PROGRAMMATIC BIOLOGICAL OPINION

FOR THE

MONONGAHELA NATIONAL FOREST

2006 FOREST PLAN REVISION

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CONSULTATION HISTORY

A previous formal consultation for the Forest Plan was completed in March 2002. That BO addressed potential adverse effects to the Indiana bat and 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 programmatic BO. The Incidental Take Statement for the March 2002 BO authorized the MNF to affect potentially suitable Indiana bat habitat by conducting the following activities annually: timber harvests on up to 6,000 acres; road construction/reconstruction on up to 47 acres; mineral development on up to 78 acres and prescribed burning on up to 300 acres. In March 2004 a Forest Plan Amendment was completed that incorporated all of the programmatic BO's terms and conditions into the Forest Plan. Since issuance of the programmatic BO, the Service and the MNF have completed tier II BOs on three major timber sale projects and a number of smaller projects encompassing the alteration of approximately 2,870 acres of potentially suitable habitat for the Indiana bat. Informal consultations, in accordance with the procedures established by the programmatic BO and the Forest Plan Amendment, have also been completed on several smaller projects.

The Service and the MNF engaged in numerous discussions regarding the development of the FPR throughout all phases of the scoping and planning process. These discussions allowed the agencies to identify measures that could be used to improve the process, clarify the intent of the Forest Plan, and provide enhanced protection of listed species. On February 17, 2006 the Service and the MNF met to discuss the content of the draft BA and make any necessary revisions. On March 30, 2006 the MNF submitted the BA to the Service. In an attached letter the MNF also requested that the Service concur with the "may affect" determinations of the BA, and initiate formal consultation on the Indiana bat and Running buffalo clover. In our letter dated May 16, 2006, the Service concurred with the determinations of the BA and initiated formal consultation as requested. On June 15, 2006 the MNF provided the Service with copy of the proposed revisions to the threatened and endangered species section of the FPR that were developed based on responses to public comments and the results of our interagency coordination. This BO assumes that the FPR will be implemented as proposed in that document. A draft BO was provided to the MNF on June 19, 2006. The MNF provided comments on the draft BO on June 28, 2006 and met with the Service to discuss those comments on June 30, 2006.

BIOLOGICAL OPINION

The Service will implement a tiered programmatic consultation approach to the FPR. The MNF and the Service have successfully utilized a tiered consultation approach since the completion of the 2002 Programmatic Biological Opinion. The Service anticipates continuing this same approach. The Tier 1 level is the review of how the overall goals and prescribed management in the Forest Plan will impact listed species over the life of the plan. The Tier 1 review will also assess the effects on listed species of the management activities (i.e., harvest, burning, etc.) the MNF will utilize to implement the FPR. No specific projects are analyzed at this level. This programmatic biological opinion on the FPR constitutes the Tier 1 level review.

The Tier 2 level is the review of how the site specific future actions will affect listed species. As individual projects are proposed under the Forest Plan, the MNF will provide the Service with project-specific information that describes: 1) a description of the proposed action and the area to be affected, 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 project-specific determination of effects, 5) a cumulative total of incidental take that has been authorized annually and to date, 6) a description of any additional actions or effects, if any, not considered in the tier I consultation. Site-specific projects should be planned to incorporate all applicable standards and guidelines identified in the FPR and all of the terms and conditions associated with the reasonable and prudent measures outlined in this opinion. Site-specific biological assessments will tier to the programmatic documents, as such; much of the information regarding the life history of listed species and other information can be referred back to the appropriate pages in the programmatic documents (Tier 1). The status of the species on the MNF should be updated as appropriate.

The Service will review the information provided by the MNF 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 letter that refers to the programmatic BO and specifies that the Service determined 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 and reasonable and prudent measures, if take is reasonably certain to occur.

DESCRIPTION OF THE PROPOSED ACTION

Overview

The MNF currently comprises over 919,000 acres in eastern West Virginia. The federally owned lands are interspersed with other private and state ownerships within the 1,700,000 acres of land contained within the MNF's proclamation boundary. The MNF is located primarily in Grant, Greenbrier, Nicholas, Pendleton, Pocahontas, Randolph, Tucker, and Webster Counties, with minor portions in Barbour and Preston Counties.

The geology of the area features steep north-south mountain ridges and deep river valleys, with elevations ranging from 900 feet near Petersburg to 4,863 feet atop Spruce Knob, West Virginia's highest point. Temperatures can vary from near 100 degrees Fahrenheit in summer to well below zero in winter. Annual precipitation ranges from about 60 inches on the west side of the Forest to about half that amount on parts of the east side. The headwaters of six major rivers—the Cheat, Elk, Gauley, Greenbrier, Potomac, and Tygart Valley rivers—are found on the MNF, as well as four impounded lakes—Lake Sherwood, Lake Buffalo, Summit Lake, and Spruce Knob Lake.

Due to its geographic location, elevation range, and complex geology, the MNF has great ecological diversity. Over 60 species of trees are known to occur within the MNF,

mostly including hardwoods, but also conifer species. Many of the tree species have high value for timber sawlogs and other products. A number of rare plants and plant communities exist, with some at their northern- or southern-most limit of their ranges. Currently 4 plant species are listed by the Service as threatened or endangered. Many of these rare plants and communities are protected in Botanical Areas, National Natural Landmarks and other similar areas. The MNF provides habitat for numerous animal species, including fish, reptiles, amphibians, birds, mammals, and invertebrates. Currently, 5 animal species are listed as threatened or endangered.

The MNF affords excellent opportunities for wildlife viewing, hunting, fishing, and other outdoor recreational activities. The MNF also offers and sells timber for harvest as a way to help achieve vegetation and habitat objectives and support local and regional economies. About 7,000 acres are open to permitted livestock grazing. The MNF provides the setting for 40-50 producing natural gas wells and additional wells associated with a natural gas storage field, which are regionally important energy sources. Other mineral resources include commercial quantities of coal, limestone, and gravel. Limestone geologies also contain numerous caves that are popular for recreation, and some that provide habitat for rare species.

The MNF transportation network has an estimated 1,752 miles of classified roads that range from paved highways to non-surfaced roads designed for high clearance vehicles. Many of these roads are available for pleasure driving, the removal of forest products, bicycling, and scenic viewing. Others are closed for resource protection or management reasons.

Major insect pests include the gypsy moth and hemlock wooly adelgid. The major disease concern at present on the MNF is beech bark disease complex.

Project Description

The Forest Service's Preferred Alternative is plan revision Alternative 2 Modified, which is referred to in this document as the FPR. The majority of the changes to the Forest Plan, when compared with the existing version, address vegetation management, backcountry recreation, water and soils, and timberland supply. Some features of the FPR represent little change or maintain the status quo relative to the existing Forest Plan. The FPR converted several Management Prescriptions (MPs) used to manage habitat for threatened and endangered species into Forest-wide direction, which will be applied wherever such habitat occurs, regardless of MP. In general, the direction contained in the Threatened and Endangered Species Amendment to the Forest Plan has been carried over into the FPR. The FPR also incorporates a number of new or updated measures that will benefit threatened and endangered species within the MNF. These measures include:

- Developing a new Spruce Management Prescription (MP 4.1) to help restore and maintain spruce and spruce-hardwood ecosystems.
- Revising the Wildlife Habitat Diversity Prescription (MP 6.1) to include an emphasis on restoration of oak-pine and oak-hickory communities, and an increased role for fire as a disturbance agent to help maintain desired conditions.

- Updating Management Plan direction to address the emerging concern of non-native invasive plant species; and provide direction to maintain or restore rare plants and communities, including Regional Forester Sensitive Species.
- Updating Riparian Management Guidelines that were developed in 1999 to be used as project-specific mitigation on the MNF and incorporating them into the FPR.
- Making additions to Forest-wide direction, MPs, and monitoring to address acid deposition and sedimentation concerns.

Table 1 provides a summary of the MPs used in the FPR and the acreage of habitat assigned to each. More detailed descriptions of the proposed action are provided in the BA, the draft Forest Plan Revision and associated draft Environmental Impact Statement and are incorporated here by reference.

Table 1. Management Prescription acres for the Forest Plan Revision.

Number	Management Prescription	Acres	Percent of Forest
3.0	Age Class Diversity	194,600	21.2
4.1	Spruce and Spruce-Hardwood Management	153,600	16.8
5.0	Designated Wilderness	78,900	8.6
5.1	Recommended Wilderness1	27,300	3.0
6.1	Wildlife Habitat Diversity	277,600	30.3
6.2	Backcountry Recreation	105,600	11.5
8.0	Special Areas	79,100	8.6

1Recommendations for Wilderness are preliminary administrative recommendations only. Any recommendation would receive further review and possible modification by the Chief of the Forest Service, the Secretary of Agriculture, and the President of the United States. Congress has reserved final decisions to designate Wilderness to the National Wilderness Preservation System.

The FPR also describes specific types of activities that may be conducted on the MNF, and where possible, sets goals or anticipates the level of effort that may occur for each of the activity types, as described below.

Mineral Operations

Active coal mining on the MNF ceased in the early 1990s. No coal mine permit applications on NFS land are pending or known to exist. At current and foreseeable coal prices, the MNF does not expect to see major or extensive coal mine development, and very probably no leasing and development of federally owned coal over the next 10-15 years. However, some underground coal mine development is possible in association with the exercise of privately owned coal rights.

Oil has never been found in commercial quantities on the MNF, and there is only a low probability for its occurrence. Therefore, oil exploration and development will not be

considered further in this BO.

Natural gas leasing, exploration, recovery, and underground storage are by far the most common forms of mineral development on the MNF. Typical activities involve seismic exploration, drilling and operation of gas wells, construction of access roads, and construction and operation of pipelines. Including both production wells and wells associated with underground gas storage, there are currently 71 existing, active gas well sites on NFS land. On average, each well site is about 2 acres with grassy ground cover, similar to hayfields. Access roads and associated pipelines create narrow linear openings and may add up to an additional 14 acres of grassy or graveled area per well site. The total acreage of surface modification is considerably less for many well sites because they are served by existing roads or the associated pipelines are co-located with roads.

A projection of Reasonably foreseeable gas development (RFD) was prepared in May 1990 and updated and validated in 2003. The RFD projects approximately 740 acres of total surface modification (wells, roads, and pipelines) per decade, including all land ownerships in the proclamation/purchase unit boundary, as well as both federal and privately-owned gas. The actual area of surface modification to date has been substantially below RFD projections due to lower than predicted levels of development and development methods that reduce surface disturbance (e.g., directional drilling from a central location, co-locating roads and pipelines).

Range Activities
Range management on the MNF consists of livestock grazing by private permittees on approximately 7,000 acres of pasture land. Activities associated with range management can include construction and maintenance of fences, loading chutes, water sources, and other small structures; application of seed, lime, and fertilizer to pastures; and control of competing vegetation by mowing or herbicide application. Development of new range allotments is expected to be limited to newly acquired land that is already pasture or hay land.

Prescribed Fire
Fire management activities on the MNF include suppression of wildfires and the use of prescribed fire to meet vegetation management objectives. The MNF has 10 or less reported wildfires each year, with the average size less than an acre. Previously, prescribed fire has been used on fewer than 300 acres of the MNF annually, and was limited to maintenance of openings or brushy areas for wildlife habitat management. However, historic records suggest that oak-hickory forest types are fire dependent, and the FPR contains objectives to increase planned amounts of prescribed fire to achieve ecosystem restoration and management goals. It is anticipated that prescribed fire could be conducted on between 10,000 and 30,000 acres of the MNF over the next decade.

Fire management activities can involve construction of fire lines using hand tools and mechanized equipment, application of water or chemical fire retardants, and use of incendiary devices to ignite prescribed fires. Fire lines are rehabilitated promptly, using

water bars and revegetation where necessary to prevent erosion. Prescribed burning is conducted under project-specific burn plans that address potential effects on other resources.

Road Related Activities
The FPR does not contain objectives for mileage of road construction and reconstruction because road needs are difficult to predict without conducting site-specific, project-level planning. However, the FPR contains a goal to provide developed roads to the density and maintenance level needed to meet resource and use objectives. The current Forest road system, not including temporary roads and woods roads, is estimated at 1,752 miles. Road construction and reconstruction is not expected to exceed 200 to 250 miles over the next 10 years. The FPR contains an objective to decommission at least 30 miles of roads over the next 10 years.

Road construction involves removal of vegetation along the road alignment, cut-and-fill as necessary to create a level road bed, installation of drainage structures, and grading of the road surface. Gravel is applied to the surface of high-standard system roads. Gravel may be applied to other roads if necessary to prevent erosion, sedimentation, and road surface damage. Roads that receive heavy use by the public may be paved. Road reconstruction is similar to construction, but usually requires less cut-and-fill and grading work. Road maintenance involves grading and adding gravel as necessary to maintain a smooth travel surface, cleaning or replacing drainage structures when necessary, and mowing or trimming encroaching vegetation. Decommissioning of roads may involve restoring the road to original contour (removing or placing of fill, and regrading), or more limited measures such as regrading the road to redirect drainage patterns, removing culverts, tilling the road surface, and other similar activities.

Recreation Activities
The MNF hosts a wide variety of recreational activities, including camping, hiking, backpacking, hunting, fishing, wildlife viewing, scenery viewing, mountain biking, horseback riding, picnicking, rock climbing, spelunking, and driving for pleasure. Several commercial outfitter/guides operate under recreational special use permits. Such permits are also used to manage occasional recreation events such as bicycle races.

Visitor use estimates indicate that the MNF receives over one million visits annually. Overall recreational use of the MNF is expected to increase in the foreseeable future in conjunction with population increases in metropolitan areas of the eastern U.S. No new major recreational developments are expected in the foreseeable future, although existing facilities may be rehabilitated or reconstructed to meet visitor expectations and demands. Limited new construction of trails and other dispersed facilities may occur in response to specific user needs; however, a general expansion of the trail system and other facilities is not expected. The FPR allows for all-terrain-vehicle use on designated trails within specific Management Prescriptions. Currently the MNF does not have any designated routes open to ATV use, although unauthorized use occurs in scattered locations.

Watershed and Aquatic Habitat Restoration Activities
Watershed improvement activities include riparian area protection and restoration, road obliteration to address sedimentation issues, structural or vegetative bank stabilization, and efforts to revegetate and stabilize exposed soils. The most extensive form of aquatic habitat management on the MNF is the application of limestone sand to streams that have been impacted by acid deposition. Aquatic habitat management may also include construction of in-stream habitat structures, as well as addition of large woody debris to streams that are deficient in that habitat component.

The revised plan contains objectives calling for the removal of 30 to 50 passage barriers and the restoration of 30 to 50 linear miles of aquatic and riparian habitat over the next decade. It is anticipated that site-specific opportunities for achieving these objectives will be identified during watershed and project-level planning. Activities are expected to be scattered and small-scale in nature, and any vegetation and soil disturbance is expected to be short-term and minor in extent.

Wildlife Habitat Management
The MNF cooperates with the West Virginia Division of Natural Resources (WVDNR) in an active wildlife habitat management program. Currently, most wildlife habitat management on the MNF consists of creating and maintaining permanent herbaceous openings to benefit turkeys, grouse, and a variety of other game and non-game species. Many of these openings are small (<2 acres) former log landings or closed roads that have been seeded. Others are larger (10+ acres) savannas that contain scattered residual trees. Many wildlife openings also contain small water holes. The FPR contains objectives to construct a total of 2,000 to 4,000 acres of wildlife openings in MPs 3.0 and 6.1 over the next 10 years. Other MPs allow openings, but do not have quantitative desired conditions or objectives.

Wildlife opening construction on log landings or closed roads involves ripping the soil to reduce compaction, whereas savanna construction involves clearing existing vegetation, removing roots and stumps, and tilling the soil. The MNF may soon begin experimenting with savanna establishment that leaves stumps in place, which involves less soil disturbance and uses prescribed burning for maintenance instead of mowing. In either case, soil preparation is followed by application of seed, fertilizer, lime, and mulch. Seed mixtures include a variety of native and non-native, non-invasive grasses and forbs. Fruit-producing shrubs and trees may be planted within openings or around the edges. Most openings are maintained by mowing, although the MNF may begin to use more prescribed fire for opening maintenance, especially for the larger savannas.

Spruce ecosystem restoration is another form of wildlife habitat management on the MNF. While very little active spruce restoration has been conducted to date, the FPR contains an objective to conduct 1,000 to 5,000 acres of active spruce restoration over the next decade. Active spruce restoration would involve partial harvests, similar to thinning, single-tree selection, group selection, or two-aged harvesting. The specific silvicultural prescription would depend on site-specific conditions. The harvesting is intended either to release spruce trees established in the understory and midstory, or to

encourage establishment of spruce from seed provided by scattered overstory spruce. The purpose is to reestablish spruce as an overstory component while maintaining or enhancing vertical habitat structure.

Like spruce restoration, Indiana bat habitat enhancement has not been extensive to date, but is expected to increase under the revised plan. The revised plan contains an objective to conduct 3,000 to 7,000 acres of Indiana bat habitat enhancement over the next decade. This habitat enhancement would be concentrated within Indiana bat primary range (see description below), most of which is within MP 6.1. Habitat enhancement would involve partial harvests, similar to thinning, single tree selection, group selection, two-aged harvesting, or modified shelterwood harvesting. The specific silvicultural prescription would depend on site-specific conditions. The intent of habitat enhancement is to create the semi-open stand structure that the Indiana bat is believed to prefer for roosting and foraging. To provide for potential roost trees, habitat enhancement would be designed to retain snags and favor large trees with sloughing bark.

Salvage Activities
Salvage logging may occur where timber stands have been damaged or killed by natural forces such as insects, disease, wind, ice, or fire. Natural disturbances on the MNF typically are small and scattered, and usually do not reach a scale that would facilitate viable salvage sales. Therefore, salvage logging does not represent a substantial component of the total timber harvested in any given year. However, large-scale salvage could occur in the event of a landscape-scale disturbance. The amount of salvage is unpredictable due to the unpredictable nature of natural disturbances.

Timber Harvest
The MNF harvests timber to provide a diversity of forest age classes and to provide timber for local and regional wood-using industries. Commercial timber harvesting is concentrated in suitable timberlands in MPs 3.0 and 6.1, and to a lesser extent MP 4.1. Each of these MPs has desired conditions for age class diversity on suitable timberland. Combined across all suitable timberlands in MPs 3.0, 6.1, and 4.1, FPR objectives call for a total of 20,000 to 40,000 acres of even-aged regeneration harvesting in the next ten years. Approximately one-third as much thinning is expected over the next decade, or approximately 7,000 to 13,000 acres. Therefore, the total amount of harvesting on suitable timber lands for the next ten years is expected to be 27,000 to 53,000 acres. This harvesting is in addition to the harvesting for spruce restoration and Indiana bat habitat enhancement. Uneven-aged regeneration harvesting may occur, but is not expected to be extensive and is not included in the acreage objectives.

The even-aged harvesting methods typically used on the MNF include shelterwood, two-aged, clearcutting with reserve trees, and thinning. The seed tree method is an available option, but is not used often because most forest types on the MNF can be regenerated more efficiently through other methods. The shelterwood method harvests the mature trees in two or more removal cuts within 3 to 20 years after the initial cut. The two-aged method harvests most of the trees in the older age class to create a young age class. Harvest entries are usually scheduled 40 to 80 years apart to maintain two distinct age

classes within the stand. Both the two-aged method and the shelterwood method are preferred where advanced regeneration is lacking or absent. The clearcutting with reserves method harvests most of the trees within a stand in one removal. Typically some reserve trees are left to meet wildlife habitat or other resource needs. The thinning method is an intermediate cut that prepares a stand for a regeneration harvest. This method removes high risk, low quality, diseased, and over mature trees to increase the health, development, and growth of the residual trees in a stand. One to several intermediate cuts may be applied in a stand prior to the regeneration harvest.

Uneven-aged harvest methods include single tree selection and group selection. These methods are rarely used for timber management on the MNF. However, they may be used to achieve non-timber objectives (see descriptions of spruce restoration and Indiana bat habitat enhancement, above). The single tree selection method harvests individual trees, both large and small, favoring trees such as beech and sugar maple that are tolerant of the shade of the residual forest canopy. The group selection method removes all trees within a small area, generally at least ½ acre but typically no larger than 2 acres, within the larger forested stand. This method allows for the growth of some of the more shade intolerant trees species within the uneven-aged stand, but is not used where deer browse is a concern.

Timber harvest operations on the MNF may use ground-based yarding, helicopter yarding, cable yarding, or some combination of these methods. Ground-based yarding is the most economical and is used wherever soil and water concerns allow it. For ground-based yarding, skid trails (similar to low standard roads) are constructed into the stands to allow skidders to drag logs to landings, where they are then loaded on trucks. Helicopter yarding is used in sensitive areas, usually to reduce potential damage to soil and water. In this system, helicopters are used to transport logs to landings. Cable yarding is rarely used on the MNF, but is an available option.

This method involves dragging logs to the landings using cables. All yarding methods require system roads or temporary roads to allow transport of logs via truck from the landing to the state highway system.

In addition to timber harvesting, timber management also involves site preparation and timber stand improvement activities. These activities may include treating shrubs, vines, herbaceous vegetation, undesirable tree species, and suppressed or poor-form trees. Depending on site-specific silvicultural prescriptions, treatments may include using manual or mechanical cutting, herbicides, prescribed fire, or some combination of these methods. Planting tree seedlings is sometimes used to increase the component of a desired species within a stand. Fencing may also be used to protect areas with regenerating vegetation from excessive deer browsing.

Gypsy Moth Control

Forest policy concerning gypsy moth defoliation is to treat only those areas where defoliation effects would make achieving management objectives difficult. Typically this approach does not result in blanket treatment across the MNF. Future widespread

treatment would be proposed only if gypsy moth populations dramatically increased. Since 1991, only biological insecticides have been sprayed on MNF lands. These include Bt, a biological pesticide that kills moth and butterfly caterpillars in the order Lepidoptera, and Gypchek, a biological pesticide specific to gypsy moths. The last significant gypsy moth defoliation on the MNF lasted from 1990 through 1995.

Firewood Cutting
Annually, 400-500 firewood permits authorize removal of 800-1000 cords of firewood. Only dead and down trees may be cut for firewood. Firewood is usually hand-carried from cutting location to the vehicle. Most firewood is taken from within 150 feet of open roads throughout the MNF or from landing sites on closed timber sales.

Action Area
The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Areas within five miles of hibernacula are known as swarming zones or Indiana bat primary zones. Indiana bats use the area within five miles of their hibernacula for swarming, mating and foraging prior to entering hibernation. Males may also be present within these areas throughout the year. Activities on the MNF that are conducted within a five mile radius of a hibernaculum could affect the bats hibernating within those caves. Therefore, for the purposes of this BO, the action area for the Indiana bat includes the proclamation boundaries of the MNF, and any Indiana bat hibernacula located either within or outside of the MNF, that has at least a portion of the MNF proclamation boundary located within a five-mile radius (primary zone) of the cave. A total of 26 hibernacula, as listed in the BA, are included in the action area. Because running buffalo clover is a sedentary species that is not likely to be affected by activities conducted any distance away, the action area for running buffalo clover is restricted to areas where it located within the MNF's proclamation boundary.

RUNNING BUFFALO CLOVER

STATUS OF THE SPECIES
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 are known to 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, but not exclusively found in regions underlain with limestone or other calcareous bedrock. 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.

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 crosspollinated 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 natural 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. Investigations into the influences of white-tailed deer on running buffalo clover germination have shown that although deer are viable vectors for running buffalo clover seed, the rates of germination of ingested seeds are low (Ford *et al.* 2003).

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 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.

Rangewide Status of the Species

Extant populations of running buffalo clover are known from 120 populations in three ecoregions: 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 MNF 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 2005d). A-ranked populations are the largest (over 1,000 individuals) and occur in highly suitable habitat, while D-ranked populations are the smallest (less than 30 individuals) and may occur in somewhat marginal habitat (see Draft Revised Recovery Plan for full discussion of rankings).

Status of the Species in West Virginia

Bartgis (1985) rediscovered running buffalo clover in West Virginia in 1983 and 1984 in Webster and Fayette counties. Both of these populations occupy old river terraces of the New River and Back Fork of the Elk River, in a dirt road and at the edge of a lawn beside a gravel road, respectively. New interest in the status of this species developed among researchers, and in 1989 they acquired search images of the species by visiting populations in Kentucky and Ohio. Subsequent surveys on river terraces, at old historical home sites, and in cemeteries proved fruitless in West Virginia.

A small clump of plants was then discovered along an unpaved road on a mountain ridge in Randolph County. The soil at the population location was derived from limestone substrate. Surveys were launched throughout the mountainous portions of the state resulting in 29 documented populations. The West Virginia Natural Heritage Program has been monitoring running buffalo clover through an annual census of rooted crowns and flowering stems since 1989.

In West Virginia, running buffalo clover seems to prefer old logging roads, off-road vehicle trails, hawthorne thickets, grazed woodlands, jeep trails, railroad grades, game trails, and old fields succeeding to mesic woodlands. The larger occurrences exist within a matrix of mesophytic deciduous forest. All populations are associated with light to moderate disturbance such as occasional off-road-vehicle traffic, stream scour, grazing, or foot-traffic. Plants occur primarily in regions underlain by limestone. To date, extant populations are located in or near the Allegheny Mountains of central to eastern West Virginia: Barbour, Fayette, Pendleton, Preston, Pocahontas, Randolph, and Tucker counties. One additional population has been documented from Brooke County in the Central Low Plateau of the Northern Panhandle. There are currently 30 extant and three extirpated occurrences throughout the state.

An estimated 76,000 plants were seen in West Virginia in 2003, down from an estimated 77,800 seen in 1996. Among all populations in West Virginia in 2003, four appear to be increasing and six appear to be dramatically declining, whereas the rest have been fluctuating in numbers of rooted crowns over an eight to ten year period of monitoring. However, the Crouch Knob population, which is the largest population in the state, is only surveyed intermittently. A total of 34,936 plants were counted there during the most recent survey in 2004. The previous survey, conducted in 1996, documented 64,998

plants. Less than half of all populations are on federal or state land, and West Virginia has no legislated protection of plant species beyond the federal ESA, nor does it have a nature preserve system.

Rangewide Conservation Needs of the Species

To achieve the recovery goals established within the Recovery Plan, thirty-four viable populations should be protected and managed throughout a majority of the species geographic range. Populations are considered protected when there are permanent assurances that the habitat will be managed. Management objectives for running buffalo clover include 1) invasive species control, 2) reducing habitat succession, and 3) defining population regulation factors. Additional recovery objectives include 1) ensuring viability of protected populations, 2) maintaining genetic diversity and germplasm, and 3) promoting public understanding of the species (Service 2006).

Previous Biological Opinions

One previous BO was completed for the Forest Plan Revision on the Wayne National Forest (WNF) in Ohio. The Revised Forest Plan for that forest provides protection and habitat enhancement for running buffalo clover were it occurs now and in other locations of the WNF if it should be found there. The WNF is committed to maintaining viability of running buffalo clover on the Forest. Only one small population currently exists on the WNF, and the loss of this population was not anticipated. Thus, that BO did not anticipate any detectable reductions in reproduction, numbers or distribution of the species.

ENVIRONMENTAL BASELINE

Status of Species within the Action Area.

West Virginia Natural Heritage Program records (unpublished) show 14 recent element occurrences within the MNF proclamation boundary, many of which consist of numerous subpopulations. Most occurrences are on the Cheat Ranger District and the western part of the Greenbrier Ranger District. Based on these data, the species appears to occur in a substantial minority of the potential habitat. Eleven of the 14 occurrences are currently located on National Forest land. All of these eleven occurrences on MNF were surveyed in either 2004 or 2005. These surveys documented a total of 40,357 rooted crowns. Surveys at the three occurrences within the proclamation boundary but on private land documented an additional 119 plants in 2005. All three of these locations have had fluctuating numbers of rooted crowns. Two of these sites are subjected to camping and/or all-terrain-vehicle use. The fluctuations may be attributable to the varying degree of disturbance over time.

Occurrences of running buffalo clover within the Fernow Experimental Forest are subject to a regularly scheduled regime of controlled disturbance; as a result, long-term population trends are stable to increasing (Schuler 2006). Activities conducted on the Fernow Experimental Forest are addressed under a separate BO (Service 2005c) and will not be covered further here.

The WVDNR 2005 Section 6 report provides the results of annual running buffalo clover

monitoring and notes the conditions at each site on the MNF (WVDNR 2006). While numbers at some locations on the MNF are increasing, most have fluctuating numbers or show a decreasing trend. The report notes that management actions such as initiating minor disturbance regimes or creating selected openings in the canopy may be needed to improve habitat conditions at some locations on the MNF. The WVDNR report also notes that invasive species such as multiflora rose (*Rosa multiflora*), garlic mustard, Japanese stiltgrass, and wingstem (*Verbesina sp.*) threaten some locations and recommends that control measures be implemented.

Because most locations of running buffalo clover on the MNF are located in or near Forest Service roads, old logging roads, or trails, they receive some type of occasional disturbance. This can result in either positive effects or negative effects to the populations depending on the type, severity, and frequency of the disturbances. For example, beneficial effects may have occurred at some sites as a result of occasional horse traffic, and after a road was closed for two years following one year of minor vehicle disturbance. Conversely, negative effects occurred at one location when it was inadvertently graded when closing an old logging road for erosion control. Additionally, a logging road was built through another population in 1998. The area was subsequently logged and the population has since declined.

In addition, sites located on Forest Service roads may be used by private landowners to access their property. The activities of these landowners can negatively impact running buffalo clover populations. For example, between 1996 and 1997, the "A site" of the Upper John's Run sub-element occurrence was heavily impacted by plowing, scraping, and vehicular traffic by a private landowner. The population declined from an estimated 1000 rooted crowns in June 1995 to 232 rooted crowns in July of 1996, to 33 rooted crowns in June 1997 (WVDNR 1997). Currently, only 14 rooted crowns exist at this location (WVDNR 2006).

Conservation Needs of the Species within the Action Area

The Recovery Plan has determined that even small populations contain genotypes important to overall genetic diversity of the clover. Therefore, there is a need to protect and maintain running buffalo clover populations at all known occurrence areas. Inherent in this is the need to determine and implement appropriate disturbance regimes. Habitat for running buffalo clover must include filtered sunlight. This often means removal of competing vegetation (especially invasive plants) and selective tree removal to prevent overshading. However, disturbance regimes should be monitored and managed so that the level of disturbance does not cause negative population trends. In order to make sure these goals are achieved, the MNF should also continue to monitor known populations and conduct surveys to locate additional populations. In order to work towards long-term permanent recovery of the species, the MNF should consider contributing towards seed storage efforts from selected locations, and developing management agreements that would remain in place if the species was delisted. Management agreements could be developed with the Service, WVDNR, and/or other state or private organizations.

EFFECTS OF THE ACTION

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

The standards and guidelines that have been incorporated into the FPR to avoid and minimize effects are provided in Appendix A. It is important to emphasize that this effects analysis is predicated on the fact that all standards and guidelines will be fully implemented. If not, this analysis may no longer be valid and formal consultation may need to be reintiatied.

Effects of the Forest Plan Goals on Running Buffalo Clover

The MNF supports the considerable majority of running buffalo clover that is known to occur throughout the state. In addition, out of the 10 known A-ranked populations throughout the species' range, three occur within MNF property. The FPR specifies that the overall desired condition for threatened and endangered species is to "maintain or enhance populations consistent with established and approved Recovery Plans" and that "effects from Forest programs or activities are at levels that do not threaten the persistence of threatened and endangered species populations." The FPR was also updated to address the emerging concern of non-native invasive plant species, which have been identified as a major threat to running buffalo clover populations. Measures to 1) control existing areas of non-native invasives; 2) programmatically reduce the spread of these species; and 3) ensure that project-level actions do not contribute to the problem, have been developed. Implementation of this guidance should substantially reduce existing threats to running buffalo clover populations on the MNF.

The fact that a substantial number of running buffalo clover populations are contained within a federally-owned area that is protected and managed for running buffalo clover significantly benefits the species. The MNF FPR has the potential to contribute to the long-term recovery of the species on a regional as well as range-wide level. However, there are substantial challenges associated with achieving the MNF's desired conditions in relation to running buffalo clover. As noted throughout this BO, running buffalo clover is a disturbance dependant species. There is some research available that provides direction on how running buffalo clover responds to specific frequencies and types of disturbance. Caution must be used when extrapolating the conclusions of those studies to other types of activities that may be conducted at other locations. Similar management actions may have different results depending on site-specific population levels and habitat conditions. Furthermore, some disturbance regimes that have demonstrated long-term beneficial effects to running buffalo clover will cause an initial decrease in population numbers (Madarish and Schuler 2002). The challenge is to provide enough disturbance to allow running buffalo clover populations to thrive, while not allowing so much disturbance that population numbers are significantly reduced or eliminated. Routine monitoring of populations using methods described in the recovery plan, following management activities will be required to distinguish between these two alternative results. These challenges make it extremely difficult to guarantee that

adverse effects to populations will not occur as a result of implementing good faith management efforts. However, because this is a disturbance *dependant* species, failing to implement management efforts could potentially result in more significant population declines. In order to address this need, the FPR proposes to develop a conservation plan that incorporates measures to protect and/or enhance running buffalo clover populations to the extent practicable; and to develop programmatic NEPA documentation that allows implementation of minor disturbance at running buffalo clover sites in order to maintain or enhance known or discovered populations (TE 68). The FPR also proposes to coordinate with the Service, WVDNR, and/or other state or private organizations to facilitate seed collection and storage efforts for running buffalo clover (TE 69). This will ensure that genetic diversity of the species is preserved, as has been recommended in the Recovery Plan.

Continued population monitoring, coupled with the development of a overall running buffalo clover conservation plan, pro-active seed storage efforts, and increased invasive species management efforts conducted under the direction of the FPR, should result in an overall net benefit to the running buffalo clover populations on the MNF.

Effects of the Specific Management Actions on Running Buffalo Clover
Due to the tendency of running buffalo clover to be located in habitats such as forest roads and trails, the MNF has acknowledged that it may not be possible to completely avoid adverse impacts to running buffalo clover when implementing management actions. In addition, as noted above, implementation of disturbance regimes intended to benefit the species, may on occasion result in short-term adverse effects to the species.

Many types of management actions covered in the FPR have the potential to benefit the species if they are planned and executed with consideration of the presence and management needs of the species. However, if these activities are conducted in running buffalo clover habitat without awareness that the species is there, or if they are not carefully implemented, these actions could be detrimental to populations. In order to address this issue, the FPR includes a standard so that the MNF will to the extent practicable, avoid implementing activities in areas that support running buffalo clover that have the potential to eliminate or have long-term detrimental effects to populations (TE71). The FPR also includes broad guidance that within watershed planning units, the MNF will identify threatened and endangered species habitat. The BA repeatedly states that projects would be preceded by site-specific surveys for threatened and endangered plants. The search period for running buffalo clover is June to July, with some plants surviving in post-flowering stage through mid-August. The FPR specifies that surveys will be conducted during appropriate time periods and that these surveys should be conducted by personnel trained specifically to identify running buffalo clover (TE 75). Appropriately timed pre-project surveys and planning are key to avoiding and minimizing adverse effects to the maximum extent practicable.

Procedures also need to be in place to carry planning-level decisions through to implementation. Individuals who plan proposed activities are most likely not the same individuals who will carry out the action. For example, conditions set in place to protect

running buffalo clover during timbering operations would need to be implemented and/or adhered to by the logging company. In order to address this issue, the FPR includes measures to ensure that managers, contractors, permittees, or cooperators are informed about avoiding or limiting management activities in the immediate vicinity of running buffalo clover populations within the project area. Projects will then be monitored to ensure that populations are not detrimentally affected over the long term (TE 77).

Road Related Activities

Because running buffalo clover tends to occur in forest roads and trails, road related activities have a high chance of affecting the species. Road construction involves clearing, grading, potential filling, and soil compaction. Placement of fill and gravel, or paving areas containing running buffalo clover could permanently eliminate populations. However, these activities can generally be designed so that running buffalo clover habitat is avoided (TE 71). Depending on the activities conducted, road reconstruction and maintenance could be less invasive than road construction. Maintenance mowing will be timed to benefit the species by reducing competition from other plants while avoiding periods of flowering and seed set (TE 78). Limited grading or scraping should not be expected to cause permanent reductions in populations if it was planned in accordance with species needs. In fact, light ground scarification and redistribution of surface materials could enhance plant growth and spread plant material into new areas that may be suitable for colonization (Madarish and Schuler 2002). Conversely, conducting these activities in wet conditions would increase compaction of the soil, restricting future seed germination. Removing large amounts of the top soil would remove the source of seeds and plants that could recolonize the site after disturbance and leave substrates that were unsuitable to support the species. Reconstructing roads may be associated with planned changes or increases in road use, or with previous heavy use. Increasing road use after ground disturbance may not allow enough recovery time for the plants to re-establish in the area.

Removal and placement of fill, or regrading areas during the process of road decommissioning could remove potential and existing running buffalo clover habitat. Tilling roads to accelerate vegetative growth would likely have short-term adverse effects, and could increase competition from other species. Alternatively tilling could spread running buffalo clover to adjacent areas. Movement of equipment to and from construction areas could crush running buffalo clover plants, or could result in enhancement of plant growth depending on the extent, duration, type of disturbance, and how wet the road surface is at the time. Activities associated with decommissioning road will vary along the length of the road and are developed based on site-specific conditions. Activities within areas containing running buffalo clover could be avoided or limited as needed. In addition, because road related activities generally have a limited duration, in most cases impacts would be short-term. Pre-project surveys would allow areas of running buffalo clover habitat to be identified and considered during project planning. Implementation of the measures included in the FPR, as listed above, will provide the mechansim to ensure that measures to protect and/or enhance running buffalo clover populations are incorporated during site-specific planning. Then, prior to initiating project activities, running buffalo clover locations will be flagged so that construction

and maintenance crews are aware of running buffalo clover locations (TE 76).

Private landowners may seek access to their properties through roads on MNF lands. Occasional or limited access associated with a landowner driving to their property would generally not be expected to significantly affect running buffalo clover populations. However, if the landowner conducts maintenance activities on the road (grading, gravel, snowplowing, widening, installing drainage control structures) or if heavy construction equipment will be using the road, running buffalo clover populations could be reduced or eliminated. During private landowner access issues, the MNF will work cooperatively with the landowner and the Service to minimize impacts to running buffalo clover. They will also inform the landowner of the presence of endangered species and the recommended actions to avoid impacts, and where possible, will add conditions to Special Use Permits or develop written management agreements with the landowner in order to protect the species (TE 79). Special use permits occurring within occupied running buffalo clover habitat may be authorized only if they are compatible with population maintenance or recovery (TE 70). If necessary, the MNF will also implement remedial avoidance measures, such as constructing alternative access areas that will avoid impacts to running buffalo clover, creating patches of potentially suitable habitat in adjacent areas, and/or relocating plants or seeds (TE 79).

Timber Harvest

Due to the large scale of timber harvest activities, and the fact that running buffalo clover tends to occur on old forest roads and skid trails that could be used to access proposed timber areas, these types of projects have a high chance of affecting running buffalo clover. The range of potential impacts, as well as potential avoidance and minimization measures, associated with using roads that support running buffalo clover to access timber harvest areas are similar to those discussed under road related activities. The effects associated with timber harvesting itself, will vary depending on the type of harvesting proposed and the extent and location of the running buffalo clover population. Because running buffalo clover needs filtered sunlight, creating occasional openings in the overstory may benefit the species. Research on the Fernow Experimental Forest in Parsons, West Virginia, demonstrated that disturbances associated with timber harvest operations, such as cutting trees and using skid roads that contained running buffalo clover, caused near-term declines followed by long-term population increases (Madarish and Schuler 2002; Schuler, personal communication). However, on the Fernow Experimental Forest skid roads are not surfaced, or seeded following the activities. These roads are only used about once per decade for one to several weeks. Disturbance rates and conditions for projects conducted on the MNF may or may not be similar. Based on the Fernow data, running buffalo clover populations need a few years to successfully rebound from the more extensive disturbances. If roads constructed for timbering activities remain open post-construction, additional disturbances from recreational traffic may restrict the ability of running buffalo clover to reestablish populations in these areas. In addition, large scale clearing of the overstory may alter microhabitat conditions on the ground so that the area becomes less suitable to support running buffalo clover. It may also stimulate increased understory and subcanopy growth which would in turn restrict the growth of running buffalo clover. Leaving slash or piling

slash in running buffalo clover habitat would most likely restrict plant growth and reduce populations. As a result of these considerations, timber harvesting activities could have a detrimental effect to running buffalo clover populations. For example, running buffalo clover populations near Lower John's Run have declined after timbering activities were conducted within the site during 1998 (WVDNR 2005). Also, timbering activities near running buffalo clover populations at Upper Rock Camp Run were conducted by the MNF in 1994. Populations at that site have fluctuated from 360 rooted crowns in 1996 to no rooted crowns being documented in 2005. When the MNF plans timbering activities in areas of potential running buffalo clover habitat, conservations measures as described for road related activities should be implemented. The FPR includes measures to avoid and minimize the potential for these impacts including stating that: piling slash around running buffalo clover populations should be avoided (TE 80); where possible, created or disturbed roads supporting running buffalo clover should be closed to additional traffic after the project is completed (TE 81); and that seeding/mulching plans should be coordinated to restrict competition with running buffalo clover (TE 81). The use of potentially invasive species, particularly non-native invasive species known to compete with running buffalo clover such as European white clover and red clover will also be avoided (TE 81).

Mineral Operations

As noted in the Project Description section, natural gas development is expected to be the most common type of mineral operation on the MNF. Development would include construction of roads and well sites, and clearing/ditching areas for pipelines. The range of potential impacts as well as potential avoidance and minimization measures associated with mineral activities are similar to those described under road related activities. Constructing new roads, well sites, and ditching for pipelines in running buffalo clover habitat would potentially eliminate populations within the affected area and should generally be avoided (TE 71).

The MNF has limited control over development of private mineral rights within MNF boundaries. In these types of cases, it may be possible to restrict or modify proposed activities as a result of pro-active coordination and outreach, however the MNF does not have the legal ability to strictly prohibit these activities. The strategy for addressing development of private mineral rights should be similar to that for private landowner access described under road related activities above (TE 79).

Wildlife Habitat Management

As detailed in the Project Description section, there are a number of types of activities that fall under the category of wildlife habitat management, including creating wildlife openings, spruce restoration, and Indiana bat habitat enhancement. As noted in the BA, most wildlife openings are less than 10 acres in size, therefore disturbance associated with constructing and maintaining these features would likely be limited in scale. Activities involved in creating these clearings, such as ripping the soil to reduce compaction, mowing, and limited clearing have the potential to benefit the species, if these activities are planned with the awareness that the species is there. There are also opportunities to enhance running buffalo clover habitat by applying techniques similar to

those used for more traditional wildlife habitat management. Consistent with the disturbance dependant nature of running buffalo clover, these activities may have short-term negative effects. Over the long-term, implementing beneficial management measures has the potential to substantially increase running buffalo populations on the MNF. The FPR provides for this by stating "If monitoring shows a declining population trend or increased threats at an occurrence, (the MNF will) implement habitat management measures such as creating selective canopy openings, initiating controlled levels of disturbance, controlling invasive species, or creating patches of potentially suitable habitat in adjacent areas" (TE 73). The MNF will also coordinate these measures with the Service and WVDNR prior to implementation, and include pre and post implementation site evaluations. As stated under timber harvest, the use of potentially invasive species, particularly non-native invasive species known to compete with running buffalo clover such as European white clover and red clover, will be avoided (TE 81).

Since running buffalo clover habitat tends not to occur in high elevation spruce forests, spruce restoration would generally not affect running buffalo clover unless access roads needed to implement the activity crossed running buffalo clover habitat. This is addressed under the road related activities discussion. Effects associated with Indiana bat habitat enhancements are consistent with those discussed under the timber harvest section.

Prescribed Fire

Implementation of prescribed fire and creation of fire breaks may create more suitable habitat for running buffalo clover throughout the MNF by reducing understory growth and creating the filtered sunlight conditions that running buffalo clover appears to need. Implementation of these activities in areas adjacent to running buffalo clover populations may allow populations to expand. However, implementation of these activities in areas known to support running buffalo clover could eliminate populations. The Recovery Plan does not recommend burning as an effective management strategy. Because much of the plant structure is above ground, fire would most likely kill plants growing on the site. Creating fire breaks in running buffalo clover habitat would dig up the substrate supporting the species, leaving potentially unsuitable substrate materials behind. In addition, topsoil containing the plant material and seed source could be submerged in piles that would restrict future plant growth and recolonization of the site. These potential for these adverse effects has been minimized by the inclusion of a standard in the FPR specifying that prescribed burns and the construction of fire breaks should not occur in occupied habitat, and that if prescribed fire must be used in running buffalo clover habitat, populations should be protected by wetting or removing fuel from the immediate area (TE 72).

Range Activities

Currently, there are no known populations of running buffalo clover within existing range allotments. Because development of new range allotments is expected to be limited, implementation of range activities in accordance with the FPR would not affect running buffalo clover. Surveys for running buffalo clover should be conducted prior to developing any new allotments. If populations are found, allowing limited grazing may

benefit the populations. However, high levels of grazing may reduce populations. Running buffalo clover does poorly in full sunlight, so grazing allotments that are "savannah-like" but not open might be acceptable to the species, while open grazing areas would not be appropriate habitat. In order to address this issue the FPR has incorporated a measure so that if running buffalo clover populations are found within active grazing allotments, populations will be monitored to determine any long-term effects from grazing. If populations are being adversely affected by grazing activities, the allotment management plan will be adjusted appropriately to reduce or eliminate effects (TE 82).

Recreation Activities
In most cases, implementation of Recreation Activities projects in accordance with the FPR is not likely to adversely affect running buffalo clover. Facility and trail maintenance would generally not alter existing habitat. Maintenance mowing could be timed to benefit the species by reducing competition from other plants will avoiding periods of flowering and seed set (See Ohio Field Office Management Recommendations for running buffalo clover). Surveys would allow new trail or facility construction to avoid running buffalo clover habitat. However, recreational truck or all-terrain-vehicle use on forest roads and trails could adversely affect running buffalo clover if roads were heavily or inappropriately used. The FPR allows for all-terrain-vehicle use on designated trails within specific Management Prescriptions. Currently the MNF does not have any designated routes open to ATV use, although unauthorized use occurs in scattered locations. Monitoring by the WVDNR has noted at least one running buffalo clover location on the MNF where heavy recreational truck or unauthorized ATV use may be having negative effects. Due to the limited amount of "authorized" areas for ATV use in and around the MNF, any trail or road opened for ATV use would be expected to receive heavy use to a degree that would be incompatible with maintaining running buffalo clover populations. Prior to changing access or use on roads or trails known to support running buffalo clover, the MNF will estimate potential frequency, timing, and severity of use and develop appropriate protection measures in cooperation with USFWS and WVDNR (TE 74). Gating or restricting access to open roads or trails will be implemented when monitoring of a running buffalo clover population shows signs of excessive disturbance (TE 83), and the MNF will also promptly investigate and address any reports of excessive or unauthorized disturbance to running buffalo clover (TE 84).

Other Projects
Implementation of projects related to Watershed and Aquatic Restoration, Gypsy Moth Control, Firewood Cutting, and Salvage Activities in accordance with the proposed plan are not likely to adversely affect running buffalo clover. These types of activities are either not likely to occur in habitats that support running buffalo clover, or the activities conducted within running buffalo clover habitat would be so limited that they would not be expected to result in any adverse effects. Additional supporting rationale for these determinations is provided in the BA and is incorporated here by reference.

Summary
Implementation of timber harvests, mineral operations, recreational activities, prescribed

fire, and road related activities under the FPR has the potential to adversely affect running buffalo clover. While, in some cases projects have the potential to adversely affect the species, other projects have the potential to benefit the species if they are planned appropriately. Because the species is disturbance dependant, in some cases the failure to implement actions may result in an adverse effect. The FPR has incorporated measures to minimize the potential for long-term adverse effects, as well as to provide for opportunities to implement projects that may have long-term beneficial effects. The Service concludes that all populations on the MNF will to be maintained if the MNF conducts the following measures as proposed:

1. Implement the "Threatened, Endangered, and Proposed Species" section of the Forest Plan Revision as proposed in the attached Appendix A;

2. Continue to conduct or support annual monitoring of known populations, following guidelines outlined in the recovery plan; and

3. Conduct surveys to determine whether the species is present and delineate the extent of the population, prior to implementing projects in potential running buffalo clover habitat,

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, road construction and maintenance, residential and commercial development, and timber harvest. It is unknown how many acres of suitable habitat for running buffalo clover could be altered or lost by these future actions. As noted in the baseline section, there are three known populations of running buffalo clover that are within the proclamation boundary but are currently on private land. The actions listed above could affect these populations and would have varying degrees of effects on running buffalo clover from no effect to adverse effects. Permanent conversion of forested habitat to unsuitable habitat through residential or commercial development would have the greatest potential impacts to running buffalo clover. Other activities would have the same general effects as MNF actions, providing they are implemented with similar methods. Overall, we anticipate that suitable habitat for running buffalo clover within the action area will increase (due to MNF habitat management) or remain at similar levels to what currently exists over the next 10 years.

CONCLUSION

The FPR has incorporated broad goals to maintain and enhance threatened and endangered species populations, and to provide for persistence of populations when planning forest activities to be implemented under the FPR. Measures to reduce and

control the spread of non-native invasive species that threaten running buffalo clover have also been provided. These broad goals provide the basis for an overall beneficial effect to running buffalo clover as a result of MNF management. At the project-specific level, there is the potential to either enhance or reduce populations of running buffalo clover as a result of projects potentially implemented under the FPR. The FPR has incorporated a substantial number of measures that will guide the planning and implementation of site-specific actions on the MNF, so that the potential for adverse impacts has been minimized. These measures, combined with pre-project surveys and continued population monitoring should ensure that all populations within the MNF can be maintained.

After reviewing the current status of running buffalo clover, the environmental baseline for the action area, the effects of the proposed FPR and the cumulative effects, it is the Service's biological opinion that the FPR, 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.

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 is provided to the extent that the ESA 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.

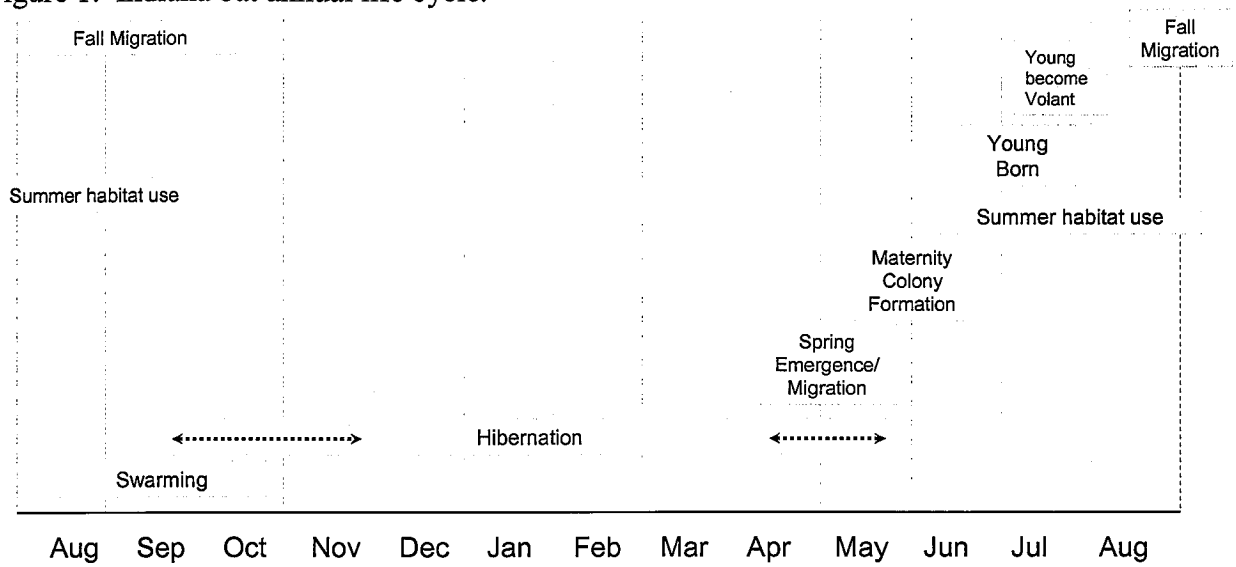
INDIANA BAT

STATUS OF THE SPECIES

General Biology and Life History of the Species

The Indiana bat is a migratory species ranging throughout the eastern U.S., from Oklahoma, Iowa, and Wisconsin, east to Vermont and south to northwestern Florida (Hall 1962, Romme et al. 1995). The Indiana bat's annual life cycle consists of hibernation, spring migration, birthing (parturition), raising of young by females (lactation), fall migration, mating (swarming), and hibernation. Each of these critical stages in this complex cycle is integral to species survival and recovery. The following discussion provides a general overview of the life cycle of the Indiana bat, and the "Life Stages" section provides additional information on this subject. An outline of the Indiana bats annual life cycle is provided in Figure 1.

Figure 1. Indiana bat annual life cycle.



Fall swarming and mating

Indiana bats return to their hibernacula in preparation for mating and hibernation as early as late July (Brack, 1983), increasing in numbers through August and peaking in September and early October (Cope and Humphrey, 1977; Hawkins and Brack, 2004; Rodrigue, 2004; Hawkins et al., 2005). Males may remain active through mid-October or later. Upon arrival at a hibernaculum, Indiana bats "swarm," a behavior in which "large numbers of bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in the caves during the day" (Cope and Humphrey, 1977). Swarming continues for several weeks during which mating occurs, generally in the latter part of the period. Adult females store sperm from autumn copulations throughout winter and fertilization is delayed until soon after spring emergence from hibernation (Guthrie, 1933).

Male Indiana bats may make several stops at multiple caves during the fall swarming period and remain active over a longer period of time at cave entrances than do females. Males are most likely to mate with the females as the latter arrive (LaVal and LaVal 1980). Nightly activity may be correlated with temperature and precipitation, as bats and their prey become constrained by falling temperatures, rain events and earlier sunset as autumn progresses (V. Brack, Environmental Solutions and Innovations, Inc., personal communication 2005). Swarming activity in West Virginia has been documented in early October with little activity after the middle of October and no activity after November 15 (Rodrigue, 2004).

Indiana bats must store sufficient fat to support metabolic processes until spring. Fat supplies for male Indiana bats are replenished as they forage in the vicinity of the hibernaculum during the fall swarming period (Brack, personal communication 2005). Female Indiana bats generally arrive in condition ready to hibernate. They spend little time foraging near the hibernaculum since they enter hibernation soon after mating (R. Clawson, Missouri Department of Conservation, personal communication 2005). Occasionally, bats will leave the vicinity of the hibernaculum or re-enter the

hibernaculum on one or more occasions (Gumbert, 2001). A possible explanation for male bat movements away from the fall swarming area may be the need for these males to find prime foraging habitat to replenish their energy reserves. Conversely, these males could be traveling to other nearby hibernacula to mate (Brack, personal communication 2005).

During autumn, when Indiana bats swarm and mate at hibernacula, male bats roost in trees nearby during the day and fly to the cave or mine at night. In Kentucky, Kiser and Elliott (1996) found male Indiana bats roosting primarily in dead trees on upper slopes and ridgetops, within 1.5 mi of their hibernaculum. In West Virginia, some male Indiana bats roosted within 3.5 mi of their cave, in trees near ridgetops, and often switched roost trees from day to day (C. Stihler, West Virginia Division of Natural Resources, pers. observ., October, 1996). One Indiana bat in Michigan roosted 1.4 mi away from the hibernaculum during fall swarming, and another chose trees at a distance of 2.1 mi (Kurta, 2000). Gumbert (2001) found an average of 1.2 mi between roost trees and the hibernaculum for 20 radio-tagged Indiana bats. Brack (personal communication, 2005) found a range of 0.18 to 0.87 mi between roost trees and a hibernaculum in Virginia, although he did not follow bats if they left the "project area" and the range may actually be greater.

Hibernation

Indiana bats tend to hibernate in the same cave or mine at which they swarm (LaVal et al., 1976; C. Stihler, pers. observation, October, 1996), although swarming has been observed at hibernacula other than those in which the bats hibernated (Cope and Humphrey, 1977). It is generally accepted that Indiana bats, especially females, are philopatric, that is, they return annually to the same hibernaculum (LaVal and LaVal, 1980). Most bats of both sexes enter hibernation by the end of November (mid-October in northern areas—Kurta et al., 1997). Indiana bats hibernate in large, dense clusters, ranging from 300 bats per square foot to 484 bats per square foot (Clawson et al., 1980; Hicks and Novak, 2002).

Caves must posses certain characteristics to be suitable as Indiana bat hibernacula. Raesly and Gates (1986) compared microhabitat and microclimate variables between occupied and unoccupied caves and mines. They found that Indiana bat hibernacula tended to have larger openings, more cave passage length, and higher ceilings compared to unoccupied sites. In addition, occupied hibernacula have noticeable airflow (Henshaw 1965). Once Indiana bats enter hibernation, they require specific roost sites in caves or mines that reach appropriate temperatures (Tuttle and Taylor 1994). Indiana bats choose roosts with a low risk of freezing. Stable low temperatures allow the bats to maintain a low metabolic rate and conserve fat reserves until they are ready to emerge in spring; thus, Indiana bats select roosts within hibernacula that best meet their needs for cool temperatures. Indiana bat hibernacula usually host other species of bats. Indiana bats are occasionally observed clustered with or adjacent to other species, including gray bats (*M. grisecens*), Virginia big-eared bats (*Plecotus townsendii vriginianus*), little brown bats and northern long-eared Myotis (Myers 1964, LaVal and LaVal 1980, Kurta and Teramino 1994).

Spring Emergence and Migration
Female Indiana bats emerge first from hibernation in late March or early April, followed by the males (Hall, 1962). The timing of annual emergence may vary across their range, depending on latitude and annual weather conditions; however, most Indiana bats have left their hibernacula by late April (Hall, 1962). Exit counts from several hibernacula in southern Pennsylvania and Big Springs Cave in Tucker County, West Virginia, suggest that peak emergence from hibernation is mid-April for these two areas (Butchkoski and Hassinger, 2002; Rodrigue, 2004). Spring surveys of the interior of Barton Hill Mine in New York documented substantial numbers of Indiana bats through April and into mid-May, however, by the end of May only one-tenth of the population remained (Hicks, in litt., 2005).

In spring when fat reserves and food supplies are low, migration is probably hazardous (Humphrey et al., 1977; Tuttle and Stevenson, 1977, Britzke et al., in press). Consequently, mortality may be high in early spring, following emergence. Perhaps this is one reason why many males do not migrate far from the hibernacula (Gardner and Cook, 2002; Whitaker and Brack, 2002). Some males remain within the vicinity of their hibernacula, where they roost and forage in open forests and agricultural lands and other openings (Brack, personal communication 2005). Movements of 2.5–10 mi (4–16 km) by male Indiana bats were reported in Kentucky, Missouri, and Virginia (Hobson and Holland, 1995; Rommé et al., 2002). However, other males leave the area entirely upon emergence in spring and have been captured throughout various summer habitats.

Indiana bat females can migrate hundreds of miles from their hibernacula. Kurta and Murray (2002) documented female Indiana bats migrating over 200 miles from their hibernacula to their maternity area and Gardner and Cook (2002) documented migratory distances in excess of 300 miles for females traveling from hibernacula to maternity areas. Conversely, recent radio-telemetry studies of spring emerging Indiana bats (primarily females) from three New York hibernacula found that these bats migrated less than 40 miles to their summer habitat (Hicks, unpublished data; S. von Oettingen, USFWS, unpublished data), indicating that migratory distance may not be consistent across the species range.

Female Indiana bats may leave immediately for summer habitat or linger for a few days near the hibernaculum. Once enroute to their summer destination, females have been documented to move quickly across the landscape. One female released in southeastern New York was documented to move 35 miles in approximately 85 minutes (Sanders et al., 2001). Radio-telemetry studies in New York documented females flying between 10 to 30 miles after release from their hibernaculum, arriving at their maternity sites within one night (Sanders et al., 2001; Hicks, 2004) and in some cases reaching their summer destination within hours of the release (C. Herzog, New York Department of Environmental Conservation, personal communication, 2005). One radio-tagged bat released from Canoe Creek Mine in Pennsylvania traveled approximately 60 miles in one evening (C. Butchkoski, Pennsylvania Game Commission, per. comm., May, 2005).

Little information is available to determine habitat use and needs for Indiana bats during

migration, although recent spring emergence telemetry studies in New York and Pennsylvania are beginning to document migratory routes in the Northeast (Butchkoski personal communication, 2005; J. Chenger, Bat Conservation and Management, personal communication, April, 2005; Hicks, personal communication, 2005). In the core of their range, most pregnant females migrate north for the summer (Gardner and Cook, 2002). In the northeastern part of their range, Indiana bats migrate in all directions to summer habitat. In Watertown, New York, Indiana bats migrated short distances (less than 10.6 mi or 17 km) north, west and south of their hibernaculum (M. Clark, New York Dept. of Environmental Conservation, personal communication, 2005). In the Lake Champlain Valley of New York and Vermont, female Indiana bats migrated east and southeast of their hibernaculum (Hicks, 2004).

Summer Life History and Behavior

Upon arriving at their summer habitat, female Indiana bats form colonies with primary and alternate roosts trees, give birth to young, raise pups until they fly and are independent, forage intensively to restore depleted fat reserves and depart in late summer and fall to migrate to their hibernacula to mate and eventually hibernate. Less is known about the male migration pattern; males may summer near the hibernacula (Whitaker and Brack, 2002) or disperse throughout the range. Males roost individually or in small numbers in the same types of trees and in the same areas as females. Non-reproductive females may also roost individually or in small numbers. Far less is known about the summer habits of males and non-reproductive females; therefore, the following section is primarily focused on summer life history aspects of reproductive females.

Reproductive females arrive at their summer habitats as early as mid-April in Illinois, New York and Vermont (Gardner et al., 1991a; Britzke, 2003; Hicks, 2004). During this early spring period, a number of roosts, including small cavities, may be used temporarily. Humphrey et al. (1977) reported that Indiana bats first appeared at their maternity roost sites in early May in Indiana, with substantial numbers arriving in mid-May. Indiana bats from hibernacula in southern Indiana and Kentucky enter southern Michigan as early as late April, although most do not arrive until the middle or end of May (Kurta and Rice, 2002). Most Indiana bats from hibernacula in New York fly directly to their summer range in Vermont and southeastern New York beginning mid-April (Britzke, 2003; Hicks, 2003).

Colony Formation

As the summer season progresses, female Indiana bats begin to congregate and form colonies. A single Indiana bat maternity colony can vary greatly in size and colony members may be dispersed among various roosts at any given time (Kurta, in press). While most of the documented maternity colonies contained 100 or fewer adult bats (Harvey, 2002), as many as 384 bats have been reported emerging from one maternity roost tree in Indiana (Lori Pruitt, USFWS, personal communication, 2004). Recent counts at well-studied colonies (with at least three years of data) in Indiana and Vermont resulted in maximum emergence counts of 104 and 270 adult females, respectively (Indianapolis Airport Authority 2003; K. Watrous, University of Vermont, unpublished data, 2005). Whitaker and Brack (2002) indicated that average maternity colony size in

Indiana was approximately 80 adult bats. The mean maximum emergence count after young became volant at 12 study areas was approximately 119 bats, indicating 60-70 adults in a primary roost at any given time (Kurta, in press).

Barclay and Kurta (2004) suggested four potential explanations for the establishment of maternity colonies in the summer: (1) roosts are limited; (2) foraging efficiency – members of a colony communicate regarding good foraging areas; (3) anti-predator mechanism; and (4) thermoregulation. Although there are probably many advantages to colonial roosting, possibly the most important factor for Indiana bats is thermoregulation (Humphrey and Cope, 1977; Kurta et al., 1996). This theory is supported by the fact that pups and females in late pregnancy are poor thermoregulators (Speakman and Thomas, 2003), and pre- and postnatal growth is controlled by the rate of metabolism and body temperature (Racey, 1982). Without clustering together, the strict thermal conditions needed to support prenatal and postnatal growth would not be available. Thus, colonial roosting is a life history strategy adopted by Indiana bats (like many other temperate zone bats) to improve their reproductive success (Barclay and Harder, 2003).

Maternity Roosts

Indiana bat maternity roosts can be described as "primary" or "alternate" based upon the proportion of bats in a colony consistently occupying the roost site (Kurta et al., 1996, 2002; Callahan et al., 1997). Maternity colonies typically use 10–20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (Callahan, 1993; Callahan et al., 1997). Before the young are volant, the composition of a colony at a primary roost is fluid, as individual bats leave and return (Barclay and Kurta, personal communication, 2005). Kurta et al. (2002) observed that certain maternity roost trees were occupied by a "quasi-stable number of Indiana bats for days or weeks" at a time. During their observations of these roost trees, individuals (based on radio-telemetry data) were found to move consistently into and out of the trees.

Alternate roosts are used by individuals or a small number of bats and may be used intermittently throughout the summer or used on only one or a few days. Most roost trees (except live trees) eventually become unusable by losing bark, falling over, or through competition with other animal. Typically these events occur suddenly and without warning (Gardner et al., 1991a; Kurta and Foster, 1995; Belwood, 2002). The use of alternate roosts may be a way of discovering new primary roosts since Indiana bats must maintain an awareness of suitable replacements in case of an emergency (Kurta et al., 1996, 2002). Numerous studies documenting roost trees used by individuals in a colony identified a range of alternate roosts. For example, based on Callahan's (1993) primary roost definition, Watrous (unpublished data, 2005) documented 12, nine, and 14 alternate roost trees for three different colonies in the Lake Champlain Valley of Vermont and New York.

Kurta (in press) postulates that Indiana bats have a fission-fusion society as demonstrated by frequent roost changing. Barclay and Kurta (personal communication, 2005) further explain "that in this type of a society, members frequently coalesce to form a group (fusion), but composition of that group is in perpetual flux, with individuals frequently

departing to be solitary or to form smaller groups (fission) for a variable time before returning to the main unit." It may be plausible that some bats select individuals with whom to roost and avoid roosting with others (Barclay and Kurta, personal communication, 2005). Although many members of a colony may reside in one tree at any one time, other members roost elsewhere as solitary individuals or in small subgroups of fluctuating composition. Such a fission-fusion society has been suggested for other species of forest bats, as well (Kerth and König, 1999; O'Donnell, 2000; Kurta et al., 2002; Willis and Brigham, 2004).

On average, Indiana bats switch roosts every 2 to 3 days although the reproductive condition of the female, the roost type and time of year will affect switching behavior (Kurta et al. 2002; Kurta in press). Lactating females may change roosts less often than pregnant or post-lactating females. Bats roosting under exfoliating bark may change more often than bats roosting in crevices (Kurta et al., 1996; Gumbert et al., 2002; Carter, 2003; Kurta, in press). Roost switching occurs less often in the spring, most likely due to colder night temperatures that may induce extended torpor (Gumbert et al., 2002; Brizke et al., in press).

Roost Tree Selection

Tree species does not appear to be an important factor in roost site selection. Tree structure, specifically the availability of exfoliating bark with roost space underneath, is a critical characteristic for roost trees. A majority of bat roosts have been located in dead or dying trees, although some roost sites have been in living trees. Indiana bat use of snags appears to be influenced by bark characteristics. The ability of a tree species to produce exfoliating bark probably influences Indiana bat use of that tree (Britzke et al. 2003, Callahan et al. 1997).

Maternity colonies are rarely found in tree cavities, and most primary maternity roosts have been located under exfoliating bark. However, studies from Michigan and Missouri that have compared the amount of exfoliating bark and Indiana bat use, and found snags with more exfoliating bark may not be used more than snags with little exfoliating bark (Kurta et al. 1996, Callahan et al. 1997). Indiana bats may pick maternity roosts with high solar exposure to increase the roost temperature, which may decrease the fetal development time and speed juvenile growth (Callahan et al. 1997). However, because males are not associated with maternity colonies and the need for high roosting temperatures (Callahan et al. 1997), they may seek cooler roosts to reduce their physiological expenditures. Callahan et al. (1997) considered roosts to be either open (exposed to solar radiation) or interior (>50% canopy cover) and found that all primary roosts were in open snags. Roost height may vary with canopy cover in order to maintain a relatively constant level of solar exposure (Gardner et al. 1991b).

Most primary roosts are found in large, dead trees, generally ranging in size from 12.2 to 29.9 inches dbh (3D/E 1995). In Vermont, maternity roosts ranged from 19 inches to 36 inches dbh (Palm 2003, Britzke et al. 2004). Alternate roost trees also tend to be large, mature trees, but the range in size is somewhat wider than that of primary roosts (7.1 to

32.7 inches dbh) (3D/E 1995). The alternate roosts identified in the action area range from 5.3 inches dbh to 10.5 inches dbh (Apogee 2003). This is the smallest documented alternate roost tree utilized by a reproductively active female Indiana bat.

Reproduction

Females give birth to a single young in June or early July (Easterla and Watkins, 1969, Humphrey et al., 1977) while in their maternity colonies. As previously discussed, forming maternity colonies reduces thermoregulatory costs, which, in turn increases the amount of energy available for birthing and raising young (Barclay and Harder, 2003). There are no documented occurrences in which a female Indiana bat has successfully given birth and raised a pup alone without the communal benefits offered by a maternity colony. Studies by Belwood (2002) show asynchronous births extending over a period of 2 weeks within one colony. This results in great variation in size of juveniles (newborn to almost adult size young) in the same colony.

In Indiana, lactating females have been recorded from June 10 to July 29 (Whitaker and Brack, 2002). Young Indiana bats are capable of flight (volant) within 3-5 weeks of birth (Mumford and Cope, 1958; Easterla and Watkins, 1969; Cope et al., 1974; Humphrey et al., 1977; Clark et al., 1987; Gardner et al., 1991a; Kurta and Rice, 2002; Whitaker and Brack, 2002). Young born in early June may be flying as early as the first week of July (Clark et al., 1987), others from mid- to late July. Once young Indiana bats are volant, the maternity colony begins to disperse. The use of primary maternity roosts diminishes, although the bats may stay in the maternity roost area prior to migrating back to their respective hibernacula. Bats become less gregarious and the colony utilizes more alternate roosts, possibly because there is no longer the need for the adult females to cluster for thermoregulation and to nurture their young (Indianapolis Airport Authority, 2003 and 2004).

Although the preceding discussion provides a seasonal framework for Indiana bat reproduction, the timing of reproductive events is somewhat weather-dependent (Grindal et al., 1992; Lewis, 1993; Racey and Entwistle, 2003). Adverse weather, such as cold spells, increases energetic costs for thermoregulation and decreases availability of insect prey and hence, energy gain. Bats respond to a negative energy balance by entering torpor; the resulting low body temperature slows biochemical reactions associated with fetal and juvenile growth and milk production and may cause annual variation when young are born and fly.

Site Fidelity

Recent research indicates that Indiana bats exhibit site fidelity to their traditional summer maternity and foraging areas. A number of studies documented female Indiana bats annually returning to the same general area to establish maternity colonies (Humphrey et al., 1977; Gardner et al., 1991a, 1991b; Gardner et al., 1996; Callahan et al., 1997; Butchkoski and Hassinger, 2002; Kurta and Murray, 2002; Indianapolis Airport Authority, 2003, 2004). Gumbert et al. (2002) differentiated between roost tree and roost area fidelity in Indiana bats, and found that bats are faithful to both areas and particular trees within those areas. Roost trees, although ephemeral in nature, may be reoccupied by

a colony for a number of years until the trees are no longer available or suitable. Roost tree reoccupation of between two to six years has been documented in a number of studies (Gardner et al., 1991b; Gumbert et al., 2002; Watrous, unpublished data, 2005; Barclay and Kurta, in press).

Individual Indiana bats appear to be faithful to their foraging areas between years. Gardner et al. (1991a; 1991b) observed that females returned to the same foraging areas between years, irrespective of whether they were captured as juveniles and tracked as adults, or if they were captured as adults and then followed. A long-term study of Indiana bats at the Indianapolis Airport followed more than 40 bats between 1997 and 2004; all these bats foraged in the same general areas, although home ranges were distinct (Sparks et al., in press.). Bats were found to move through their foraging habitat so predictably that researchers with receivers were able to move into an area prior to the bat arriving (Sparks et al., in press). On one occasion data was collected for the same bat in two different years. Roosting and foraging habitat were remarkably consistent between years including occasional nocturnal visits to a day roost on the opposite end of the colony's foraging range, despite the fact that the bat was pregnant when tracked in 2003 and lactating in 2004 (Sparks et al., in press). In Michigan, Kurta and Murray (2002) recaptured 41 percent of females when mist netting at the same area in subsequent years. Further studies of this colony reported a wooded fenceline as a commuting corridor for at least 9 years (Winhold et al., 2005; Kurta, in press).

Food Habits

The Indiana bat feeds on flying insects, with only a very small amount of spiders being included in the diet. Dietary studies indicate that four orders of insects contribute most to the diet—Coleoptera, Diptera, Lepidoptera, and Trichoptera (Belwood, 1979; Brack, 1983; Brack and LaVal, 1985, Lee, 1993; Kiser and Elliot, 1996; Kurta and Whitaker, 1998; Murray and Kurta, 2002a). Various reports, however, differ considerably in which of these orders are most important. Terrestrial-based prey (moths and beetles) were more common in southern studies, whereas aquatic-based insects (flies and caddisflies) dominated in the north. Hymenopterans (winged ants) also are abundant in the diet of Indiana bats, for brief, unpredictable periods corresponding with the sudden occurrence of mating swarms. Although not as dramatic, seasonal occurrence of Asiatic oak weevils in the diet indicates use of an abundant resource available only for a limited part of the season. At individual colonies, dietary differences exist between years, within years by week, between pregnancy and lactation, and within nights (Murray and Kurta, 2002a). Consistent use of moths, flies, beetles, and caddisflies throughout the year at various colonies suggests that Indiana bats are selective predators to a certain degree, but incorporation of ants and weevils into the diet also indicates that these bats can be somewhat opportunistic. Hence, Murray and Kurta (2002a) suggest that the Indiana bat may best be described as a "selective opportunist," as are a number of other Myotis species (Fenton and Morris, 1976).

Foraging Behavior

Indiana bats begin emerging from a roost to forage shortly after sunset, although there is considerable variation in timing within a colony that is not related to light level, ambient

temperature, or number of bats inside (Gardner et al., 1991a; Viele et al., 2002). Observations of light-tagged animals and bats marked with reflective bands indicate that Indiana bats typically forage in closed to semi-open forested habitats and forest edges (Humphrey et al., 1977; LaVal et al., 1977; Brack, 1983). Radiotracking studies also indicate that foraging usually occurs in various types of forest, including flood plain, riparian, lowland, and upland forest (Garner and Gardner, 1992; Murray, 1999; Butchkoski and Hassinger, 2002; Murray and Kurta, 2002b; Watrous, unpublished data, 2005). Indiana bats hunt primarily around, not within, the canopy of trees, but they come down to subcanopy and shrub layers on occasion. In riparian areas, Indiana bats primarily forage around and near riparian and flood plain trees, solitary trees and the forest edge on the flood plain (Belwood, 1979; Cope et al., 1974; Humphrey et al., 1977; Clark et al., 1987). Murray (1999; Murray and Kurta, 2002b) identified 13 foraging areas used by pregnant and lactating Indiana bats in southern Michigan: 5 were used only by pregnant bats; 4 used only by lactating bats; and 4 used by both pregnant and lactating bats. Individual females visited 1 to 4 foraging areas each night. When 2 or 3 bats were radio-tracked simultaneously, they seldom used the same foraging area and were found in different areas over three miles apart.

Foraging or commuting over open fields is uncommon (Brack, 1983; Menzel et al., 2001). With respect to commuting, it is not known how wide a gap must be before bats hesitate to cross it. Indiana bats consistently flew over a 30-ft-wide road in Pennsylvania (Butchkoski and Hassinger, 2002) and occasionally flew across a four-lane interstate in Indiana (D. Sparks, Indiana State University, personal communication, March, 2005), but they did not fly across fields that stretched for more than 0.6 mi in Michigan (Murray and Kurta, 2002b). Rather, Murray (1999; Murray and Kurta, 2002b) demonstrated that Indiana bats favored wooded corridors when traveling between roosts and foraging areas, often adding many kilometers to their nightly commute. These corridors often were as simple as a single line of trees along a fencerow separating agricultural fields.

Home range

Indiana bats are known to occupy distinct home ranges, particularly in the summer (Garner and Gardner, 1992). Home range size may vary between the summer, spring and fall habitats, the sexes and the reproductive status of the females. Kiser and Elliot (1996) identified minimum foraging areas for 15 Indiana bats at a hibernaculum in Kentucky. Their estimates ranged from approximately 28 hectares to 267 hectares (excluding the cave in the estimate), with a mean of 156 ± 101 hectares. Rommé et al. (2002) tracked 6 Indiana bats near hibernacula in Missouri and calculated a mean home range of 667 ± 994 hectares for spring and fall and 1,584 ± 1,424 hectares for fall home range. More recently, Menzel et al. (2005) determined the mean summer home range size of 11 Indiana bats to be 144.7 hectares. Watrous (unpublished data, 2005) has tentatively calculated approximately 287 hectares as a mean summer home range for Indiana bats in Vermont.

In Canoe Creek, Pennsylvania, an area with significant changes in elevation, reported distances between roost and foraging areas ranged between 1.5 to 2.8 miles with an average distance of 2.1 miles (Butchkoski and Hassinger, 2002). In West Virginia,

female Indiana bats have been documented traveling a maximum distances of 2.5 miles from capture sites and roost trees at one location in Boone County (Compliance Monitoring Inc. 2006). At another West Virginia maternity colony, distances of up to 1.7 miles between roost areas and foraging ranges were documented (Apogee 2006). Throughout the Indiana bat's range, documented linear distances between roosts and foraging areas for females have ranged from 0.3 to 5.2 miles, although most distances were less than half the maximum distance (Murray and Kurta, 2004; Sparks et al., in press). Murray and Kurta (2004) and Sparks et al. (in press) speculate that the variations in distances to forage areas were due to differences in habitat type, inter-specific competition, and landscape terrain.

Fall migration

Maternity colonies begin disbanding during the first 2 weeks in August, although large colonies in southern areas may contain a steadily declining number of bats into mid-September (Humphrey et al., 1977; Kurta et al., 1993). Even in northern areas, such as Michigan, a few Indiana bats may remain into late September and early October; these late migrants may be young-of-the-year (Kurta and Rice, 2002). Members of a maternity colony do not necessarily hibernate in the same cave, and may migrate to caves that are over 190 miles apart (Kurta and Murray, 2002).

Review of Endangered Species Information

The Indiana bat was listed as endangered by the Service on March 11, 1967 (32 Federal Register 4001). Listing was warranted based primarily on large-scale habitat loss and degradation, especially at winter hibernation sites, and significant population declines that continue today. During winter, Indiana bats are restricted to suitable hibernacula, mainly caves, throughout the karst regions of the east-central U.S. As a result, conducting censuses of hibernating bats is the most reliable method of tracking population/distribution trends range-wide, and provides a good representation of the overall population status and distribution. More than 85% of the range wide population occupies nine Priority One hibernacula (hibernation sites with a recorded population greater than 30,000) in Indiana, Kentucky, and Missouri. Priority Two hibernacula (hibernation sites with a recorded population greater than 500 but less than 30,000) are known from the aforementioned states, in addition to Arkansas, Illinois, New York, Ohio, Tennessee, Virginia, and West Virginia. Hellhole in Pendleton County, West Virginia, is a Priority Two cave with a winter (2004) population of approximately 11,890 bats. Hellhole is officially designated Critical Habitat by the Service. Priority Three hibernacula (less than 500) are known from 17 states. The limestone region of West Virginia in Preston, Tucker, Randolph, Pendleton, Pocahontas, Greenbrier, Monroe and Mercer Counties contains approximately 28 hibernacula.

Continued Threats

Because disturbance to hibernacula is a major threat to the Indiana bat, protection of hibernacula is a management priority. Arousal of the bats following disturbance (e.g., spelunkers, scientists, predators) can be detrimental (Hall 1962, Myers 1964, LaVal et al. 1976, Humphrey 1978, LaVal and LaVal 1980). Therefore, entry into Indiana bat hibernacula should be prohibited from September through mid-May (Humphrey 1978,

LaVal and LaVal 1980, Service 1999). Improperly designed cave gates that alter cave airflow patterns (particularly trapping warm air) may reduce, and in some instances destroy, hibernacula suitability (Humphrey 1978, Richter et al. 1993, Tuttle and Kennedy 1999). In addition to population threats from human disturbance, hibernating Indiana bats are also vulnerable to natural disturbances, and destruction of any hibernacula can have a tremendous impact on the population because of the limited number of hibernacula (Hall 1962). While many hibernacula have been protected, disturbance to hibernacula continues. For example, the largest hibernacula in Indiana (50,941 Indiana bats in 2003) is not gated, and based on data from electronic monitors in the cave, unauthorized visits to this cave occur during critical life stage periods. Also, at the only large hibernacula in Ohio (9,436 Indiana bats in 2004), there are still tours, as well as other commercial activities, taking place in the cave during the hibernation period.

Land use practices have also been identified as a suspected cause in the decline of the Indiana bat, particularly because habitat in the bats' maternity range has changed dramatically from pre-settlement conditions. Indiana bats exhibit site fidelity to their traditional summer maternity and foraging areas, and are known to return to the same general area to establish maternity colonies from year-to-year (Humphrey et al. 1977; Gardner et al. 1991a, b; Callahan et al. 1997; Indianapolis Airport Authority 2003, 2004; Kurta and Murray 2002; Butchkoski and Hassinger 2002; Gardner et al. 1991a, Gardner et al. 1996). Roosting/foraging area fidelity may serve to increase the probability of successful reproduction, and to maintain social interactions between members of the population. Bats using familiar foraging and roosting areas may have decreased susceptibility to predators, increased foraging efficiency, and an improved ability to switch roosts if impacts occur to the original roost (Gumbert et al. 2002). In turn, site fidelity may also inhibit the ability of Indiana bats to pioneer new areas (Sparks *in* Service 2004). Due to the ephemeral nature of roosting sites, bats are probably not dependant on the continued suitability of an individual tree. However, landscape level alterations in traditional maternity habitats may adversely affect Indiana bat survival and reproductive success.

In addition to an increased focus on Indiana bat summer habitat, attention has also been directed to investigate pesticide exposure (Clark et al. 1987; Clawson 1987; Garner and Gardner 1992; Callahan et al. 1997; 3D/E 1995; O'Shea and Clark 2002; Kurta and Murray 2002). Insecticides have been known or suspected as the cause of a number of bat die-offs in North America, including endangered gray bats in Missouri (Reidinger 1972; Clark and Prouty 1976; Clark et al. 1978). The insect diet and longevity of bats also exposes them to environmentally persistent organochlorine chemicals that may bioaccumulate in body tissue and cause sub-lethal effects such as impaired reproduction (O'Shea and Clark 2002).

Rangewide Status of the Species

From the time that the species was listed, the range-wide population of the Indiana bat has declined from approximately 883,300 Indiana bats in 1960/1970 to 387,301 in 2003/2004, or approximately 56 percent (Clawson 2002; Lori Pruitt, personal communication, 2004). 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%.

The results from the 2001 to 2005 biennial counts suggest that at least for this period, the extreme decreases observed in each previous decade may not have occurred during the first half of this decade. From 2001 to 2003 and 2003 to 2005, increases (4.2% and 16.7%, respectively) in the estimated range-wide numbers were observed. These are the first calculated increases in the range-wide population estimate since the Indiana bat was listed and monitoring began. However, efforts are currently underway to evaluate the variability between different survey techniques and surveyors used throughout this period, and establish a confidence interval around these reported results. As a result, there is in sufficient information available at this time to determine current population trends from these observed results. Therefore, although the observed increases are encouraging, we are uncertain of the future population trend.

Status of the Species in West Virginia

Summer Populations

Prior to 2003, there were no documented areas of Indiana bat maternity activity in the state. However, in the summer of 2003, two post-lactating female Indiana bats were captured and tracked to roost trees in Boone County, West Virginia. These captures represented the first documented Indiana bat maternity activity in West Virginia. Maternity activity at this site was again confirmed when additional surveys were conducted in the summer of 2004. Surveys at this site during 2005 located two primary roost trees and resulted in a maximum emergence count of 73 bats. In the summer of 2004, a second maternity colony of approximately 25 bats was confirmed through the capture and tracking of a lactating female Indiana bat. This colony was located adjacent to the MNF in Tucker County and is located within 2-miles of a known Indiana bat hibernacula. That same summer, three male Indiana bats were captured on another site on the MNF in Pendleton County. These bats were tracked to a roost tree and subsequent emergence counts on that tree revealed 23 bats. Although, maternity activity (through the presence of female Indiana bats) was not confirmed at this site, data suggest that this site may also support a maternity colony. A third maternity colony was documented as a result of surveys conducted in 2005 near Kanawha State Forest in Boone County. Emergence counts at the two identified primary roost trees documented a maximum count of 49 bats. In addition to these captures near potential or confirmed maternity colonies, individual male Indiana bats have been captured at numerous locations throughout the state in the following counties: Clay, Nicholas, Fayette, Randolph, Pendleton, Preston, Pocahontas, and Raleigh.

These captures of both male and female bats confirm that the Indiana bat uses forested habitats throughout the state for summer foraging and roosting. The increase in recent captures may not reflect an actual increase in densities of Indiana bats summering within the state, rather these results may reflect the fact that survey efforts in relation to project review and monitoring have increased in recent years.

Winter Populations

While winter hibernacula monitoring shows Indiana bat populations were decreasing in portions of their range in recent decades, estimated winter populations in West Virginia have been increasing since the early 1980's (WVDNR, 2004). Since 1990, hibernating populations in West Virginia have more than doubled from an estimated 6,500 to 13,698 in 2006 (WVDNR, 2006 – unpublished). Increases in the number of bats hibernating in Hellhole have accounted for most of this growth. Protection measures limiting access to the cave occurred when the entrance to Hellhole was fenced in 1985. Most other significant caves in West Virginia have also been gated or fenced, to protect Indiana bat populations.

It should be noted that the relationship between wintering populations and summering populations is not clearly understood. It is known that individuals of a particular maternity colony come from one to many different hibernacula, therefore the summer location of most, if any, individuals of any particular hibernacula is often not known. Indiana bats have been documented to travel up to 300 miles from their hibernaculum to their maternity areas (Gardner and Cook 2002). Therefore, bats wintering or summering in West Virginia may come from a number of surrounding states, and the status of Indiana bats within each state's hibernacula may not reflect the status of that state's maternity population.

Rangewide Conservation Needs of the Species

In order for the Indiana bat to have a reasonable chance for survival and recovery, the current population must be stabilized and increased. The only options available for stabilizing and increasing the population are to increase its recruitment (birth and survival of young to breeding age) or reduce its mortality rate. The annual cycle (for females) of hibernation, spring migration, parturition, lactation, fall migration, mating, and hibernation can be broken at any point, resulting in the loss of that individual from the population, and her remaining reproductive potential in the population. The vulnerable point(s) in this cycle may very well differ by geographic area, and even within the same area. Therefore, efforts to protect hibernacula from disturbances need to continue. This should include implementing closure plans, constructing and maintaining appropriately designed gates, and restoring microhabitat conditions in hibernacula that have been altered. Efforts should also be made to protect and restore adequate fall swarming habitat within primary zones around hibernacula. Occupied maternity habitat should be identified and maintained. Research to further delineate the migratory relationship between summering and wintering populations should also be pursued.

Previous Incidental Take Authorizations

Prior formal consultations involving the Indiana bat 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) and West Virginia Department of Environmental Protection for various water-related and coal mining projects, (d) the Department of Defense for operations at several different military

installations and (e) the National Park Service for vegetation management and prescribed burn activities. Additionally, an incidental take permit has been issued under section 10 of the ESA to an Interagency Taskforce for expansion and related development at the Indianapolis Airport in conjunction with the implementation of a Habitat Conservation Plan. A summary of these consultations is provided in Appendix C – Table C1.

It is important to note that in conducting many of these consultations, survey information was unavailable. Often the Service relied on a host of valid factors in helping the Federal agency determine whether Indiana bats may be present. For example, many projects were expected to be implemented over a number of years. If survey information indicated that Indiana bats were present in nearby areas, the assumption may have been made that Indiana bats had the potential to be present in the action area at some point during the life of the project. To ensure the Federal agency and the Service met the mandate of the section 7(a)(2), if the best scientific and commercial data available indicated that reproductively active Indiana bats may be present, a maternity colony was generally assumed to potentially be present within the action area. We believe this conservative approach fully accords with the intent of Congress and the ESA of 1973, although it likely resulted in over-estimating the number of individuals or colonies that may have been impacted by Federal actions.

Previous consultations have addressed impacts to hibernating or swarming bats, known maternity areas, or habitat that was assumed to be occupied. Due to the various life stages affected, and conservative assumptions made (as discussed above) and the difficultly in documenting actual take to Indiana bats (as more fully described in each BO and the Incidental Take Statement section of this current BO), different methods have been used to estimate the amount of potential take. Depending on the consultation, take has been measured either by estimating numbers of affected roost trees, individual bats or maternity colonies, or acres of potentially suitable habitat. The measure selected is based on the most accurate and reasonable means available for each site-specific analysis. For example, as shown in Table C1, BOs have exempted take to Indiana bats on approximately 867,000 acres of potentially occupied habitat. However, new information that became available after the issuance of some of the BOs resulted in subsequent "not likely to adversely affect" determinations for activities that affected 472,000 of those exempted acres. In addition, over 75,000 acres of the total 867,000 acres of exempted take have been superceded by new BOs, resulting in potential double counting of the affected acres. Such as in the case of the BO for the Northeast Research Station, where forest stands are harvested multiple times over many years, with each entry being counted as a separate acre of annual take (Service 2005c). Due to these factors, the most appropriate measure of the effects of previous consultations is to evaluate the ultimate outcome of the projects.

Thirteen National Forests and one Forest Service Research Station within the range of the Indiana bat have recently completed consultation at the programmatic level. Consultation under section 7 of the ESA is necessary to ensure Federal agency actions are not likely to jeopardize the continued existence of listed species or result in the destruction or modification of critical habitat of such species. The Service concluded that the proposed

Forest Plans were unlikely to jeopardize the continued existence of the Indiana bat and issued biological opinions with associated incidental take statements. Although these incidental take statements anticipated the potential take of reproductive females, we have not confirmed the loss of any maternity colonies on a National Forest. The reasons for this are likely two-fold. First, notwithstanding the conservative assumption that a maternity colony existed in the action area, to date, only six maternity colonies have been actually confirmed to exist on the affected National Forests. Additionally, surveys to identify and confirm further colonies are ongoing. As detailed in Table C2, the National Forests covered by these BOs generally conduct some form of Indiana bat population monitoring, including mist net surveys, acoustical monitoring, and hibernacula surveys, as appropriate. These surveys have served to document either: the continued presence of Indiana bats on the forests; the discovery of new maternity colonies on the subject forest; or the continued lack of presence of Indiana bats even though the conservative assumption of potential presence was made. Second, each Forest Plan includes conservation measures (i.e., standards and guidelines) and the project-specific reasonable and prudent measures. These conservation measures and reasonable and prudent measures are designed to protect all known or newly discovered maternity colonies and to ensure an abundance of suitable Indiana bat habitat on the National Forests. Based on the results of the monitoring discussed above, it appears that these measures have been effective at protecting known populations of the bat within the National Forest system. Incidental take exempted on National Forests is monitored and reported by acres of habitat lost or altered. Based on the anticipated levels of take as described in Table C2, over 95% of these acres are affected by varying degrees of temporary loss (short-term and long-term) as a result of timber management activities or prescribed burns (Service 2005a). In order to ensure that the anticipated level of take is not exceeded, each National Forest provides annual reports of the actual level of take that has been implemented. Although reported levels have not been compiled for all the Forests, for many Forests, including the MNF, actual incidental take implemented has been less than the level exempted in the BOs. If the compilation of annual reporting indicates anything inconsistent with this evaluation, further assessments will be made.

Several incidental take statements have been issued to other Federal agencies conducting activities not likely to jeopardize the future existence of the Indiana bat. Unlike those incidental take statements issued for the National Forest Land and Resource Management Plans, some of these other Federal agency actions were certain to impact known occupied habitat. To minimize the effect of these projects, the Federal action agencies agreed to implement various conservation measures. These measures 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 the biological opinions and associated incidental take statements issued for non-Forest Plan activities anticipated the loss of a maternity colony. The Fort Knox biological opinion [1999] exempted the take of two potential maternity colonies and

individual Indiana bats. However, the biological opinion did not specify whether the "take" consisted of loss of the colonies or take in the form of harm and harassment. Additional monitoring of the maternity colony following the completion of the 2004 BO for the Laxare East and Black Castle Contour projects, documented a colony much larger than previously anticipated. Additional project modifications subsequent to that discovery resulted in the retention of all known roost trees and protection of some potential foraging areas. Reinitiation of that consultation in 2006 concluded that while the colony would experience adverse effects, the colony should be able to persist through the life of the project. Required monitoring for three additional consultations (Camp Atterbury, Newport Military Installation, and Indianapolis Airport) has confirmed that the affected colonies persisted through the life of the project and continue to exist today. We recognize that given the philopatric nature of Indiana bats and the long lifespan, 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 longer-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 conservative assumptions about Indiana bat presence, we are confident that the number of Indiana bats actually exposed to the environmental impacts of the Federal actions is far less than anticipated. Furthermore, although not definitive, pre- and post-project implementation monitoring of several maternity colonies preliminarily suggests that our standard conservation measures, when employed in concert, appear to be effective in minimizing adverse effects on the affected Indiana bats.

ENVIRONMENTAL BASELINE

Summer Populations within the Action Area

As shown in Table 2 below, over the past nine years, the MNF has conducted Indiana bat surveys at over 440 mist net sites. These surveys resulted in the capture of a total of 16 Indiana bats, only one of which was female. One juvenile male was captured in 1999, which suggested that there may be maternity activity in the area of the capture. However, four years of intensive follow-up surveys failed to capture any other Indiana bats within that area. This data in conjunction with other factors such as climatic conditions, and the late-season timing of the capture, led Service, WVDNR, and MNF biologists to conclude that this capture was a migrating individual (Service 2005b). As a result of informal and formal coordination between the Service and the MNF, and as documented in the terms and conditions of the 2002 programmatic BO, the MNF recently adapted Indiana bat monitoring efforts to focus on detecting the presence of the bat in likely habitat, rather then surveying locations prior to project clearance. The revised approach should allow for improved protection for the species and more accurate tracking and evaluation of potential maternity habitat within the MNF. As demonstrated in the table, detection of the bat on the MNF has increased since the revised approach has been implemented.

Table 2: Overview of Recent Indiana Bat Mist Net Surveys on the MNF

Year	# areas	# net sites	Ibats captd?	M/F	Repro cond.	General Location
1997	7	70	no	-	-	-
1998	15	86	no	-	-	-
1999	9	41	yes	1/0	juvenile	under bridge near Richwood
2000	2	24	yes	1/0	adult	Glady
2001	5	47	yes	1/0	adult	Tygarts Valley
2002	2	11	no	-	-	-
2003	9	51	yes	1/0	adult	recapture of Glady bat
2004	4	55	yes	4/1	adult/lactating	Reeds Creek/Lower Glady
2005	6	56	yes	7/0	adult	Reeds Creek, Lower Glady

The 2004 surveys provided the first solid evidence of maternity activity within the MNF. A lactating female was caught near Lower Glady. Subsequent tracking of the bat resulted in a roost tree being located on private land just across the MNF boundary. As noted in the "*Status of the Species in West Virginia*" section, emergence counts on that tree documented a colony of at least 25 bats. The roost area being used by the colony was subjected to a wildfire during the spring of 2002 which created an abundance of dead tress and trees with sloughing bark (D. Arling, USFS, pers. comm.). The site had also been extensively timbered prior to the wildfire and is located within two miles of an Indiana bat hibernacula. This combination of factors concentrated a large number of potential roost trees in an area with open canopy conditions that was easily accessible to the bats. Although the roost trees were not on MNF property, it is likely that Indiana bats use the MNF for foraging and potentially as a secondary roost area. Follow up surveys conducted in 2005 captured numerous male Indiana bats, but no females. However, field investigators noted that the bark had fallen off the previously used roost tree, suggesting that the bats may have moved to a new more suitable roost tree within the vicinity. As noted in the "*Status of the Species in West Virginia*" section, there is one other suspected maternity colony on the MNF in Pendleton County. Follow-up surveys for this area are planned for 2006.

Winter Populations within the Action Area

As noted above there are 26 Indiana bat hibernacula located within the action area. Six of these caves are located within the MNF. One of these caves, Coal Run, had only one Indiana bat during the most recent survey in 1993. However, surveys at the other five caves have been conducted in the past two years, and documented a total of 478 Indiana bats. Most of these bats occur in either Big Springs Cave or Cave Hollow/Arbogast Cave. Overall population trends for these two caves are either stable or increasing. The MNF and other partners have implemented protective measures such as gating and seasonal cave closures, on these caves.

There are nine other Indiana bat hibernacula that occur within the proclamation boundary but are not currently within the MNF. This includes Hellhole, the largest hibernacula within the state. Population trends at Hellhole are clearly increasing with 11,890 Indiana bats documented during the most recent survey, which was conducted in the 2004-2005 winter season. This represents an almost 39% increase from the previous surveys conducted during the 2000-2001 winter season. Recent surveys at four other caves within the proclamation boundary documented 216 Indiana bats. Population trends at these caves are generally stable. Three caves, Cass Cave, Simmons-Mingo, and Smokehole, have no recent survey data.

Eleven additional hibernacula have entrances that occur outside the proclamation but have a portion of the MNF proclamation boundary located within a five-mile radius (primary zone) of the cave. Seven of these caves have not been surveyed since 2000. The other four caves have been documented to support a total of 725 Indiana bats in surveys since 2004. Population trends are increasing for all but Martha's Cave.

In summary, the MNF provides swarming habitat for 26 recent or historical hibernacula, and maintains the entrances for 6 of these. Recent surveys have documented a total of 13,309 Indiana bats using hibernacula within the action area. Overall, population trends for these caves have been stable to increasing. Additional information on these caves and the survey results through 2005 is presented in the BA, and is incorporated here by reference.

Habitat conditions within the Action Area

Of the approximately 919,000 acres of habitat currently within the MNF, about 96% is forested. The MNF supports a number of different forest types including spruce, mixed mesophytic and cove hardwoods, northern hardwood, oak, and pine-oak forest. Some of these forest types are not likely to be used by the Indiana bat. For example, spruce forests occur in high elevation and have cool, moist conditions. These areas generally would not be expected to provide the large hardwood snags and warm conditions typical of maternity areas. Other forest types, such as cove hardwoods and oak forests, provide the climatic conditions and tree species typical of Indiana bat maternity areas, and therefore provide potentially suitable habitat. Table 3 below outlines the amount of each forest type that is currently available on the MNF.

Table 3: Amount of Forest Habitat (Acres) by Type on the MNF

Forest Type	Current MNF Lands		Proclamation Boundary	
mixed mesophytic/cove hardwoods	360,000	39%	620,000	36%
oak forest	250,000	27%	370,000	22%
northern hardwoods	170,000	18%	350,000	21%
Spruce	48,000	5%	51,000	3%
other (hemlock, oak-pine, non-forest)	91,000	10%	309,000	18%
Total	***919,000***	***100%***	***1,700,000***	***100%***

Of the overall forested habitat currently within the MNF, 58% is in the > 80 year old age class, while another 34% is in the 40-79 year old age class. Most of the non-forested habitat consists of either savannas; grassland; or aquatic habitats such as wetlands, ponds, streams, or bogs. Indiana bats seem to use forested stream corridors as preferred foraging and commuting areas (Humphrey et al. 1977; LaVal and LaVal 1980; Butchkoski and Hassinger 2002; Romme et al.1995). The large amount of mature and potentially suitable forested habitat interspersed with aquatic areas provides significant roosting and foraging opportunities for the Indiana bat. It should be noted however, that even within forest types, site-specific conditions may make certain areas more suitable for the Indiana bat than others. These factors include number of suitable snags, the percent overstory and understory canopy closure, and the proximity to other suitable foraging and commuting areas. Information to evaluate the overall suitability of habitat within the MNF on a forest-wide basis has not been fully compiled. While site-specific information may not be available for every important habitat parameter, the Forest's stand database contains information on forest type, stand age, dbh, species composition, etc. Also, the Forest's Ecological Land Type data layer contains ecological community mapping that could help identify potential areas of high quality habitat. This information has not been summarized in a way that offers a concise picture of Indiana bat habitat suitability on a Forest-wide basis, but it is available for constructing site-specific descriptions of habitat quality at the project level.

As noted above, there are 26 known Indiana bat hibernacula that have all or part of their primary zones within the proclamation boundary of the MNF. These primary zones are particularly important to the Indiana bat during the fall when the bats use these areas for foraging and mating prior to entering hibernation. Males are likely to be found within these areas throughout the summer maternity period. In addition, the recent discovery of a maternity colony within one of these primary zones suggests that these areas have an increased potential to support maternity activity as well. The MNF provides roughly 228,000 acres of habitat within the primary zones of the 26 hibernacula that are within or near the proclamation boundary. Although specific information on the type and distribution of forested habitat throughout these primary zones is not available, conditions are expected to be similar to conditions found on MNF overall.

Conservation Needs of the Species within the Action Area
The MNF provides habitat for swarming, hibernating, and summering Indiana bats. Therefore, within the action area the conservation needs include: 1) maintaining suitable conditions within hibernacula and protecting them from disturbance; 2) providing suitable habitat conditions for Indiana bat foraging and roosting within primary zones and other areas of the Forest; and 3) documenting areas of Indiana bat maternity activity and maintaining habitat conditions in those areas so they continue to remain suitable.

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

The standards and guidelines that have been incorporated into the FPR to avoid and minimize effects are provided in Appendix A. It is important to emphasize that this effects analysis is predicated on the fact that all standards and guidelines will be fully implemented. If not, this analysis may no longer be valid and formal consultation may need to be reintiatied.

Effects of the Forest Plan Goals on the Indiana Bat
The FPR specifies that the overall desired condition for threatened and endangered species is to "maintain or enhance populations consistent with established and approved Recovery Plans" and that "effects from Forest programs or activities are at levels that do not threaten the persistence of threatened and endangered species populations." The FPR also further elaborates upon these broad goals by providing standards and guidelines specific to various types of Indiana bat habitat and life stages, as described below.

Indiana Bat Hibernacula
Indiana bats tend to congregate together in caves and are particularly sensitive to disturbance during the hibernation period. There are 26 Indiana bat hibernacula within the action area. Six of these are currently on MNF property. The FPR includes specific standards and guidelines that protect Indiana bat hibernacula. These include restricting public entry during the hibernation period (TE 45); installing and maintaining appropriate cave gates when necessary (TE 08-11); developing protection measures if any new hibernacula are found (TE 28); establishing "key areas" consisting of at least 150 acres near each hibernacula (TE 54/55); and restricting activities such as vegetation management, construction, special use permits, and seismic exploration that can occur within those key areas (TE 42-44; 47-52; 56). Implementation of these measures should ensure that Indiana bats hibernating within caves on the MNF are adequately protected from most reasonably foreseeable threats, and that suitable habitat conditions are retained. The proposed measures are substantially similar to those being implemented under the current Forest Plan. Currently Indiana bat populations in known hibernacula are monitored bi-annually. As noted in the "Baseline" section, populations of Indiana bats within caves on the MNF have generally been stable to increasing, suggesting that existing measures are effective. As a result, the Service concludes that the FPR should

provide an overall *beneficial effect* to the species during this most sensitive life stage. Continued bi-annual population monitoring of known hibernacula should provide data to gauge the effectiveness of the proposed measures.

Indiana Bat Primary Areas
The MNF provides roughly 228,000 acres of habitat within the primary zones (five mile radius) of the 26 hibernacula that are within or near the MNF proclamation boundary. The FPR refers to swarming zones as Indiana bat "Primary Range" and includes goals, objectives, standards and guidelines (TE 29 – 41) that outline how these areas should be managed. The overarching goal for these areas is to "manage naturally occurring tree species composition to provide a continuous supply of suitable roost trees and foraging habitat for Indiana bat. Achieve vegetative diversity that maintains or improves Indiana bat habitat. Where consistent with management prescription emphasis, use a variety of silvicultural methods to create desired age class diversity". The FPR also specifies that these areas will be managed to provide a continuous supply of suitable roost trees by maintaining a minimum of 50 percent of each primary range on MNF property in age classes greater than 40 years old, and that management of vegetation 5 inches dbh or greater may only be implemented if activities: a) maintain or improve Indiana bat or other TEP or Sensitive species' habitat; b) address public or worker safety concerns; or c) achieve research objectives. Additional standards provide direction regarding retaining snags and tree species that are preferred roost trees; and place restrictions on special use permits, federal mineral exploration, and explosives.

When taken together, these measures should ensure that suitable habitat conditions for Indiana bat foraging and roosting are provided within affected primary zones. However, in order to determine the most appropriate management activities that should be implemented within each primary zone and to gauge consistency with the criteria listed above, information on the baseline condition of each primary zone will be required. As noted in the "Baseline – Habitat Conditions within the Action Area" section, data on the abundance of each habitat type and forest age class distribution specific to each primary zone has not yet been fully compiled. The Service recommends that information regarding baseline habitat conditions be developed for all primary zones within the MNF. Some primary ranges within the proclamation boundary contain very little MNF land, while others lie largely in wilderness or remote backcountry areas. As a result, the MNF's ability to implement beneficial active management in these areas is limited. Priority should be placed on developing baseline information on primary zones that have high potential to implement active management. This information should be used to evaluate and develop potential management activities within each zone.

Indiana Bat Maternity Areas
The FPR includes standards and guidelines developed specifically to address Indiana bat maternity areas. These include conducting investigations to document maternity colonies where evidence of them exists (TE 26); retaining all known roost trees (TE 25); and establishing a buffer around the site and stating that site-specific protective measures will be determined in cooperation with the Service and the WVDNR when a maternity area is documented (TE 27). Other standards and guidelines restrict activities such as vegetation

management, explosives, special use permits, federal mineral activities, and seismic exploration that can occur within identified maternity areas (TE 42, 48, 49, 50, 53 and 56). The effectiveness of these measures in ensuring that maternity colonies on the MNF are protected and maintained depends on two key factors: 1) whether current procedures are effective in detecting and providing data on maternity activity within the MNF; and 2) the nature of any site-specific measures that are developed.

As noted in the "Baseline" section, the MNF recently adapted Indiana bat monitoring efforts to focus on detecting the presence of the bat in likely habitat, rather then relying exclusively on surveying locations prior to project clearance. The FPR does not require that this strategy be continued, however the strategy is consistent with the terms and conditions of the previous 2002 BO. Since the revised approach has been implemented, detection of the bat on the MNF has increased and at least one, and potentially two, maternity areas on the MNF have been identified. If surveys using the current sampling strategy and frequency continue, the MNF should be able to document the presence of maternity colonies more comprehensively than if surveys were restricted to project clearance areas. For example, under the previous approach many areas of the MNF that were not the target of potential projects would not be surveyed, leaving maternity colonies in those areas undetected. Also, under the current approach, surveys are conducted annually on a watershed basis targeting areas that have the highest potential to support maternity habitat. Previously, surveys were required in order to document the lack of maternity activity in a project area, and as a result, surveys may have been necessarily conducted in sub-optimal habitats. It should be noted that the current methodology is not expected to identify every roost tree, foraging area, or maternity site used by summering Indiana bats on the MNF. This would require comprehensive, large scale and repeated surveys/radio telemetry over the more than 900,000 acres that comprise the MNF; a task that would be logistically and economically impracticable. Rather the Service concludes that current strategy effectively provides a high probability of detecting areas of maternity activity on the MNF, and recommends its' continued implementation.

Once evidence of maternity area is identified, the FPR establishes a protective management zone around the site, and specifies that any needed protection measures within the zone shall be determined at a site-specific level in cooperation with USFWS and WVDNR. Data from other maternity colonies in West Virginia and throughout the species range indicate that Indiana bats generally travel up to 2.5 miles between capture sites, roost trees and foraging areas (Apogee 2006, Compliance Monitoring 2006, A. King, personal communication; see also Life History – Home Range section). Therefore, establishing a 2.5 mile radius from the discovery site (as proposed in the FPR) would encompass the area most likely to be used by the maternity colony. However, the actual home range of the colony is not likely to be uniform. Bats may travel a greater or lesser distance in any one direction, depending upon habitat conditions in the area. The FPR appropriately provides flexibility in modifying this zone based on site-specific data.

As noted above, the nature of any site-specific measures that are developed will determine the extent to which maternity colonies on the MNF are protected and

maintained. It would be extremely difficult to develop detailed programmatic prescriptions as to appropriate management techniques to be conducted within Indiana bat maternity areas, particularly since some of these areas may currently be unidentified. The abundance and distribution of different habitat types; the availability and quality of foraging, roosting, and watering areas; and the presence and orientation of migration and travel corridors should all be considered when evaluating potential management actions. Additionally, our understanding of maternity colonies' habitat requirements and how they react to certain types of management actions is likely to develop over time as new research and data is developed. At the programmatic level, requiring site-specific coordination between biologists familiar with the area and knowledgeable about the biology of the bat provides an appropriate means of developing and evaluating potential management actions within identified maternity areas.

In summary, implementation of the FPR at the programmatic level as proposed, coupled with continued implementation of the current Indiana bat sampling strategy, provides a reasonable means for detecting, protecting, and managing for Indiana bat maternity activity on the MNF. It is not expected that the proposed approach will be capable of detecting, and therefore avoiding impacts to, all areas used by summering Indiana bats. However, it is anticipated that the most important areas will be identified and managed to maintain and support maternity activity. The Service recommends continued implementation of the established sampling strategy, unless new information suggests that a different sampling strategy would be more effective for monitoring maternity activity and summer habitat use.

Other Areas of the Forest

The FPR has included specific measures to protect habitat areas that have the highest potential to be used by the Indiana bat during various life stages, however Indiana bats may also occur outside these high probability areas. Male Indiana bats often roost individually during the summer, and may be transient throughout many areas of the MNF during the summer. In addition and as noted above, is not practicable to identify every roost tree, or habitat area used by summering Indiana bats on the MNF. While the likelihood that an individual Indiana bat may be present in other areas of the forest outside of the high probability areas is reduced, the FPR includes forest-wide standards that serve to further minimize the potential that an occupied roost tree will be affected. Measures include retaining all shagbark hickory trees 5 inches in diameter at breast height (dbh) or greater in harvest units except where public or worker safety concerns or research opportunities exist (TE 23) and retaining an average of at least 6 snags per acre that are 9 inches dbh or greater within harvest units, except where public or worker safety concerns exist (TE 24). The MNF will also create additional snags, if needed, from the available leave trees to make up any difference and prioritize snag retention and creation from the largest to the smallest dbh (TE 24).

Summary

The MNF provides habitat for swarming, hibernating, and summering Indiana bats. The FPR includes measures to protect and manage habitats that support these three key life stages. Additional measures to minimize impacts on other areas of the forest have also

been implemented. When combined, these measures should provide an appropriate means to ensure that suitable habitat conditions are maintained and potentially enhanced, on a forest-wide programmatic scale. Continued population monitoring of hibernacula, continued implementation of surveys to detect the presence of maternity areas, and development of data regarding baseline conditions within primary zones would provide a means to gauge the overall effectiveness of these measures and develop appropriate management actions at the site-specific level.

Effects of the Specific Management Actions on the Indiana Bat

Although the overall goals of the proposed action are expected to have beneficial effects for the Indiana bat, the means by which the Forest Service will achieve their goals may unavoidably cause adverse effects to this species. Thus, this section assesses the likelihood and magnitude of impacts that may result from the management actions proposed. Generally the potential effects from implementing specific management actions on the MNF fall into two categories: direct mortality or harm resulting from the removal of trees or burning of occupied habitats; and indirect effects associated with habitat modifications that may disrupt breeding, feeding, or sheltering behaviors. The potential severity of these adverse effects and the probability that they will occur will vary based upon the location of the project in relation to occupied Indiana bat habitats, the time of year in which the activities are implemented, and the type and scale of the habitat modification. The analyses below describe how each management activity is expected to affect Indiana bats.

Timber Harvest

Timber harvest activities are expected to be the most widespread and common type of managment activity to be implemented under the FPR. The MNF estimates that they will implement timber harvest activities on a total of between 33,000 and 69,000 acres over the next 10 years. This includes a number of different harvest types including regeneration harvest (20,000 – 40,000 acres), thinning (7,000 – 13,000 acres), harvest to improve Indiana bat habitat within primary range (3,000 -7,000 acres), spruce restoration and enhancement (1,000 – 5,000 acres), and harvest to create wildlife openings (2,000 – 4,000 acres).

Timber harvests have the potential to remove Indiana bat roost trees. Trees that have a dbh of greater than 5 inches are considered potential Indiana bat roost trees. Trees with a dbh less than this have an extremely low liklihood of being used by the Indiana bat (see Life History - Roost Tree Selection section), and as a result, clearing these small dbh trees should not adveresely affect the bat.

As discussed above, Indiana bats are expected to be concentrated in certain areas of the forest during certain times of the year. Areas that have a high probability of containing Indiana bats include primary zones, known maternity areas, and hibernacula. However, Indiana bats also have the potential to occur outside these high probability areas. Conducting timber harvest activities in any area of the forest has the potential to cause adverse effects to and/or take of the Indiana bat, however the likihood of affecting an Indiana bat is increased in high probability areas. The types of effects and the likihood of

occurrance are discussed in detail below.

Tree removal during the non-hibernation period (April 1 - November 14) may result in mortality (take) of roosting Indiana bats, if a tree that contains a roosting bat is removed. If a bat using a roost tree that is removed is not killed during the removal, the roosting bat would be forced to find an alternative tree, causing a significant loss of energy that would result in harm or harassment of the individual. If the affected roost tree is a primary roost tree used by an Indiana bat maternity colony, adverse effects could include reduced colony cohesion; increased stress; and increased energy demands from searching for new roost areas, including decreased thermoregulatory efficiency. These impacts can lead to reduced reproductive success (Kurta et al. 2002; Kurta and Murray 2002; Gumbert et al. 2002; Kunz and Lumsden 2003; Indianapolis Airport Authority 2003; Garner and Gardner 1992; Racey and Entwistle 2003; Humphrey et al. 1977; Pierson 1998). Loss of an inhabited primary roost tree is most likely to occur during the maternity period (May 15 to August 15).

During the Indiana bat swarming period (August 16 through November 14), bats are likely to be concentrated within the five mile radii around established hibernacula (primary zones). As a result, there is an increased chance that clearing trees within the primary zones during this time period may result in the removal of an occupied roost tree. Because Indiana bats tend to roost individually during swarming, any mortality or harm that occurred under these circumstances would be limited to individual bats and would not adversely affect colony cohesion or reproductive success, as described above. As described in the "Baseline" section, the hibernacula that occur within the action area support Indiana bat populations ranging from one individual to almost 12,000 individuals The probability that a bat would be present within a tree that was removed would depend on which particular primary zone was affected, and the number and type of trees that were being removed. During the swarming period, bats may move around between the primary zones of a number of different hibernacula. Therefore, it is not possible to precisely predict the number of bats potentially present within a specific primary zone. However, hibernacula that support larger populations of bats are likely to have larger numbers of bats present within the primary zones at any one time. Site-specific planning and evaluation will be required to assess the potential effects to bats and to develop appropriate avoidance and minimization measures. In addition, the MNF anticipates that between 3,000 and 7,000 acres of habitat within the primary zones will be affected by timber harvest activities over the next decade; this represents less than 3% of the total amount of primary habitat (228,000 acres) that is present on the MNF. So any impacts that occur each year would be restricted to a small, localized area.

Because Indiana bats are not expected to be present in trees during the hibernation period (November 15 and March 31), clearing trees during this time period would avoid the potential for direct mortality and harm. However, if established maternity roost tree is cut during the winter, Indiana bats would be required to search for new roosting habitat in the spring, and adult females would be faced with finding suitable maternity sites at a time when "they are already stressed from the rigors of hibernation, migration, and the increased energy costs of pregnancy" (Garner and Gardner 1992). For these reasons,

Gumbert et al. (2002) suggest that managers should retain all roost trees used by Indiana bats. However, it is likely that due to the ephemeral nature of roost trees, the Indiana bat has evolved to be able to relocate to replacement roosts when their previously-used roost trees become unsuitable. Studies have shown that adults use multiple roosts (Humphrey et al. 1977; Gardner et al. 1991a; Garner and Gardner 1992; Callahan 1993; Kurta et al. 1993; Romme et al.1995). Bats that are aware of alternate roost sites are more likely to survive the sudden, unpredictable destruction of their present roost than those bats which have never identified alternate roosts (Kurta et al. 2002; Kurta and Murray 2002; Gumbert et al. 2002). Therefore, even in the rare instance that an individual established roost tree is cut, as long as other established roosts remain in the vicinity of the project, impacts associated with the loss of individual roost trees are likely to be short-term.

As noted in the "Effects of the Forest Plan Goals on the Indiana Bat - Indiana Bat Maternity Areas" section, it is not reasonable or practicable to expect that every roost tree, foraging area, or maternity site used by Indiana bats on the MNF could be identified. However, prior to developing or implementing projects, pre-project surveys for Indiana bats will be conducted at the watershed level. Results of these surveys should increase the potential that roosting and foraging areas are identified. The FPR requires retention of all known roost trees (TE 25) and coordination with the Service prior to implementing activities in known or suspected maternity areas (TE 25, 26). The FPR has also incorporated numerous measures to reduce the potential that unidentified Indiana bat roost trees will be removed. For example, the FPR has standards that require retaining all shagbark hickories 5 inches DBH or greater (TE 23); and retaining a minimum number of larger sized snags per acre within all harvest units and creating additional snags where necessary (TE 24). These measures ensure that the trees with the highest probability of serving as roost trees are retained throughout the forest. In addition, in areas that have the highest probability of providing roost trees (e.g. primary zones and near hibernacula) vegetation management of trees greater than 5 inches dbh can only be conducted to maintain or improve Indiana bat habitat unless safety or research concerns exist (TE 31, 43) . As a result, it is expected that site-specific planning in these areas will ensure that high quality roosting habitat is provided and retained. As a result of the measures listed above, the Service concludes that while there is potential to unknowingly remove an established Indiana bat roost tree during implementation of timber harvest activities, in most cases this likelihood will be small, and would be restricted to the removal of single (rather than multiple) lower quality alternate roost trees. The exception to this conclusion is discussed separately in the "Salvage Harvest" section below.

Effects of Timber Harvest on Habitat Suitability

The conditions created by thinning are not expected to decrease the long-term suitability of treated areas as Indiana bat roosting habitat. Thinning will create openings in the forest canopy. Indiana bat primary roosts are usually not surrounded by closed canopy and are often warmed by solar radiation, which provides a favorable microclimate for growth and development of young during normal weather. Humphrey *et al.* (1977) hypothesized that roost trees were usually located in openings within the forest because they provided the necessary thermoregulatory characteristics. This is supported by the analysis conducted of several maternity sites by Romme et al. (1995) who found that

most roosts were located in areas that had a canopy closure of 60 to 80%. Thinning could reduce the existing canopy closure levels to more optimal levels for Indiana bat foraging and increase the solar exposure of the remaining trees within the harvest area, thus potentially making them more suitable for Indiana bat roosting habitat. While this beneficial effect is the primary intent of harvest units within primary zones, the effect is short-term, because canopy closure occurs in approximately 5-10 years after thinning.

A more long-term effect of thinning is increased residual growth on the remaining trees, creating larger diameter and more suitable roost trees. Thinning would reduce vegetative competition and promote larger, older trees and allow remaining hardwood trees to grow larger. As noted in the "Life History" section, the exfoliating bark hardwood trees, such as hickories and large oaks, often provide roost sites. The retention of snags and other den trees will further increase the potential that a substantial number of potential roost trees within the project area will be maintained. Damage to residual trees during felling can also improve roosting quality and quantity, as damaged areas that become cavities and crevices are more likely to develop due to resulting pathogen and insect attack at the injury point. In this instance, the opening up of canopy cover should improve foraging as well as roosting conditions.

Regeneration harvests may involve two-aged, shelterwood, and clearcut methods. All these methods have the potential to affect potential foraging, roosting and migratory habitat by reducing canopy closure below optimal levels (Romme et al.1995). In addition, potential roost trees would be removed and future roost tree availability could be reduced by the removal of most of the large trees. The effect of potential roost tree loss would last several decades until trees in the regenerated areas reach roost tree size. Two-aged and shelterwood harvests would both remove more potential roost and maternity trees than thinning, and would result in the potential reduced suitability of these areas to support Indiana bats. However, the two-aged and shelterwood regeneration harvest methods may be modified to achieve Indiana bat management objectives as opposed to timber objectives. Trees slated to be retained could be selected based on their large size, and potential suitability for roost trees. The removal of tree species and snags known to provide Indiana bat roost trees would be avoided, and fewer large trees may be removed overall. In this case, after the initial short-term disturbance, overall suitability may not be significantly reduced, and may be enhanced over the long-term. Site-specific evaluation and coordination will be required to ensure that management prescriptions are appropriately designed to meet these objectives. Since clearcut harvesting removes the majority of trees and results in a fully open canopy, the effects of this harvest type are more severe and last for a greater duration. Areas affected by this harvest type would become unsuitable to support Indiana bats.

Uneven-aged harvest methods such as single tree selection and group selection are used less frequently on the MNF than the other methods discussed above. Group selection results in the removal of all trees within an area generally at least 0.5 acre in size, and potentially up to 2 acres. Because these methods generally result in much more localized habitat alterations and leave surrounding forested areas intact, they are not expected to substantially decrease overall habitat suitability.

The FPR anticipates that between 1,000 and 5,000 acres of habitat will be subject to spruce habitat restoration over the next decade. Active spruce restoration would involve harvests similar to thinning, single tree selection, group selection, or two aged regeneration, depending on site-specific conditions. Therefore, impacts to habitat suitability would be similar to those described above. However, it is anticipated that most spruce restoration activities would be conducted in cooler, moist, higher elevation forests that already have a spruce/conifer component. Areas selected for spruce restoration area not expected to be preferred Indiana bat habitats, and once spruce forest conditions are established, the areas would most likely not be suitable Indiana bat habitat.

The FPR anticipates between 2,000 and 4,000 acres of timber harvest to create wildlife openings will be conducted over the next decade. Many of these areas will be areas that are developed on log landings and temporary roads that are constructed in order to conduct timber harvest activities in surrounding areas, so the actual areas harvested specifically for the creation of wildlife openings may be less than the amount projected. However, the MNF will likely construct some larger wildlife savannas that are not associated with lands and roads that will require timber harvesting. Although most wildlife openings are small (typically less than two but with some savannas greater than ten acres) they may be contiguous with other disturbed areas. Since these areas will have sparse tree cover and a largely open canopy, the effects of this harvest type are similar to other types of regeneration harvests. Generally, habitat suitability for the Indiana bat is expected to be reduced due to removal of the tree canopy, but some foraging and roosting could occur around the edges of openings and within areas that have residual trees.

While Indiana bats may also forage in upland forests and the edges of open spaces, the data appear to suggest that Indiana bats often preferentially use forested riparian areas for foraging. (Belwood 1979; Cope et al. 1978; Humphrey et al. 1977; Clark et al. 1987; Gardner et al. 1991*b*). The recent work of Owen et al. (2004) illustrates and further supports the biological importance of forested riparian habitats to bats in the Appalachians. The FPR incorporates Riparian Management Guidelines that restrict disturbances and establish vegetative buffers around streams on the MNF. Thus, it is likely that regardless of the type of timber harvest implemented, the Indiana bat's preferred foraging habitat will be retained. In addition, many researchers suggest that the ability of Indiana bats to adapt to habitat alterations within established home ranges would depend upon whether there was a sufficient amount of suitable forested (foraging and roosting) habitat in adjacent areas for the bats to move into (Sparks, Kurta, Currie, Clawson, and Gardner *in* Service 2004). As noted in the Baseline section, 96% of the MNF is currently forested. The MNF anticipates that less than 1% of the forest will be affected by projects in any one year. The 6,900 acres of potential timber harvest activities conducted each year are likely to be scattered over many areas of the forest, so that there will be ample, unaffected forested habitat adjacent to any one treatment area. Site-specific evaluations and Tier II biological opinions will provide the mechanism to ensure that sufficient potentially suitable Indiana bat habitat will remain post-project.

Salvage Activities

Timber salvage harvests would occur only after areas have already been damaged or altered by natural disturbances, insect infestations, or disease. Salvage operations on the MNF typically affect few acres in any given year, and would be accommodated within the estimates of overall habitat affected for timber harvests provided above. Areas potentially subject to salvage operations would have large numbers of dead or dying trees that would potentially provide abundant, high quality roosting opportunities for the Indiana bat. These types of harvests have the greatest potential to either remove multiple established roost trees, or significantly reduce habitat suitability for the bat. Salvage activities within known or suspected maternity areas would be particularly detrimental, and would have significant potential to remove large numbers of roosts, including primary roost trees. However, the development of site-specific protective measures by the MNF, in coordination with the Service and the WVDNR, would likely result in the recommendation that this type of activity be avoided. Salvage in Indiana bat primary range, which would include hibernacula and key areas on MNF lands, would be unlikely to occur due to a requirement to retain all snags over 5 inches in diameter within harvest units in Indiana bat primary range (TE 32). The requirement that vegetation management in primary range must be primarily for enhancement or maintenance of Indiana bat habitat also would make salvage unlikely in primary range (TE 31). However, salvage could occur elsewhere across the MNF and could potentially affect undiscovered maternity sites or roosting individuals.

Road Related Activities

Over the next 10 years, the MNF expects to affect between 630 and 780 acres of habitat as a result of road related activities such as road construction, reconstruction, and decommissioning. Indiana bats have been known to forage and travel along narrow forest roads with good canopy cover. Therefore, it is possible that road related activities could affect Indiana bats, and that tree removal associated with these activities could result in the removal of potential roost trees. The potential for this to occur and the potential effects will vary based on the location and timing of the proposed activitiy, in the same manner as described under the "Timber Harvest" section. Potential impacts to habitat suitability will vary depending on the type of activity. Paving and widening exisiting roads may reduce canopy cover to the extent that these areas would become unsuitable, similar to the effects described for clearcuts. Maintaiing and repairing roads could result in temporary, short-term disturbances that may not affect long-term habitat suitability. Construction of small, new roads could create new traveling and foraging corridors that would increase habitat suitability for the bat. In most cases, the potential for removing established roost trees, as well as the impacts to habitat suitability, are expected to be minor since each individual project will most likely affect a small, linear area. However, since road related activities often occur as part of other projects such as timber harvests or mineral development, cumulative effects could occur. The FPR includes measures, as listed under the "Timber Harvest" section, to avoid and minimize effects including retaining all known roost trees, and coordinating with the Service prior to implementing activities in known or suspected maternity areas. In addition, the FPR does not allow for any new road construction within 200 feet of a hibernacula (TE 51).

Mineral Operations
Over the next 10 years, the FPR anticipates that 740 acres of land within the MNF proclamation boundary may be affected by federal and private mineral development activities. Most of these activities are expected to be related to natural gas development, including the construction of new wells, storage facilities, pipelines, and associated access areas. Approximately one-third to one-half of this acerage could result from developing federal gas. Most wells and storage facilities would involve clearing approximately two acres of habitat. Potential adverse effects, and the likelihood that these effects would occur, would be similar to those described for wildlife openings, and related to the timing and location of the activity as described under the "Timber Harvest" section. The effects of constructing pipelines and access areas are the same as those described under "Road Related Activities." The FPR states that surface occupancy for federal mineral activities is not allowed within 200 feet of a hibernacula, or within key areas (TE 52), but may be allowed within primary zones and within maternity area on a case-by-case basis if they are compatable with Indiana bat management (TE 38, 53). In these situations, site-specific planning and coordination will be required to determine if additional avoidance and minization measures are available or appropriate.

Because the MNF does not control the development of private mineral rights, effects associated with those potential activities are not addressed under this BO, however, the the FPR does state that the MNF will work with other state and federal permitting agencies to reduce adverse effects to threatened and endangered species, in the event the developement of private mineral rights was to occur (TE 06).

Prescribed Fire
The FPR anticipates that between 10,000 and 30,000 acres of habitat on the MNF will be subject to prescribed fire or wildfire suppression activities over the next decade. Prescribed fire activities include site preparation work such as constructing fire breaks, as well as implementing the actual burn. Impacts associated with site preparation activities are similar to those discussed under road related activities above. Similar to the discussion provided under the timber harvesting section, the nature and extent of effects resulting from implementation of the actual burn will depend on the timing and location of the fire.

Conducting prescribed burning outside the hibernation period could result in direct mortality or injury to the Indiana bat caused by burning or smoke inhalation, especially death to young bats that are not able to fly. The likelihood of this happening, however, is reduced due to the anticipated method and timing of the burning. Because activities within a 2.5 radius around known or potential areas of Indiana bat maternity activity will only be conducted after coordinating with the Service and the WVDNR to develop site-specific protection measures, it is anticipated that conducting prescribed fire activities in these known sensitive areas during periods when Indiana bats might be actively using the area would generally be avoided. In addition, prescribed fires would generally only occur in the spring between March 1 and May 31, which is prior to the time that most young are born, or in the fall between November 1 and December 15, which is after all young are volant (Peter Fischer, Fire Program Manager, MNF, personal communication,

June 2006). While little to no research is available to document the potential direct effects of fire on Indiana bats, anecdotal information suggests that Indiana bats might be capable of escaping burning roost trees when necessary and if volant. In Tucker County, West Virginia, on MNF land, a myotid bat flew out of a burning snag during a prescribed fire and into an unburned forested area during the spring of 2001 (Rodrigue and Schuler, personal communication). Additionally, two red bats (*Lasiurus borealis*) were observed flying from another prescribed burn unit into an unburned area during another prescribed fire (Rodrigue et al. 2001). The MNF estimates that typical fire would move across the landscape at a target speed of less that 1-5 ft/minute. Because the proposed burns will be slow moving, most bats should have time to move out of the affected area.

Conducting prescribed burning during the hibernation period would generally not cause direct mortality or injury to Indiana bats, unless the fire was conducted in proximity to a hibernaculum (e.g. within a primary area). If smoke entered the cave, bats could be asphyxiated, awakened, and caused to either flee or relocate. Casual monitoring of smoke in or near caves on the Mark Twain National Forest and the Ozark National Forest during prescribed burns has not shown any detectable effect to hibernating bats (U.S. Forest Service 2005). There are no documented cases of hibernating Indiana bats being harmed from smoke from prescribed burning outside of the cave. Elder and Gunier (1981) did, however, note mortality of hibernating gray bats from smoke from a fire set inside a cave. Prescribed burns conducting within primary areas could be planned to avoid or minimize smoke at or near the caves by incorporating specific wind speed and direction, mixing height, and other parameters into site-specific burn plans.

Prescribed burns could be conducted during the spring when Indiana bats are emerging from hibernation, or during the late fall when the bats are preparing to hibernate. At these times the bats are expected to be concentrated in their primary zones. Conducting prescribed burns within the primary zones when bats are expected to be concentrated in these areas would disrupt foraging behavior and potentially fall mating behavior and increase the number of bats potentially exposed to adverse effects. Timing prescribed burns within the primary zones so that they occur either early in the spring or in early winter when the bats would be hibernating, or conducting smaller scale (300 acre or less) burns within these areas would minimize the potential impacts.

Indirect effects in the form of harm or harassment of Indiana bats may result from loss of potential roost trees, or by forcing the bats to abandon active roost trees. Because the MNF estimates that fires would generally only burn for one day, any potential harassment of bats would be temporary and short-term. Although it is not known how long or if the bats would continue to avoid these areas after they were burned. In addition, female Indiana bats in the non-maternity season and/or males typically have numerous suitable day-roosts available and they frequently roost-switch; therefore in the event that a bat is forced to flee from a burn area where it is roosting, other day-roosts are likely present on the area nearby that are available for Indiana bats to use. However, the extent to which roosting areas are disturbed will depend on the size of the proposed burn. The MNF anticipates that on average prescribed burns will cover approximately 300 acres, although larger burns of up to 3000 acres are possible. Larger scale burns have the potential to

affect a greater proportion of potential roosting areas, while the average size burn would likely leave other roosting areas in the vicinity of the project intact.

While prescribed burns could have some negative effects on the Indiana bat, as described above, overall prescribed fire will likely improve Indiana bat foraging and roosting habitat. Prescribed burning most often results in some degree of midstory mortality to small-diameter trees and shrubs, producing more open understory conditions. Opening of the midstory may improve foraging and roosting habitat conditions. Individual mortality to trees would increase the number of snags and create scattered canopy gaps, which would improve roosting. Increased insect populations produced in burned areas for foraging is also likely to occur in successional years. Carter et al. (2000) state that additional potential roost cavities and snags can be created in forested stands by utilizing prescribed fire, depending on fire intensity, increase the availability of snags. Snags could be created either directly by fire mortality or indirectly by making them more susceptible to insect attacks or pathogens (Bull et al. 1997). Depending on the tree species, live trees subsequently killed by fire activity would remain as suitable potential roost trees until such a time that peeling/lost bark renders them unsuitable as summer roost sites. The Indiana bat maternity colony discovered in the summer of 2004 in Lower Glady, Tucker County, West Virginia was located in an area subjected to a wildfire during the spring of 2002 (D. Arling, USFS, pers. comm.). This site is located in close proximity to an Indiana bat hibernacula, and to the MNF. It is likely that Indiana bats are using this area as a maternity site as a result of its close proximity to a hibernacula and the abundance of roost trees that were created as a result of forest fires. Therefore, the long-term indirect effects of prescribed fire activities on the MNF may be beneficial to the Indiana bat.

In summary, direct effects from prescribed burns have been minimized by conducting burns when young Indiana bats are expected to be volant. Minimization of adverse effects from burns conducted around known maternity areas, within primary zones, or near hibernacula will be accomplished through development of site-specific management plans that may address burn timing, size, and smoke control. Indirect adverse effects in the form of harm and harassment of Indiana bats being forced to flee from roosting and foraging areas may result from prescribed fire on the MNF. However, these adverse effects are expected to be short-term and localized. Long-term beneficial effects, in the form of habitat enhancements may occur as a result of prescribed fire activities.

Small Scale Projects

Historically, under the previous Forest Plan, the MNF implemented a limited number of projects that involve small scale tree clearing each year. These projects have included work to: maintain trails; construct or maintain right-of-ways; or access areas to cap abandoned gas wells. Tree clearing activities on these projects has generally been restricted to removal of selected individual trees and affected less than 1.5 acres of forested habitat per project. These projects were not contiguous with, or part of, other projects that were being implemented by the MNF. It is anticipated that no more than ten individual, small scale projects that involve less than 1.5 acres of tree removal will be implemented per year. If these small scale projects occur outside of known Indiana bat

primary or maternity areas, and retain trees that have characteristics of typical Indiana bat roost trees (i.e. shagbark hickories and snags as described in the "Timber Harvest" section), it is extremely unlikely that they would result in the removal of an occupied Indiana bat roost tree, or that they would reduce the suitability of the overall area for Indiana bat foraging or roosting. Therefore, the Service concludes the chance that the individual implementation of these small-scale projects would adversely affect an Indiana bat is discountable. However, at the programmatic level, implementation of these types of projects may contribute to the cumulative amount of habitat alternation occurring throughout the forest. Annual monitoring of the amount of acreage affected by these types of projects would ensure that cumulative effects are not significant.

Recreational Activities
No large-scale development of new recreational facilities is planned under the FPR, however, maintanance and renovation of existing facilities may occur. It is expected that most of these activities will not alter existing habitat suitability and either will not involve clearing of any trees that could serve as potential roost trees (i.e. trees greater than 5 inches dbh), or would only remove very few selected individual trees. As a result, in general these activities are not likely to advesely affect the Indiana bat.

Recreational spelunking is a popular activity on the MNF. Allowing indivuals or groups to enter hibernacula for recreation purposes when the bats are present could disturb hibernating bats, resulting in increased energy expenditures, decreased fitness, and reduced chances of survival. The FPR prohibits public entry into major hibernacula from September 1 to May 15 (TE 45). Minor hibernacula may remian open if the MNF, the Service and the WVDNR agree that public entry would be extremely unlikely to cause harm or mortality to Indiana bats. As a result, adverse effects from recreational caving activites are not likely to occur.

Watershed and Aquatic Restoration, Gypsy Moth Control, Firewood Cutting, and Range Activities
Implementation of projects related to Watershed and Aquatic Restoration, Gypsy Moth Control, Firewood Cutting, and Range Activities, in accordance with the proposed plan, are not likely to adversely affect the Indiana bat. Watershed improvement activities, such as vegetative bank stabilization and efforts to revegetate and stabilize exposed soils, could enhance habitat characteristics along treated streams, resulting in beneficial effects to potential Indiana bat foraging habitats. The pesticides used for gypsy moth control are not known to affect vertebrates. Treatments in areas known to support Indiana bats, such as primary zones, would be restricted to use of Gypcheck, a pesticide that is specific to gypsy moth. Indiana bats are not expected to be present in hay fields or pasture areas affected by range management activities, or in the dead and downed trees associated with firewood cutting. Additional supporting rationale for these determinations is provided in the BA and is incorporated here by reference.

Summary
Implementation of timber harvests, mineral operations, and road related activities under the FPR has the potential to adversely affect the Indiana bat through the removal of

occupied roost trees or by causing changes in habitat suitability that could affect breeding, feeding and sheltering behaviors. Removal of established roost trees could cause direct mortality or injury of bats occupying the tree or cause individual roosting bats significant loss of energy that would result in harm or harassment of the individual. If the affected roost tree is a primary roost used by an Indiana bat maternity colony, adverse effects could include reduced colony cohesion; increased stress; and increased energy demands from searching for new roost areas and decreased thermoregulatory efficiency. These impacts can lead to reduced reproductive success. The potential for these effects to occur is related to the time of year that the trees are cut and the location of the action in relation to areas of expected high Indiana bat concentrations, such as known or suspected maternity areas and primary zones. While the potential to unknowingly remove or damage an established Indiana bat roost tree during implementation of these activities can not be discounted, in most cases this likelihood will be small, and would be restricted to the removal of single (rather than multiple) lower quality alternate roost trees. Depending on the type of activity, projects have the potential to increase habitat suitability, have only minor or short-term effects, or to make areas unsuitable to support the bats. Forested riparian corridors that provide preferred foraging habitat, and significant amounts of adjacent forested habitat that potentially provide roosting opportunities, will likely remain after implementation of individual projects, thereby minimizing the potential effects of any reduced habitat suitability. Regardless of project type, the FPR has included measures to significantly avoid and minimize the potential for adverse effects to occur. Adverse effects for individual projects will be evaluated and further minimized on a site-specific basis.

Similar to the projects discussed above, prescribed burns have the potential to cause direct mortality or injury to bats or cause changes to habitat suitability. Due to the method and timing of proposed burns, the potential for direct mortality or injury has been minimized. It is anticipated that disturbances related to prescribed burns will be limited and short-term. Long-term effects may include increased habitat suitability.

Projects associated with recreational activities, watershed and aquatic restoration, gypsy moth control, firewood cutting, and range activities are not likely to adversely affect the Indiana bat either because they do not affect habitats or landscape features that are used by the bat, because they will occur on such a limited scale, or because avoidance measures have been put in place.

CUMULATIVE EFFECTS

Cumulative effects include the combined effects of any future state, local, or private actions that are reasonably certain to occur within the action area covered in this BO. 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 ESA. Of the 1,700,000 acres within the action area, 919,000 acres are currently under MNF ownership. Any actions conducted on MNF lands will require separate section 7 consultation. Therefore, cumulative effects, as defined in the ESA, are not expected to occur within those lands.

Based on past trends, future non-federal actions within the action area but on private lands are anticipated in the form of private mineral development, road construction and maintenance, residential and commercial development, and timber harvest. New windpower facilities may also be developed. The Service is aware of a number of projects on private lands that are reasonably certain to occur within the action area. These projects include wind farm developments, limestone quarries, and timber harvests. In all cases, the Service is actively coordinating with private land owners and/or the state agencies responsible for conducting or permitting these activities. When it is not possible to avoid adverse effects, it is expected that impacts from these projects will be evaluated under separate section 7 consultations, including consultation on ESA section 10 permits. It currently unknown how many acres of suitable habitat for Indiana bat 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 or construction of windfarms in close proximity to large scale hibernacula would have the greatest potential impacts to Indiana bat. To date, there are no known instances of Indiana bats being killed by wind farms, although no windfarms currently exist in primary zones and monitoring data on migrating bats is limited. The Service is actively coordinating with the Public Service Commission and private developers to avoid the potential for adverse effects. Mineral development and most road construction activities are either permitted or conducted by state agencies that routinely coordinate with the Service to avoid impacts. Other activities such as timber harvests would have the same general effects as described for MNF actions. Under the FPR, lands on the MNF are managed to primarily maintain healthy forested habitats. In addition, caves and Indiana bat hibernacula are protected from disturbance. These protections are not necessarily in place on private lands. As a result, we anticipate that implementation of the FPR will not significantly contribute to cumulative effects, and may offset the negative effects of habitat loss and degradation that might occur on adjacent private lands in the absence of these protections.

CONCLUSION

Individual projects implemented under the FPR have the potential to adversely affect Indiana bats, through the loss of individual roost trees or reduced habitat suitability. The FPR has included substantial measures to ensure that these adverse effects are avoided and minimized. Forest management actions that have the potential to adversely affect the bat will annually affect less than 1% of MNF and a total of between 5% and 10% of the MNF over the next decade. Even when these impacts are considered in conjunction with areas on the MNF that are currently not forested, it is anticipated that the MNF will provide over 780,000 of forested habitat that should be available to the bat. The MNF is known to provide habitat for swarming, hibernating, and summering Indiana bats. The FPR includes programmatic measures to protect and manage the habitats that support these three key life stages. These measures should provide an appropriate means to ensure that suitable habitat conditions are maintained and potentially enhanced, on a forest-wide scale. It is therefore anticipated that overall the FPR will not result in the long-term or significant reduction of populations of the Indiana bat on the MNF.

After reviewing the current status of the Indiana bat, the environmental baseline, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that implementing the MNF's Forest Plan Revision as proposed, is not likely to jeopardize the continued existence of the Indiana bat. Critical habitat has been designated for this species, however none will be affected by this action.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA, and federal regulation pursuant to section 4(d) of the ESA, prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. "Harm" is further defined by the Service to mean an act which actually kills or injures wildlife, including significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service to mean an intentional or negligent act or omission that creates the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral 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 conducted by the Federal agency or applicant. 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 ESA provided that such taking is in compliance with the terms and conditions of the incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the MNF and any applicant or agent, as appropriate, for the exemption of section 7(o)(2) to apply. The MNF has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the MNF should (1) fail to assume and implement the terms and conditions, or (2) fail to require an applicant to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to any permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the MNF must report the progress of the action and its impact on the species to the Service as specified in this Incidental Take Statement [50 CFR § 402.14(i)(3)].

Level of Take

Although, based on the best scientific and commercial data available, there have been no documented cases of Indiana bats being incidentally taken during previous activities on the MNF, the Service believes that if Indiana bats are present or utilize an area proposed for timber harvest, prescribed burn, or other disturbance, incidental take of Indiana bats could occur. The FPR is a comprehensive plan level document that allows and guides, but does not authorize site-specific actions to occur. The standards and guidelines proposed substantially reduce the potential for adverse effects and incidental take to occur as a result of actions implemented under the FPR. Therefore, many projects completed under the FPR that comply with all of the standards and guidelines and other project commitments detailed in the BA would not adversely affect the Indiana bat. In

those instances no incidental take would occur. However, other site-specific projects conducted under the FPR may result in adverse effects to individual Indiana bats that rise to the level of take. The potential for these effects to occur will be further evaluated as individual projects are implemented.

The Service anticipates that actual incidental take of Indiana bats as a result of the projects implemented under the FPR will be difficult to quantify and detect due to the bat's small body size, widely dispersed individuals under loose bark or in cavities of trees, and unknown areal extent and density of their summer and fall roosting populations range within the MNF. Monitoring to determine take of individual bats within an expansive area of forested habitat is a complex and arduous task. Unless every individual tree that contains suitable roosting habitat is inspected by a knowledgeable biologist before management activities begin, it would be impossible to know if a roosting Indiana bat is present in an area proposed for harvest. Inspecting individual trees is not considered by the Service to be a practical survey method and is not recommended as a means to determine incidental take. However, the areal extent of potential roosting and foraging habitat affected can be used as a surrogate to monitor the level of take.

As detailed in Table 4 below, the Service anticipates that no more than 10,052 acres of potential Indiana bat habitat will be disturbed annually as a result of all project activities on the MNF. This figure represents an annual maximum, and it is anticipated that the actual level of incidental take will be substantially less, as reflected in the estimated range of take over the next decade. It is estimated, therefore, that no more that 1% of the MNF will be disturbed each year, and that over the next decade a total of between 5% and 10% of the MNF will be subject to some type of project that may alter or disturb potentially suitable Indiana bat habitat.

Table 4. Estimated acreage of management activities on the MNF that may contribute to take of Indiana bats during the first decade of the planning horizon.

Activity	Maximum Annual Acreage	Total Estimated Acreage During First Decade
Development of federal minerals	74	740
Prescribed fire and wildfire suppression	3000	10,000 – 30,000
Road construction and reconstruction	78	630 – 780
Small Scale Projects (>1.5 acres)*	15	150
Activities involving timber harvest:		
Programmed regeneration harvest	4000	20,000 – 40,000
Programmed thinning	1300	7,000 – 13,000
Timber harvest to improve Indiana bat habitat within primary range	700	3,000 – 7,000
Timber harvest for spruce ecosystem restoration and enhancement in MP 4.1	500	1,000 – 5,000
Timber harvest for wildlife openings	400	2,000 – 4,000
Timber harvest total	**6900**	**33,000 – 69,000**
Total acreage of all activities that may contribute to take	**10,052**	**44,370 – 100,520**

* The acreage impacts associated with these projects are not expected to increase the total impacts over the levels estimated for other project categories.

Implementation of the terms and conditions associated with the reasonable and prudent measures will reduce further the impact of the potential for incidental take. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The MNF must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize incidental take of the Indiana bat. In order to be exempt from the prohibitions of section 9 of the ESA, the MNF must comply with the following terms and conditions which implement the RPMs and outline reporting/monitoring requirements. These terms and conditions are non-discretionary. Each RPM is listed in italics, followed by numbered terms and conditions that implement each RPM.

RPM 1: Proposed management activities shall be planned, evaluated, and implemented consistent with measures developed to protect the Indiana bat and to reduce adverse impacts.

1.1 The MNF shall implement the "Threatened, Endangered, and Proposed Species" section of the Forest Plan Revision as proposed in the attached Appendix A.

1.2 The MNF shall develop information regarding baseline habitat conditions for all primary zones within the MNF. Where available, this information should include abundance and distribution of various habitat and land-use types, and forest age class distribution. Priority shall be placed on developing baseline information for primary zones with high potential for implementing beneficial management actions. This information shall be used to evaluate and develop potential management activities within each zone, in accordance with the criteria outlined in Appendix A. For each proposed project within a primary zone, pre- and post-project conditions shall be determined and included in site-specific biological evaluations as described in 3.2 below.

1.3 Prior to implementing individual prescribed fire activities, the MNF shall coordinate with the Service to develop any appropriate site-specific measures to avoid and minimize impacts to potential Indiana bat habitats.

1.4 Prior to implementing individual activities within an Indiana bat primary zone, the MNF shall coordinate with the Service to develop any appropriate site-specific measures to enhance and/or minimize impacts to potential Indiana bat habitats.

1.5 Each year, the MNF may implement up to ten individual, small scale projects that 1) involve less than 1.5 acres of tree removal per project; 2) occur outside of known Indiana bat maternity or primary zones; and 3) retain shagbark hickories and snags to the extent practicable. It will be assumed that projects meeting these criteria are not likely to adversely affect the Indiana bat. The acreage of tree removal associated with these activities will be monitored and reported by the MNF as described in 3.1 and 3.2 below. The cumulative total acreage affected by these projects shall not exceed 15 acres. If individual projects beyond this total are proposed, a not likely to adversely affect determination can not be assumed.

1.6 Projects on the MNF may proceed without formal consultation if site-specific projects proposed for implementation are surveyed for Indiana bats according to protocols established by the Service, and no Indiana bats are detected. If the projects are not completed within three years of the Indiana bat surveys, the surveys must be updated. The MNF's standard watershed-based surveys typically cannot be relied upon for site-specific clearance. Protocols for clearance surveys must be established on a project-specific basis in consultation with the Service. When project-specific clearance surveys are conducted and Indiana bats are not detected, it will be assumed that the bats may be present, but in such low numbers that the project is not likely to adversely affect the bat. However, clearance surveys can not be used to avoid formal consultation for projects in primary range

or within 2.5 miles of a maternity site, roost tree, or capture site. Project acres planned and implemented in this manner will not be counted against the annual allowable acres permitted under the programmatic incidental take statement.

1.7 Projects implemented during the Indiana bat hibernation period (November 15 through March 31) may proceed without formal consultation, if informal consultation between the Service and the MNF concludes that these projects are not likely to adversely affect Indiana bats, and the proposed timing of project implementation is incorporated as a conservation measure of the proposed project. Projects planned and implemented in this manner will not be counted against the annual allowable acres permitted under the programmatic incidental take statement.

RPM 2: The Forest Service, in cooperation with the Service and the WVDNR, shall continue to monitor the status of the Indiana bat on the MNF.

2.1 The MNF shall continue to cooperate with the WVDNR and the Service to conduct their bi-annual population monitoring of hibernacula within the action area.

2.2 The MNF shall continue to seek identification of maternity sites and evidence of summer use on the MNF on a watershed basis. Unless otherwise agreed to by the Service, surveys shall be conducted annually using survey methods and frequencies that follow guidelines and protocols established by the Service. Proposed survey strategies and areas shall be coordinated with the Service and the WVDNR prior to initiating annual efforts. The Service and the WVDNR shall be notified within five days of the capture of an Indiana bat. If Indiana bats are captured, follow up surveys using radio telemetry or other Service-approved methods shall be used to identify potential roosting and foraging areas. The MNF shall provide the Service and the WVDNR with a report of all survey results by January 1 of each year.

RPM 3: The Forest Service shall monitor tree removal activities and prescribed burning on the MNF to determine whether measures to protect the Indiana bat, and the terms and conditions of the BO are being implemented as required.

3.1 In order to track the amount of incidental take actually implemented, by November 15 of each year, the MNF will provide the Service with a report of the total amount of acres of tree removal and prescribed burning conducted during the prior fiscal year, and cumulatively to date. The report shall also provide a list of individual projects implemented that year and the amount of acres affected for each activity type of that project. Throughout the year, the MNF shall also monitor the amount of incidental take implemented and notify the Service if and when the cumulative total acreage for the year reaches or exceeds 80 percent of the annual allowance.

3.2 To ensure that the exemption of incidental take is appropriately documented, the Service will implement a tiered programmatic consultation approach. As individual projects are proposed under the Forest Plan, the MNF shall provide project-specific information to the Service that (1) describes the proposed action and the specific area to be affected, (2) identifies the species that may be affected, (3) describes the manner in which the proposed action may affect listed species, and the anticipated effects, (4) specifies that the "anticipated effects from the proposed project are similar to those anticipated in the programmatic BO", (5) quantifies the cumulative total of take that has been authorized annually and to date, and (6) describes any additional effects, if any, not considered in the tier I consultation.

The Service will review the information provided by the MNF for each proposed project. If it is determined during this review that a proposed project is not likely to adversely affect listed species, the Service will complete its documentation with a standard concurrence letter that refers to this BO (the tier I programmatic document), and specifies that the Service concurs that the proposed project is not likely to adversely affect listed species or designated critical habitat. If it is determined that the proposed project is likely to adversely affect listed species or designated critical habitat, then the Service will complete a tier II BO, including a project-specific incidental take statement. Each tier II BO will also calculate the cumulative total of incidental take authorized annually and to date.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following activities:

1. Collaborate with the Service on an outreach program specifically directed towards eastern woodland bat species and their conservation needs. The program would target federal, state, and private foresters, land managers and the general public.

2. Retain or create ephemeral pools during log road abandonment, where appropriate, to provide additional sources of drinking water for forest bats. Such pools should be located such that they do not create a risk of erosion, sedimentation, or other adverse impacts on soil and water resources.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation for the MNF proposed Forest Plan Revision. As

required by 50 CFR 402.16, reinitiation of formal consultation is required when 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 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 is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such a take must cease, pending reinitiation of consultation.

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Appendix A:

Threatened, Endangered, and Proposed Species Section

of the

2006 Forest Plan Revision

Note: This text has been modified from that presented in the July 2005 Draft Environmental Impact Statement in order to address public comments, and the results of consultation between the Service and the MNF.

Threatened, Endangered, and Proposed Species

Forest Service Manual and Handbook management direction for Threatened, Endangered, and Proposed (TEP) species is in FSM 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management, and in FSH 2609.13 – Wildlife and Fisheries Program Management Handbook. See FSM and FSH direction for other appropriate resources in this section.

Although all threatened, endangered, or proposed species on the Forest may not be individually addressed in the Forest-wide management direction, the Forest is obligated to provide sufficient habitat to contribute to their survival and recovery. This obligation is spelled out in more detail in the Endangered Species Act, Forest Service Manual and Handbook direction, and various recovery plans, conservation strategies and agreements, and Memoranda Of Understanding. In addition, Section 7 consultation will occur at the project level for all proposed actions that may affect these species or their habitat. The Forest Plan does not authorize or implement specific actions and therefore cannot predict potential effects from these actions. The actions and effects would occur at the project level and will be addressed in consultation at that level.

DESIRED CONDITIONS

Habitats for Threatened and Endangered Species are managed to maintain or enhance populations consistent with established and approved Recovery Plans. TEP management is coordinated with management of other resources to contribute to species recovery and achieve multiple-use objectives. Habitats for Proposed species are managed to help preclude listing as Threatened or Endangered under the Endangered Species Act (ESA). Effects from Forest programs or activities are at levels that do not threaten the persistence of TEP species populations.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
General Direction		
Goal	TE01	Provide habitat capable of contributing to the survival and recovery of species listed under the ESA. Provide habitat that may help preclude Proposed species from becoming listed.
Goal	TE02	Integrate TEP habitat management with other resource objectives.
Goal	TE03	Work with USFWS, WVDNR, and other appropriate personnel to identify and manage habitat for TEP species. Participate in recovery plan development for threatened or endangered species that occur on the Forest, or that may be influenced by Forest management activities.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Goal	TE04	Within watershed-level planning units, identify TEP species habitat and opportunities to maintain, restore, or enhance habitat conditions. Design and implement management actions at the project level to address opportunities and provide for ecological conditions, population viability, reproductive needs, and habitat components for TEP species.
Goal	TE05	Collaborate on outreach programs for TEP species and their conservation needs.
Standard	TE06	When proposed exploration or development of privately owned mineral rights may adversely affect TEP species or habitat, the Forest shall work with state and federal mineral operation permitting agencies to reduce adverse effects.
Standard	TE07	Special use permits may be authorized in TEP species habitat if the uses do not adversely affect populations or habitat. This standard does not apply to Indiana bat or running buffalo clover. See special uses direction for these species, below.
Cave Habitat and Species		
Standard	TE08	Cave entry during closed periods for scientific study and observation may be permitted by Forest Supervisor's written approval and permit from USFWS or delegated authority.
Standard	TE09	Gates or fences installed at cave entrances shall allow free entry and exit by TEP species and shall not restrict normal airflows.
Standard	TE10	Gate installation that disturbs a cave feature or floor must have an archaeological survey prior to disturbance.
Standard	TE11	Gates and fences shall be monitored and maintained. Base monitoring frequency on past cave visits, access, and potential for disturbance. Maintenance and repair of gates shall be undertaken within a reasonable time frame from vandalism discovery.
Additional Forest-wide direction to address the needs of specific TEP species is identified below.		
Virginia Big-Eared Bat		
Goal	TE12	Within six miles of hibernacula, maternity colonies, and bachelor colonies, create or maintain a diversity of open, herbaceous habitats where consistent with MP emphasis.
Standard	TE13	Before taking actions on buildings that are within 6 miles of hibernacula, maternity colonies, or bachelor colonies, evaluate the buildings' potential to serve as roosting habitat and take action to avoid or minimize impacts as necessary. Actions (disposal, construction, reconstruction, etc.) are allowed during the hibernation period (November 16–March 31) without roosting habitat evaluation.
Standard	TE14	Within 200 feet of hibernacula, maternity colonies, or bachelor colonies, vegetation management shall only be conducted for: a) Bat habitat maintenance or improvement, b) Public safety, or c) Research.
Standard	TE15	New recreation facility construction is prohibited within 200 feet of hibernacula, maternity colonies, or bachelor colonies.
Standard	TE16	Prohibit public entry into caves and mines used as major hibernacula from September 1 to May 15. Minor hibernacula that harbor very few individuals in most years may remain open to the public if the Forest, USFWS, and WVDNR agree that public entry would be extremely unlikely to cause harm or mortality of Virginia big-eared bats.
Standard	TE17	Prohibit public entry into caves and mines used as maternity or bachelor colonies during the nursery season from April 1 to September 15.
Standard	TE18	Surface occupancy is not allowed for mineral operations on federal minerals that are within 200 feet of hibernacula, maternity colonies, or bachelor colonies.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Standard	TE19	Seismic exploration is prohibited within 200 feet of hibernacula, maternity colonies, or bachelor colonies unless it can be demonstrated that it would not have an adverse impact on bat populations or habitat.
Standard	TE20	Explosives shall not be used within 200 feet of hibernacula, maternity colonies, or bachelor colonies unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat. Explosives outside of this area shall not be used when such use has potential to damage the cave or disturb the bat.
Standard	TE21	New road or trail construction is prohibited within 200 feet of hibernacula, maternity colonies, or bachelor colonies.
Standard	TE22	If any new Virginia big-eared bat hibernacula, maternity colonies, or bachelor colonies are discovered on the Forest, the Forest shall develop appropriate protection measures in cooperation with USFWS and WVDNR. These measures could include closure orders, signs, fences, or gates.
Indiana Bat The following terms and definitions (see Glossary) are critical to understanding direction for Indiana bats: 1. Primary Range 2. Hibernacula 3. Key Areas 4. Maternity site		
Standard	TE23	Retain all shagbark hickory trees 5 inches in diameter at breast height (dbh) or greater in harvest units except where public or worker safety concerns or research opportunities exist.
Standard	TE24	After post-harvest treatments, retain an average of at least 6 snags per acre that are 9 inches dbh or greater within harvest units, except where public or worker safety concerns exist. Create additional snags, if needed, from the available leave trees to make up any difference. Prioritize snag retention and creation from the largest to the smallest dbh.
Standard	TE25	Retain all known roost trees until such time as they no longer serve as roost trees (e.g. lose their exfoliating bark or cavities, fall down, decay, or are no longer used by bats).
Standard	TE26	Where evidence of maternity colonies (reproductively active females or juveniles prior to August 15) is discovered, the Forest shall establish a 2.5-mile radius buffer around the evidence site and search for actual maternity colonies within this management zone. The radius may be adjusted if warranted by new scientific information. The search shall continue for 3 field seasons or until a maternity site is confirmed, whichever occurs sooner. While the search is ongoing, proposed actions in the management zone shall be reviewed in cooperation with USFWS and WVDNR to determine any site-specific protection measures that may be needed. If and when a maternity colony is found, the management zone shall be adjusted as specified in TE27. If no other evidence of maternity activity is found for 3 field seasons, the management zone shall expire.
Standard	TE27	If a maternity site is discovered, establish a management zone centered on the site. The management zone shall not exceed a 2.5-mile radius unless site-specific factors or new scientific information indicate that a larger zone is needed. The zone may be smaller than a 2.5-mile radius if an evaluation of topography, known roost tree locations, proximity of permanent water, or other site-specific habitat characteristics indicates that a smaller zone is likely to satisfy the habitat needs of the colony. Needed protection measures within the zone shall be determined at a site-specific level in cooperation with USFWS and WVDNR.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Standard	TE28	If any new Indiana bat hibernacula are discovered on the Forest, the Forest shall develop appropriate protection measures in cooperation with USFWS and WVDNR. These measures could include closure orders, signs, fences, or gates.
Indiana Bat Primary Range		
Goal	TE29	Manage naturally occurring tree species composition to provide a continuous supply of suitable roost trees and foraging habitat for Indiana bat. Achieve vegetative diversity that maintains or improves Indiana bat habitat. Where consistent with management prescription emphasis, use a variety of silvicultural methods to create desired age class diversity.
Objective	TE30	Provide a continuous supply of suitable roost trees by maintaining a minimum of 50 percent of each primary range on NFS lands in any combination of mid successional (40-79 years), mid to late successional (80-120 years), and late-successional (>120 years) age classes.
Standard	TE31	Management of vegetation 5 inches dbh or greater may only be implemented if activities: a) Maintain or improve Indiana bat or other TEP or Sensitive species' habitat, or b) Address public or worker safety concerns, or c) Achieve research objectives.
Standard	TE32	Retain all harvest unit snags greater than 5 inches dbh except where public or worker safety concerns exist.
Standard	TE33	Leave at least 5 cull trees per acre, if available—preferably shagbark hickory, bitternut hickory, red oak, white oak, sugar maple, white ash, green ash, and/or sassafras. Prioritize cull retention from the largest to the smallest dbh.
Standard	TE34	New livestock grazing areas shall not cause maintained openings to exceed 5 percent of each primary range. Allotment Management Plans shall be modified, if needed, to ensure allotment management is compatible with Indiana bat habitat management.
Standard	TE35	When designing and implementing regeneration harvest units, the following direction shall be used to help retain appropriate leave trees for Indiana bat habitat: a) Preferred residual trees for shelterwood and two-aged regeneration harvests should include the following species as available: shagbark hickory, bitternut hickory, red oak, white oak, sugar maple, white ash, green ash, and/or sassafras. Prioritize residual trees from the largest to the smallest dbh. b) Retain clumps of live trees and shrubs at a rate of 1/3 an acre per 5 to 8 acres of regeneration harvest area. Clumps should be co-located with other retained features.
Standard	TE36	Maintain a component of large over-mature trees, if available, in all uneven-aged harvest units to provide suitable roosting habitat.
Standard	TE37	Regeneration harvest shall not cause the early successional (0-19 years) age class of forest stands to exceed 10 percent of each primary range at any time.
Standard	TE38	Special use permits and federal mineral exploration and development may be allowed within the primary range if they are compatible with Indiana bat management.
Standard	TE39	Explosives may be allowed within the primary range if it can be demonstrated that this activity will not have an adverse effect on bat populations or habitat.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Guideline	TE40	Shelterwood and two-aged regeneration harvests are the preferred silvicultural methods. Alternate methods may be used to meet other vegetation or wildlife habitat objectives when compatible with Indiana bat habitat management. Thinning from below is the preferred management method for stands originating before 1905. Other appropriate or preferred measures to maintain or improve Indiana bat habitat within primary range may be developed under consultation with USFWS and WVDNR.
Guideline	TE41	Without preventing the regeneration of desired tree species, sufficient basal area should be retained in even-aged harvest units to meet the habitat needs of Indiana bats. Basal area determinations should be coordinated between the project silviculturist and wildlife biologist, based on site-specific vegetative conditions and habitat needs.
Indiana Bat Hibernacula, Key Areas, and Maternity Sites		
Standard	TE42	Management of vegetation that is less than 5 inches dbh generally may occur within 200 feet of the hibernacula, within key areas, or within 2.5 miles of known maternity sites during any time of the year, provided adverse disturbance to bats is avoided.
Standard	TE43	Management of vegetation 5 inches dbh or greater may only be implemented within 200 feet of hibernacula or within key areas to: a) Maintain or improve Indiana bat, TEP, or Regional Forester Sensitive Species habitat, b) Address public or worker safety concerns, or c) Achieve research objectives.
Standard	TE44	No new recreational facilities shall be constructed within 200 feet of hibernacula or within key areas.
Standard	TE45	Prohibit public entry into caves and mines used as major hibernacula from September 1 to May 15. Minor hibernacula that harbor very few individuals in most years may remain open to the public if the Forest, USFWS, and WVDNR agree that public entry would be extremely unlikely to cause harm or mortality to Indiana bats.
Standard	TE46	Construction or other permanent activities may only occur in key areas if they maintain or improve Indiana bat habitat or provide for public safety.
Standard	TE47	Do not issue permits for special uses occurring within 200 feet of hibernacula that would adversely affect Indiana bat populations or habitat.
Standard	TE48	Special use permits occurring within key areas and within 2.5 miles of maternity sites may be authorized if they are compatible with Indiana bat population maintenance or recovery.
Standard	TE49	Seismic exploration is not allowed within 200 feet of hibernacula, within key areas, or within 2.5 miles of maternity sites unless analysis can demonstrate it would not have an adverse impact on bat populations or habitat.
Standard	TE50	Explosives shall not be used within 200 feet of hibernacula, within key areas, or within 2.5 miles of active maternity sites, unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat. Explosives outside of these areas shall not be used when such use has potential to damage the cave or disturb the bat.
Standard	TE51	New road or trail construction is prohibited within 200 feet of hibernacula.
Standard	TE52	Surface occupancy for proposed federal mineral operations is not allowed within 200 feet of hibernacula or within key areas.
Standard	TE53	Surface occupancy for proposed federal mineral operations within 2.5 miles of maternity sites shall be evaluated on a case-by-case basis. Any surface occupancy must be compatible with Indiana bat population maintenance or recovery.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Standard	TE54	Establish and maintain a key area of at least 150 acres, if available, within each primary range.
Guideline	TE55	A key area should be contiguous and located as close to the cave as possible. Where available, this area should include 20 acres of late successional forest, and an additional 130 acres of mid-to-late successional or late successional forest.
Guideline	TE56	New road or trail construction should avoid key areas and maternity sites.
Cheat Mountain Salamander		
Goal	TE57	Identify opportunities to reduce fragmentation of populations and habitat.
Standard	TE58	Prior to proposed vegetation or ground disturbance in known or potential habitat, field surveys must be conducted and occupied habitat must be delineated.
Standard	TE59	Ground and vegetation-disturbing activities shall be avoided within occupied habitat and a 300-foot buffer zone around occupied habitat, unless analysis can show that the activities would not have an adverse effect on populations or habitat.
Bald Eagle		
Standard	TE60	Maintain 1,500-foot protection zones around nest sites that have been active within the last three nesting seasons. Activities within this zone must be compatible with bald eagle management. Compatibility determinations shall be made on a case-by-case basis.
Standard	TE61	Seasonal closure orders may be used to control human disturbance in the vicinity of nests.
Standard	TE62	A nest and the tree or structure where it is located shall not be removed or damaged as long as any usable portion of the nest remains, regardless of the time elapsed since the nest was last used, unless there is a concern for public health or safety.
West Virginia Northern Flying Squirrel (WVNFS)		
Standard	TE63	Suitable habitat shall be determined using maps collaboratively produced by the Forest, USFWS, and WVDNR. These maps shall be reviewed during watershed or project analysis and refined when Forest, USFWS, and WVDNR biologists determine that suitable habitat is or is not present. All verified capture sites shall be included in the suitable habitat maps.
Standard	TE64	Suitable habitat shall be considered occupied. Vegetation management activities in suitable habitat shall only be conducted after consultation with USFWS, and: a) Under an Endangered Species Act Section 10 research permit to determine the effects of an activity on WVNFS or to determine activities that would contribute to the recovery of the species, or b) To improve or maintain WVNFS or other TEP species habitat after research has demonstrated the beneficial effects of the proposed management, or c) When project-level assessment results in a no effect or may affect, not likely to adversely affect determination, or d) To address public safety concerns.
Standard	TE65	New developed recreation facilities, such as visitor centers or campgrounds, shall not be constructed in suitable habitat. Smaller facilities—such as foot trails, trailheads, picnic sites, ¼ acre vistas—may be constructed if they result in a no effect or may affect, not likely to adversely affect determination.
Standard	TE66	Development of federal gas and oil is generally allowed as long as: (a) it remains within the limits projected in the 1991 Environmental Assessment Oil and Gas Leasing and Development and (b) protection measures for WVNFS are developed through consultation with the USFWS prior to Forest Service approval of operations.
Shale Barren Rock Cress		

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Standard	TE67	Vegetation manipulation and ground-disturbing activities are prohibited within shale barrens unless no feasible alternatives exist. Exceptions may be allowed for research or information-gathering activities.
Running Buffalo Clover		
Goal	TE68	Develop a conservation plan that incorporates measures to protect and/or enhance running buffalo clover populations to the extent practicable. Develop programmatic NEPA documentation that allows implementation of minor disturbance at running buffalo clover sites in order to maintain or enhance known or discovered populations.
Goal	TE69	Coordinate with USFWS, WVDNR, and/or other state or private organizations to facilitate seed collection and storage efforts for running buffalo clover.
Standard	TE70	Special use permits occurring within occupied running buffalo clover habitat may be authorized only if they are compatible with population maintenance or recovery.
Standard	TE71	To the extent practicable, avoid implementing activities in areas that support running buffalo clover that have the potential to eliminate or have long-term detrimental effects to populations, such as placement of fill and gravel; paving; constructing new roads, well sites, or ditching for pipelines.
Standard	TE72	To the extent practicable, avoid conducting prescribed burns or constructing fuel breaks for prescribed burns through known running buffalo clover populations or habitat. If prescribed fire is used within running buffalo clover habitat, protect known populations by wetting or removing fuel from the immediate area.
Guideline	TE73	Where needed to help maintain or restore running buffalo populations, the Forest should implement habitat management measures such as creating selective canopy openings, initiating controlled levels of disturbance, controlling invasive species, or creating patches of potentially suitable habitat in adjacent areas. Measures should be coordinated with the USFWS and WVDNR prior to implementation, and include pre and post implementation site evaluations.
Guideline	TE74	Prior to changing access or use on roads or trails known to support running buffalo clover, estimates of potential frequency, timing, and severity of use should be made, and the Forest should develop appropriate protection measures in cooperation with USFWS and WVDNR.
Guideline	TE75	Surveys for running buffalo clover should be conducted June through no later than mid-August. Surveys should be conducted by personnel trained specifically to identify running buffalo clover.
Guideline	TE76	Prior to initiating project activities, running buffalo clover locations should be flagged so that managers, contractors, permittees, or cooperators are aware of running buffalo clover locations, unless it is determined on a case-by-case basis that marking populations would have more potential to cause negative effects.
Guideline	TE77	Prior to initiating project activities, managers, contractors, permittees, or cooperators should be informed about avoiding or limiting management activities in the immediate vicinity of running buffalo clover populations within the project area. Projects should be monitored to ensure that populations are not detrimentally affected over the long term.
Guideline	TE78	Maintenance mowing should be timed to benefit the species by reducing competition from other plants while avoiding periods of flowering and seed set.

Management Direction for TEP Species		
Type	**Number**	**Direction Description**
Guideline	TE79	When addressing private landowner access issues, work cooperatively with the landowner and the USFWS to minimize impacts to running buffalo clover. Inform the landowner of the presence of endangered species and the recommended actions to avoid impacts. Where possible, add conditions to Special Use Permits or develop written management agreements with the landowner in order to protect the species. If necessary, implement mitigation measures such as creating patches of potentially suitable habitat in adjacent areas, relocating plants or seeds, and/or constructing alternative access routes that would avoid long-term detrimental impacts to RBC.
Guideline	TE80	Piling slash around running buffalo clover populations should be avoided.
Guideline	TE81	Where possible, roads supporting running buffalo clover that are created or disturbed during timbering operations should be closed to additional traffic after the project is completed. Seeding/mulching plans should be coordinated to avoid the use of potentially invasive species, particularly non-native invasive species known to compete with running buffalo clover such as European white clover and red clover.
Guideline	TE82	If running buffalo clover populations are found within active grazing allotments, populations should be monitored to determine any long-term effects from grazing. If populations are being adversely affected by grazing activities, the allotment management plan should be adjusted appropriately to reduce or eliminate effects.
Guideline	TE83	Gating or restricting access to roads or trails should be implemented when monitoring of a running buffalo clover population shows signs of excessive disturbance from road or trail traffic.
See also Wildlife and Fish Objective WF09, Fire Management Standard FM12, Wildlife and Fish Standard WF14, Minerals Standards MG36 and MG 50, Soil and Water Guideline SW51, Lands and Special Uses Guideline LS05.		

Appendix B:
Analysis of Potential Effects
to Other Threatened, Endangered, and Species

This section documents the results of the Service's independent analysis of the FPR's potential effects to threatened and endangered species other than the Indiana bat and running buffalo clover that are likely to occur on the MNF. In a letter to the MNF dated May 16, 2006, the Service concurred with the Forest Service's "not likely to adversely affect" conclusions regarding these species.

The following seven measures provide the general direction for threatened and endangered species in the FPR, and apply to all species on the MNF.

1. Provide habitat capable of contributing to the survival and recovery of species listed under the ESA. Provide habitat that may help preclude proposed species from becoming listed.

2. Integrate TEP habitat management with other resource objectives.

3. Work with USFWS, WVDNR, and other appropriate personnel to identify and manage habitat for TEP species. Participate in recovery plan development for threatened or endangered species that occur on the Forest, or that may be influenced by Forest management activities.

4. Within watershed-level planning units, identify TEP species habitat and opportunities to maintain, restore, or enhance habitat conditions. Design and implement management actions at the project level to address opportunities and provide for ecological conditions, population viability, reproductive needs, and habitat components for TEP species.

5. Collaborate on outreach programs for TEP species and their conservation needs.

6. When proposed exploration or development of privately owned mineral rights may adversely affect TEP species or habitat, the Forest shall work with state and federal mineral operation permitting agencies to reduce adverse effects.

7. Special use permits may be authorized in TEP species habitat if the uses do not adversely affect populations or habitat. This standard does not apply to Indiana bat or running buffalo clover. See special uses direction for these species, below.

Application of these measures should ensure that the MNF actions are not likely adversely affect listed species other than Indiana bat and running buffalo clover. Additional protective measures and supporting rationale for individual species are provided below.

Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*)
The Virginia big-eared bat uses caves for both maternity habitat and hibernacula. The Virginia big-eared bat forages in a variety of habitats but in West Virginia, it appears to prefer pastures and open fields that occur within six miles of the caves (Stihler 1995). As outlined in the Biological Assessment, habitats on the MNF include 37 caves that are used by the Virginia big-eared bat during either the maternity or winter hibernation period and/or the foraging habitats that surround the caves. The FPR includes numerous measures designed specifically to avoid and protect habitats that support this species including: fencing or gating caves known to support the species; restricting public entry to caves during the periods that that are occupied; maintaining a diversity of open, herbaceous habitats within six miles of Virginia big-eared bat hibernacula, maternity colonies, and bachelor colonies; and restricting activities that (such as vegetation management, mineral activities, seismic exploration, explosives, and road /trail construction) that can occur within 200 feet of occupied caves so that the potential to disturb roosting bats is discountable . The implementation of these measures should serve to ensure that disturbances and adverse effects to any caves or foraging areas that support this species are avoided.

West Virginia Northern Flying Squirrel (*Glaucomys sabrinus fuscus*)
The West Virginia northern flying squirrel occurs in high elevation forests with a primarily red spruce component. Its range is restricted to the central Appalachian Mountains in eastern West Virginia and western Virginia. The FPR includes the following three measures designed to identify and protect West Virginia northern flying squirrel habitat on the MNF. Implementation of these measures should serve to ensure that disturbances and adverse effects to this species and its habitats are avoided:

- Suitable habitat shall be determined using maps collaboratively produced by the Forest, USFWS, and WVDNR. These maps shall be reviewed during watershed or project analysis and refined when Forest, USFWS, and WVDNR biologists determine that suitable habitat is or is not present. All verified capture sites shall be included in the suitable habitat maps.

- Suitable habitat shall be considered occupied. Vegetation management activities in suitable habitat shall only be conducted after consultation with USFWS, and:
    a) Under an Endangered Species Act Section 10 research permit to determine the effects of an activity on WVNFS or to determine activities that would contribute to the recovery of the species, or
    b) To improve or maintain WVNFS or other TEP species habitat after research has demonstrated the beneficial effects of the proposed management, or
    c) When project-level assessment results in a no effect or may affect, not likely to adversely affect determination, or
    d) To address public safety concerns.

In addition, the FPR includes a new management prescription developed to maintain and restore spruce forests within the MNF. Implementation of projects consistent with this prescription should provide a beneficial effect by increasing the amount and quality of forests with habitat qualities that are known to support the species.

Cheat Mountain Salamander (*Plethodon nettingi nettingi*)
The Cheat Mountain salamander has a range that is limited to the high elevation forests with a red spruce component that occur within the Allegheny Mountains in northeastern West Virginia. The FPR includes the following three measures designed to identify and protect Cheat Mountain salamander habitat on the MNF. Implementation of these measures should serve to ensure that disturbances and adverse effects to this species and its habitats are avoided:

- Identify opportunities to reduce fragmentation of populations and habitat.

- Prior to proposed vegetation or ground disturbance in known or potential habitat, field surveys must be conducted and occupied habitat must be delineated.

- Ground and vegetation-disturbing activities shall be avoided within occupied habitat and a 300-foot buffer zone around occupied habitat, unless analysis can show that the activities would not have an adverse effect on populations or habitat.

These survey procedures and buffer zones are consistent with the recommendations made in the Cheat Mountain Salamander Recovery Plan (Service 1991).

Bald Eagle (*Haliaeetus leucocephalus*)
There are currently two known bald eagle nests sites on the MNF. Both sites occur within the Spruce Knob – Seneca Rocks National Recreation Area. Little to no active management is expected to occur near these sites. The following three measures have also been included in the FPR, and should serve to ensure that disturbances and adverse effects to any nest sites are avoided:

- Maintain 1,500-foot protection zones around nest sites that have been active within the last three nesting seasons. Activities within this zone must be compatible with bald eagle management. Compatibility determinations shall be made on a case-by-case basis.

- Seasonal closure orders may be used to control human disturbance in the vicinity of nests.

- A nest and the tree or structure where it is located shall not be removed or damaged as long as any usable portion of the nest remains, regardless of the time elapsed since the nest was last used, unless there is a concern for public health or safety.

These procedures and buffer zones are consistent with those recommended in the Service's Bald Eagle Protection Guidelines (Service 2001). Foraging habitat for the species occurs along a number of river, lakes, and streams throughout the MNF. The FPR has incorporated riparian guidelines (see FPR Soil and Water Resources – Stream Channels, Lakes, and Wetlands Section) that will restrict activities that may occur within foraging habitats that may support this species.

Shale Barren Rock Cress (*Arabis serotina*)
This species has specific habitat requirements and only occurs in shale barrens in eastern West Virginia and Virginia. It is estimated that only about 100 acres of this habitat type occurs on the MNF. Botanical surveys conducted prior to implementing management actions would identify any occurrences of this species or habitat type within proposed project areas. The FPR prohibits vegetation manipulation and ground-disturbing activities within shale barrens except for research or when no feasible alternatives exist. If populations were found during surveys, or any of the exceptions listed above were triggered, the MNF would consult with the Service on a case-by-case basis to develop measures to avoid impacts (see General Direction # 3, 4, and 7).

Small-whorled Pogonia (*Isotria medeoloides*)
There is only one known occurrence of this species within the action area. This single, isolated and known occurrence of a threatened plant is easily avoided at the project level. In addition, This site is located within a stand that has been classified as having "very high scenic integrity". As a result, programmed commercial harvest at this location is considered unlikely. Botanical surveys conducted prior to implementing management actions would identify any additional occurrences on the MNF. If populations were found during surveys, the MNF would consult with the Service on a case-by-case basis to develop measures to avoid impacts (see General Direction # 3, 4, and 7).

Virginia Spirea (*Spiraea virginiana*)
Virginia spiraea generally grows along rocky, flood scoured banks of high energy streams and rivers however, it has also been documented along roadsides adjacent to wetlands and other flood prone areas. There is one known location of this species on the MNF however, potential habitat for Virginia spiraea occurs along a number of rivers within the forest. Botanical surveys conducted prior to implementing management actions would identify any occurrences of this species or habitat type within proposed project areas. The FPR has incorporated riparian guidelines (see FPR Soil and Water Resources – Stream Channels, Lakes, and Wetlands Section) that will restrict activities that may occur within riparian habitats that may support this species such that impacts would be avoided.

Appendix C

Table C1: Indiana bat biological opinions including form of incidental take and amount exempted.

PROJECTS	USFWS OFFICE AND DATE BO ISSUED	INCIDENTAL TAKE (IT) FORM	TAKE EXEMPTED or SURROGATE MEASURE TO MONITOR
Shawnee National Forest LRMP Note: This BO has been superceded by a December 2005 BO.	ILFO April 30, 1992	IT by killing or injury	10 individual bats from timber harvest or timber management activities over 10 years; 10 bats over 10 years from mist netting or other monitoring activities
Fort Leonard Wood Master Plan, Ongoing Mission	CMFO December 31, 1996	IT by harming	Number not determined, no measures given, however if RPM's are implemented no take would occur
Cherokee National Forest LRMP Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	TNFO January 1997	IT by killing harming or harassing	1300 acres
Relocation of US Army Chemical School & US Military Police School to Fort Leonard Wood, Missouri	CMFO	IT by harming, harassing, killing	56 hibernating bats from fog oil and TPA smoke pots; summer bats difficult to determine sub-lethal take
Daniel Boone National Forest LRMP Note: This BO has been superceded by a March 2004 BO.	TNFO April 1997	IT by killing, harming, or harassing	4500 acres
Ozark-St. Francis National Forest LRMP Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	ARFO June 25, 1998	IT by killing, harming or harassing	Annual 8000 acres of timber harvest in hardwoods, 11000 acres harvest of pine and pine/hardwoods; 30,000 acres of prescribed burning
Construction of New Training Facilities at Fort Knox, KY	TNFO October 1998	IT by killing, harming or harassing	2000 acres
Construction of a Qualification Training Range at Fort Knox, KY	TNFO October 1998	IT by killing, harming or harassing	80 acres

Construction & operation of the Multi-purpose training Range at the Camp Atterbury Army National Guard Training Site-Edinburgh Indiana	INFO December 4, 1998	IT by harm through habitat loss and exposure to toxic agents	1 maternity colony (200 bats total) and 99.7 ha forest
Proposed stream bank stabilization at Yano Range and upgrade of the Wilcox Tank Range at Fort Knox, KY	TNFO April 1999	IT by loss of summer roosting, foraging, and maternity habitat	1800 acres; 2 maternity colonies
Agricultural Pesticide Application Practices at Newport Chemical Depot, Newport IN	INFO April 13, 1999	IT by harm through exposure to pesticides	2 maternity colonies with 74 bats total
Ouachita National Forest LRMP Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	ARFO April 26, 1999	IT by killing, harming or harassing	40,000 acres commercial harvest; 3,000 acres wildlife management & road construction. reconstruction; 24,000 acres thinning; 200,000 acre prescribed burning
Mark Twain National Forest LRMP This BO has been superceded by the September 2005 BO	CMFO June 23, 1999	IT by killing, harming, or harassing	Timber harvest – 20,000 acres per year (py); Prescribed fire - 12,000 acres py; Wildlife habitat improvement -2000 acres py; Timber stand improvement – 4000 acres py; Soil & water improvement – 150 acres py; Range management – 50 acres py; Mineral exploration & development – 50 acres py; Wildfire fire lines – 50 acres py; Special use – 50 acres py; Road construction – 25 acres py
Impacts of Forest Management and Other Activities to the Bald Eagle, Indiana Bat, Clubshell and Northern Riffleshell on the Allegheny National Forest, Pennsylvania	PAFO June 1999	IT by killing, harming, or harassing	Within a 5-year period (1999 to 2003), the disturbance of 45,594 acres
National Forests in Alabama Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	ALFO December 10, 1999	IT by killing, harming or harassing	No more than 100 trees
Supplement for Proposed Bridges & Alignments Modifications to Kentucky Lock Addition Project	TNFO January 2000	IT by killing, harming or harassing	No more than 20% of available suitable habitat

Green Mountain National Forest LRMP Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	NEFO 2000	IT by harming or harassing	300 acres
White Mountain National Forest LRMP Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	NEFO 2000	IT by farming or harassing	1,500 acres
Nantahala and Pisgah National Forests LRMP Amendment #5	2000	IT by killing, harming, or harassing (killing least likely)	4,574 acres py
Hazard Tree Removal and Vegetation Management Program at Mammoth Cave National Park	TNFO June 2000	IT by loss of roosting habitat, direct mortality or by forcing bats to abandon tree	No measure of take given
Salvage Harvest Necessitated by 1998 Storm Damage on the Daniel Boone National Forest	TNFO July 2000	IT by killing, harming, or harassing	3,100 acres
North East research Station – Fernow Experimental Forest – Five year plan	WVFO November 2000	IT by potential harm or mortality of roosting bats	210 acres timber harvest and 154 acres prescribed burn
National Forests in Alabama Re-initiation Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	ALFO January 23, 2001	IT by killing, harming or harassing	Level of take changed for southern pine beetle suppression areas – upper limit of 65 suitable roost trees
Hoosier National Forest LRMP Note: This BO has been superceded by a January 2006 BO.	BFO June 13, 2001	IT by harm	Pine clear cuts – 578 acres; Pine shelterwood cuts – 391 acres; Pine thinning – 408 acres; Hardwood group selection cuts – 777 acres; HW single tree selection cuts – 100 acres; HW even aged salvage cuts – 518

			acres; Prescribed fire treatment – 7000 acres; Forest openings maintenance – 3311 acres; Timber stand improvement – 2264 acres; Special use permits – 286 acres; Wildfire management – 250 acres; road construction – 16 acres; hazard tree removal – 100 trees; trail construction – 15 miles
Wayne National Forest LRMP Note: This Bo has been superceded by a November 2005 BO.	ROFO September 20, 2001	IT by harm	Permanent loss of habitat – 2504 acres; Alteration of habitat 8102 acres plus 125 trees
Ozark-St. Francis National Forest Prescribed Fire Plan (an amendment to June 1998 LRMP BO) Note: As a result of new information, this Forest is now operating under a "not likely to adversely affect" determination, and this BO is no longer in effect.	ARFO March 21, 2002	IT by loss of roost trees and potential roost trees	Prescribed fire - 153,000 acres py
1986 (as amended) Monongahela National Forest Land and Resource Management Plan (Forest Plan) (Note – the current BO will supercede this BO)	WVFO March 2002	IT by killing, harming, or harassing	A maximum of 6,125 acres annually and prescribed burning on a maximum of 300 acres annually.
Huron-Manistee National Forest LRMP Note: This Bo has been superceded by a March 2006 BO.	ELFO June 13, 2003	IT by killing, harming, or harassing	0-65 bats; 3,150 ac (1,275 ha) of potential Indiana bat habitat may be harvested and 2,648 ac (1,071 ha) of habitat may be burned for fire management or wildlife habitatmanagement activities for the duration of this proposed action
Great Smoky Mountains National Park Prescribed Burning	TNFO August 12, 2003	IT by loss of suitable roosting or foraging habitat	One maternity colony
Construction, Operation, and Maintenance of Alternative 3C of Interstate 60 from Indianapolis to Evansville	BFO December 3, 2003	IT by harming, killing	Summer action area: permanent direct & indirect loss of up to 1527 acres of forested habitat and 40 acres of non-forested wetlands. Winter action area: permanent loss of up to 947 acres of forest habitat surrounding 10 known hibernacula. Death by

			vehicle collisions: 10 Indiana bats py
2003 Revised Jefferson National Forest Land and Resource Management Plan, Virginia, West Virginia, Kentucky	VAFO January 2004	IT by killing, harming, or harassing	16,800 acres total (15,000 fire; 1,800 other habitat manipulations)
Daniel Boone National Forest Revised LRMP	KYFO March 20, 2004	IT by killing, harming, or harassing	Green tree harvest – 4000 acres; Salvage/sanitation – 350 acres; Prescribed burning during summer – 50000 acres
Upper Mississippi River – Illinois Waterway System Navigation Feasibility Study	RIFO, Marion Suboffice, & TCFO August 2004	IT by injury, death, harming or harassing	511 acres of forested habitat annually for 50 years. Less than 20 bats per year.
Department of the Army 88th Regional Readiness Command, US Army Reserve Center	ROFO April 14, 2005	IT by harming or harassing	18 acres of high quality roosting and foraging habitat
Construction, Operation, and Maintenance of the U.S. 33 Nelsonville Bypass	ROFO April 15, 2005	IT by harming, death, injury	No more than 10 Indiana bats
Big Monon Ditch Reconstruction Project	BFO May 24, 2005	IT by harming and harassing	Permanent loss of 75 acres of occupied summer habitat
Mark Twain National Forest 2005 Forest Plan , Missouri	MOFO September 2005 (replaces previous BO completed June 1999)	IT through removal of roost trees	10 occupied roost trees over 10 years; 19,400 acres and 240 miles of fireline
Wayne National Forest Land and Resource Management Plan	OHFO November 2005 (replaces previous BO completed September 20, 2001)	IT through removal of roost trees	no more than 4 occupied roost trees will be incidentally taken over the next ten years; 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

Shawnee National Forest LRMP	ILFO December 3, 2005	IT through harming, harassing, and killing	First 10 Years of plan: -- 11,565 acres of timber harvest/mgt. and minerals mgt. -- 5,630 acres of timber stand improvement and wetlands mgt. Second 10 Years of plan: -- 21,255 acres of timber harvest/mgt. and minerals mgt. -- 13,289 acres of timber stand improvement and wetlands mgt. Mortality of up to 2 individuals during research and monitoring.
North East research Station – Fernow Experimental Forest – Five year plan	WVFO December 2005 (replaces previous five year BO completed November 2000)	IT by potential harm or mortality of roosting bats	124 acres timber harvest and 466 acres of prescribed burns (previous 210 acres timber harvest and 154 acres prescribed burn)
Hoosier National Forest LRMP	BFO January 2006 (replaced June 2001 BO)	IT by injury or death or harassing	no more than four (4) occupied roost trees/year and between four (4) and twelve (12) individuals injured or killed each year. 2956-acres; 60 hazard trees; 100 "accident" trees per year
Huron-Manistee National Forest LRMP	MIFO March 2006	IT through harming, harassing, and killing	for first 10 years of revised Forest Plan: Thinning = 59,497 Clearcut = 45,144 Shelterwood = 8,261 Selection = 0
Biological Opinion – Impacts of the Laxare East and Black Castle Contour Coal Mining Projects on the Indiana bat (Reinitiation of February 2005 BO)	WVFO March 2006	IT in the form of harm due to habitat loss, degradation and fragmentation, Harassment during active mining, Permanent loss of foraging loss and roosting habitat, habitat fragmentation and degradation, permanent loss of streams and their associated watering and prey base for Indiana bats, long term alteration of streams	No more than 17 adult females and their pups; 912 acres of forested habitat and 5.0 miles of stream

Table C2: Summary of Current Programmatic Incidental Take Exemptions for the Indiana Bat on National Forests in Forest Service Regions 8 and 9.

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
Allegheny June 1999	None	8,394 total acres per year	NA	Not written into BO, but FWS requires annual mist net monitoring	Brad Nelson, Biological and Watershed Sciences Program Coordinator, 6/30/06	Take categories include trail construction, timber management, wildlife habitat management, prescribed fire, road construction/reconstruction/ restoration, and oil and gas development
Green Mountain/Finger Lakes February 2006	None	None	None	Annual mist netting in areas where bats are most likely to occur	BE for the final revised Forest Plan	The GM/FL is operating under a "not likely to adversely affect" determination
Hoosier January 2006	2	2956-acres; 60 hazard trees; 100 "accident" trees per year	6.41 females with pups and 12.34 males per year	Hibernacula surveys, Surveys of proposed project areas	Jason Engle, Wildlife Biologist, 6/30/06; Gary Dinkel, Ecosystem Program Manager 7/7/06	A recent salvage sale of 1,500 to 2,000 acres received a project-specific take statement for 22 individuals.

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
Huron-Manistee March 2006	None known, but small isolated colonies considered likely	Total for first 10 years of revised Forest Plan: Thinning = 59,497 Clearcut = 45,144 Shelterwood = 8,261 Selection = 0 Total for second 10 years of revised Forest Plan: Thinning = 55,658 Clearcut = 47,096 Shelterwood = 22,879 Selection = 16,299	4 roost trees containing up to 16 individuals over 10 years	Survey hibernaculum every 5 years. Summer surveys according to FWS protocol every 3 years. Additional studies as appropriate on summer presence, fall swarming, and spring staging.	Programmatic BO	

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
Mark Twain September 2005	Multiple – difficult to extract info. from BO. BA says 1 on MTNF lands; there are others on private land in proclamation boundary.	-- 15,000 acres of salvage per year -- 4,400 acres of "hazard tree removal" per year -- 240 mi. of Rx fire line per year	10 occupied roosts over 10 years	Annual mist netting and Anabat surveys prioritized to emphasize likely habitat	Programmatic BO; also BO summary prepared by Jody Eberly, MTNF Forest Wildlife Biologist 9/20/05	The BO defines "hazard tree removal" to include recreation site maintenance, trail maintenance, road construction and reconstruction, and construction of temporary roads and skid trails.
Monongahela Current BO	1 confirmed on private land in the proclamation boundary.	For March 2002 BO: -- 6,000 acres timber harvest per year -- 47 acres road construction/ reconstruction per year -- 78 acres mineral development per year	NA	Annual mist netting prioritized to emphasize likely habitat	Programmatic BO for T&E amendment	

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
Shawnee December 2005	2	First 10 Years: -- 11,565 acres of timber harvest/mgt. and minerals mgt. -- 5,630 acres of timber stand improvement and wetlands mgt. Second 10 Years: -- 21,255 acres of timber harvest/mgt. and minerals mgt. -- 13,289 acres of timber stand improvement and wetlands mgt.	-- Up to 2 Indiana bats may be killed during the project period as a result of monitoring and research activities.	-- Occupied Ind. bat hibernacula and maternity colonies on the SNF. -- The extent of use by Ind. bats on the SNF. -- Habitat use at all sites where Ind. Bats are documented should be characterized and quantified at local & landscape levels using GIS. -- Estimated Ind. Bat habitat available before and after site-specific project implementation. -- Number of suitable roost trees for Ind. bats using FIA data every 5 years.	Programmatic BO	The take allowed in acres is based on our proposed acres of management during the next 2 decades.

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
Wayne November 2005	None	10-year totals: -- 392 acres of permanent roads -- 146 acres of temp roads -- 740 acres of skid trails and landings -- 50 acres of utility development -- 74 miles of fire lines	No more than 4 roosts over the next 10 years	Mist net surveys conducted most years since 1997; sites and level of effort vary	Programmatic BO	
White Mountain September 2005	None	None	None	Mist netting for woodland bats every other year	Plan Revision BE; Leighlan Prout, Forest Wildlife Biologist, 7/5/06	BE made a NLAA determination. They used to operate under a programmatic take statement, but changed their determination during plan revision. The local FWS office now believes that the Indiana bat does not occur on the Forest.

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
Daniel Boone March 2004	None. Lactating female and a juv. have been captured but no roosts have been identified	Annual take authorized: -- 4000 ac. green tree harvest -- 350 ac. salvage/sanitation -- 50,000 prescribed burning	N/A	Monitoring of activities, roost trees, and artificial structures.	Richard Braun Forest Wildlife Bio. 859.745.3173	BO on file.
Jefferson January 2004	None	Annual Incidental take: --16,800 acres total o 15,000 fire o 1,800 other hab. manipu lations	N/A	Monitoring of activities, mist netting based on suitable habitat	Carol Hardy-Croy Forest Wildlife Biologist 540.265.5155 Dennis Krusac Endangered Species Specialist USDA Forest Service, Southern Region 404-347-4338	

Forest	No. Known Maternity Colonies	Take Exemption – Acres	Take Exemption – No. Individuals or Roosts	Population Monitoring	Information Source	Comments
George Washington – Jefferson September 1997	None	Annual incidental take authorized: -- 4,500 ac		Mist-netting activities	Dennis Krusac Endangered Species Specialist USDA Forest Service, Southern Region 404-347-4338	Combined. Draft for GW is in works. Final for Jefferson follows.
NF of North Carolina – Nantahala and Pisgah NFs April 2000	1 on Nantahala	Annual incidental take authorized: -- 4,574 ac.	N/A	??	FSWeb	BO on file
Northeast Research Station – Fernow Experimental Forest December 2005	None	124 acres timber harvest and 466 acres of prescribed burns (previous 210 acres timber harvest and 154 acres prescribed burn)	N/A	Anabat acoustical monitoring, additional surveys (mist net, hibernacula, swarming) coordinated with Service annually	B. Douglas WVFO end spp. specialist	