over the past 4 years only 20 hazard trees were removed in the summer. Most hazard trees are not suitable roost trees for the Indiana bat (L. Andrews per.com). The WNF estimates that about 2% of the hazard trees to be taken down in the summer could be potentially suitable roost tress. Based on past trends on the WNF it is unlikely that a primary roost or important secondary roost would be removed. Hazard tree removal is usually carried out in the winter when Indiana bats would not be directly exposed. Although it is difficult to predict, based on past trends, the likelihood that a hazard tree occupied with females and non-volant pups would be removed is extremely low. A standard is in place (SFW-TES-10) that requires emergence surveys on hazard trees that may be potential maternity trees before they are removed in recreation areas (i.e., high public use areas). If an emergence survey detects a maternity tree, every effort will be made to save the tree unless it is an immediate safety issue. As it is extremely unlikely that an occupied roost tree will need to be removed no injury or mortality is anticipated to occur. If a minor secondary roost tree is cut, we fully expect that the individuals will be able to readily locate a new roost within its traditional roosting area upon returning the following summer. Thus, if a roost tree is removed in the winter, we do not anticipate any detectable negative fitness response.

Summary
The overall goals and objectives of the Revised Forest Plan are expected to be beneficial for the Indiana bat. Adverse effects to the Indiana bat through implementation of the Revised Forest Plan may result from disturbance from human presence, reduction in foraging habitat, and loss of unknown roost trees. We anticipate, however, that the S&G will greatly limit the extent to which these adverse effects will occur. We expect that is it reasonably certain that occupied secondary or less important roost trees could be removed during the summer period as a result of construction of roads, skid trails, and log landings; creation of fire lines; and utility development. These actions may result in fitness consequences at the individual level, but are not expected to have negative population-level consequences. Specifically, fitness level consequences to individual females are not anticipated to rise to the level of affecting the fitness of the maternity colony due to the few number of individuals that are expected to be exposed. Likewise, take of single males is not expected to be detected at the hibernaculum or the population level.

Although 9.2% of the suitable Indiana bat habitat in the action area could be altered through Forest Plan implementation, much of this alteration will result in long term habitat improvements

for the Indiana bat. Many S&G are in place to avoid and minimize adverse effects. In addition, activities which may directly or indirectly affect the Indiana bat and its habitat would likely be distributed across the landscape and over time. Tier II project analysis will occur and at that time any additional protective measures needed to avoid or minimize adverse effects will be identified. The amount of suitable Indiana bat habitat found on the WNF will increase by 30,620 acres over the next ten years with the implementation of the Revised Forest Plan. Standards, guidelines, and WNF's Conservation Plan ensure the following: 1) protection of known and potential hibernacula and swarming sites; 2) maintenance, protection, and creation of foraging and roosting habitat; 3) obtaining information on population distribution, status and trends; 4) providing bat educational opportunities for WNF staff; and 5) conducting studies that aid in the survival and recovery of the Indiana bat. Thus, we anticipate that the short-term individual fitness consequences will occur, over the long-term, but the Revised Forest Plan will benefit Indiana bats occurring within the action area overall. Thus, we do not anticipate any detectable negative consequences to the populations in which the individuals occurring within the action area belong to. As such, no detectable reductions in reproduction, numbers or distribution for the species are anticipated.

Table 5. Effects analysis for Indiana bat

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
Agriculture	grazing		shortening vegetation	all life stages	none	
			maintain open habitat	all life stages	none	
	haying		noise disturbance	all life stages	none	
			soil compaction	all life stages	none	
			maintain open habitat	all life stages	none	
Timber Management	Road construction		see transportation	see transportation	see transportation	see transportation
	Skid & Log landings		remove groups of trees	indirect winter exposure and direct & indirect summer exposure	winter: none because of S&G	
					summer: range from no response to mortality--> decrease roosting sites-->slow pre- and post-natal development--> reduced young and female survival; decrease foraging efficiency-->reduce young and adult survival; direct injury or mortality from felling roost tree	short-term reduction in reproductive success
			soil compaction	all life stages	none	
	Even-aged	clear-cut	decrease stem density	winter: no direct exposure	NA	
				winter: indirect exposure - all life stages	none because of S&G	
				summer harvest: all life stages	range from no response -->decrease foraging efficiency--> reduce young and adult survival	no response
			oak regeneration	all life stages	increase roost opportunities	none to increase reproduction success & numbers
			increase solar exposure	all life stages	improve roosting opportunities with increase pre- and post-natal development efficiency, which leads into increase adult fitness (less time needed to care for young, better thermoregulatory conditions-->less torpor, lower metabolic expenditure)	none to increase reproduction success & number
			increase noise/human presence	summer harvest: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
		thinning	same as clear-cut without oak regeneration	same as clear-cut	same as clear-cut	same as clear-cut

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
		Shelterwood and Two-aged cuts	same as clear-cut	same as clear-cut	same as clear-cut	same as clear-cut
	Uneven-aged		remove individual trees or group selection	winter: no direct exposure	NA	
				winter: indirect exposure - all life stages	none because of S&G	
				summer harvest: all life stages	range from no response-->decrease foraging efficiency--> reduce young and adult survival	no response
			reduce vegetation clutter	same as individual trees or group selection	no response to increase foraging success; increased travel corridors	
			increase noise/human presence	summer harvest: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase solar exposure	all life stages	improve roosting opportunities with increase pre- and post-natal development efficiency, which leads into increase adult fitness (less time needed to care for young, better thermoregulatory conditions-->less torpor, lower metabolic expenditure)	increase reproduction success & number
	Crop tree release		same as clear-cut without oak regeneration	all life stages	none because of S&G	
Recreational Management	Pond/lake construction		increase sunlight/edge	all life stages	improve roosting opportunities with increase pre- and post-natal development efficiency, which leads into increase adult fitness (less time needed to care for young, better thermoregulatory conditions-->less torpor, lower metabolic expenditure)	none to increase reproduction success & numbers
			increase noise/physical disturbance	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase water sources	all life stages	increase foraging efficiency- increase fitness	
	trails (construction, operation, and maintenance)		loss of 265 linear forest acres	indirect winter exposure and direct & indirect summer exposure	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			decrease understory; canopy maintained	indirect winter exposure and direct & indirect summer exposure	no response to increase foraging success; increase travel corridors	

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
			increase erosion; runoff	all life stages; no direct winter exposure; indirect winter exposure and both direct & indirect summer exposure	no response due to S&G	
			increase noise/human presence	summer harvest: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase invasive species	all life stages	no response	
			soil disturbance/compaction	all life stages	no response	
	construction of facilities/ parking lots		loss of 60 acres forest - along roadsides/trails	indirect winter exposure and direct & indirect summer exposure	range from no response to avoidance of existing foraging areas--> decrease for efficiency	no response
			increase erosion; runoff	all life stages; no direct winter exposure; indirect winter exposure and both direct & indirect summer exposure	no response due to S&G	
			increase noise/physical disturbance	summer: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase invasive species	all life stages	no response	
			soil disturbance/compaction	all life stages	no response	
	Operation of facilities/ parking lots		increase noise/physical disturbance	summer: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase invasive species	all life stages	no response	
Transportation	Construction	new construction	loss of linear forest	winter: no direct exposure	NA	
				winter: indirect exposure - all life stages	none because of S&G	
				summer harvest: all life stages	range from no response to mortality-->decrease roosting sites-->slow pre- and post-natal development-->reduced young and female survival; direct injury or mortality from felling roost tree	short-term reduction in reproductive success

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
			noise/physical disturbance	summer: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			spread nonnative species	all life stages	no response	
			increase erosion; runoff	all life stages; no direct winter exposure; indirect winter exposure and both direct & indirect summer exposure	no response due to S&G	
		upgrading/ widening	loss of trees	winter: no direct exposure	NA	
				winter: indirect exposure - all life stages	none because of S&G	
				summer harvest: all life stages	range from no response to mortality-->decrease roosting sites-->slow pre- and post-natal development-->reduced young and female survival; direct injury or mortality from felling roost tree	short-term reduction in reproductive success
			noise/physical disturbance	summer: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase erosion; runoff	all life stages; no direct winter exposure; indirect winter exposure and both direct & indirect summer exposure	no response due to S&G	
	Decomissioning		close & rehabilitate roads	all life stages	decrease noise & physical disturbance & rehabilitation will improve habitat	none to increase reproduction success & numbers
	Maintenance	resurfacing and roadside maintenance	noise/physical disturbance	summer: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
Fire Management	Hazardous fuels reduction	Mechanical methods	noise/physical disturbance	summer: all life stages	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			reduced size and intensity of wildfires	all life stages	decreased fire-related mortality; reduced fire-related impacts on prey abundance	none to increase reproduction success & numbers

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
			lop and scatter	all life stages	no response	
			control/reduce NNIS	all life stages	no response	
	Prescribed Burning (low intensity; for multiple purposes)	fire	reduced size and intensity of wildfires	all life stages	decreased fire-related mortality; reduced fire-related impacts on prey abundance	none to increase reproduction success & numbers
			maintain natural openings/wildfire dependant habitats	all life stages	no response	
			smoke/airborne particulate matter	winter: no direct exposure; summer: limited direct exposure	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs; no direct effects during maternity/non-volant period due to S&G	no response
			control/reduce NNIS	all life stages	no response	
			reduced understory/clutter	all life stages	improve travel/foraging habitat; response range from none to increased foraging success	none to increase reproduction success & numbers
			snag destruction	winter: no direct exposure; winter/summer: indirect effects to all life stages	range from no response to mortality-->decrease roosting sites-->slow pre- and post-natal development-->reduced young and female survival; decrease foraging efficiency--> reduce young and adult survival; no direct injury or mortality due to S&G	no response
			snag creation	winter: no direct exposure; winter/summer: indirect effects to all life stages	increased snags improve roosting habitat -> increased pup development -> increased adult fitness (less time needed to care for young, better thermoregulatory conditions -> less torpor, lower metabolic expenditure)	none to increase reproduction success & numbers
		fire lines	74 miles of fire lines; loss of trees	winter: no direct exposure; winter/summer: indirect effects to all life stages; summer direct	range from no response to mortality-->decrease roosting sites-->slow pre- and post-natal development-->reduced young and female survival; decrease foraging efficiency--> reduce young and adult survival; direct injury or mortality from felling roost tree	short-term reduction in reproductive success
			noise/physical disturbance	winter: none, summer: limited direct exposure to all life stages	no response	
			spread NNIS	all life stages	no response	

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
			increased erosion; runoff	winter: none, summer: limited direct exposure to all life stages	no response	
	Fire suppression	Fire line control (hand tools, bulldozers, ATVs, tractors, water, & foam)	increased erosion; runoff	winter: none, summer: limited direct exposure to all life stages	no response due to S&G	
			reduced size and intensity of wildfires	all life stages	decreased fire-related mortality; reduced fire-related impacts on prey abundance	none to increase reproduction success & numbers
			noise/physical disturbance	winter: none, summer: limited direct exposure to all life stages	no response	
			spread NNIS	all life stages	no response	
		Aerial control (water or foam)	increased erosion; runoff	winter: none, summer: limited direct exposure to all life stages	no response	
			noise/physical disturbance	winter: none, summer: limited direct exposure to all life stages	no response	
			reduced size and intensity of wildfires	all life stages	decreased fire-related mortality; reduced fire-related impacts on prey abundance	none to increase reproduction success & numbers
		Rehab (seed, mulch, waterbars)	reduce erosion; runoff	all life stages	no response	
Watershed	wetland restoration		increase / improve wetland habitat	all life stages	increase foraging efficiency- increase fitness	none
			soil disturbance compaction	all life stages	none	
			increase insect production	all life stages	increase foraging efficiency- increase fitness	none
			short-term increase noise/physical disturbance/human presence during construction	all bats if in summer; none if winter	no response	
	stream/riparian restoration		decrease runoff/sediment	all life stages	increase foraging efficiency- increase fitness	none
			increase forest habitat	all life stages	increase roost and forage opportunities	none to increase reproduction success & numbers

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
			improved flow/sinuosity	all life stages	range from no response to increase foraging efficiency - increase fitness	none
			short-term increase noise/physical disturbance/human presence during construction	all bats if in summer; none if winter	no response	
	acid mine drainage projects	doser construction	loss of 270 forested acres	indirect winter exposure and direct & indirect summer exposure	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
		limestone channel & wetland construction	increase water quality	all life stages	increase foraging efficiency- increase fitness	none to increase reproduction success & numbers
			increase invasive plants	all life stages	no response	
		temporary roads	short-term increase noise/physical disturbance/human presence during construction	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease for efficiency; slow pre- and post natal development-->increase energy costs	no response
			soil disturbance/ compaction	all life stages	none	
		closing mine portals	loss of hibernacula	direct winter exposure and direct & indirect summer exposure	no response due to S&G	
			modified air flow/temperature	direct winter exposure and direct & indirect summer exposure	no response due to S&G	
Pest Management	mechanical (mowing, cutting, digging, pulling)		soil disturbance/ compaction	all life stages	none	
			increase sunlight on forest floor	all life stages	none	
			improve health of mast trees (grape vine removal)	all life stages	increase roost opportunities in long term	none to increase reproduction success & numbers
			increase noise/physical disturbance/human presence	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
			increased biodiversity - long term	all life stages	range from no response to increase foraging efficiency-increase fitness	none
	chemical (pesticides & herbicides)		overspray/non-target death	all life stages	none	
			decreased water quality	all life stages	no response due to S&G to decreased foraging efficiency	none
			increased biodiversity - long term	all life stages	range from no response to increase foraging efficiency-increase fitness	none
	biological		effects on non-target species	NA		
			increase biodiversity - long term	all life stages	range from no response to increase foraging efficiency-increase fitness	none
Wildlife Management	reforestation		increase forest habitat	all life stages	increase roost and forage opportunities	none to increase reproduction success & numbers
	Establish wildlife openings		increase sunlight/edge	all life stages	improve roosting opportunities with increase pre- and post-natal development efficiency, which leads into increase adult fitness (less time needed to care for young, better thermoregulatory conditions-->less torpor, lower metabolic expenditure)	none to increase reproduction success & numbers
			short-term increase noise/physical disturbance/human presence	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease for efficiency; slow pre- and post natal development-->increase energy costs	no response
	maintain forest openings		noise/physical presence	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease for efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase invasive species	all life stages	no response	
	install bat-friendly gates		protect potential hibernacula	all bats	range from no response to increase in winter survival and increased fitness	none to increase numbers
Land acquisition & exchange			increased forested land/ contiguous protection	all life stages	increase roost and forage opportunities	none to increase reproduction success & numbers
Mineral development	Oil/gas development (federal leases)	Temporary access roads	see transportation			

Management Elements			Environmental Impact	Ibat Exposure	Ibat Response	Population RND Response
		Facilities construction and operation	noise/physical disturbance	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			loss of trees	winter: no direct exposure	NA	
				winter: indirect exposure - all life stages	none because of S&G	
				summer harvest: all life stages	range from no response -->decrease foraging efficiency-->reduce young and adult survival	no response
			spread nonnative species	all life stages	no response	
			increase erosion; runoff	winter: none, summer: limited direct exposure to all life stages	no response due to S&G	
	utility lines	create and maintain lines and rights-of way	loss of trees	indirect winter exposure and direct & indirect summer exposure	winter: none because of S&G	short-term reduction in reproductive success
					summer: range from no response to mortality-> decrease roosting sites-->slow pre- and post-natal development--> reduced young and female survival; decrease foraging efficiency-->reduce young and adult survival; direct injury or mortality from felling roost tree	
			increase erosion; runoff	winter: none, summer: limited direct exposure to all life stages	no response due to S&G	
			increase noise/human presence	all bats if in summer; none if winter	range from no response to temporary abandonment->decrease foraging efficiency; slow pre- and post natal development-->increase energy costs	no response
			increase invasive species	all life stages	no response	
			soil disturbance/compaction	all life stages	no response	
Hazard tree removal			loss of 2,550 trees	indirect winter exposure and very limited direct & indirect summer exposure	no response due to S&G	
			short-term increase noise/physical disturbance/human presence	all bats if in summer; none if winter	range from no response to temporary abandonment--> decrease for efficiency; slow pre- and post natal development-->increase energy costs	no response

Effects of Management Activities on running buffalo clover

Table 6 describes all management actions, their environmental impacts, and the effects to running buffalo clover. Effects are analyzed based on what life history stage is exposed (plants or seeds) and what the response to that exposure may be. As many actions could have a range of responses based on frequency or intensity of the exposure, additional details are provided in the text below. S&G that minimize exposure or response are described in more detail in Appendix A.

Timber Management

Removal of trees in and of itself, may affect running buffalo clover, but the intensity and supporting actions are what determine how the species will respond. As running buffalo clover is a disturbance dependant species, some level of timber harvest may be beneficial for the species (Madarish and Schuler 2002). Actions that provide moderate soil disturbance and introduce filtered sunlight to a closed canopy system will illicit a positive response from running buffalo clover including increased germination and flowering. Whereas, clearcutting or road construction would expose the species to habitat conditions that are unsuitable for survival and reproduction.

Guidelines are in place that require surveys for running buffalo clover to occur before any ground disturbing or canopy altering action takes place (GFW-TES-31). This should avoid most impacts to running buffalo clover forestwide. Running buffalo clover may be exposed to adverse actions if populations were not detected during surveys. This is possible with this species due to a seed bank that may geminate after surveys have been conducted.

Recreation and Transportation

Guidelines require surveys before any ground disturbing or canopy altering action takes place (GFW-TES-31). If populations are found in a proposed trail or road construction site, there is a standard (SFW-TES-30) that requires avoidance of plants and minimization of the habitat surrounding the plants (e.g. changes in canopy cover). Running buffalo clover found along an existing trail may benefit from the increased sunlight a trail footprint provides as well as occasional trampling (e.g. horseback or hiking). If running buffalo clover is exposed to intense disturbance, such as heavy ORV traffic, the species may respond adversely through direct mortality and loss of suitable habitat through soil compaction. Running buffalo clover may also be exposed to invasive species that occur along trails and roads. Invasive plants are a major threat to the recovery of running buffalo clover range-wide (USFWS 2005a). Responses from this type of exposure may range from none to decreased growth, reproduction, and mortality due to competition for resources and overshading.

Fire Management

Guidelines require surveys before any ground disturbing or canopy altering action takes place (GFW-TES-31). If populations are found in a prescribed fire area standards and guideline are in place that require actions to avoid exposure to ground disturbing activities related to fire line construction as well as to the fire itself (SFW-TES-27, SFW-TES-28). If undetected plants are exposed to fire or in a wildfire situation where surveys are not conducted, individual plants may respond adversely through death, but if a seed bank is available fire may benefit the species and

elicit a positive response through increased germination due to reduction in plant competition and increased light levels on the ground.

Watershed Improvements and Wildlife Management
Running buffalo clover may be exposed to watershed improvements and wildlife management activities that involve forest restoration. If plants were detected through surveys and exposed to riparian improvements they would exhibit positive responses due to improved forested habitat including increased plant growth and reproduction. In addition, creation of new suitable habitat through reforestation may increase the potential for new populations of running buffalo clover through seed dispersal.

Pest Management
Running buffalo clover is not expected to be exposed to control measures for grape vine or non-native invasive insect species (gypsy moth), but will be exposed to invasive plant control. In known running buffalo clover populations control will consist of mechanical methods, as guideline GFW-TES-29 restricts the use of herbicides near running buffalo clover sites. Running buffalo clover may respond to mechanical methods such as mowing or pulling invasive plants by exhibiting increases in germination, growth, and reproduction.

Land Acquisition & Exchange
Standards and guideline require that all lands to be exchanged are surveyed for running buffalo clover, thus the species is not expected to be exposed to that activity. Running buffalo clover may be exposed to acquisition of new forested lands and is expected to respond favorably due to management that benefits that species.

Energy
Although S&G are in place to protect running buffalo clover and its habitat when federally-owned minerals are leased (SFW-TES-30, GFW-TES-31, and Appendix H-Notification 3) this may not be the case for placement of utility lines. In particular, surveys for running buffalo clover may not be able to occur during the spring or summer when the species is detectable. Coal mining on the forest is possible due to outstanding rights, but is highly unlikely to occur within the next ten years and thus will not be analyzed here. Currently, the only population of running buffalo clover on the forest is protected from mineral developments.

Table 6. Effects Analysis for running buffalo clover

Management Elements			Environmental Impact	RBC Exposure	RBC Response	Population RND Response
Agriculture	grazing		shortening vegetation	NA		
			maintain open habitat			
	haying		increase noise/human presence			
			soil compaction			
			maintain open habitat			
Timber Management	Skid trails		soil disturbance	plants and seeds	ranges from none due to S&G to increased germination of seeds and decreased growth or mortality of plants	none to increase in numbers and reproduction
	Roads and Log landings		remove groups of trees	plants and seeds	ranges from none due to S&G to decreased growth and mortality	none
			increased invasive plants	plants and seeds	ranges from none to decreased fitness due to competition	none
			soil compaction	plants and seeds	ranges from none due to S&G to mortality of plants	none
	Even-aged	clear-cut	decrease stem density	plants and seeds	ranges from none due to S&G to mortality due to unsuitable habitat	none
			oak regeneration	plants and seeds	none	
			increase solar exposure	plants and seeds	ranges from none due to S&G to increased germination of seeds and decreased growth or mortality of plants	none
			increase noise/human presence	NA		
		thinning	same as clear-cut without oak regeneration	plants and seeds	ranges from none due to S&G to increased germination of seeds and decreased growth or mortality of plants	none to increase in numbers
		shelterwood and two-aged	same as clear-cut	plants and seeds	ranges from none due to S&G to increased germination of seeds and decreased growth or mortality of plants	none to increase in numbers
	Uneven-aged		remove individual trees or group selection	plants and seeds	ranges from none due to S&G to decreased growth or mortality	none to increase in numbers
			increase noise/human presence	NA		

Management Elements			Environmental Impact	RBC Exposure	RBC Response	Population RND Response
			increase solar exposure	plants and seeds	ranges from none due to S&G to increased germination of seeds and decreased growth or mortality of plants	none to increase in numbers
	Crop tree release		same as clear-cut	plants and seeds	ranges from none due to S&G to increased germination of seeds and decreased growth or mortality of plants	none to increase in numbers
Recreational Management	Pond/lake construction		increase sunlight/edge	NA		
			increase noise/physical disturbance			
			increase water sources			
	trails (construction, operation, and maintenance)		loss of 265 linear forest acres; canopy maintained	plants and seeds	ranges from none due to S&G to increased growth, reproduction along edges to mortality within trail footprint	none
			increase erosion; runoff	plants and seeds	none due to S&G	
			increase noise/human presence	NA		
			increase invasive species	plants and seeds	reduced fitness due to competition	none
			soil disturbance/compaction	plants and seeds	ranges from none due to S&G to increased germination of seeds along trail and mortality of plants within trail	none
	construction of facilities/ parking lots		loss of 60 acres forest - along roadsides/trails	plants and seeds	ranges from none due to S&G to increased growth, reproduction along edges to mortality within facility footprint	
			increase erosion; runoff	plants and seeds	none due to S&G	
			increase noise/physical disturbance	NA		
			increase invasive species	plants and seeds	reduced fitness due to competition	none
			soil disturbance/compaction	plants and seeds	ranges from none due to S&G to increased germination of seeds along disturbance and mortality of plants within footprint	none
	Operation of facilities/ parking lots		increase noise/physical disturbance	NA		
			increase invasive species	plants and seeds	reduced fitness due to competition	none
Transportation	Construction	new construction	loss of trees/vegetation	plants	ranges from none due to S&G to mortality	none
			soil compaction	plants and seeds	ranges from none due to S&G to tissue damage to mortality	none
			noise/physical disturbance	NA		
			spread nonnative species	plants and seeds	reduced fitness due to competition	none

Management Elements			Environmental Impact	RBC Exposure	RBC Response	Population RND Response
			increase erosion; runoff	plants and seeds	none due to S&G	
		upgrading/ widening	loss of trees/vegetation	plants	ranges from none due to S&G to mortality	none
			noise/physical disturbance	NA		
			increase erosion; runoff	plants and seeds	none due to S&G	
	Operation		increased human access	NA		
			spread nonnative species	plants and seeds	reduced fitness due to competition	none
			noise/physical disturbance	NA		
		roadside maintenance	noise/physical disturbance	NA		
Fire Management	Hazardous fuels reduction	Mechanical methods	reduced size and intensity of wildfires	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
			noise/physical disturbance	NA		
			lop and scatter	plants	range from none to tissue damage and reduced reproduction	none
	Prescribed Burning		reduced size and intensity of wildfires	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
			74 miles of fire lines; loss of trees	plants and seeds	range from none due to S&G to mortality	none
			maintain natural openings/wildfire dependant habitats	NA		
			noise/physical disturbance	NA		
			smoke/airborne particulate matter	NA		
			control/reduce NNIS	plants and seeds	range from none to increase in germination, vegetative growth and reproduction	none
			reduced understory/clutter	plants and seeds	range from none to increase in germination, vegetative growth and reproduction	none to increase in numbers and reproduction
			snag destruction	NA		
			snag creation			
	Fire suppression	Fire line control (hand tools, bulldozers, ATVs, tractors, water, & foam)	increased erosion; runoff	plants and seeds	none due to S&G	

Management Elements			Environmental Impact	RBC Exposure	RBC Response	Population RND Response
			reduced size and intensity of wildfires	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
			loss of trees	plants	range tissue damage to mortality	none
			spread nonnative species	plants and seeds	reduced fitness due to competition	none
		Aerial control (water or foam)	increased erosion; runoff	plants and seeds	range from none to reduction in vegetative growth and reproduction	none
			reduced size and intensity of wildfires	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
		Rehab (seeding, mulch, waterbars)	reduced erosion	plants and seeds	none due to S&G	
Watershed	wetland restoration		increase / improve wetland habitat	NA		
			soil disturbance compaction			
			increase insect production			
			short-term increase noise/physical disturbance/human presence during construction			
	stream/ riparian restoration		decrease runoff/sediment	plants and seeds	range from none to beneficial for germination and vegetative growth	increase in numbers
			increase forest habitat	plants and seeds	provide suitable habitat for germination, growth, and reproduction	none to increase in numbers and reproduction
			improved flow/sinuosity	NA		
			short-term increase noise/physical disturbance/human presence during construction	NA		
	acid mine drainage projects	doser construction	loss of 270 forested acres	NA		
		wetland construction	increase noise			
		limestone channels	decrease canopy cover			
		temporary roads	increase invasive plants			

Management Elements			Environmental Impact	RBC Exposure	RBC Response	Population RND Response
			increase water quality			
			soil disturbance/ compaction			
Pest Management	mechanical (mowing, digging, pulling)		soil disturbance/ compaction	plants and seeds	range from none due to S&G to increased fitness to mortality	none
			increase sunlight on forest floor	plants and seeds	beneficial for germination and reproduction	none to increase in numbers and reproduction
			improve health of mast trees (vine removal)	NA		
			increase noise/physical disturbance/human presence	NA		
			increased biodiversity - long term	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
	chemical (pesticides & herbicides)		overspray/non-target death	plants	none due to S&G	none
			decreased water quality	NA		
			increased biodiversity - long term	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
	biological		effects on non-target species	NA		
			increase biodiversity - long term	plants and seeds	range from none to beneficial for germination, vegetative growth and reproduction	none to increase in numbers and reproduction
Wildlife Management	reforestation		increase forest habitat	plants and seeds	provide suitable habitat for germination, growth, and reproduction	none to increase in numbers and reproduction
	develop forest openings		loss of 500 forested acres	NA		
			increase sunlight/edge			
			short-term increase noise/physical disturbance/human presence during construction			
	maintain forest openings		noise/physical presence	NA		
			increase invasive species			

Management Elements			Environmental Impact	RBC Exposure	RBC Response	Population RND Response
Land acquisition & exchange			increased forested land/ contiguous protection	plants and seeds	provide suitable habitat in federal ownership for germination, growth, and reproduction	none to increase in numbers and reproduction
Energy	Oil/gas development	Temporary access roads	noise/physical disturbance	NA		
			loss of trees; canopy breaks	plants and seeds	beneficial for germination and reproduction	none to increase in numbers and reproduction
			soil compaction	plants and seeds	none due to S&G	none
			spread nonnative species	plants and seeds	reduced fitness due to competition	none
			increase erosion; runoff	plants and seeds	none due to S&G	
		Facilities construction	noise/physical disturbance	NA		
			loss of trees/vegetation	plants and seeds	none due to S&G	none
			spread nonnative species	plants and seeds	reduced fitness due to competition	none
			increase erosion; runoff	plants and seeds	none due to S&G	
		facilities operation	noise/physical disturbance	NA		
			increased human access	NA		
	utility lines		decrease understory; canopy maintained	plants and seeds	beneficial for germination and reproduction	increase in numbers and reproduction
			increase erosion; runoff	plants and seeds	none due to S&G	
			increase noise/human presence			
			increase invasive species	plants and seeds	reduced fitness due to competition	none
			soil disturbance/compaction	plants and seeds	range from none to tissue damage to mortality	none

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of State, tribal, local, or private actions that are reasonably certain to occur within the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Based on past trends, future non-federal actions within the action area are anticipated in the form of private oil and gas development, coal, clay, and limestone mining, road construction and maintenance, and timber harvest. Development of up to 150 oil and gas wells (about 79 acres) may occur on the WNF due to outstanding mineral rights. This energy development is not considered a federal action, as no permit is required from the WNF. It is estimated that the number of people in the action area could increase by 8.5% by 2020 (USFS 2005), bringing with them increased housing development, industrial and commercial sites.

It is unknown how many acres of suitable habitat for Indiana bat or running buffalo clover could be altered or lost by these future actions. The actions listed above would have varying degrees of effects on listed species from no effect to adverse effects. Permanent conversion of forested habitat to unsuitable habitat would have the greatest potential impacts to Indiana bat and running buffalo clover. Other activities would have the same general effects as WNF actions, providing they are implemented with similar methods and protective measures. We anticipate that suitable habitat for federally listed species within the action area will increase (due to WNF habitat management) or remain at similar levels to what currently exists over the next ten years.

VI. CONCLUSION

Indiana bat

After reviewing the current status of Indiana bat, the environmental baseline for the action area, the effects of the proposed Forest Plan Revision and the cumulative effects, it is the Service's biological opinion that the WNF Forest Plan Revision, as proposed, is not likely to jeopardize the continued existence of Indiana bat. Critical habitat for this species has been designated at hibernacula in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia; however, this action does not affect these areas, thus, no destruction or adverse modification of that critical habitat is anticipated.

As explained in our Effects section, we anticipate that there may be individual fitness consequences but do not expect any colony or population level fitness implications. Instead, we anticipate over the long-term the goals of the proposed action, even with the anticipated negative cumulative effects, will benefit Indiana bats occurring within the action area. Thus, we do not anticipate any appreciable reductions in reproduction, numbers or distribution for the species.

Running buffalo clover

After reviewing the current status of running buffalo clover, the environmental baseline for the action area, the effects of the proposed Forest Plan Revision and the cumulative effects, it is the

Service's biological opinion that the WNF Forest Plan Revision, as proposed, is not likely to jeopardize the continued existence of running buffalo clover. No critical habitat has been designated for this species; therefore, none will be affected.

The Revised Forest Plan provides protection and habitat enhancement for running buffalo clover were it occurs now and if it should be found in other areas of the WNF. As shown through their Conservation Plan (Appendix A) the WNF is committed to maintaining viability of running buffalo clover on the Forest. Only one small population currently exists on the WNF, although not anticipated, the loss of this one population would not appreciably hinder the recovery of the species as a whole. Thus, we do not anticipate any detectable reductions in reproduction, numbers or distribution for the species.

INCIDENTAL TAKE STATEMENT

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of Federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened animals, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

In this incidental take statement, we are evaluating the incidental take of Indiana bats that may result from the implementation of the Revised Forest Plan for the WNF. The Forest Plan is a comprehensive plan level document that allows and guides, but does not authorize site-specific actions to occur. With the implementation of the Revised Forest Plan we anticipate some adverse effects to occur to the Indiana bat. As such, some site-specific projects, conducted under the Forest Plan may result in adverse effects to individual Indiana bats that rise to the level of take. The S&G proposed substantially reduce the potential for adverse effects and incidental take to occur as a result of actions implemented under the 2005 Forest Plan. Therefore, projects completed under the 2005 Forest Plan that comply with all of the S&G and other project commitments detailed in the BA in many cases would not adversely affect the Indiana bat therefore no incidental take would occur in those instances. However, as described within the Effects section, an unknown occupied roost tree could be removed, particularly during 1) construction of permanent and temporary roads, 2) construction of skids and landings, 3) utility construction, and 4) fire line construction.

It is anticipated that occupied secondary roost or less important roost trees may be unknowingly cut. These trees are likely to be occupied by either singly roosting males or a few females. It is reasonable to assume that only a subset of these individuals will be directly taken through injury or death (Bellwood 2002) and that most of the individuals in the occupied roost tree will escape. Although very difficult to predict, we anticipate that an unknown occupied roost tree could be

cut during any of the activities identified above. The occurrence of this, however, we believe is unlikely to be more than once per activity. Thus, we anticipate that no more than 4 occupied roost trees will be incidentally taken over the next ten years.

Incidental take of Indiana bats will be difficult to detect for the following reasons: the species is highly motile; the species occurs in habitat (e.g., trees) that makes detection difficult; and finding dead or moribund bats is unlikely due to a small body size and the likely scavenging of specimens by predators. However, we believe the level of take of this species can be monitored by tracking the level of habitat modification and adherence to S&G. Specifically, if the S&G are not implemented, or if the current anticipated level of habitat loss is exceeded, we fully expect the level of incidental take to increase as well. Thus, incidental take will be monitored using the number of acres/miles provide in Table 7 below.

Table 7. Management activities causing habitat modification rising to the level of take over ten years.

Activity	Measure
Permanent Road Construction & Reconstruction	392 acres
Temporary Road Construction	146 acres
Skid Trails and Log Landings	740 acres
Utility Development	50 acres
Fire Lines	74 miles

EFFECT OF THE TAKE

In the accompanying Biological Opinion, the Service determined that, based on the Revised Forest Plan and the conservation measures described in Appendix A this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. The amount of suitable Indiana bat on the WNF will increase over the next ten years. Only a small fraction of the suitable Indiana bat habitat on the WNF will be altered over the next ten years through the implementation of the Forest Plan. Furthermore, most of these actions are short term habitat alteration that may improve foraging and roosting habitat for the Indiana bat in the long term. The proposed activities are not anticipated to reduce the status of the Indiana bat on the WNF, and thus the implementation of the Forest Plan will not appreciably reduce the likelihood of survival and recovery of the Indiana bat.

REASONABLE AND PRUDENT MEASURES

The Service believes that the WNF has proposed all possible measures necessary to minimize impacts of incidental take as part of their Forest Plan in the form or goals, objectives, standards, and guidelines and in the Conservation Plan (Appendix A). In order to be exempt from the prohibitions of section 9 of the Act, the WNF must comply with all S&G, and monitoring proposed in the Forest Plan's Conservation Plan. This includes monitoring the extent of incidental take that occurs on a project-by-project basis for the next ten years.

MONITORING

The implementing regulations for incidental take require that Federal agencies must report the progress of the action and its impact on the species (50 CFR 402.14(i)). To meet this mandate, the WNF will monitor and report the progress of their action as follows:

1. As individual projects are proposed under the PBO, the WNF will provide the Service project-specific information that includes 1) a description of the proposed action and the area to be affected including latitude and longitude information, 2) the species that may be affected and their known proximity to the project area, 3) a description of how the action may affect the species, 4) a determination of effects, 5) a cumulative total of incidental take that has occurred to date under the PBO, and 6) a description of any additional actions or effects, if any, not considered in the tier I consultation.

2. On an annual basis, the WNF will provide the Service a tally of acreages as listed in Table 2 for all management actions. This is to ensure the anticipated level of impacts do not exceed what was analyzed under the PBO. In addition, the WNF will provide the Service with a tally of hickory trees that were removed during the implementation of management activities to enable the project to proceed without causing adverse effects to other resources important to the Indiana bat (GFW-TES-9).

REINITIATION NOTICE

This concludes formal consultation with the WNF on the Revised Land and Resource Management Plan. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if; (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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Appendix A. Revised Forest Plan Conservation Plan for Federally Listed Species

(taken from WNF Revised Forest Plan)

Conservation Direction and Guidance for all Federally Listed Species

Administrative & Technical Information

Consult with the Fish and Wildlife Service to ensure activities planned and implemented on the WNF are in accordance with the Endangered Species Act.

To ensure that the exemption of incidental take is appropriately documented, the Fish and Wildlife Service will implement a tiered programmatic consultation approach. As individual projects are proposed under the Forest Plan, the Forest Service shall provide project-specific information to the Fish and Wildlife Service that:

a. describes the proposed action and the specific area to be affected;

b. identifies the species that may be affected;

c. describes the manner in which the proposed action may affect Federally listed species, and the anticipated effects;

d. specifies that the anticipated effects from the proposed action are similar to those anticipated in the programmatic Biological Opinion for the revised Forest Plan;

e. a cumulative total of incidental take that has occurred to date under the Tier I Biological Opinion; and

f. describes any additional effects, if any, not considered in the Tier I consultation.

The Fish and Wildlife Service will review the information for each proposed project and this project-specific review is appropriately documented. If it is determined that an individual proposed project is not likely to adversely affect federally listed species, the Fish and Wildlife service will complete its documentation with a standard concurrence letter that refers to the Biological Opinion for the revised Forest Plan, the Tier I programmatic document (i.e., it "tiers" to it), and specifies that the Fish and Wildlife Service concurs that the proposed project is not likely to adversely affect listed species or critical habitat. If it is determined that the proposed project is likely to adversely affect listed species or designated critical habitat, then the Fish and Wildlife Service will complete a Tier II Biological Opinion with a project-specific incidental take statement.

Protection of Individuals

For all federal oil and gas lease projects, the Forest Service is responsible for assuring that the area to be disturbed is examined prior to allowing any surface disturbing activities on lands covered by this lease type. The examination is to determine effects upon any plant or animal species listed, or proposed for listing, as Federally endangered or threatened and their habitats. If the findings of this examination determine that the operation(s) may have a detrimental effect on a species covered by the Endangered Species Act, the operator's plans may be denied or restrictions added.

The Forest Service has the responsibility to conduct the required examination. In cases where the Forest Service time frames cannot meet the needs of the lessee/operator, the lessee/operator may, at his discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. An acceptable report must be provided to the Forest Service identifying the anticipated effects of the proposed action on Federally endangered and threatened species, or their habitats. [Appendix H - Oil & Gas Leasing Notification 3]

Inventory, Analysis and Monitoring

Coordinate and cooperate with the U.S. Fish and Wildlife Service and experts from other agencies, universities, and organizations to conserve, protect, recover, and monitor populations and habitats of Federally listed species.

Education and Awareness

Provide training opportunities for employees on the identification, biology, and habitat requirements of Federally listed species along with monitoring techniques.

Species-specific Conservation Direction and Guidance

A. **Indiana Bat**

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Administrative & Technical Information

Preferred Indiana bat roost trees include the following species: shagbark hickory, shellbark hickory; bitternut hickory; silver maple; green ash; white ash; eastern cottonwood; northern red oak; post oak; white oak; slippery elm; American elm; black locust; pignut hickory; red maple; sugar maple; and black oak. This list of trees is based on review of literature and data on Indiana bat roosting requirements. Other species may be added, as identified.

When identifying existing Indiana bat roosting habitat (SFW-TES-10(a)), the trees that are hollow, have major splits, or have broken tops need to have characteristics that provide maternity habitat for one or more Indiana bats. In other words, these trees must possess crevices into the hollow area or where the split or broken top occurred for it to provide habitat for this species. Furthermore, trees with broken tops should be 6 inches dbh or greater where the broken top occurs.

Discovery of dead bats of undetermined species on the WNF should be reported immediately to the U.S. Fish and Wildlife Service, Reynoldsburg Field Office, and the remains transported on ice to that office. The USFWS will make the final species determination of any dead or moribund bats found on the WNF. If an Indiana bat is identified, the USFWS will contact the appropriate USFWS law enforcement office.

No attempt should be made to handle any live bat, regardless of its condition. This does not apply to individuals who are permitted, as agents of the State, to conduct work on Federally listed bat species.

Report bats that appear to be sick or injured to USFWS Reynoldsburg Field.

Protection of Individuals

Goal 5.1.1 – Retain or develop Indiana bat roosting and foraging habitat; protect all known Indiana bat hibernacula.

Objective 5.1.1a – If additional Indiana bat hibernacula are discovered on NFS land, install bat-friendly gates to prevent unauthorized entry.

SFW-**TES-1** – Deter human access to areas surrounding known hibernacula by closing or relocating trails that lead to, or pass within easy viewing distance of hibernacula.

SFW-**TES-2** – Establish a one-quarter mile buffer around all known hibernacula. Within this one-quarter mile buffer:

a. Prohibit new trail and road construction;

b. Do not conduct prescribed burning during the fall swarming period (generally mid-August to mid-October) or during the hibernation period (September 15th through April 15th);

c. Do not permit surface occupancy for exploration or development of Federally owned minerals;

d. Implement vegetation management only to maintain or improve Indiana bat roosting, swarming, or foraging habitat.

GFW**-TES-3** – Establish a one-quarter mile buffer around all mine openings that are known Indiana bat fall swarming sites, but where actual Indiana bat hibernation has not been established. Reduce or eliminate human disturbances within the buffer. Implement vegetation management only to maintain or improve Indiana bat roosting, swarming, or foraging habitats.

SFW**-TES-4** – Develop prescribed burning plans that specify weather conditions that would prevent smoke dispersal into known hibernacula.

SFW**-TES-5** – Before backfilling any mine openings, such as portal entrances or subsidence depressions with developed openings, conduct surveys for potential bat presence during the fall swarming period (generally mid-August to mid-October).

GFW**-TES-6** – Conduct pre-gating and post-gating mist net surveys at mines where bat-friendly gates are installed.

SFW**-TES-13** – Prohibit the cutting of standing dead trees for firewood.

SFW-MIN-10 (Appendix H, Stipulation 10) **–** Within management areas where surface occupancy is generally permitted, apply the No Surface Occupancy stipulation for Federal leases where the following conditions occur:

- Areas within ¼ mile of Indiana bat hibernacula

Appendix H, Stipulation 12 (Controlled Surface Use on USA oil and gas leases – Known locations of Federally listed species) **–** No cutting of snags (trees with less than 10% live canopy), shagbark or shellbark hickories, or trees that are hollow and/or have major splits or broken tops, except during the bat hibernation season (September 15th – April 15th). If such trees are a safety hazard, they may be cut anytime they pose an imminent threat to human safety, but if cut in the non-hibernation season, the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter.

Habitat Protection & Improvement

Goal 5.1.1 – Retain or develop Indiana bat roosting and foraging habitat; protect all known Indiana bat hibernacula.

Objective 5.1.1a – If additional Indiana bat hibernacula are discovered on NFS land, install bat-friendly gates to prevent unauthorized entry.

SFW-TES-7 – When even-aged regeneration methods are used, retain forested flight corridors within and between early successional habitat patches. These flight corridors may include forested corridors along ephemeral, intermittent, and perennial streams; and where present, clumps of snags and trees of varying size classes in the early successional habitat. When present, leave larger-sized trees on the edges of early successional patches for future maternity roosts.

SFW**-TES-8** – Within hardwood cutting units with uneven-aged vegetation management prescriptions, maintain an average of at least 60 percent canopy cover.

GFW**-TES-9** – Retain all shagbark and shellbark hickory trees greater than or equal to 6 inches dbh, unless removal is necessary to protect human safety or to avoid adverse impacts to steep

slopes, erodible soils, floodplains or wetlands (e.g., cut a hickory rather than relocating a skid trail onto a steep slope).

SFW-**TES-10** – During the non-hibernation season (April 15th – September 15th), do not cut, unless they are a safety hazard:

a. Trees of any species 6 inches dbh or greater that are hollow, have major splits, or have broken tops that provide maternity habitat.

b. Snags 6 inches dbh or greater that have Indiana bat roost tree characteristics. Consider any tree with less than 10 percent live canopy to be a snag.

When removal of hazard trees is necessary in a recreation area during the non-hibernation season (e.g., developed recreation sites, access roads, trails), conduct emergence surveys at the identified hazard trees that possess the characteristics identified above, and at any hazard trees that possess large areas of loose bark providing maternity habitat.

SFW-**TES-11** – Schedule any summer prescribed burning after August 15th to reduce potential effects on Indiana bat reproduction.

SFW-**TES-12** – With all hardwood timber harvests, retain a minimum of 12 live trees per acre (averaged over the cutting unit) of any species that are 6 inches dbh or greater with large areas of loose bark, unless they pose a safety hazard.

In addition to these, retain live preferred roost trees, when present to provide a supply of future roost trees (i.e., large, overmature trees) as shown in the following table. Refer to the Administrative & Technical Information section above for a list of tree species preferred as roost trees by Indiana bats. Consult with the U. S Fish and Wildlife Service regarding exceptions that may be needed to minimize adverse effects to other resources or human health and safety.

Indiana Bat Preferred Roost Tree Size Class	Number of live trees to retain (average per acre over the cutting unit)
>20 inches (dbh)	3*
>11 in (dbh and < 20 in (dbh)	6

*If there are few or no live Indiana bat roost trees > 20 inches dbh in the stand, retain three live trees > 16 inches dbh and < 20 inches dbh per acre (averaged across the cutting unit). If there are no live trees > 16 inches dbh, retain nine additional live trees > 11 inches dbh and < 16 inches dbh per acre (averaged across the cutting unit).

SFW-**TES-13** – Prohibit the cutting of standing dead trees for firewood.

GFW-**TES-14** – Provide water sources that promote aquatic insect production and provide drinking sources for Indiana bats along suitable flight paths, especially in upland areas, and off/away from recreation sites, and designated trails and roads.

Appendix H, Stipulation 12 **–** No cutting of snags (trees with less than 10% live canopy), shagbark or shellbark hickories, or trees that are hollow and/or have major splits or broken tops, except during the bat hibernation season (September 15th – April 15th). If such trees are a safety hazard, they may be cut anytime they pose an imminent threat to human safety, but if cut in the non-hibernation season, the Forest Service biologist must be notified in advance. This stipulation applies only to trees over six inches in diameter.

Education & Awareness

Provide refresher training to employees, as needed, to ensure proper identification of Indiana bat roosting habitat. Such training should include how to recognize potentially suitable maternity roosts from non-maternity roost trees.

Provide training to employees on the proper methods for conducting emergence surveys.

Inventory, Analysis & Monitoring

Emphasis will be placed on collecting information that supports Indiana bat recovery objectives. This may include, but is not limited to, monitoring population trends of known hibernacula; monitoring of microclimate conditions in known hibernacula, and assessing our understanding of Indiana bat winter and summer distributions on the WNF, including any maternity colonies.

Monitor annually and report every five years the answers to the following monitoring questions, as required in Chapter 4 of the Forest Plan:

a. How many acres of potentially suitable Indiana bat habitat were protected or improved?

b. How many bat-friendly gates were installed on known Indiana bat hibernacula?

B. **Bald Eagle**

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Administrative & Technical Information

By June 1 of each year, provide an annual report to the U.S. Fish and Wildlife Service and the Ohio Division of Wildlife, which includes the following:

a. Results of any winter searches for communal bald eagle night roosts and concentrations, including mid-winter bald eagle surveys conducted in cooperation with the USFWS and the Ohio Division of Wildlife;

b. Discovery of any bald eagle nesting territories on the WNF. If no surveys have been conducted and no territories discovered on the WNF during an annual reporting period, an annual report should be submitted with a statement to this effect;

c. Documented cases of a prescribed fire that behaved contrary to predicted movement patterns and which resulted in a confirmed adverse impact to bald eagles.

For any prescribed fire that could potentially impact bald eagles, provide the USFWS with the opportunity to review burn plans with the WNF Fire Management Officer prior to the burn plan's approval.

Protection of Individuals

Goal 5.1.2 – Protect bald eagle communal night roosts, daytime concentration sites, and occupied breeding territories.

SFW-**TES-16** – Protect any bald eagle communal night roosts and concentrations (including nests) discovered during winter surveys or during any additional field surveys or proposed project areas, following guidelines outlined in the Northern States Bald Eagle Recovery Plan.

SFW-**TES-17** – Report discovery of bald eagle nests immediately to the U. S. Fish and Wildlife Service and the Ohio Department of Natural Resources, Division of Wildlife.

SFW-**TES-19** – Allow no prescribed fire within one-half mile of occupied bald eagle sites. Consider all bald eagle communal night roosts, daytime concentration sites, or occupied breeding territories as occupied sites. To prevent smoke inversion from occurring at occupied bald eagle sites, and to minimize smoke drifting toward them from prescribed fires outside the one-half mile radius of occupied sites, require burn plans to take into account of wind direction, speed, and mixing height as well as transport winds.

Appendix H, Stipulation 12 **–** Protect known nests and roosts as described in the Bald Eagle Recovery Plan, or as directed by the U. S. Fish and Wildlife Service.

Habitat Protection & Improvement

SFW-**TES-18** – Protect supercanopy trees, or other identified congregation roost trees, along major river corridors and lakes in addition to following Forest-wide riparian area standards and guidelines.

Appendix H, Stipulation 12 **–** Protect all supercanopy trees or other identified congregation roost trees for bald eagles along major river corridors and lakes.

Education & Awareness

Provide field training for new employees so they will be able to recognize bald eagle signs at night roosts, even when eagles are absent.

Inventory, Analysis & Monitoring

Objective 5.1.2a – Conduct a minimum of three annual winter searches to locate any previously unknown communal night roosts or bald eagle concentrations.

SFW-**TES-15** – Focus winter bald eagle searches in areas that eagles are known to frequent or where concentrated food sources occur near NFS land. Conduct searches during early-, mid-, and late-winter. Follow search criteria outlined in the Northern States Bald Eagle Recovery Plan.

SFW-**TES-20** – If the bald eagle is found nesting on the Wayne National Forest, monitor populations according to the recovery plan. At such time as the bald eagle is de-listed, use the de-listing monitoring plan.

In addition to these Forest-wide objectives and standards, monitor annually and report every five years the answers to the following monitoring questions, as required in Chapter 4 of the Forest Plan:

a. How many winter bald eagle searches were conducted?

b. How many bald eagles were observed?

C. **American Burying Beetle**

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Protection of Individuals

Goal 5.1.3 – Cooperate in efforts to reintroduce the American burying beetle.

GFW-**TES-21** – Discourage the use of bug zappers by campers in dispersed or developed recreation sites within 10 air miles of known occupied American burying beetle habitat.

GFW-**TES-23** – During the American burying beetle activity period, use bait-away methods prior to and during the implementation of major earth disturbing activities that occur in known occupied American burying beetle habitat.

GFW-**TES-26** – Restrict the use of insecticides within known occupied American burying beetle habitat.

Habitat Protection & Improvement

GFW-**TES-22** – Limit ground compaction to the minimum area possible during major earth disturbing activities (including, but not limited to new road and trail construction, mineral resource exploration and development, or new facilities) that occur in suitable American burying beetle habitat within 10 air miles of known occupied American burying beetle habitat.

GFW-**TES-24**– In occupied American burying beetle habitat, design new roads with the minimum safe width necessary for planned use of the road.

GFW-**TES-25** – Within 10 air miles of known occupied American burying beetle habitat, keep ground disturbance to a minimum during the reconstruction and maintenance of existing roads. Limit width of road, ditches, and surface materials to the minimum necessary for the planned use.

Inventory, Analysis & Monitoring
Cooperate in efforts to determine the extent of occupied habitat on the WNF as reintroduction efforts continue on NFS lands and non-Federal lands.

Monitor annually and report every five years the answers to the following monitoring question, as required in Chapter 4 of the Forest Plan:

a. What cooperative efforts were accomplished to achieve the reintroduction of the American burying beetle?

D. **Running Buffalo Clover**

Additional resource management direction and guidance found in the Forest Plan and should be considered during project planning and implementation, as needed, to promote recovery of this species.

Protection of Individuals

Goal 5.1.4 – Actively manage known populations of running buffalo clover to maintain appropriate habitat conditions.

SFW-**TES-27** – Implement measures to protect known running buffalo clover populations during prescribed fire activities. These may include, but are not limited to wetting down the occupied area, raking off fuels from the occupied area, or constructing firelines around the occupied area.

SFW-**TES-28** – Avoid mechanical construction of firelines in known occupied RBC habitat. Mechanical fireline construction adjacent to known RBC populations must maintain appropriate light conditions in known occupied habitats.

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GFW-**TES-29** – Restrict the application of herbicides within 25 feet of known running buffalo clover populations.

Habitat Protection & Improvement

Objective 5.1.4a – Maintain partial to filtered sunlight over and adjacent to occupied habitat.

SFW-**TES-30** – Protect and maintain known RBC populations during road and trail construction, reconstruction, and maintenance by locating ground disturbance outside the occupied habitat. Appropriate light conditions must be maintained in the occupied habitat during such activities.

GFW-**TES-31**: Conduct surveys for running buffalo clover in suitable habitat prior to implementing ground or canopy disturbing activities.

Education & Awareness

Ensure employees are familiar with locations of known running buffalo clover populations on the WNF. Conduct annual refresher training on running buffalo clover identification for all field-going employees.

Inventory, Analysis and Monitoring

Objective 5.1.4b – Conduct annual monitoring of known running buffalo clover populations and adjacent areas to identify potential risks or management needs.

Monitor annually and report every five years the answers to the following monitoring question, as required in Chapter 4 of the Forest Plan:

a. What running buffalo clover population and habitat monitoring efforts were accomplished?

Appendix B. Documentation of Indiana bat on the WNF.

1979 Mine surveys and mist netting conducted in 1979 and 1980 did not record the Indiana bat on the WNF (Bookhout and Lacki, 1981).

1997 Mist net surveys were conducted in July on the Athens Unit (20 sites) and on the Ironton Ranger District (20 sites) (Kiser and Bryan, 1997). Four lactating female Indiana bats were captured along the Hocking River in the Haydenville area on the Athens Unit. This was the first evidence that maternity roost(s) occurred in or near the WNF on the Athens Unit. One male Indiana bat was captured in the Shawnee area of the Athens Unit. One male was captured in the Five Forks area on the Ironton Ranger District.

1998 Mist net surveys were conducted during the summer at 11 sites in the Bluegrass Ridge area of the Ironton Ranger District, but failed to capture Indiana bats (Kiser et al., 1998).

A passive survey was conducted at a mine opening on the Ironton Ranger District in September, and a harp trap survey was conducted at the same location in October (L. Andrews, pers. comm.). One male Indiana bat was captured, indicating that Indiana bats may have been using the mine for hibernation.

1999 Wintering Indiana bats were confirmed when an abandoned limestone mine was entered and approximately 150 Indiana bats were found. This mine has since been designated as a Priority III hibernaculum.

Mist net surveys were conducted in June and July on the Athens Unit (19 sites) and the Ironton Ranger District (18 sites) (Kiser et al., 1999). One adult male Indiana bat was captured in the Dorr Run area on the Athens Unit. Biologists captured what they thought was a pregnant Indiana bat in the Dorr Run area, however genetic study determined it to be a little brown bat. Five Indiana bats (three adult males, one young-of-year male, and one post-lactating female) were captured in the Bear Run area on the Ironton Ranger District. This survey provided the first indication of reproduction occurring on the Ironton Ranger District. Six of the Indiana bats captured during the mist net surveys (four adult males, one juvenile male, and one post-lactating female) were fitted with radio-transmitters, and three were successfully tracked to collect more information about their summer roost tree use (Schultes, 2002).

2000 Abandoned limestone mines near the Priority III hibernaculum were entered in February, but no Indiana bats were found.

Mist net surveys were conducted in June and July on the Athens Unit (25 sites) and the Ironton Ranger District (26 sites) (Kiser et al., 2000; Schultes, 2002). Two adult male Indiana bats were captured, one on the Athens Unit (Dorr Run area) and one on the Ironton Ranger District (Bear Run area). One additional adult male was captured on privately-owned land adjacent to the Dorr Run area of the Athens Unit.

Three of the adult male Indiana bats captured during the mist net surveys were fitted with radio-transmitters and tracked to collect more information about their summer roost tree use (Schultes, 2002).

In September during a fall-swarming survey, a female Indiana bat was captured at the entrance to an abandoned underground coal mine in the Dorr Run area (Athens Unit) (Brack and Little, 2001).

2001 The Priority III hibernaculum was closed to the public with the installation of a bat-friendly gate.

2002 Fall swarming surveys in September resulted in the capture of a male Indiana bat in the Snake Hollow area of the Athens Unit (L. Andrews, pers. comm.). The individual was

captured in a mist net that was set at the entrance to an abandoned underground coal mine.

2003 A February survey of the Priority III hibernaculum found approximately 200 Indiana bats inside the mine (Schultes, 2003).

Two abandoned limestone mines in the Bear Run area on the Ironton Ranger District were closed to the public with bat-friendly gates.

2004 The "Brushy Mine", an abandoned limestone mine, was surveyed in February. Illegal off-highway vehicles had been driving into the mine, posing a threat to human safety, as well as to any bats inhabiting the mine. No Indiana bats were observed in the mine, however other species were documented. A mist net survey was conducted at the Brushy Mine in June. Bats were captured, but no Indiana bats were netted. A bat-friendly gate was installed at the mine in June, after the mist net survey, to protect the bats from human disturbance.

Mist net surveys were conducted in June and July on the Marietta Unit (37 sites) and the Ironton Ranger District (13 sites). No Indiana bats were captured (Meade, 2004)).

Relative humidity and temperature data loggers were installed in the Priority III hibernaculum in September to monitor microclimate trends over time.

In late-September, an adult female Indiana bat was captured at an entrance to an abandoned underground coal mine in Monkey Hollow (Athens Unit) during a fall-swarming survey (L. Andrews, pers. comm.).

2005 A February survey of the Priority III hibernacula detected 333 Indiana bats (Schultes 2005).

The temperature and relative humidity data loggers in the Priority III hibernaculum were downloaded and reset in August 2005. Data have not been analyzed to date.

Fall swarming surveys occurred in September 2005 at several open mine portals on the Athens Unit. No Indiana bats were detected.