Threatened and Endangered Species

INTRODUCTION

The Monongahela National Forest (MNF) is known for its diversity, for which there are many reasons. The Forest is situated geographically so that it is at the southern reaches of some species, and the northern extent of others. Elevations vary by 4,000 feet, and precipitation ranges from 30 to 60 inches a year, depending on locale. There are also a large variety of land, soil, and forest types on the MNF. Contributing to this diversity are many rare species and communities. Some of these plants are rare or imperiled enough that they have been federally listed under the Endangered Species Act (ESA) for protection. There are currently four listed plant species and five listed animal species on the MNF. This analysis looks at how proposed management alternatives and direction in plan revision may affect these listed species or their habitats.

Need For Change

During the Analysis of the Management Situation, no specific need for change was identified for the way the 1986 Forest Plan (as amended) addresses threatened and endangered (T&E) species and their habitats. However, in drafting the 2006 Forest Plan, greater emphasis was placed on threatened, endangered, and rare plant communities by describing desired future conditions, incorporating key elements of the 2004 T&E Species Amendment, and expanding the overall management direction related to rare plants and communities.

The Forest Service Manual directs that the Forest will:

- Manage habitats and activities to achieve recovery objectives for T&E species.
- Emphasize conservation and recovery of T&E and proposed species and their habitats.
- Prescribe measures to prevent adverse modification of essential habitats.
- Protect individuals from harm.

The 1986 MNF Forest Plan was developed to maintain or enhance species composition, structure and function of central Appalachian ecosystems while providing various goods and services to the American people. Since 1986, the Plan has been amended based upon various changed conditions, including changes to listed species and new information on T&E species habitats.

Threatened and Endangered Species Amendment to the 1986 Plan

The MNF completed a T&E Species Amendment to the 1986 Plan in March, 2004. As part of the amendment process, a biological assessment (BA) pertaining to the nine federally listed species occurring on the MNF was completed. During the assessment, the USFWS recommended the development of new habitat identification and management guidelines for the West Virginia northern flying squirrel. The USFWS amended the Appalachian Northern Flying Squirrel's Recovery Plan (USFWS 1990) in September, 2001 (USFWS 2001).

The BA concluded that for all T&E species found on the MNF, with the exception of the Indiana bat, continued implementation of the 1986 Forest Plan would result in a no effect or may affect, not likely to adversely affect determination. The BA also concluded that continued implementation of the 1986 plan would result in a may affect, likely to adversely affect determination for the Indiana bat for timber harvest, road construction/reconstruction, mineral development, and prescribed fire.

The Forest Service and USFWS entered into formal consultation for the Indiana bat on November 9, 2001 and the Service issued their final programmatic Biological Opinion and Incidental Take Statement in March 2002. Specifically, the Incidental Take Statement anticipates the taking of an unquantifiable number of Indiana bats from tree removal activities and prescribed burning occurring outside of the hibernation period (April 1 – November 14) annually on the MNF. Activities limited annually by the Incidental Take Permit include:

- Timber harvest 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.

The T&E Species Amendment incorporated reasonable and prudent measures and terms and conditions identified in the Biological Opinion and was approved in March 2004.

Issues and Indicators

Issue Statement

Forest plan management strategies may affect federally listed species and their habitats.

Background

Federal agencies must comply with the ESA of 1973 as amended, which includes a requirement to consult with the U.S. Department of Interior, Fish and Wildlife Service (USFWS) on projects that may affect federally listed threatened, endangered or proposed species. Currently there are 9 federally listed species known to occur on the MNF, but no species that are proposed for listing.

Although Forest Plan revision would have no direct effects on T&E species, Plan revision does provide for species protection and habitat restoration through management direction and the allocation of management prescriptions that would limit or prohibit management activities that pose a threat to T&E species or their habitats. Other management prescriptions could allow certain activities that may pose threats. This analysis will look at the relationships between those prescriptions and how management allowed within them may potentially affect listed species and their habitats.

Indicators

For each listed species, effects are assessed by determining whether management direction in place is adequate to protect listed species and their habitats from potential direct, indirect, and cumulative effects of the four management alternatives considered in detail. Potential effects for some species are based on the level and intensity of management activities that could occur under the Management Prescriptions assigned to each alternative. Specifically, the following key habitat components are used to assess effects on these species:

Running buffalo clover:

- Potential effects to young and old successional stages of mixed mesophytic forest by alternative

Shale barren rock cress:

- Potential effects to shale barrens by alternative

Small whorled pogonia:

- Potential effects to old and mature mixed mesophytic forest, old and mature oak forests, and old and mature pine-oak forests by alternative

Virginia spiraea:

- Potential effects to the banks of low-elevation large streams by alternative

Virginia big-eared bat:

- Potential effects to foraging area by alternative
- Potential effects to maternity and hibernacula sites by alternative

Indiana bat:

- Potential effects to maternity site habitat by alternative
- Potential effects to hibernacula by alternative
- Potential effects to key area habitat by alternative
- Potential effects to primary range by alternative

West Virginia northern flying squirrel:

- Potential effects to suitable habitat (high-elevation spruce and spruce-hardwood forests) by alternative

Cheat Mountain salamander:

- Potential effects to Cheat Mountain salamander habitat by alternative

Bald eagle:

- Potential effects to nesting habitat in riparian areas by alternative.

Additionally, species viability outcomes from the Species Viability Evaluation will be used as an indicator of potential cumulative effects on all the species noted above.

Scope of the Analysis

The affected area for direct and indirect effects to threatened and endangered species and their habitats are the lands administered by the MNF in West Virginia. This area represents National Forest System lands where T&E species occur and may occur, and where management activities may affect individuals and populations. For analysis of cumulative effects, both National Forest System lands and lands of other ownership within the proclamation boundary will be considered. Past, present, and reasonably foreseeable actions on all lands are considered.

For direct, indirect, and cumulative effects, the time frame for analysis is the 100-year planning horizon. Analysis over the entire planning horizon allowed us to evaluate the effects of management through a period when existing forest communities will age substantially relative to current conditions. However, projections beyond the first decade or two must be viewed with caution because of the potential for changes in management emphasis, as well as substantial uncertainty over factors beyond the control of the Forest, such as continued acid deposition, global climate change, and human population growth.

CURRENT CONDITIONS

The section includes an overview of the affected environment, and descriptions of species that are currently listed as threatened or endangered under the ESA, with information on their national, regional, and local habitats. There are currently 4 listed plant and 5 listed animal species known for the MNF. There are no species currently proposed for federal listing.

Within the proclamation and purchase unit boundaries of the Forest are approximately 1.7 million acres. Of these, about 919,000 acres are in federal ownership. The MNF is situated at the intersection of the southern reaches of some tree and plant species, and the northern extent of others. The Forest is mountainous, with a range in elevation from about 900 feet to a maximum of 4,863 feet mean sea level, further contributing to the wide diversity in vegetation. The general axis of the Forest is northeast to southwest.

The Forest spans portions of two sub-regional ecologic sections: Section M221A - The Northern Ridge and Valley, and Section M221B - The Allegheny Mountains. The Allegheny range creates a rain shadow effect, with precipitation on the eastern side averaging 30 to 45 inches per year and the western slopes averaging 45 to 60 inches.

The Forest is further divided into subsections, encompassing one subsection within Section M221, Subsection M221Aa - The Ridge and Valley, and four subsections within Section M221B, Subsection M221Ba – Northern High Allegheny Mountains, Subsection M221Bb – Western Allegheny Mountains, Subsection M221Bc – Southern High Allegheny Mountains, and Subsection M221Bd – Eastern Allegheny Mountain and Valley. These are nationally delineated subsections of the ecological units in the United States. Monongahela National Forest personnel classified the Forest by Landtype Associations (LTA) to better describe the local conditions and aid in large-scale planning. LTAs are divisions of the land at a landscape scale and are smaller than subsections but larger than ecological landtypes. There are 26 LTAs on the MNF,

representing an integration of climate, geomorphology, and broad assemblages of vegetation. These LTAs contain repeating patterns of soil and vegetation groupings that are further delineated at the ecological landtype scale. The LTAs identified for the MNF can be grouped by five broad vegetation zones: red spruce, mixed mesophytic hardwoods, northern hardwoods, xeric oaks, and alluvial riparian zones of major rivers.

Threatened and Endangered Plant Species

The diverse landscape described above provides habitat for four federally threatened or endangered plant species. These are: running buffalo clover (*Trifolium stoloniferum*), shale barren rock cress (*Arabis serotina*), small whorled pogonia (*Isotria medeoloides*), and Virginia spiraea (*Spiraea virginiana*). Habitats for these plants range from river banks to shale barrens and rich woods, and are described in detail for each species below.

Running Buffalo Clover (*Trifolium stoloniferum*)

Running buffalo clover (RBC) is a federally endangered perennial clover found on rich, fertile, semi-shaded habitats. This plant has been found in open forests, lightly disturbed areas such as old logging roads, and old farmsteads and cemeteries.

For the Species Viability Evaluation conducted for this analysis, young and old successional stages of mixed mesophytic forests, and acres of woodlands/savannahs were used to estimate habitat. These features can only provide a rough approximation of RBC habitat, given the broad scale of the analysis and the limited data available on this species and its suitable habitat. Current estimates of woodland savannah habitat include hay fields and pastures, and constitute the bulk of the acreage. Estimates of habitat affected by the implementation of the Forest Plan do not include the woodland/savannah habitat because this type may not represent suitable habitat for RBC on the Forest. All of the old successional stage is not suitable habitat because not all of it is likely to have a broken canopy or the preferred limestone-derived soils. Likewise, the entire young mixed mesophytic forest habitat likely is not suitable because the canopy is completely open, or regeneration has progressed to the point that it is not open enough. Also, suitable habitat likely exists in the mature successional stage (not included in the estimate) because of partial disturbances of the canopy. Therefore, habitat abundance is rated as occasional as a best estimate.

Habitat on the MNF - Potential habitat is widespread and nearly contiguous across much of the Forest, but actual suitable habitat is limited to lightly disturbed areas. Such areas tend to be scattered, but the possibility of seed dispersal via deer (Pickering 1989) may serve to connect some patches.

West Virginia Natural Heritage Program records (unpublished data 2003a) show 16 recent element occurrences within the MNF proclamation boundary, several of which consist of multiple 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. Only three of the known occurrences are on private

land. Forest Service occurrences are protected, although lack of disturbance may be an issue for these occurrences.

Threats - Regional threats to RBC include: direct loss of habitat; reduced ground disturbance and permanent loss of disturbed woodlands along streams and terrace areas, habitat fragmentation, competition from non-native plants and altered natural disturbance regime (USDA Forest Service 2001). The clover may have been tied to disturbances made by large herbivores, particularly bison. With the elimination of large herbivores from the range of the clover, not only was the habitat lost but so were potential routes and mechanisms of dispersal (USFWS 1989). An additional threat that has caused decline is reduced fire frequency resulting in the loss of open woodlands (Ostlie 1990). Current knowledge indicates RBC needs slight disturbance to thrive, but the specific types and severity of disturbance are not well understood.

Small Whorled Pogonia (*Isotria medeoloides*)

Small whorled pogonia (SWP) is a federally threatened perennial of the orchid family. Habitat ranges from mixed deciduous or mixed deciduous/coniferous forests to dry, oak or oak-pine forests. Highly acidic, nutrient poor soils may be characteristic of habitat, however with only one site in West Virginia, generalizations are difficult. SWP is characterized by wide population fluctuations from year to year (USFWS 1992a).

Habitat on the MNF - Habitat abundance was rated as common and its distribution considered connected in the SVE. Habitat on the Monongahela was estimated for the SVE as old and mature mixed mesophytic forest, old and mature oak forests, and old and mature oak-pine forests. These habitat types are estimated to cover about 66 percent of the land within the Forest boundary. The fact that the species is very rare suggests that these forests may not accurately represent suitable habitat. The “common” rating is based on the extreme abundance of the mixed mesophytic forest type.

SWP is only known from one location within the Forest boundary. No plants were observed at this location when it was last surveyed in 2002 (West Virginia Natural Heritage Program unpublished data 2003a). This very limited distribution may indicate the existence of a microhabitat preference that is not reflected in the habitat ratings, or it may indicate the action of an unidentified threat. Alternatively, it could be the result of inadequate survey efforts, or a combination of both.

Threats - Habitat destruction is the primary threat to SWP range-wide. Herbivory by deer, and collecting and damage from research activities are secondary threats (USFWS 1992a).

Shale Barren Rockcress (*Arabis serotina*)

Shale barren rockcress (SBRC) is a federally endangered biennial herb found mainly on shale barrens of eastern counties of West Virginia. *Arabis serotina* can be jeopardized by drought, habitat degradation, stochastic events, herbivory and other biotic factors (USFWS 1991b).

Habitat on the MNF - Potential and known habitat within the entire MNF is estimated to be less than 100 acres. Habitat abundance was determined to be rare and distribution patchy through the Species Viability Evaluation process.

West Virginia Natural Heritage Program records (unpublished data 2003a) show 11 element occurrences within the Proclamation boundary, all but one of which is on Forest Service land. Shale barrens on Forest Service land are not likely to be vulnerable to destruction, but occurrences generally have few individuals (NatureServe 2003 accessed 3/23/04, USFWS 1991b) and must be considered somewhat vulnerable to extirpation in light of the possible deer browse threat.

Threats - Regional threats to existing SBRC populations include deer herbivory and invasion of non-native species. Insect pollinators are vulnerable to Dimilin spraying for gypsy moth control. SBRC habitat is generally not under threat from forest management practices.

Virginia Spiraea (*Spiraea virginiana*)

Virginia spiraea is a federally threatened clonal shrub found on damp, rocky banks of larger, high gradient streams. This shrub may also be found at the flood-scoured mouths of side streams, rocky isles, seasonally flooded side channels, and in shrub thickets between river and forest. The shrub may be found in either full sun or shade.

A combination of factors contributes to the rarity of the species, including a very narrowly defined habitat niche that is subject to scouring and flooding, apparent lack of successful sexual reproduction, limited opportunities for colonization, and competition from other species (West Virginia Natural Heritage Program 1991). Most occurrences range-wide are of poor quality and have low viability. It is estimated that there are fewer than 30 different genotypes range-wide (NatureServe 2003 accessed 3/31/04).

Within a watershed, occurrences potentially are connected along streams via water-borne seed dispersal or flood-dispersed vegetative fragments. Populations in different watersheds are isolated from each other. Connectivity could be important for the species' long-term viability because when clones from different localities are grown together, they fruit prolifically and produce viable seed (USFWS 1992b).

Habitat on the MNF - Elevation range for known occurrences in West Virginia is 1000 to 1800 feet. It is not known whether this represents a preference or is an artifact of the species' very limited distribution. Low elevations (less than 2500 feet) on the Forest are limited to the western part of the Cheat District, the eastern part of the Potomac District, the Tygart River valley, the Gauley River valley, and the southern end of the White Sulphur district. For this analysis, the banks of larger streams within these low-elevation areas are presumed to represent potential habitat for Virginia spiraea.

Within the Forest, there is one element occurrence consisting of two subpopulations along the Greenbrier River at the southern edge of the White Sulphur District. Based on this information,

the species appears to occupy only a small fraction of the potentially available habitat. Habitat abundance is rated as occasional with a patchy distribution.

Threats - Because Virginia spiraea is primarily a shrub of the riparian ecotone between forested slopes and the rocky shores of high-energy rivers, the factors that most affect the species are those that either eliminate its habitat all together, or curtail the moderate level of flood-scouring it seems to require. It is thought that scouring reduces competition from native and non-native plants that would otherwise out-compete it. Recreational users may pose an additional threat by clearing riverside sites for fishing, camping and rafting. Large scouring floods and competition from native and non-native plant species are threats as well (West Virginia Natural Heritage Program 1991).

Threatened and Endangered Animal Species

The five federally T&E terrestrial animal species on the MNF are: Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Indiana bat (*Myotis sodalis*), West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*), bald eagle (*Haliaeetus leucocephalus*) and Cheat Mountain salamander (*Plethodon nettingi*). Habitats for these species range from riparian areas to caves, and are described in detail for each species below.

The eastern cougar (*Puma concolor couguar*); gray wolf (*Canis lupis*); and gray bat (*Myotis grisescens*) are currently listed species. However, according to WVDNR records, the last confirmed occurrence of eastern cougar was 1887. Similarly, the last confirmed occurrence of the gray wolf was in 1900, and both species are considered extirpated from West Virginia. There is a single record of gray bat in West Virginia from a winter bat count in Hellhole Cave in 1991. At this time, that occurrence is considered accidental in West Virginia. Due to their lack of occurrence, these species will not be discussed further in this analysis.

Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*)

Virginia big-eared bat (VBEB) was listed as endangered on December 31, 1979. A USFWS Recovery Plan was signed May 8, 1984. The subspecies *virginianus* is a year-round cave obligate species occupying a very limited geography in the central Appalachians. In the mid 1990's the West Virginia/North Carolina populations numbered more than 13,000 bats. The total population in 1997 was less than twenty thousand (Natureserve 2005). Five West Virginia colony sites have been designated as "critical habitat" for VBEB (Federal Register 1979, USFWS 1984). They are shown in Table TE-1, below. Numerous other caves and abandoned mines in West Virginia have records of hibernating or summering Virginia big-eared bats, with numbers ranging from a single bat to over 1,000.

The WVDNR monitors 10 summer Virginia big-eared bat maternity colonies, many of which have been censused annually since 1983. Two known bachelor colonies are not monitored on an annual basis. The numbers from the summer censuses have shown a generally increasing trend over time, with the overall population trending more toward stability over the last decade (see data in Stihler and Wallace 2005). The initial survey in 1983 recorded 3,213 adult Virginia big-eared bats from eight caves. The most recently reported survey in 2005 recorded 5,990 bats from

10 caves. The highest number recorded in any survey was 6,416 in 1999 (Stihler and Wallace 2005).

Table TE-1. Critical Habitat for the Virginia Big-eared Bat in West Virginia

Cave	Ownership	Cave Use	Protection
Cave Hollow/Arbogast	NFS lands	Maternity, Hibernaculum	Gated and fenced
Cave Mountain	NFS lands	Maternity, Hibernaculum	Gated
Hellhole Cave	Private but within Forest proclamation boundary	Hibernaculum	Fenced
Hoffman School	Private and within 6 miles outside Forest boundary	Maternity, Hibernaculum	Gated
Sinnit/Thorn Cave	Private and more than 6 miles outside Forest boundary	Maternity, Hibernaculum	Gated

Virginia big-eared bats are not migratory; however, they may move among different caves and mines during the summer and fall. The longest recorded movement is 40 miles (Barbour and Davis 1969). They begin to return to winter hibernacula in September, but continue to feed during warm evenings. By December, they return to hibernation.

Male and female Virginia big-eared bats winter hibernate singly or in mixed clusters within caves or mines. In spring, females form smaller maternity colonies. Males move to different cave areas and may form bachelor colonies or remain solitary. Nocturnal activities in maternity colonies vary as the maternity season progresses. During May and most of June, when females are pregnant, the colony remains outside the cave most of the night; however, birth takes place within caves. After birth in late June and July, the females' nightly emergent behavior depends on the needs of their young. When the young are weaned in August, nursery colonies disperse.

Virginia big-eared bats feed predominantly on moths, but also on beetles, true flies, mosquitoes, bees, wasps, and ants (USDA Forest Service 2001). Virginia big-eared bats generally forage near their summer caves. Virginia big-eared bats have been documented foraging up to 6 miles from cave entrances (Stihler 1995), and foraging areas may include lightly grazed pastures, fields, and forest edges.

Use of different foraging habitats among Virginia big-eared bat populations in different locations appears to be a response to different habitat availabilities and demonstrates the species' flexibility to local conditions (Adam et al. 1994). Geographically isolated Virginia big-eared bat populations have been observed using different foraging habitats (Adam et al. 1994, Buford and Lacki 1995). In Virginia, the bats have been documented foraging over open pastures, corn and alfalfa fields, and around tree crowns, while Virginia big-eared bats in a forested landscape in Kentucky have been observed foraging in forested habitats.

Habitat within the 6-mile-radius foraging areas around West Virginia hibernacula and summer colonies is very diverse. The majority of the foraging areas are not on National Forest land, but

rather private agricultural fields. Limited radio-tracking data from West Virginia have documented female Virginia big-eared bats foraging over hay fields, forests, old fields, and riparian corridors (Stihler 1994a). Most activity has been observed in a mosaic of these habitats rather than large areas of one habitat type. Herbaceous vegetative structure may be an important foraging habitat component.

Habitat on the MNF - Important habitat for the Virginia big-eared bat on the MNF consists of identified summer colony sites, hibernation sites, and foraging areas (6 mile radius from hibernacula and summer colonies). Under the 1986 Plan as amended, hibernacula and summer colonies are managed through Forest Plan direction for Opportunity Area 837.

Twenty-three caves with Virginia big-eared bat records lie within the Forest proclamation boundary. Six of these caves harbor concentrations of dozens to hundreds or thousands of individuals during the winter, summer, or both. The remaining caves typically harbor a few bats or are based on old records of a few individuals. Of the 23 occupied caves within the proclamation boundary, eight are located on NFS lands. Three of these eight (Cave Hollow/Arbogast, Cave Mountain, and Peacock) typically harbor major concentrations of dozens to over a thousand individuals. These three caves are discussed in greater detail below. In addition to the 23 occupied caves in the proclamation boundary, 14 caves with Virginia big-eared bat records lie within 6 miles outside the proclamation boundary. Table TE-2 summarizes the 37 Virginia big-eared bat caves that are within the proclamation boundary or within 6 miles outside the boundary.

Table TE-2. Virginia Big-eared Bat Hibernacula within the MNF Proclamation Boundary or Within 6 miles Outside the Boundary

Cave Name	County	Major or Minor[1]	Location	Colony Type	Gated or Fenced
Cave Hollow/Arbogast	Tucker	major	NFS land	maternity and hibernaculum	yes
Peacock Cave	Grant	major	NFS land	maternity and hibernaculum	no
Cave Mountain Cave	Pendleton	major	NFS land	maternity and hibernaculum	yes
Big Springs Cave	Tucker	minor	NFS land	hibernaculum	yes
Bowden Cave	Randolph	minor	NFS land	hibernaculum	no[2]
Harper Trail Cave	Randolph	minor	NFS land	hibernaculum	no
Mill Run Cave #1	Pendleton	minor	NFS land	unknown	no
Mill Run Cave #2	Pendleton	minor	NFS land	unknown	no
Hellhole Cave	Pendleton	major	within proclamation boundary, not NFS land	hibernaculum and bachelor	yes
Schoolhouse Cave	Pendleton	major	within proclamation boundary, not NFS land	maternity and hibernaculum	yes
Mystic Cave	Pendleton	major	within proclamation boundary, not NFS land	maternity	no
Acorn Cave	Tucker	minor	within proclamation boundary, not NFS land	unknown	no

Cave Name	County	Major or Minor[1]	Location	Colony Type	Gated or Fenced
Izaak Walton Cave	Randolph	minor	within proclamation boundary, not NFS land	hibernaculum	no
Stewart Run Cave	Randolph	minor	within proclamation boundary, not NFS land	hibernaculum	no
Sinks of Gandy	Randolph	minor	within proclamation boundary, not NFS land	hibernaculum	no
Spring Cave	Randolph	minor	within proclamation boundary, not NFS land	hibernaculum	no
Alpena Cave number 1	Randolph	minor	within proclamation boundary, not NFS land	unknown	no
Alpena Cave number 2	Randolph	minor	within proclamation boundary, not NFS land	unknown	no
Aqua-Terra Cave	Randolph	minor	within proclamation boundary, not NFS land	hibernaculum	no
Cedar Hill Cave	Grant	minor	within proclamation boundary, not NFS land	unknown	no
Smoke Hole Cave	Pendleton	minor	within proclamation boundary, not NFS land	unknown	no
Mill Run Cave	Tucker	minor	within proclamation boundary, not NFS land	unknown	no
Warner's Cave	Pendleton	minor	within proclamation boundary, not NFS land	unknown	no
Minor Rexrode Cave	Pendleton	major	within 6 miles outside proclamation boundary	bachelor and hibernaculum	yes
Hoffman School Cave	Pendleton	major	within 6 miles outside proclamation boundary	maternity and hibernaculum	yes
Lambert Cave	Pendleton	major	within 6 miles outside proclamation boundary	maternity	yes
Mill Run Cave	Pendleton	major	within 6 miles outside proclamation boundary	maternity and bachelor	no
Elkhorn Mountain Cave	Grant	major	within 6 miles outside proclamation boundary	bachelor	no
Trout Cave	Pendleton	minor	within 6 miles outside proclamation boundary	hibernaculum	no
New Trout Cave	Pendleton	minor	within 6 miles outside proclamation boundary	hibernaculum	no
Gale Warner's Cave	Pendleton	minor	within 6 miles outside proclamation boundary	maternity (historic)	no
Flute Cave	Pendleton	minor	within 6 miles outside proclamation boundary	autumn transition	no
Brook Stemple Cave	Preston	minor	within 6 miles outside proclamation boundary	unknown	no
Keys Cave	Pendleton	minor	within 6 miles outside proclamation boundary	hibernaculum	no
Rexrode Cave	Pendleton	minor	within 6 miles outside proclamation boundary	unknown	no
Seneca Caverns	Pendleton	minor	within 6 miles outside proclamation boundary	unknown	no
Sites Cave	Pendleton	minor	within 6 miles outside proclamation boundary	unknown	no

[1]Major hibernacula typically host dozens, hundreds, or thousands of bats, while minor hibernacula host very few bats in most years.
[2]Part of the main passage of Bowden Cave is blocked by a safety barricade, but the part of the cave that typically hosts Virginia big-eared bats is not gated or fenced.

Since 1992, which was the first year in which all of the currently known major summer colonies were surveyed, the three major caves on NFS land have accounted for approximately 30 to 40 percent of the total number of individuals in the surveyed West Virginia maternity colonies. The total number of individuals in the three caves has generally exhibited a stable to slightly upward trend since 1989 (Figure 3), reflecting the increasing numbers in Cave Hollow/Arbogast and Peacock Cave and the decreasing numbers in Cave Mountain Cave.

Based on the 6-mile radius for foraging, there are an estimated 604,000 available foraging acres within the MNF proclamation boundary. Foraging areas within the proclamation boundary are very diverse. A sizeable minority of the land within foraging areas is private agricultural land. Other non-NFS land uses within the foraging areas include timber harvests, strip mining, limestone/rock quarries, State Park, and National Wildlife Refuge land. Characterization of habitat use is difficult due to the paucity of telemetry data and the fact that much of the available habitat is on private land, which has no stand data. NFS land contains approximately 324,000 acres of Virginia big-eared bat foraging area. Limited telemetry data from NFS land recorded Virginia big-eared bats foraging in mixed oak and pine-oak stands (Stihler 1994a).

Threats - Cave dwelling bats are particularly at risk due to disturbances within the cave environment. Disturbances (recreation or commercial use, changes in cave microclimate, and natural disasters) during hibernation and maternity rearing can have devastating affects to bat populations. Removal of buildings that are being used as roosting or resting areas may also be a threat.

In addition to direct effects to roosting individuals, Virginia big-eared bats may be indirectly vulnerable to activities that affect foraging. Herbaceous foraging habitats such as old fields, hay fields, and pastures that are not maintained may be degraded or eliminated by reforestation. Insecticides, particularly those used for gypsy moth, may adversely affect the food supply (Sample and Whitmore 1993).

Wind turbines used to generate electric power are a relatively new threat to bats in West Virginia. Although no mortality of endangered bats has been documented, wind turbines on private land in Tucker County were estimated to have killed over 2,000 bats of various species during the period 4 April through 11 November 2003 (Curry and Kerlinger, LLC 2004). During a six-week search period in the summer of 2004, the same turbines were estimated to have killed between 1,364 and 1,980 bats (Arnett et al. 2005). These windmills are not located near any Virginia big-eared bat hibernacula. It is reasonable to assume that Virginia big-eared bats could be killed if wind turbines were to be constructed closer to hibernacula.

Indiana Bat (*Myotis sodalis*)

Indiana bat was listed as endangered on March 11, 1967. The original 1983 USFWS Recovery Plan is under revision and has not been finalized. However, a draft of the revised version is often used to provide guidance for management activities (USFWS 1999).

Indiana bat distribution is generally associated with limestone karst in the eastern U.S. (Menzel et al. 2001). Indiana bats occupy distinct habitat types: mines and caves are used for hibernation, while forested areas are used for summer foraging, roosting, and fall swarming.

Wintering colonies require very specific climatic regimes in caves or mines (Menzel et al. 2001). Habitat conditions are so specific that more than 85 percent of the range-wide bat populations hibernate in just 9 caves in Indiana, Kentucky and Missouri (USFWS 1999). Indiana bats hibernate in compact clusters containing males and females; however, females enter hibernation earlier in autumn than do males.

Summer foraging and maternity roosting habitat is difficult to quantify at a range-wide, regional, or local level due to variability of known maternity roost sites and lack of knowledge about landscape-scale habitat characteristics. However, based on a review of range-wide data, Romme et al. (1995) constructed a habitat suitability model that suggests that optimal canopy closure for roosting ranges from 60 to 80 percent. Romme et al. (1995) further described optimal roosting habitat as having an abundance of large trees and snags (>8.7 inches DBH) and a relatively open understory. Tree structure, specifically the availability of exfoliating bark or cavities that provide roost space, is a critical characteristic for roost trees. Indiana bats use isolated trees in openings as roost trees (Kurta et al. 1993), and they may switch between shaded and unshaded roost trees depending on weather conditions (Callahan et al. 1997; Menzel et al. 2001) and physiological requirements associated with thermal regulation. Indiana bat maternity colonies generally use both primary and alternate roost trees (Britzke et al. 2003).

Most known maternity sites have been located in forested tracts in agriculturally dominated landscapes in Missouri, Iowa, Indiana, and Illinois (USFWS 1999). A small number of maternity colonies recently have been reported in heavily forested mountainous areas of western North Carolina, eastern Tennessee (Britzke et al. 2003), and West Virginia. Colonies generally are found under the loose bark of dead or dying trees, but roosts have been found in tree cavities (Gardner et al. 1991).

Menzel et al. (2001) suggested that foraging occurs in riparian areas, upland forests and woodlots, and over ponds. Information from limited radio telemetry work on the MNF in recent years supports this assessment of foraging habitat use. Insects are caught and consumed while the bats are flying. Prey insects include moths, beetles, flies, caddis flies, stoneflies, lacewings, and ants. Moths and beetles are the largest part of most diets.

Most studies of Indiana bat foraging habitat use have been observational in nature. The few that have tried to investigate preference and avoidance of specific habitats were subject to potential methodological biases that raise questions about the validity of the results (see studies reviewed in Menzel et al. 2001 and USFWS 1999). Based on a review of range-wide data, Romme et al.

(1995) constructed a habitat suitability model that suggests that optimal canopy closure for foraging ranges from 50 to 70 percent. However, few data are available to demonstrate a clear preference or avoidance of particular forest canopy conditions.

In addition to forest canopies, Indiana bats also are known to forage along forest edges, in early successional areas, and along strips of trees extending into more open habitat, but drinking water must be available near foraging areas (Romme et. al. 1995). Large open pastures or croplands, large areas with less than 10 percent canopy cover, and stands with large, unbroken expanses of young, even-aged forests are avoided or are rarely used (Romme et al. 1995).

Indiana bats begin pre-hibernation swarming near caves as early as August, and continue swarming through October or November, depending upon local weather conditions. Swarming entails congregating around hibernacula prior to hibernation and flying into and out of cave entrances from dusk to dawn (Kiser and Elliot 1996). This is a biologically important period because during this time, bats mate and replenish fat reserves prior to hibernating (USFWS 1983).

Habitat on the MNF - The area of influence for Indiana bat on the MNF is currently recognized as four distinct areas:

1) Maternity sites are evidenced by lactating females or juveniles discovered prior to August 15.
2) Hibernacula are the caves or mines that are occupied by hibernating Indiana bats.
3) Key areas provide mature forest habitat near hibernacula. A key area is at least 150 acres in size, and, as appropriate, includes 20 acres of older growth forest and 130 acres of mature forest located as close to the cave as possible.
4) Primary range, which includes summer foraging, roosting, and fall swarming areas, is defined as all areas within 5 miles of hibernacula.

Under the 1986 plan as amended, maternity sites, hibernacula, and key areas are managed under Opportunity Area 838, whereas primary range is managed under a combination of MPs 6.3, 5.0, and 6.2.

West Virginia is within the Indiana bat's eastern maternity range, but not within its core range. Until recently, nighttime temperatures on most of the MNF were thought to be too cold to support numerous maternity colonies (Stihler pers. comm. 1999, Tolin pers. comm. 1999). Despite extensive summer surveys throughout West Virginia and the MNF, prior to summer 2003 there were no confirmed maternity colonies in the state. However, in 2003 a maternity colony was discovered in the southern part of West Virginia. This colony was confirmed again in 2004 (Chapman 2005). Also in 2004, a confirmed maternity colony was located on private land within the MNF proclamation boundary in Tucker County. That same summer, a male Indiana bat was tracked to a roost tree on the MNF in Pendleton County that contained 23 bats. Maternity activity is suspected at this site, though not confirmed because no lactating females or juveniles were captured.

Potential summer/maternity roosting and foraging habitat is widely available as the MNF is over 95 percent forested, with nearly 90 percent of the forested area being more than 60 years old. Given the average growth rates on the MNF, the stands that are over 60 years old most likely

have a mean diameter in excess of the 8.7 inches needed for quality roosting habitat. Trees exhibiting roosting characteristics—such as shagbark (*Carya ovata*) and bitternut hickory (*Carya cordiformis*), red (*Quercus rubra*) and white oak (*Quercus alba*), sugar maple (*Acer saccharum*), white (*Fraxinus americana*) and green ash (*Fraxinus pennsylvanica*), and sassafras (*Sassafras albidum*)—are plentiful throughout the Forest. Snag abundance currently is below optimum levels in most areas, but snags do contribute to summer roosting habitat quality. Field observations suggest that most of these stands have closed or nearly closed canopies, which may be denser than optimal for roosting and foraging. As aging continues, canopy gaps from dying trees will become more prevalent, reducing the overall canopy cover. However, because less than 5 percent of forested acreage currently exceeds 120 years old, gap dynamics are not likely to be widespread during the first decade or two of the planning horizon.

Hibernating Indiana bats have been observed in many West Virginia caves, with numbers ranging from a single observation to populations over 11,000. The largest West Virginia population is found in Hellhole Cave in Pendleton County. This cave is designated as Priority Two "Critical Indiana Bat Habitat" (Federal Register 1976). It lies on private land within the MNF's proclamation boundary. Over the years it has been censused, Hellhole's wintering population has gone from 210 Indiana bats in 1984 to 11,890 in 2005.

Based on recent WVDNR surveys and data in MNF files, 15 Indiana bat hibernacula are located within the MNF proclamation boundary (Stihler et al. 2001; Stihler and Wallace 2002, 2003, 2004, 2005; USDA Forest Service unpublished data). Seven of these are major hibernacula that regularly harbor dozens to hundreds or thousands of hibernating Indiana bats. The other eight typically host a few individuals or are based on old records of a few individuals. Six of the 15 hibernacula within the proclamation boundary have all or most of their entrances on NFS lands. Of these six, two (Big Springs and Cave Hollow/Arbogast) regularly host dozens to hundreds of Indiana bats. Eleven additional hibernacula lie within 5 miles outside the proclamation boundary. At the programmatic level, key areas have been defined around hibernacula within and near the proclamation boundary, although additional analysis likely will be necessary to refine these at the site-specific level. Table TE-3 presents an information summary for the hibernacula that lie within the proclamation boundary or within 5 miles outside of the boundary.

Of the six hibernacula on NFS land, Big Springs, Cave Hollow/Arbogast, and Two Lick Run are closed to public entry during hibernation season. Big Springs and Cave Hollow/Arbogast have additional protection from fences or gates. Cave Mountain is gated to protect a Virginia big-eared bat maternity colony, but the cave remains open to the public during hibernation season.

Table TE-3. Indiana Bat Hibernacula Within the MNF Proclamation Boundary or Within Five Miles Outside the Boundary

Cave Name	County	Major or Minor Hibernaculum[1]	Location	Gated or Fenced
Big Springs Cave	Tucker	major	NFS land	yes
Cave Hollow/Arbogast Cave	Tucker	major	NFS land	yes
Two Lick Run Cave	Randolph	minor	NFS land	no

Cave Name	County	Major or Minor Hibernaculum[1]	Location	Gated or Fenced
Bowden Cave System	Randolph	minor	NFS land	no[2]
Coal Run Cave	Tucker	minor	NFS land	no
Cave Mountain Cave	Pendleton	minor	NFS land	no[3]
Hellhole Cave	Pendleton	major	within proclamation boundary, not NFS land	yes
Izaak Walton Cave	Randolph	major	within proclamation boundary, not NFS land	no
Stewart Run Cave	Randolph	major	within proclamation boundary, not NFS land	no
Falling Spring Cave	Randolph	major	within proclamation boundary, not NFS land	no
Tub Cave	Pocahontas	minor	within proclamation boundary, not NFS land	no
Schoolhouse Cave	Pendleton	minor	within proclamation boundary, not NFS land	yes
Cass Cave	Pocahontas	minor	within proclamation boundary, not NFS land	no
Simmons-Mingo Cave	Randolph and Pocahontas	minor	within proclamation boundary, not NFS land	no
Smoke Hole Cave	Pendleton	minor	within proclamation boundary, not NFS land	no
Martha's Cave	Pocahontas	major	within 5 miles outside proclamation boundary	no
Snedegar's Cave	Pocahontas	major	within 5 miles outside proclamation boundary	no
Fortlick Cave	Randolph	major	within 5 miles outside proclamation boundary	no
Trout Cave	Pendleton	major	within 5 miles outside proclamation boundary	no
Lobelia Saltpeter Cave	Pocahontas	minor	within 5 miles outside proclamation boundary	no
Bob Gee Cave	Greenbrier	minor	within 5 miles outside proclamation boundary	no
Gooseberry Cave	Randolph	minor	within 5 miles outside proclamation boundary	no
Higgenbothams Cave #1	Greenbrier	minor	within 5 miles outside proclamation boundary	no
Higgenbothams Cave #2	Greenbrier	minor	within 5 miles outside proclamation boundary	no
Higgenbothams Cave #3	Greenbrier	minor	within 5 miles outside proclamation boundary	no
Higgenbothams Cave #4	Greenbrier	minor	within 5 miles outside proclamation boundary	no

[1]Major hibernacula typically host dozens, hundreds, or thousands of bats, while minor hibernacula host very few bats in most years.
[2]Part of the main passage of Bowden Cave is blocked by a safety barricade, but the part of the cave that typically hosts Indiana bats is not gated or fenced.
[3]Cave Mountain Cave is gated to protect a Virginia big-eared bat maternity colony, but the gate remains open during the hibernation season when the cave is used by Indiana bats.

Primary range around all the hibernacula within the proclamation boundary and within 5 miles outside the boundary includes an estimated 228,000 acres of NFS land. Stihler (1996) found that Indiana bat males foraged and day roosted near hibernacula (within 3.5 miles, or 5.6 km) throughout summer. He observed that these males often switched roost trees from day to day, roosting in trees near ridge tops. Based on Stihler's work, a 5-mile zone around hibernacula is considered primary range for those Indiana bats that stay around the caves in the summer. Primary range also contains the areas around the caves that are used for fall swarming. The NFS land in these 5-mile zones is similar to habitat in the rest of the Forest, namely mostly forested areas over 60 years old and having dense canopies.

Threats - The population of this species in the core of its range appears to have declined over the long term despite protection efforts at all known major hibernacula. Causes of the decline are not known; however, researchers are focusing on impacts from surrounding land uses, pesticides, heavy metals, and genetic variability (see reasons for decline listed in USFWS 1999). In contrast, hibernacula monitoring in West Virginia shows that estimated populations have increased since the early 1980s. Most significant caves are gated or fenced, which has protected Indiana bat populations and likely has been responsible for their increases.

Human disturbance of hibernating bats and cave vandalism are two primary factors contributing to Indiana bat declines. Other causes include natural disasters, habitat alteration, chemical contamination, historic collecting and handling, poorly designed and installed cave gates, cave commercialization, insecticides and natural predators. The effects of timber harvesting on Indiana bat foraging patterns is unknown, especially during the spring and fall swarm and during summer (Menzel et al. 2001).

Disturbance of maternity colonies also is a potential threat, especially if the disturbance involves removing or damaging maternity roost trees. Also, excessive noise (e.g., construction equipment) near maternity roosts is known to disturb maternity colonies (Garner and Gardner 1992; cited in Evans et al. 1998).

Wind turbines used to generate electric power are a relatively new threat to bats in West Virginia. Although no mortality of endangered bats has been documented, wind turbines on private land in Tucker County were estimated to have killed over 2,000 bats of various species during the period 4 April through 11 November 2003 (Curry and Kerlinger, LLC 2004). During a six-week search period in the summer of 2004, the same turbines were estimated to have killed between 1,364 and 1,980 bats (Arnett et al. 2005). These windmills are not located near any Indiana bat hibernacula. It is reasonable to assume that Indiana bats could be killed if wind turbines were to be constructed closer to hibernacula.

West Virginia Northern Flying Squirrel (*Glaucomys sabrinus fuscus*)

West Virginia northern flying squirrel (WVNFS) is a nocturnal sciurid that inhabits disjunct high-elevation "islands" in the central Appalachians of eastern West Virginia and western Virginia (Menzel et al. 2004). In 1985, the USFWS added the West Virginia northern flying squirrel to the endangered species list. An Appalachian Northern Flying Squirrels Recovery Plan

was released September 24, 1990. A Recovery Plan Update was signed on September 6, 2001 which included a Guideline for Habitat Identification and Management for *Glaucomys sabrinus fuscus* (USFWS 2001).

Throughout their range, northern flying squirrels use both tree cavities and leaf nests. Leaf nests and cavities serve a variety of purposes including diurnal sleeping sites, feeding stations during nocturnal foraging and as nests for raising young (Menzel et al. 2004). The squirrels apparently subsist on lichens and fungi, but also eat seeds, buds, fruit, staminate cones, and insects (USFWS 2001). Fecal samples of WVNFS indicate the most common foods eaten were lichens, fungi (mostly underground/hypogeous), pollen, and insects (Mitchell 2001).

In the central Appalachians, WVNFS commonly prefer conifer/hardwood ecotones or mosaics dominated by red spruce and fir with hemlock (*Tsuga canadensis*), beech (*Fagus grandifolia*), yellow birch (*Betula allegheniensis*), sugar (*Acer saccharum*) or red maple (*Acer rubrum*), and black cherry (*Prunus serotina*) associates. WVNFS have also been captured in northern hardwoods with conifer understory (Stihler et al. 1995). Northern flying squirrels have been captured in stands of various ages, understories, densities, and species composition, but most have been in moist forests with some widely-spaced, mature trees, and abundant standing and downed snags (USFWS 2001, WVDNR 1997), usually with some conifer (spruce, hemlock, fir) present (Stihler 1994b). These habitats seem well suited to WVNFS' gliding locomotion, cavity nest requirements, and reliance on wood-borne fungi and lichens for food (USFWS 1990).

Habitat on the MNF - Under the 1986 Forest Plan as amended, suitable habitat for WVNFS is managed under MP 8.0/Opportunity Area 832. Suitable habitat is identified and mapped consistent with the Guidelines for Habitat Identification and Management found in the updated *Appalachian Northern Flying Squirrels Recovery Plan* (USFWS 2001). A map of suitable habitat is collaboratively produced between the MNF, USFWS and WVDNR and is reviewed and refined at the project level. All mapped suitable habitat is assumed to be occupied by WVNFS, and emphasis is placed on protecting this habitat. The current version of the map shows approximately 150,000 acres of suitable habitat on NFS lands.

The MNF is believed to contain a large majority of the range-wide habitat for the WVNFS (Stihler pers. comm. 1999). There have been 1,180 documented captures in West Virginia through November 2005; 1,011 have occurred on MNF lands. In general, almost all West Virginia northern flying squirrel captures in West Virginia have been associated with red spruce and mixed spruce/northern hardwood forest types (Stihler et al. 1995).

Surveys conducted to date have documented the range of the species throughout much of the higher elevations of the Forest (USDA Forest Service unpublished data), but data have not been sufficient to determine population levels or trends.

Threats - Almost all of West Virginia's high-elevation spruce forest was cut during the railroad logging era from the 1880s to the 1930s. While red spruce regenerated in some areas, fires and soil disturbance that followed logging favored hardwood regeneration in many areas, such that spruce forest within the MNF proclamation boundary now covers a small fraction of its estimated original extent (see Terrestrial Ecosystem Diversity section of EIS Chapter 3).

Beyond direct habitat changes, historical logging also may have favored WVNFS competitors and pathogens via hardwood range expansion. WVNFS may be displaced by the more aggressive southern flying squirrel (*G. volans*) in certain overlapping hardwood habitats. The southern flying squirrel also may transmit the parasite *Strongyloides robustus*, which can be fatal to northern flying squirrels (USFWS 2001).

The greatest current threat to WVNFS is habitat destruction, fragmentation, or alteration. Negative habitat alterations are associated with forest clearing, mineral extraction, and residential/resort development. Because the 1986 Forest Plan as amended contains habitat protections, these threats occur primarily on private land. Possible future declines in spruce forest due to atmospheric deposition of acid and heavy metals threaten to further reduce the range and quality of remaining conifer-hardwood habitats.

Cheat Mountain Salamander *(Plethodon nettingii)*

The Cheat Mountain salamander was listed as threatened on August 18, 1989. A Recovery Plan was released on July 25, 1991 (USFWS 1991a). Critical habitat has not been designated.

The Cheat Mountain salamander is a relict species with isolated populations (Pauley 1997, Kramer et al. 1993). It is geographically restricted to high-elevation forests containing a red spruce component and mixed deciduous forests with a *Bazzania*-dominated forest floor (Pauley 1997). The species' entire range is limited to the higher portions of the Allegheny Mountains in northeastern West Virginia (Pauley 1997).

This plethodontid (lungless) salamander requires microhabitats with high relative humidity or moisture, as respiration occurs through the skin. Old, structurally complex forests are more likely than young forests to provide the necessary moist, stable microenvironment (USDA Forest Service 2001).

Habitat on the MNF - High potential Cheat Mountain salamander habitat on NFS land is estimated at over 100,000 acres; surveys have documented occurrences at scattered locations within that habitat (USDA Forest Service unpublished data). A few known occurrences lie outside mapped high potential habitat. Cheat Mountain salamanders are generally confined to high-elevation areas in the northern and central portions of the Forest. While this species is typically associated with spruce, studies have not conclusively established a preference for any one forest type. Recent surveys have expanded the known range of the Cheat Mountain salamander to about 935 square miles, with about 65 of the 85 known occurrences located on the MNF.

Threats - The extensive logging of spruce around the turn of the century is the most likely cause of decline for this species. Competition from other similar plethodontids, genetic isolation of populations, habitat degradation (e.g., acid deposition), habitat fragmentation, and habitat disturbance all continue to contribute to the limited occurrence of the species (Pauley 1980, USFWS 1991a).

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was first listed on March 11, 1967. On July 12, 1995, the USFWS reclassified the bald eagle from endangered to threatened throughout the lower 48 states (Federal Register 1995). De-listing has been proposed based on substantial population increases in recent decades.

Bald eagles are closely associated with large bodies of water with abundant fish populations during both the breeding and non-breeding season (Buehler 2000, DeGraaf and Yamasaki 2001). Bald eagles forage along rivers, large streams, and lakes, where they perch in trees near the water's edge and wait for fish or waterfowl to come along. The proportional importance of the various food items may vary regionally.

Breeding most often occurs within one mile of the water bodies that provide primary food sources (USFWS 1990a). Nests are built in super-canopy trees approximately 100 yards from the nearest forest edge (Cline 1985). Overall, bald eagles prefer areas with limited disturbance from humans (Buehler et al. 1991), although anecdotal reports suggest that some individuals or pairs can become habituated to various levels of human activity (e.g., Stihler and Wallace 2002, Stihler and Wallace 2004).

Habitat on the MNF – Although riparian forests are widespread and common on the MNF, large bodies of water that are suitable for eagle foraging are limited. The Smoke Hole area, in along the South Branch of the Potomac River, provides good forage and nest habitat. Although the MNF has no large lakes or impoundments, smaller lakes such as Buffalo Lake, Summit Lake, Spruce Knob Lake, and Lake Sherwood provide potential habitat. Lake Moomaw on the George Washington National Forest is a larger lake located about 5 miles from the MNF's southeastern border. Bald eagles have nested at this lake. The small lakes on the MNF may be used primarily by non-breeding eagles traveling south from northeastern breeding areas, or north from southern breeding areas.

Two recent bald eagle nest sites are known from the MNF, both in the Smoke Hole vicinity. One of these nest sites has consistently fledged young for a number of years, while the other was first discovered during the 2003 nesting season. Both sites are in the Spruce Knob – Seneca Rocks National Recreation Area, and one is located in a remote backcountry area of the NRA.

Threats – Pesticide (DDT and DDE) and heavy metal accumulations reduced bald eagle reproduction and caused most of the historic population decline (Cline 1985). Suspension of DDT use in 1972 has resulted in substantial population increases, and bald eagle numbers are no longer declining (hence the proposed de-listing).

Direct human disturbance, including intentional shooting, has also contributed to historic population declines. Although the bald eagle population in West Virginia is increasing, several eagles have been shot in West Virginia in the past decade. Shootings and disturbance at nest sites still affect eagles in this state (Stihler and Wallace 2003, 2004, 2005). Current MNF management activities, including recreation, do not appear to be negatively affecting bald eagle nesting at either MNF site, as young are being fledged annually.

Habitat destruction and degradation via shoreline development, recreational waterway and shoreline use, and non-point and point source water pollution still threaten bald eagles in some areas (Federal Register 1995).

ENVIRONMENTAL CONSEQUENCES

Resource Protection Methods

Below are the mitigation or management requirements common to all alternatives that will be used to protect threatened and endangered species. Resource protection methods come in the form of laws, regulations, policies, FSM and FSH direction, Forest Plan direction, and Forest Plan implementation strategies.

Laws, Regulations, and Policies

Table TE-4. Major Laws and Regulations Influencing Management and Protection of Threatened and Endangered Species on the Forest

Act/Law/Regulation/Policy	Date	Law/CFR/FSM/FSH Number
Organic Administration Act	06/04/1897	30 Stat. 11
Weeks Law	03/01/1911	P.L. 61-435
Endangered Species Act	1973	16 U.S.C. 1531
Interagency Cooperation on Consultation	06/03/1986	50 CFR 402
Interagency Cooperation Under the Endangered Species Act	07/01/1994	59 FR 166 34271-34275
Forest Service Manual, Wildlife, Fish, and Sensitive Plant Habitat Management	Updated as needed	FSM 2600
Forest Service Manual, Threatened, Endangered, and Sensitive Plants and Animals	Updated as needed	FSM 2670
Forest Service Handbook, Wildlife, Fish, and Sensitive Plant Habitat Management	Updated as needed	FSH 2600
Forest Service Handbook, Threatened, Endangered, and Sensitive Plants and Animals	Updated as needed	FSH 2670

One main law governs the management of TEP species on National Forest System lands – the Endangered Species Act of 1973. National laws and regulations have also been interpreted for implementation in Forest Service Manuals, Handbooks, and Regional Guides. Some of the more influential laws, regulations, and policies governing TEP species and habitat management on federal lands are referenced in Table TE-4.

Forest Plan Direction

Forest Plan direction for the management and protection of threatened and endangered species occurs at the Forest-wide level. The 1986 Forest Plan had relatively little direction for T&E species until a Threatened and Endangered Species Amendment was adopted in 2004. Forest-wide direction in the Revised 2006 Plan incorporates and modifies the 2004 amendment

direction, and it has been expanded to include a separate section for Threatened, Endangered, and Proposed (TEP) Species with additional goals, and a clearer description of desired conditions. Objectives, standards, and guidelines have also been rewritten in some instances to provide concise and clearer direction, and better integration between protection and management of TEP species habitat and other resources. Some direction from the 1986 Plan as amended has been removed, including items that were process-oriented, or repeated existing law or policy, or that conflicted with other resource management.

The 2006 Forest Plan also includes threatened and endangered species in the Forest Integrated Desired Conditions. The desired condition is for ecosystems on the Forest to support species diversity, with emphasis on maintaining or restoring populations of game and non-game wildlife and fish; threatened, endangered, proposed, and sensitive species; and rare plant communities.

Forest Plan Implementation

Any proposed project on the Forest that may affect listed species or their habitats would follow Forest Plan management direction for the protection of TEP species and their habitats. In addition, the ESA Section 7 Consultation process would be followed. Proposed projects would be evaluated and implemented according to the following sequence of activities:

- Determine whether potential habitat is present in the area to be affected.
- Determine the type and amount of suitable habitat in the project area.
- When necessary and practical for evaluating effects, conduct surveys for TEP species with potential habitat in the area to determine their presence, absence, distribution, or other relevant population characteristics. When surveys are not necessary or practical, assume presence within suitable habitat.
- Analyze potential effects of project activities on TEP species and their habitats.
- Identify any measures needed to avoid or reduce effects to TEP species and their habitats.
- Document and disclose analysis results and impact avoidance/reduction measures through the NEPA process.
- Consult informally with USFWS, and submit a biological assessment with a determination of effects for their concurrence.
- In the case of a likely to adversely affect determination, initiate formal consultation with USFWS.
- Integrate any terms and conditions from the resulting USFWS biological opinion as part of project implementation.

During and after project implementation, monitoring may also be conducted to validate the implementation and effectiveness of project design or impact avoidance/reduction measures.

General Effects to T&E Plant Species

Running Buffalo Clover (RBC)

Effects from Mineral Operations - Federal and private owned mineral development may occur within RBC habitat, but development is not expected to be extensive or vary much by alternative (see Mineral Resources section). By far the major activity that could affect this species is

disturbance related to gas development (well sites, roads, pipelines). On average, each well site is approximately 15.5 acres, with associated roads and pipelines that create narrow linear openings and ground disturbance. On average each gas well site includes a 2 acres of opening, 2 acres of access roads, and 11.5 acres of pipeline. Effects could be both negative and positive. Negative effects could occur if individuals or populations are directly eliminated from the disturbance site; however, site-specific surveys prior to operations would greatly reduce this potential. Activities would also provide ground disturbance that could allow nearby populations to expand their numbers.

Effects from Range Activities – RBC habitat would not be affected by continued range management activities, and range management activity would not vary by alternative. No new range areas are expected to be created. Some pastures may include potential habitat if they include forested areas and are on soils derived from limestone. Cattle paths may create habitat for RBC similar to pre-settlement conditions found on game trails. Negative impacts could include herbivory of RBC by cattle and positive impacts could include spreading seeds by the animals.

Effects from Fire-related Activities – Fire suppression activities are not expected to vary by alternative, nor can it be predicted where these activities would occur. Effects could be both negative and positive. Negative effects could occur if individuals or populations are directly eliminated from the disturbance site. Activities would also provide ground disturbance that could allow nearby populations to expand their numbers. However, wildfire and fire suppression activities are currently at fairly low levels on the Forest, and they are not expected to increase dramatically over the short term.

Prescribed fire is allowed within most areas of the Forest. Site-specific burn plans would be completed at the project level for each burn, and these plans would be designed to mitigate any potential adverse effects on T&E species. Prescribed fire is currently limited to 300 acres per year by the Forest's Incidental Take Statement for Indiana bat, but Alternatives 2, 2M, and 4 would increase this amount by as much as tenfold. Potential direct effects to RBC could be both positive and negative. Fire line construction could remove individuals if surveys are not made before construction. Prescribed burning itself is an attempt to re-introduce an ecosystem component that would create the open conditions favored by RBC. Change in fire regime is considered a threat to RBC because of habitat loss.

Effects from Road-related Activities - Various road management activities (construction, reconstruction, decommissioning and maintenance) could affect individuals, populations, or habitat. Effects could be both negative and positive. Negative effects could occur if individuals or populations are directly eliminated from the disturbance site; however, site-specific surveys prior to operations would greatly reduce this potential. Activities would also provide ground disturbance that could allow nearby populations to expand their numbers.

Effects from Recreation Activities – Developed and dispersed recreation activities would not measurably affect RBC population or habitat. No large-scale facility or trail development is planned under any alternative. Although facilities are allowed in many areas, any development

would be very small on a Forest-wide scale. Facility and trail maintenance would not affect habitat.

Effects from Watershed Restoration Activities - Soil and water restoration activities tend to occur in localized areas and would be preceded by site-specific surveys prior to project implementation. Short-term effects from disturbance would be similar to those described for Road-related Activities, above. These types of activities are not expected to vary much by alternative.

Effects from Salvage Activities – Timber salvage would occur only after areas have been already damaged or altered by natural disturbances, and would likely not vary much by alternative over the short term. Effects would typically be minimal due to the relatively small scale of salvage operations on this Forest, and any activities would be preceded by site-specific surveys for T&E plants.

Effects from Wildlife Habitat Management Activities - Wildlife opening or savannah establishment could eliminate individuals or populations from the disturbance site; however, site-specific surveys prior to operations would greatly reduce this potential. Potential effects from fire or harvest-related habitat treatments are covered elsewhere in this section. Fisheries habitat restoration activities would likely have no effect on RBC populations or habitat.

Effects from Timber Harvest Activities – Timber harvest would likely have the greatest potential for effects on RBC habitat due to the relatively widespread potential for ground disturbance and habitat manipulation. This potential would vary by alternative and will be therefore addressed in the Direct and Indirect Effects section below.

Small Whorled Pogonia (SWP)

Effects from Mineral Operations - Federal and private owned mineral development may occur within SWP habitat, but development is not expected to be extensive or vary much by alternative (see *Mineral Resources* section). By far the major activity that could affect this species is disturbance related to gas development (well sites, roads, pipelines). On average, each well site is approximately 2 acres, with associated roads and pipelines that create narrow linear openings and ground disturbance, for a total of about 15.5 acres of disturbance. Negative effects could occur if individuals or populations are directly eliminated from the disturbance site; however, site-specific surveys prior to operations would greatly reduce this potential.

Effects from Range Activities – SWP habitat would not be affected by continued range management activities, and range management activity would not vary by alternative since existing pasture areas are not potential habitat for SWP. No new range areas are expected to be created.

Effects from Fire-related Activities – Fire suppression activities are not expected to vary by alternative, nor can it be predicted where these activities would occur. Negative effects could occur if individuals or populations are directly eliminated from the disturbance site. However,

wildfire and fire suppression activities are currently at fairly low levels on the Forest, and they are not expected to increase dramatically over the short term.

Prescribed fire is allowed within most areas of the Forest. Site-specific burn plans and a NEPA analysis would be completed at the project level for each burn, and burn plans would be designed to mitigate any potential adverse effects on T&E species. Prescribed fire is not likely to be used as a vegetation management tool in mixed mesophytic forests because fire is not a common disturbance regime there. However, prescribed fire could be used in oak and pine-oak forests because fire is considered a disturbance that needs to be re-introduced in some areas. The one known SWP site is located in an area considered to be Fire Regime I (0-35 year, low intensity). The SWP site is in a mesic micro-site within this landscape. Prescribed fire could be applicable to essentially all of the mature oak and mature pine-oak forests considered habitat for SWP. Based on the single occurrence on the Forest, SWP found in these forest types would likely be found in areas with ephemeral or intermittent water that would likely act as fire breaks. In general, prescribed fires on the Forest create patchy burned conditions. However, the potential exists for prescribed fire to impact individual SWP plants.

Effects from Road-related Activities - Various road management activities (construction, reconstruction, decommissioning and maintenance) could affect individuals, populations, or habitat. Negative effects could occur if individuals or populations are directly eliminated from the disturbance site; however, site-specific surveys prior to operations would greatly reduce this potential.

Effects from Recreation Activities – Developed and dispersed recreation activities would not measurably affect SWP population or habitat. No large-scale facility or trail development is planned under any alternative. Although facilities are allowed in many areas, any development would be very small on a Forest-wide scale. Facility and trail maintenance would not affect habitat.

Effects from Watershed Restoration Activities - Soil and water restoration activities tend to occur in localized areas and would be preceded by site-specific surveys prior to project implementation. Short-term effects from disturbance would be similar to those described for Road-related Activities, above. These types of activities are not expected to vary much by alternative.

Effects from Salvage Activities – Timber salvage would occur only after areas have been already damaged or altered by natural disturbances, and would likely not vary much by alternative over the short term. Effects would typically be minimal due to the relatively small scale of salvage operations on this Forest, and any activities would be preceded by site-specific surveys for T&E plants.

Effects from Wildlife Habitat Management Activities - Wildlife opening or savannah establishment could eliminate individuals or populations from the disturbance site; however, site-specific surveys prior to operations would greatly reduce this potential. Potential effects from fire or harvest-related habitat treatments are covered elsewhere in this section. Fisheries habitat

restoration activities would likely have no effect on SWP populations or habitat because they would not occur within potential habitat.

Effects from Timber Harvest Activities – Timber harvest would likely have the greatest potential for effects on SWP habitat due to the relatively widespread potential for ground disturbance and habitat manipulation. This potential would vary by alternative and will be therefore addressed in the Direct and Indirect Effects section of this analysis.

Shale Barren Rock Cress

Potential habitat for SBRC is defined as shale barren areas with surface rock. Potential and known habitat on the Forest is estimated to be less than 100 acres. An analysis of programmatic effects is not suited for such a small acreage. Known sites are protected by either assignment to an 8.0 management prescription or as protected inclusions in other prescriptions. Populations are monitored and management of the habitat is coordinated with the WVDNR Heritage Program staff. Therefore, there would likely be no measurable direct or indirect effects to SBRC as a result of implementing any of the alternatives.

Virginia Spiraea

Virginia spiraea is a riparian shrub found mainly along lower elevation reaches of high energy streams and rivers, this habitat is estimated to be about 18,000 acres across the Forest. Because this habitat is not wide-spread across the Forest and the plant is restricted to riparian areas, an analysis of effects by management prescription or activity is not necessary. Riparian area protection measures identified under Forest-wide shade strips for Alternative 1, and under revised Forest-wide Soil and Water direction for Alternatives 2-4, would be applied site-specifically at the project level, and would greatly reduce the potential for impacts to Virginia spiraea along streams and rivers. As with other T&E species, surveys would be made before management occurs. Generally timber harvest does not occur in the riparian areas of larger streams and rivers. Threats to the species include large scouring floods, competition from natives and non-native plants, and clearings made by recreationists. Therefore, there would likely be no measurable direct or indirect effects to Virginia spiraea as a result of implementing any of the alternatives.

General Effects to T&E Animal Species

Virginia Big-eared Bat

General effects are described below for VBEB foraging habitat, hibernacula, and maternity/ summer colony sites. VBEB typically forage within 6 miles of their hibernacula and summer colony sites. Foraging areas remain constant (exceptions would be new cave or summer colony discoveries) and would not vary by alternative.

Effects from Mineral Operations - There are currently 44 existing gas well sites within Virginia big-eared bat foraging areas. Gas well sites generally add to landscape diversity and provide potential Virginia big-eared bat foraging habitat, although they could degrade habitat if

they are constructed in existing herbaceous openings. It is not possible to predict with any accuracy the amount of future gas development under the plan alternatives, although the amount is expected to be within the limits projected by the 1991 Environmental Assessment for oil and gas development (USDA Forest Service 1991). All Forest Plan alternatives provide broad direction on where and how leasing and development of federal gas can occur, but do not make specific decisions about the location, amount, or timing of gas development. The amount of surface modification associated with future gas development is not expected to be extensive under any alternative (see *Mineral Resources* section in Chapter 3 of the EIS). In addition, plan direction includes the following protections:

- Under Alternative 1, seismic exploration and use of explosives would not be allowed within 200 feet of hibernacula, maternity colonies, and bachelor colonies. Under the action alternatives, seismic exploration and use of explosives would not be allowed within 200 feet of these features unless analysis shows that such activities would not adversely affect Virginia big-eared bat populations or habitat.

- Under all alternatives, surface occupancy for federal mineral operations would not be allowed within 200 feet of hibernacula, maternity colonies, or bachelor colonies.

Development of other minerals is rare on the Forest, but could occur in the future. Effects from minerals other than gas developments are difficult to predict because they vary depending on what is being developed, recovery methods, surface disturbance intensity and reclamation.

For these reasons, it is expected that Virginia big-eared bat foraging would not be adversely affected by existing or future federal mineral activities, although quality foraging areas may increase slightly due to creation of new herbaceous openings. Because the total area to be affected by development of federal minerals is expected to be small, effects on foraging habitat are likely to be negligible. Protections for hibernacula, maternity, and bachelor colony sites would make adverse effects to these features unlikely.

Development of privately-owned minerals beneath NFS lands is controlled by the deed. While the MNF would attempt to coordinate with private mineral owners and the USFWS to avoid impacts, the MNF generally has little authority over private mineral operations. Depending on the terms of the mineral severance deed, the MNF may have some discretion over the location of surface occupancy associated with private mineral developments. In such cases the MNF would encourage locations that avoid adverse impacts to Virginia big-eared bat sites. The federal action would be limited to the MNF's authority, which may not include the effects of the mineral development itself. Therefore, any effects of private mineral development beyond those over which the deed allows MNF discretion are not analyzed as part of this federal action. ESA compliance for those effects would be the responsibility of the private mineral developer.

Effects from Range Activities - There are currently 4,315 Forest Service range allotment acres within available Virginia big-eared bat foraging area. Range allotments provide habitat diversity and contribute to the mosaic of land types within forage areas. Under all alternatives, development of new range allotments is expected to be limited to newly acquired land that is already pasture or hay land. Therefore, bat foraging would not be affected by continued range

management activities, as activities would not alter habitat or foraging opportunities.

There are no known hibernacula or summer colony sites within existing range allotments. There may be instances where abandoned buildings located within Forest Service range allotments are used during the summer by Virginia big-eared bats; however, grazing activities within those allotments should not affect Virginia big-eared bat use. Prior to taking actions on buildings within 6 miles of hibernacula or summer colonies, Forest-wide direction for all alternatives requires that the buildings be evaluated to determine whether they are being used by Virginia big-eared bats, and negative effects must be avoided. Therefore, range management activities are not expected to affect roosting or hibernating Virginia big-eared bats.

Effects from Fire-related Activities – The location and extent of wildfire suppression activities are difficult to predict due to the unpredictable nature of wildfire. Fire suppression along edge and within brushy habitats allows for continued succession, which could eventually reduce available edge and habitat diversity. Wildfire suppression in forested areas may deter formation of new edge habitat and openings. These potential negative effects would likely be more than compensated for by the use of prescribed fire, as described below. Currently wildfire and fire suppression activities occur at fairly low levels on the Forest, and they are not expected to increase dramatically over the short term under any alternative.

Prescribed burning is allowed within Virginia big-eared bat foraging areas under all alternatives. Site-specific burn plans would be completed at the project level for each burn, and these plans must consider potential effects on TEP species. It is believed that burn plans could be designed to avoid adverse effects on Virginia big-eared bats. Past prescribed burns have been used to maintain openings and edge habitats that otherwise could revert to forest. Repetitive burning may result in loss of mid and understory species, but may promote herbaceous species. An expanded prescribed fire program would create more open stands with an herbaceous component in the understory, which could improve Virginia big-eared bat foraging areas. The amount of prescribed fire in foraging areas would vary by alternative and is analyzed in more detail under the discussion of direct and indirect effects by alternative.

Under all alternatives, vegetation management, which could include prescribed burning, would only occur within 200 feet of hibernacula or maternity/summer colonies to maintain or enhance bat habitat, or for public safety or research purposes. Prescribed fire within 200 feet of hibernacula and maternity/summer colonies is considered unlikely because of the risk of smoke entering the cave, but no plan alternative specifically prohibits it. If prescribed fire were to be used, a burn plan would be required to ensure protection or maintenance of TEP species and habitat. Naturally occurring wildfire is unpredictable; however, fire suppression would be used to extinguish fires that are close enough to known maternity/summer colonies or hibernacula for smoke to enter the cave. Negligible effects to Virginia big-eared bat hibernacula and maternity/summer colony sites from fire-related activities are expected due to the protections described above.

Effects from Road-related Activities - Current Forest roads provide edge habitat and travel corridors used by many species, including bats. New road construction or reconstruction would likely increase these beneficial effects. Road decommissioning would have the opposite effect as

corridors fill in with trees over time, unless decommissioned roads are maintained as linear wildlife openings. It is possible that Virginia big-eared bats could collide with vehicles traveling during the night. However, the majority of night-time vehicular use within Virginia big-eared bat foraging areas would occur on state or county roads rather than Forest roads.

Future road construction and decommissioning levels are difficult to predict for a number of reasons (see *Road Transportation System* section in Chapter 3 of the EIS). Also, under all alternatives it is expected that the overall amount of roads added to the transportation system would only be a very small portion of the 324,000 available foraging acres on the Forest due to such factors as MP road density constraints, anticipated incidental take restrictions for the Indiana bat, site-specific resource concerns, and a 2006 Forest Plan goal to determine the minimum transportation system necessary to achieve access management objectives.

Under all alternatives, new road or trail development is prohibited within 200 feet of Virginia big-eared bat hibernacula and summer colonies. Currently there are no Forest Service system roads or trails within 200 feet of any Virginia big-eared bat maternity/summer colony sites or hibernacula. Unauthorized user-created trails may lead to some caves; however, they are not part of the transportation or trail system and any effects caused by these trails are not considered to be effects caused by implementation of the Forest Plan. Due to the prohibition on road and trail construction within 200 feet of these areas, there would be no effects to Virginia big-eared bat hibernacula or maternity/summer colony sites.

Effects from Recreation Activities – Dispersed recreation opportunities occur within foraging areas; however, these activities would not measurably affect VBEB foraging activity as most human recreation is done during daylight hours. There are several developed recreation areas within VBEB foraging habitat, ranging from day use picnic areas to the Seneca Rocks Discovery Center. Existing facility and trail maintenance would not measurably affect Virginia big-eared bat foraging habitat. No large-scale facility development or new trail development is planned under any alternative. Although facilities are allowed in many areas, any development would be very small on a Forest-wide scale.

Sport caving (spelunking) is fairly popular on the MNF and will likely continue in the future. There are an estimated 260 inventoried caves on the Monongahela National Forest; and 14 are heavily used, mainly because of their easy accessibility. All VBEB hibernacula located on Forest Service lands are closed to public entry from September 1 to May 15. Caves used during the maternity season are closed to public entry from April 1 to September 15 (2006 Forest Plan Standards TE16, TE17). Caving activities and restrictions would not vary by alternative. For these reasons, no effects are expected to Virginia big-eared bat hibernacula or maternity sites under any alternative.

Effects from Watershed Restoration Activities – Soil, water, riparian, and aquatic restoration within foraging areas and within 200 feet of hibernacula and maternity/summer colony sites are not explicitly limited under any Forest Plan alternative. However, if such activities involve vegetation management, they may occur within 200 feet of hibernacula and maternity/summer colony sites only if conducted for maintenance or improvement of bat habitat, public safety, or research. Restoration activities tend to occur in localized areas on a very small scale, and would

therefore not measurably affect available Virginia big-eared bat foraging habitat, hibernacula, maternity or summer colony sites across the Forest.

Effects from Salvage Activities – Timber salvage would occur only after areas have been already damaged or altered by natural disturbances. As VBEBs are not known to use trees for roost or maternity sites, tree removal would have negligible negative effects on habitat or individuals, and could have a small positive effect by opening up potential foraging areas. Activities would not occur within 200 feet of hibernacula or maternity sites unless the activity is beneficial to VBEB or other threatened or endangered species. These activities would not vary by alternative.

Effects from Wildlife Habitat Management - Wildlife habitat management may add to diversity within VBEB foraging habitat depending on the activity planned. Wildlife opening creation and maintenance would help ensure edge habitat and herbaceous foraging habitat. Other localized activities would likely have little or no effect unless they were specifically designed to benefit VBEB foraging habitat. Fisheries habitat restoration activities would be limited to stream channel and bank enhancements and would have no affect on VBEB foraging. Activities would not occur within 200 feet of hibernacula or maternity/summer colony sites unless the activity is beneficial to VBEB or other threatened or endangered species. These activities would not vary by alternative.

Effects from Timber Harvest Activities – As noted above, tree removal and associated road activities are not major concerns for this species. Virginia big-eared bats use caves year-round, although standing timber may be used for night roosting. Because the bats return to caves during the day, or occasionally day roost under bridges or in man-made structures, there would be little or no direct effect on Virginia big-eared bat individuals from timber harvesting activities. Under all alternatives, activities would not occur within 200 feet of hibernacula or maternity/summer colony sites unless they are conducted for maintenance or improvement of bat habitat, public safety, or research. Therefore, timber harvest activities are not expected to have any negative effects on hibernacula and maternity/summer colonies under any alternative.

Timber harvest could affect Virginia big-eared bat foraging habitat due to its ability to create openings and edge, particularly through even-aged regeneration harvest. Because Virginia big-eared bats forage in a wide variety of open and forested habitats, even-aged regeneration harvest over a modest portion of the landscape is not believed to have measurable negative effects on habitat. However, timber harvest has not been shown to be beneficial. Under all alternatives, less than 20 percent of Virginia big-eared bat foraging habitat would be considered suitable timberland, so even-aged regeneration harvest would be likely to affect only a small portion of foraging habitat.

Indiana Bat

Effects from Mineral Operations – Natural gas leasing is by far the most common form of mineral development on the Forest. Although gas exploration and development are generally allowed within Indiana bat habitat, there are a number of restrictions that would limit effects from these activities:

- Alternative 1 would prohibit seismic exploration and explosive use within key areas and within 200 feet of hibernacula. The action alternatives would prohibit seismic exploration and explosive use in these areas unless analysis shows that these activities would not adversely affect bat populations or habitat.
- All alternatives would prohibit surface occupancy for federal mineral operations within key areas and within 200 feet of hibernacula.
- Alternative 1 would prohibit surface occupancy for federal mineral operations within 2 miles of a maternity site. The action alternatives would stipulate that surface occupancy within 2.5 miles of a maternity site must be compatible with Indiana bat population maintenance or recovery.

The total amount of surface modification associated with future gas development is not expected to be extensive under any alternative (see description of mineral activities above, also the *Mineral Resources* section in Chapter 3 of the EIS).

Other mineral development is rare on the Forest, but could occur in the future. Effects from minerals other than gas developments are difficult to predict because they vary depending on what is being developed, recovery methods, surface disturbance intensity, and reclamation.

For the reasons listed above, it is expected that mineral operations would have minor effects on Indiana bats and their habitats under all alternatives. However, mineral development usually does involve a certain amount of land clearing and road development, which could remove potential roost trees or harm roosting bats. Therefore, not all risk of adverse effects due to mineral activities can be eliminated.

Development of privately-owned minerals beneath NFS lands is controlled by the deed. While the MNF would attempt to coordinate with private mineral owners and the USFWS to avoid or reduce impacts, the MNF generally has little authority over private mineral operations. Depending on the terms of the mineral severance deed, the MNF may have some discretion over the location of surface occupancy associated with private mineral developments. In such cases the MNF would encourage locations that avoid adverse impacts to Indiana bat sites. The federal action would be limited to the MNF's authority, which may not include the effects of the mineral development itself. Therefore, any effects of private mineral development beyond those over which the deed allows MNF discretion are not analyzed as part of this federal action. ESA compliance for those effects would be the responsibility of the private mineral developer.

Effects from Range Activities – There are currently 1,777 acres of Forest range allotments within Indiana bat primary range, and there are no known hibernacula, key areas, or maternity sites within these allotments. Range allotment locations and management activities allowed within allotments would not vary by alternative and are not expected to increase in the foreseeable future. Continued range management would have no effect on Indiana bat habitat components or individuals because grazing activities and facilities would not alter Indiana bat habitat or disturb populations.

Effects from Fire-related Activities – Both wildfire and prescribed fire have the potential to destroy or create snags for Indiana bat roost trees or maternity sites. Under the action

alternatives, protective measures for NFS lands within 2.5 miles of potential or confirmed maternity sites would be determined at a site-specific level in cooperation with USFWS and WVDNR. Alternative 1 would apply protective measures within a 2-mile radius. Under all alternatives, prescribed fire plans would include provisions to protect known roost trees, including both maternity and non-maternity roosts. The one confirmed Indiana bat maternity site within the proclamation boundary (found in 2004) is located in an area that experienced a wildfire in 2003, resulting in a generous number of snags with sloughing bark. This maternity site is on private land within the proclamation boundary and would not be subject to MNF management, although the 2.5-mile radius surrounding the site includes NFS lands that would be subject to conservation measures, with activities to be considered on a case-by-case basis.

Prescribed or controlled fire could also be used to help thin out and maintain favorable foraging and roosting conditions within Indiana bat habitat. Opportunities for prescribed fire within primary range would vary by alternative and are covered in the discussion of direct and indirect effects by alternative. Uncontrolled wildfire, on the other hand, would have more potential for stand-replacing events over time as stands age and fuels increase. Stand-replacing fire would add habitat diversity, but, depending on the size of the event, could be detrimental to foraging conditions by opening up too much forest canopy.

Harm or mortality of individual bats could result from smoke entering occupied hibernacula, roost trees, or maternity sites. Prescribed fire and associated fuel reduction activities may also cause harm or mortality through flames, heat, and loss of roost trees. However, prescribed fire is subject to a burn plan under all alternatives. The burn plan likely would require that burning be conducted under conditions that optimize smoke dispersal, and likely would contain provisions to protect hibernacula, known roost trees, and known maternity sites. Therefore, negative effects of prescribed fire on individuals are expected to be infrequent. However, because some roost trees and maternity sites may not be detected, all risk associated with prescribed fire cannot be eliminated.

All alternatives would continue the current policy of suppressing wildfires when they are detected. Wildfire suppression activities such as fire line construction could destroy potential roost trees. Every effort would be made to avoid known roost trees, within the constraints of protecting human life and property. Typically, wildfire on the Forest does not exceed 100 acres per year, and at this rate the potential effects to Indiana bats and their habitats due to fire suppression activities would be minor.

Effects from Road-related Activities – Current Forest roads provide edge habitat and travel corridors used by many species, including bats. Road corridors also provide solar exposure to trees and snags along the road, potentially increasing their suitability as roost trees for Indiana bats. New road construction or reconstruction would likely increase these beneficial effects. Road decommissioning would have the opposite effect as corridors fill in with trees over time, except where decommissioned roads are maintained as linear wildlife openings.

The major negative effects of road construction are the loss of potential roost trees and potential harm or mortality of roosting bats during clearing of the road alignment. The possibility also exists that Indiana bats could collide with vehicles traveling during the night. However, the

majority of night-time vehicular use within Indiana bat foraging areas would occur on state or county roads rather than Forest roads, so collisions are considered extremely unlikely.

Future road construction and decommissioning levels are difficult to predict for a number of reasons (see *Road Transportation System* section in Chapter 3 of the EIS). The overall amount of roads added to the transportation system is expected to be a very small portion of the 228,000 acres of primary range on the Forest due to such factors as MP road density constraints, site-specific resource concerns, and a 2006 Forest Plan goal to determine the minimum transportation system necessary to achieve access management objectives. Also, Forest-wide standards in the 2006 Forest Plan prohibit new road construction within 200 feet of Indiana bat hibernacula and require that new roads avoid key areas and maternity sites. For all of these reasons, road-related activities are expected to have small adverse effects on Indiana bats and their habitats. However, the potential for loss of roost trees and harm to roosting bats during road construction and reconstruction cannot be discounted.

Effects from Recreation Activities – Developed recreation facilities include campgrounds, picnic areas, swimming beaches, visitor centers and historic sites. No large-scale facility development is planned for the foreseeable future, but the 2006 Forest Plan does allow construction of new facilities. Although new facilities are allowed in primary range, any development likely would cover a negligible portion of the total Forest-wide foraging and swarming habitat. Forest-wide direction for all alternatives prohibits the construction of new recreational facilities within key areas and within 200 feet of hibernacula, so developed recreation would not impact these habitat features. Facility construction, renovation, and maintenance is likely to be quite limited for the foreseeable future, with habitat alteration consisting of removing small numbers of trees in localized areas such as trailheads, campgrounds, picnic areas, etc. Therefore, tree cutting associated with recreation facilities is considered extremely unlikely to cause loss of roost trees or harm to individuals.

Dispersed recreation occurs outside of developed sites and includes activities such as boating, driving for pleasure, fishing, hunting, caving, hiking and biking. Dispersed recreation activities that use existing roads, trails, and other access features do not change habitat structure, so they should have no effect on primary range or maternity sites. Development and reconstruction of trails is expected to be very limited for the foreseeable future under all alternatives, so loss of roost trees and harm to individuals due to tree cutting for trail work is considered extremely unlikely. Under all alternatives, new trail development is prohibited in key areas and within 200 feet of hibernacula, and thus would not affect these habitat components. Therefore, these dispersed recreation activities are unlikely to affect Indiana bats.

Sport caving (spelunking) is fairly popular on the MNF and will likely continue in the future. Forest Plan direction under all alternatives requires that major hibernacula be closed to public entry from September 1 to May 15. Direction for the action alternatives clarifies that minor hibernacula can remain open to public use if the MNF, USFWS, and WVDNR agree that such use would be extremely unlikely to cause harm or mortality. Based on this direction, it is unlikely that recreational cave use would adversely affect hibernating Indiana bats.

Effects from Watershed Restoration Activities – Watershed restoration activities would not likely vary much by alternative and are not expected to adversely affect Indiana bats or their habitats because activities would be localized and designed to restore riparian areas or road corridors to productivity over the short and long term. Activities do not typically remove the types of trees that bats could use for roosting or maternity sites. However, if a maternity site is discovered within in a watershed restoration area, protective measures would be determined at a site-specific level in cooperation with USFWS and WVDNR.

Effects from Wildlife and Fish Habitat Restoration – Fish habitat restoration likely would not affect Indiana bats or their habitats because restoration activities would be localized within streams and stream banks and would not impair the ability of streams to serve as water sources and foraging corridors. Creation of large woody debris from standing trees could remove some potential roost trees, but this activity likely would involve only scattered individual trees in small, localized areas. Therefore, harm to a roosting bat would be extremely unlikely to occur.

Wildlife habitat management to enhance Indiana bat primary range could differ across alternatives and is covered in the discussion of direct and indirect effects by alternative. Maintained wildlife openings in primary range generally are not considered habitat restoration for the Indiana bat, although in otherwise closed canopy forested areas, they could contribute to habitat diversity. Proposed wildlife openings in primary range would need to be evaluated on a case-by-case basis to ensure that they benefit the Indiana bat.

Wildlife opening creation outside of primary range would continue Forest-wide. Many openings are small (< 1 acre) and are created in conjunction with timber harvest activities, i.e., seeded log landings and temporary roads. While creation of such openings may involve minor expansion of the landings, tree removal is very limited and is extremely unlikely to cause any harm to roost trees or Indiana bats beyond that due to the original timber harvest. Larger openings and savannas are sometimes created in areas other than log landings. Tree removal associated with such openings may have a risk of harm to roost trees and individuals. For a discussion of differences in the amount of openings among the alternatives, see the Terrestrial Ecosystem Diversity section in this chapter.

Other small-scale wildlife management activities, such as nest boxes, water holes, reptile/amphibian coverboards, etc. would involve little or no habitat disturbance and are extremely unlikely to affect the Indiana bat.

Effects from Salvage Activities - Timber salvage would occur only after areas have already been damaged or altered by natural disturbances, insect infestations, or disease. Salvage in Indiana bat primary range, which would include hibernacula and key areas on NFS lands, would be unlikely to occur under any alternative due to a requirement to retain all snags over 5 inches in diameter within harvest units in primary range. 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 under any alternative. Salvage could occur elsewhere across the Forest and potentially affect undiscovered maternity sites or roosting individuals. If allowed by the timing of the salvage activities, surveys would be conducted prior to project implementation to try to identify any unknown maternity sites and roost trees. If a site

is discovered, protective measures would be determined at a site-specific level in cooperation with USFWS and WVDNR. Any roost trees discovered, including non-maternity roost trees, would be protected until they no longer serve as roost trees. However, salvage activities often must be conducted quickly following tree mortality, so adequate surveys may not be possible in many cases. Also, mist net surveys cannot guarantee that all roost trees will be located. Therefore, the risk of harm or mortality of roosting bats cannot be eliminated.

Effects from Timber Harvest Activities – Within primary range, which also includes all hibernacula and key areas, management of vegetation 5 inches dbh or greater may only be implemented to improve or maintain Indiana bat or other TEP or sensitive species habitat, address public or worker safety concerns, or achieve research objectives. See the discussion of beneficial effects of habitat management in the discussion of direct and indirect effects by alternative. Effects of timber harvest outside of primary range would vary by alternative and are covered below in the discussion of direct and indirect effects by alternative.

Timber stand improvement and site preparation may involve control of understory vegetation and small trees up to 5 inches DBH. By enhancing semi-open stand structure, timber stand improvement could have beneficial effects on Indiana bat foraging and roosting habitat. Trees less than 5 inches DBH generally do not provide roosting habitat, so negative effects from timber stand improvement are considered extremely unlikely.

West Virginia Northern Flying Squirrel

Effects from Mineral Operations - Natural gas leasing is by far the most common mineral development on the Forest. Development of federal gas would generally be allowed in suitable WVNFS habitat as long as it is within the limits projected in the 1991 Environmental Assessment for oil and gas leasing and development (USDA Forest Service 1991), and as long as protection measures for WVNFS are developed through consultation with USFWS.

Including both production wells and wells associated with gas storage, there are currently 71 existing gas well sites on NFS lands. Only 12 of these occur within suitable West Virginia northern flying squirrel habitat. 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. Effects from future gas development likely would be similar under all alternatives. However, due to the irregular shape of most areas of suitable habitat, for many potential wells it is possible that not all of the impact associated with the well and its supporting facilities would occur within suitable habitat. The MNF would work with lessees to locate impacts outside of suitable habitat to the extent possible. For the foreseeable future, the maximum potential disturbance associated with gas development on all land ownerships within the proclamation boundary is estimated to be 740 acres per decade (See *Mineral Resources* section in this Chapter). It is not possible to predict accurately how much of this development would occur within WVNRS suitable habitat on NFS land. However, Forest Plan direction to apply site-specific protection measures is expected to make negative effects extremely unlikely.

Development of other federal minerals currently is rare on the Forest, but could occur in the future under the 2006 Forest Plan. Other than natural gas, coal and limestone are the only minerals known to be present in commercial quantities. Demand for these minerals currently is being met through off-Forest sources, and the scattered nature of federal coal deposits makes them unlikely to be developed in a cost-effective fashion. Therefore, development of minerals other than natural gas is not likely to be extensive (see *Mineral Resources* section in this chapter). Effects from minerals other than gas developments are difficult to predict because they vary depending on what is being developed, recovery methods, surface disturbance intensity, and reclamation. The 2006 Forest Plan does not specifically address these other operations as they relate to West Virginia northern flying squirrel habitat, so consultation with USFWS would occur on a project-by-project basis. However, given that extensive development is unlikely, adverse effects are considered extremely unlikely.

Development of privately-owned minerals beneath NFS lands is controlled by the deed. While the MNF would attempt to coordinate with private mineral owners and the USFWS to avoid impacts, the MNF generally has little authority over private mineral operations. Depending on the terms of the mineral severance deed, the MNF may have some discretion over the location of surface occupancy associated with private mineral developments. In such cases the MNF would encourage locations that avoid adverse impacts to WVNFS and suitable habitat. The federal action would be limited to the MNF's authority, which may not include the effects of the mineral development itself. Therefore, any effects of private mineral development beyond those over which the deed allows MNF discretion are not analyzed as part of this federal action. ESA compliance for those effects would be the responsibility of the private mineral developer.

Effects from Range Activities - Because some grazing allotments have inclusions of forested land dispersed within them, there are 428 allotment acres currently typed as suitable WVNFS habitat. There is also a single known WVNFS capture record located within a grazing allotment. Under all alternatives, Forest Plan direction addressing vegetation management in suitable habitat would prohibit vegetation manipulation associated with range management unless it could be shown to have no adverse effects. Continuation of current livestock grazing would be extremely unlikely to affect WVNFS or suitable habitat, as grazing activities would not alter WVNFS habitat or use. Development of new range allotments is expected to be limited to newly acquired land that is already pasture or hay land. Range allotment locations and management activities allowed within allotments are not expected to change appreciably in the foreseeable future. Range management would be extremely unlikely to cause negative impacts to West Virginia northern flying squirrel habitat or individuals because grazing activities and facilities would not detrimentally alter existing habitat or disturb populations.

Effects from Fire-related Activities - Typically, wildfire starts on the Forest do not exceed 100 acres per year, and starts would not generally spread within suitable WVNFS habitat as these areas are high-elevation, moist stands. When wildfire occurs, suppression activities would occur to the extent possible, which could limit fire damage in suitable habitat. Because large wildfires are not likely to occur within suitable habitat, negative effects from wildfire suppression activities would be extremely unlikely.

Prescribed fire activity would not normally occur in suitable squirrel habitat unless the proposed burns meet research or habitat enhancement criteria in the 2006 Forest Plan direction for suitable habitat. In the unlikely event that prescribed fire is used in suitable habitat, a prescribed burn plan would be developed prior to burning, and consultation with USFWS would also occur to determine ways to avoid adverse effects. Therefore, adverse effects due to prescribed fire are extremely unlikely.

Effects from Road related Activities – Due to restrictions on vegetation management in WVNFS suitable habitat, little road construction and reconstruction is likely to occur in suitable habitat. Limited exceptions to this may be made for research projects, projects related to mineral development, or access to private lands. Such limited road reconstruction and maintenance within suitable habitat has little potential to affect WVNFS adversely.

Effects from Recreation Activities - Developed recreation facilities include campgrounds, picnic areas, swimming beaches, visitor centers, and historic sites. Several developed facilities may exist within suitable WVNFS habitat; however, new developed facilities are prohibited in suitable habitat. Smaller facilities such as trails, trailheads, picnic sites, and ¼-acre vistas are allowed in suitable habitat, but only if project-level analysis determines that an adverse effect is unlikely. Typical maintenance activities do not involve large-scale habitat alteration and would have little or no potential for adverse effects.

Dispersed recreation activities occur outside of developed sites and include activities such as boating, fishing, hunting, hiking, and biking. Because WVNFS are nocturnal, dispersed recreation disturbances from hiking, backpacking, hunting, fishing, camping, mountain biking, etc. would likely not affect WVNFS. These activities also would not alter the habitat enough to cause measurable effects.

Effects from Watershed Restoration – Watershed restoration activities typically involve stabilization of stream banks, exposed soils, and decommissioned road beds, as well as the addition of habitat structure to stream channels. Such activities have little or no potential to affect West Virginia northern flying squirrels or their suitable habitat. To the extent that such activities involve vegetation management, Forest Plan direction under all alternatives would not allow them within suitable habitat unless project-level analysis determined that the activities would not be likely to cause an adverse effect.

Effects from Wildlife and Fish Habitat Restoration - New wildlife habitat improvements would not occur within WVNFS suitable habitat unless they are part of approved research on suitable habitat, they improve suitable habitat based on the results of earlier research, or project-level analysis determines that they would not be likely to adversely affect the WVNFS. Therefore, there is little or no potential for adverse effects. Such projects would have the potential for beneficial effects through the enhancement of habitat.

Spruce restoration areas that are outside of suitable habitat have the potential for beneficial effects over the long term. Because these areas are not considered suitable habitat, there is little or no potential for adverse effects due to active spruce restoration, and long-term beneficial effects would be expected due to possible increases in habitat. The Terrestrial Ecosystem

Diversity and Management Indicator Species and Other Species of Interest sections in this chapter discuss spruce restoration potential by alternative.

Effects from Salvage Activities - Salvage harvesting is not allowed in suitable WVNFS habitat unless it meets the conditions set by Forest Plan direction (research on suitable habitat, improvement of suitable habitat, or is not likely to adversely affect the squirrel). If a natural disturbance damages suitable habitat so extensively that it is no longer considered suitable, salvage harvesting could occur. However, prior to project approval, the suitable habitat map would need to be changed in coordination with USFWS and WVDNR. Therefore, no adverse effects are expected.

Effects from Timber Harvest Activities - Vegetation/timber management generally is not allowed in WVNFS suitable habitat. Exceptions to this prohibition would only occur on a case-by-case basis if they meet the conditions set by Forest Plan direction (research on suitable habitat, improvement of suitable habitat, or not likely to adversely affect the squirrel). Non-suitable habitat is presumed to be unoccupied by WVNFS (USFWS 2001), so adverse effects due to timber management outside of suitable habitat are unlikely. Therefore, timber management is not expected to have adverse effects on WVNFS.

Cheat Mountain Salamander

The 2006 Forest Plan provides essentially complete protection for Cheat Mountain salamander occurrences on NFS land. Forest-wide direction requires that, prior to any ground- or vegetation-disturbing activity, known and potential habitat be surveyed and the extent of occupied habitat be delineated. The direction further requires that ground- and vegetation-disturbing activities be avoided in occupied habitat and a 300-foot buffer, unless analysis shows there would be no adverse effect on populations or habitat. Therefore, most management activities are not expected to adversely affect the Cheat Mountain salamander, and a discussion of effects for each activity is not presented here.

Bald Eagle

All MNF management activities would have little or no potential to affect the bald eagle under any alternative. Both known nest sites are in the Spruce Knob-Seneca Rocks National Recreation Area, and one site is in a remote backcountry portion of the NRA. Little or no active management is expected near these sites, and public motorized access would not be allowed in the vicinity of the backcountry site. Dispersed recreation would be the only potential source of impacts, and current levels of use have not caused problems. Should increased use become a concern, 2006 Forest Plan direction provides for closure orders to control disturbance.

Under the action alternatives, potential foraging habitat would be protected from most negative impacts of management activities by revised Forest-wide direction for soil and water. Under the No Action alternative, similar direction would be applied through project-specific mitigation measures. This direction places buffers of 100 feet on perennial and large intermittent streams, 50 feet on small intermittent streams, and 25 feet on ephemeral streams. Within these buffers, all programmed timber harvest and all but essential soil disturbance (e.g., road crossings) is

prohibited. This protection is expected to reduce management-related impacts to water quality to a negligible level from the standpoint of eagle foraging habitat. Continued maturation of trees in these buffers would likely improve nest site availability over the long term, and continued recovery of aquatic communities from historic impacts would likely improve foraging habitat. Also on a Forest-wide basis, 2006 Forest Plan direction protects all bald eagle nests, whether currently known or discovered in the future, with 1,500-foot buffers. Within these buffers, management strategies that are compatible with eagle nesting would be determined on a case-by-case basis. For these reasons, the potential for negative effects would be negligible, while improvements in nesting and foraging habitat would be likely.

Direct and Indirect Effects to T&E Plant Species by Alternative

Running Buffalo Clover (RBC)

Potential habitat for RBC was estimated as mixed mesophytic hardwood forests in either early or old age classes. RBC is most often found on soils derived from limestone in areas with canopy gaps, and not all mixed mesophytic hardwoods forests fit this more detailed description. Table TE-5 displays the approximate acres of potential habitat by management prescription at the start of the planning period for all alternatives. Since potential habitat is based on successional stages, over time some areas will move into or out of potential habitat due to either management actions or no action. Effects due to changes over time longer than the 5 to 10 years considered here are discussed under the Cumulative Effects subsection.

Table TE-5. Acres of Potential RBC Habitat by MP by Alternative

Management Prescriptions	Alt 1	Alt 2	Alt 2M	Alt 3	Alt 4
MP 5.0, 5.1, 6.2 – Little or no vegetation management	2,600	3,000	3,000	8,000	2,700
MP 4.1, 6.3, 7.0, 8.0 – Low levels of vegetation management	9,700	8,600	8,600	6,900	8,800
MP 2.0, 3.0, 4.0, 6.1 – Active vegetation management	19,900	22,800	22,800	19,400	22,900

Management prescriptions 5.0, 5.1, and 6.2 are grouped together as they represent the areas of lowest potential for active vegetation management. Running buffalo clover is an interesting species to manage. While it is a federally endangered plant, it does need some level of disturbance to perpetuate. Potential habitat in these areas will continue to be suitable for RBC, however shading and lack of mechanical disturbance may limit spread. Known populations will continue to be monitored, and actions proposed as needed. Because active management is not likely in these areas, potential habitat is not likely to be surveyed, so new populations may not be found.

Management prescriptions where active vegetation management is most likely are grouped together for estimate of effects. These MPs include 2.0, 4.0 (Alternative 1 only), 3.0, and 6.1. Most of the potential habitat for RBC is found in these MPs. Surveys for threatened, endangered, and sensitive species would be made in areas proposed for active management. Any populations or individuals found would be protected. Potential direct and indirect effects to RBC in these areas include loss of individuals and populations though road construction, timber

harvest and associated developments (skid roads and landings for example). Most known populations of RBC on the Forest are associated with old, seldom used roads. If an older road in potential habitat is used for access, and RBC not surveyed for, individuals could be lost. RBC is somewhat resilient to disturbance in that pieces of plants will re-colonize a road after use, however, if use includes full reconstruction (addition of gravel, continued maintenance), potential habitat and individuals may be lost. Again, surveys for the plant before action would reduce the likelihood of these effects.

Management prescriptions 4.1, 6.3, 7.0, and 8.0 may have low to moderate amounts of vegetation management. MP 4.1 includes areas where active management is expected (mixed hardwoods) and areas where it is generally not expected (suitable habitat for WVNFS). MP 6.3 is primary range for Indiana bats (Alternative 1 only) where some management may be desired. MP 7.0 (Alternative 1 only) includes developed recreation areas, which would not receive much vegetation management but may have vegetation disturbed by recreation development and concentrated use. In Alternative 1, MP 8.0 includes habitat suitable for the West Virginia northern flying squirrel.

MP 8.1 is the NRA, some of which may receive vegetation management, and some of which (SPNM areas) would not. MP 8.2 includes areas designated as National Natural Landmarks. MP 8.3 includes designated Scenic Areas. MP 8.4 includes Ecological Areas, such as Botanical Areas, designated across the Forest. Active management is not likely in MP 8.2, 8.3, or 8.4 areas. MP 8.5 is the Fernow Experimental Forest, which includes known RBC populations. Current research on the Fernow includes a study on the disturbance needs and tolerances of RBC. When actions are proposed on the Fernow, surveys are made for threatened, endangered, and sensitive species. As in other areas of the Forest with active management, known sites would be avoided so that direct effects to RBC would be reduced to minimal if any. MP 8.6 are Grouse Management Areas, which may be periodically managed to maintain early successional conditions.

Because RBC requires some level of disturbance for maintenance of a population, individual plants may be negatively affected as habitat is managed for the population as a whole. The Biological Opinion for the 2006 Forest Plan outlines conservation measures to be used to managed RBC individuals and their habitat. These conservation measures have been incorporated in the 2006 Forest Plan as goals, standards, and guidelines. Forest-wide direction has been added (TE68 through TE83) to address the management needed to conserve RBC.

Alternative 1 - This alternative has about 19,900 acres in active vegetation management MPs with potential RBC habitat. These acres represent about 58 percent of the potential habitat on the Forest. Although 6.3 is considered a suited timber MP for this alternative, relatively little active vegetation management is anticipated due to Indiana bat habitat concerns.

Alternative 2 - Alternative 2 has an estimated 22,800 acres in active vegetation management MPs with potential RBC habitat. These acres represent about 66 percent of the potential habitat on the Forest.

Alternative 2 Modified - Alternative 2 modified has an estimated 22,800 acres in active vegetation management MPs with potential RBC habitat. These acres represent about 66 percent of the potential habitat on the Forest.

Alternative 3 - Alternative 3 has the fewest acres (19,400) in active vegetation management MPs with potential RBC habitat. These acres represent about 56 percent of the potential habitat on the Forest. This alternative also has the most acres (8,000) in MPs with little or no vegetation management potential that is also potential RBC habitat. Under Alternative 3 there is slightly lower risk of impacting RBC potential habitat by active vegetation management. However, knowing that RBC needs some level of mild disturbance to perpetuate and spread, continued monitoring of known populations would be needed.

Alternative 4 - Alternative 4 has the most acres (22,900) in active vegetation management MPs with potential RBC habitat. These acres represent about 67 percent of the potential habitat on the Forest. The acres of potential habitat in areas where active management is likely to occur is about the same as in Alternative 2.

Summary - Timber harvest activities, road construction and reconstruction, and road decommissioning (when it requires earth-moving activities) all have potential to affect RBC. Alternatives 4, 2, and 2 Modified have the greatest chance of impacting RBC and its habitat directly through disturbance. However, considering RBC needs a low level of disturbance to compete with other species, the effects of active management may be positive as well. Since RBC has been found to be tied to either limestone geology or very rich soils, the acres based on mixed mesophytic forests on any geology or soil type as presented in Table TE-4 likely overestimate potential impacts.

Small Whorled Pogonia

Potential habitat for SWP is defined as old and mature mixed mesophytic hardwood forests, old and mature oak, and old and mature pine-oak forests. Table TE-6 shows the acres of this potential habitat for all alternatives at the start of the planning period. Small whorled pogonia has only been found in one location on the Forest. Because of the rarity and difficulty in predicting where we may find SWP again, the potential habitat will not be broken out by management prescription or alternative. Since potential habitat is based on successional stages, over time some areas will move into or out of potential habitat due to management action or no action. Effects due to changes over time, longer than the 5 to 10 years considered here, are discussed under cumulative impacts.

Table TE-6. Acres of Potential SWP Habitat for All alternatives and All MPs

Community Type	Current Acres
Mixed mesophytic hardwoods(old and mature)	329,100
Oak (old and mature)	229,600
Pine-oak (old and mature)	44,500
Total	603,200

Mixed mesophytic forests cover a large portion of the Forest, essentially forming the matrix in which other habitat types occur. Because there is so much area considered potential habitat and this species is so rare, it could be interpreted that the potential habitat description does not accurately represent suitable habitat for this species. As stated before, survey efforts are generally focused on areas where active forest management is to occur; this lack of knowledge may also represent inadequate surveys efforts. SWP may be present in areas not usually proposed for active forest management.

Under all alternatives, the majority of the area considered potential habitat is again found in areas with MPs allowing active forest management. In these areas, direct and indirect effects to SWP would be avoided through surveys made before action is taken. Habitat destruction is the primary threat to this species. Potential habitat in MP 5.0, 5.1, 6.2, and most 8.0 areas is generally protected by the fact that little active management occurs in these areas.

Because this species is so rare and is known to remain dormant in some years, it could be missed in surveys of areas proposed for active management. The largest potential for this to occur is in MP 3.0 or 6.1 areas. If the plant is missed in surveys, direct effects from ground-disturbing activities could include destruction of habitat or loss of individuals. This potential is slightly lower in Alternative 3 than in Alternatives 1, 2, 2 Modified, or 4.

Prescribed fire could be used to manage vegetation on about 162,500 acres of current old and mature oak forests in Fire Regimes I or III, and on about 38,000 acres in old and mature pine-oak forests in Fire Regimes 1 or III. Without considering the management prescription, prescribed fire could be used on about 27 percent of the potential suitable habitat.

Shale Barren Rockcress

There would likely be no measurable direct or indirect effects to SBRC as a result of implementing any of the alternatives. See *General Effects to T&E Plant Species and Habitat* section for this species, above.

Virginia Spiraea

There would likely be no measurable direct or indirect effects to Virginia spiraea as a result of implementing any of the alternatives. See *General Effects to T&E Plant Species and Habitat* section for this species, above.

Direct and Indirect Effects to T&E Animal Species by Alternative

Virginia Big-eared Bat

Effects From Prescribed Fire – Prescribed fire within VBEB foraging circles could have beneficial effects on foraging habitat by encouraging an herbaceous understory. Estimates of potential improvement to Virginia big-eared bat habitat through prescribed fire are based on Forest-wide goals and objectives. Forest-wide prescribed fire objectives focus on Fire Regime

Condition Class (FRCC) I, 3 and FRCC III, 2. These condition classes represent fire-adapted communities that are at risk of losing ecosystem components because of fire exclusion. Objectives also focus on MPs 3.0, 6.1, 6.3, and 8.1, where the management emphasis is compatible with prescribed fire. Objectives for prescribed fire differ among alternatives, with Alternatives 1 and 3 maintaining the current Forest-wide annual limit of 300 acres. Alternatives 2 and 2M have higher objectives that attempt to balance the need for prescribed fire with the Forest's expected ability to accomplish burning to meet that need. Alternative 4 has the highest objective for prescribed fire, which is based primarily on the need as determined by the FRCC classifications. See the Vegetation Management section of this chapter for a more detailed discussion of projected prescribed fire amounts by alternative.

Table TE-7 displays projected amounts of prescribed fire within VBEB foraging habitat for the first decade. These projections assume that prescribed fire would be applied in high priority areas within foraging habitat with the same priority level as similar areas outside of foraging habitat. Because of goals and objectives to enhance habitat for endangered species, areas within foraging habitat could have an even higher priority than other FRCC I, 3 and III, 2 areas, which could result in a larger amount of habitat treated. Conversely, budget and staffing limitations could result in smaller amounts of habitat treated.

Table TE-7. Projected Acres of Prescribed Fire in Virginia Big-Eared Bat Foraging Habitat During the First Decade of the Planning Horizon

Indicator	Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Total VBEB Foraging Circle Acres on NFS Land	324,000	324,000	324,000	324,000	324,000
FRCC I, 3 and FRCC III, 2 Acres in MPs 3.0, 6.1, 6.3, 8.1, in VBEB Circles	62,000	69,000	67,000	63,000	69,000
Maximum Projected Acres of Prescribed Fire Treatment in VBEB Circles During the First Decade	1,000	10,000	10,000	1,500	24,000

Alternatives 1 and 3 would have little potential to improve VBEB foraging habitat using prescribed fire, whereas Alternative 4 would increase prescribed fire in VBEB habitat to more than 20 times the currently allowed level. Alternatives 2 and 2M would increase prescribed fire in VBEB habitat substantially beyond current levels, but would still be far below the levels of Alternative 4. Although specific objectives for prescribed fire have not been formulated beyond the first decade of the planning horizon, similar amounts of prescribed fire are expected in subsequent decades.

Indiana Bat

Effects From Prescribed Fire – Within Indiana bat primary range, prescribed fire could be used to create and maintain semi-open stand structure that is favorable for roosting and foraging. Estimates of potential improvement to Indiana bat habitat within 5 miles of hibernacula through prescribed fire are based on Forest-wide goals and objectives in the 2006 Forest Plan. Objectives focus on Fire Regime Condition Class (FRCC) I, 3 and FRCC III, 2. Objectives also focus on MPs 3.0, 6.1, 6.3, and 8.1, where the management emphasis is compatible with prescribed fire.

Table TE-8. Projected Acres of Prescribed Fire in Indiana Bat Primary Range During the First Decade of the Planning Horizon

Indicator	Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Total Acres of Indiana Bat Primary Range on NFS Land	228,000	228,000	228,000	228,000	228,000
FRCC I, 3 and FRCC III, 2 Acres in MPs 3.0, 6.1, 6.3, 8.1, in Primary Range	48,000	50,000	50,000	43,000	51,000
Maximum Projected Acres of Prescribed Fire Treatment in Primary Range During the First Decade	800	7,600	7,600	1,000	18,000

Table TE-8 displays projected amounts of prescribed fire within Indiana bat primary range for the first decade. These projections assume that prescribed fire would be applied in high priority areas within primary range with the same priority level as similar areas outside of primary range. Because of goals and objectives to enhance habitat for endangered species, areas within primary range could have an even higher priority than other FRCC I, 3 and III, 2 areas, which could result in a larger amount of habitat treated. Conversely, budget and staffing limitations could result in smaller amounts of habitat treated.

Alternatives 1 and 3 would have little potential to improve primary range using prescribed fire, whereas Alternative 4 would increase prescribed fire in primary range to more than 20 times the currently allowed level. Alternatives 2 and 2M would increase prescribed fire in primary range substantially beyond current levels, but would still be far below the levels of Alternative 4. Although specific objectives for prescribed fire have not been formulated beyond the first decade of the planning horizon, similar amounts of prescribed fire are expected in subsequent decades.

Effects From Habitat Enhancement in Primary Range – Wildlife habitat restoration within Indiana bat primary range would be designed to improve or maintain bat habitat and would therefore have beneficial effects. Some of the attributes that characterize optimal Indiana bat habitat, such as larger trees and more snags, may be achieved simply by allowing stands to grow older over time. However, to maintain foraging and roosting habitat with a semi-open canopy and a fairly open mid-story would require a certain amount of management in most stands. These conditions would be created or maintained primarily through thinning or uneven-aged harvest. While such timber harvest would be designed to have beneficial effects on Indiana bat habitat, it could negatively affect potential roost trees, roosting individuals, or undiscovered maternity colonies. These negative effects are discussed below under the Timber Harvest section. Beneficial effects could include enhancement of roosting and foraging habitat by creating partial canopy openings. Thinning and uneven-aged harvest would have the added benefit of increasing the growth rate of the remaining trees, which contributes to the development of large-diameter potential roost trees.

The expected amount of harvesting for habitat enhancement in primary range was estimated based on Plan objectives for the first decade of the planning horizon (see Table TE-9). Only Alternative 2M has an explicit objective for Indiana bat habitat enhancement; however, similar habitat enhancement would be desirable under all alternatives. Habitat enhancement for the other alternatives was estimated by proportionally extrapolating the Alternative 2 objective to the areas of primary range that would be available for enhancement based on MP allocations and

tentative timber suitability. During the first decade of the planning horizon, Alternatives 1, 2, 2M, and 4 would have similar amounts of habitat enhancement in primary range. The amount would be lower in Alternative 3 because of larger land allocations to MPs where silvicultural habitat treatments would be unlikely.

Table TE-9. Projected Acres of Silvicultural Habitat Enhancement in Indiana Bat Primary Range During the First Decade by Alternative

Indicator	Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Total Acres of Indiana Bat Primary Range on NFS Land	228,000	228,000	228,000	228,000	228,000
Acres of Primary Range Where Silvicultural Habitat Enhancement would be Allowed	89,000	86,000	85,000	67,000	94,000
Maximum Projected Acres of Silvicultural Habitat Enhancement in Primary Range	7,300	7,100	7,000	5,500	7,700

Effects From Timber Harvest – Timber harvest within and outside of primary range could affect unknown maternity sites or roosting individuals, but surveys would be conducted prior to project implementation to try to identify any unknown sites. If a maternity site is discovered, protective measures would be determined at a site-specific level in cooperation with USFWS and WVDNR. Any roost trees discovered would be protected until they no longer serve as roost trees. Plan direction addressing leave trees and snag retention would help maintain essential habitat components and further reduce the likelihood of harming or killing a roosting bat. However, bats are highly mobile and roosting habitat often is ephemeral, so it is possible that some areas harboring roosting Indiana bats would not be discovered or protected by snag retention and leave tree direction. Therefore, the potential for harming a roosting bat cannot be eliminated for any timber harvest operation that occurs outside the hibernation period. Indiana bats on and near the MNF are known to use a wide variety of live and dead trees as roosts, and the density of roosting bats is not known. Therefore, it is not possible to estimate reliably the number of Indiana bats that are expected to be harmed or killed.

Timber harvest has the most potential of any activity for affecting habitat structure, particularly outside of primary range. For example, even-aged regeneration harvests would remove most of the forest canopy, which may not produce optimum foraging habitat for this species. Timber harvesting does not appear to discourage Indiana bats from using nearby trees as roosts, and in fact may make them more attractive by allowing more warming by solar radiation (USFWS 1999). However, the disturbance during timber cutting may temporarily displace bats from nearby roosts. Outside of primary range, timber harvests would not necessarily be beneficial for Indiana bat habitat, but negative effects to habitat would be minor because most roosting, foraging, and swarming activity is believed to occur within primary range.

Programmed timber harvest is harvest that occurs on suitable timber lands and is intended to progress toward desired conditions for timber production and age class diversity. Programmed harvest does not include silvicultural treatments in primary range or other habitat enhancement treatments. Total Forest-wide programmed timber harvest (regeneration and intermediate harvests combined) for the planning period would be highest under Alternative 1 and lowest

under Alternative 3 (See Table TR-14 in the *Timber Supply* section of this chapter). Alternatives 2, 2M, and 4 would have intermediate harvest levels.

West Virginia Northern Flying Squirrel

It is expected that all of the alternatives would adequately protect WVNFS populations and habitat through Forest-wide and MP direction, as well as the ESA Section 7 consultation process with USFWS. See *General Effects to T&E Wildlife Species and Habitat* section, above.

Cheat Mountain Salamander

There would likely be no measurable direct or indirect effects to Cheat Mountain salamanders as a result of implementing any of the alternatives. See *General Effects to T&E Wildlife Species and Habitat* section, above.

Bald Eagle

There would likely be no measurable direct or indirect effects to bald eagles as a result of implementing any of the alternatives. See *General Effects to T&E Wildlife Species and Habitat* section, above.

Cumulative Effects for T&E Plant Species

For analysis of cumulative effects, both National Forest System lands and lands of other ownership within the proclamation boundary were considered. Past, present, and reasonably foreseeable actions on all lands were also considered.

The assumption is made that the Endangered Species Act and consultation processes will be followed for any projects implemented under the Forest Plan. Biological Assessments and Evaluations would be completed on all federal actions with the potential to affect T&E species or their habitats.

Past actions have created the habitat conditions present and described for each species. For the endemic species with narrowly defined habitat, the plants' rarity on the landscape is not likely a response of past actions. For RBC, for example, past actions of timber harvest and associated road construction have perpetuated assumed natural habitat of disturbance caused by bison or other large herbivores.

Outcomes from Terrestrial Plant Species Viability Evaluation

Estimates of viability related to the potential impacts of management were made based on the following viability factors: habitat abundance, habitat distribution and connectivity, and population factors. Ratings for each component were made along with confidence ratings for the viability factors. The outcomes for the four T&E plant species are given in Table TE-10.

Looking at the SVE outcomes provides a good estimate of potential cumulative effects. The outcomes were based on habitat and actions within the MNF boundary regardless of ownership. For a species to receive an outcome of 'C', 'D', or 'E', one of the three viability factors were rated in the high risk category. If all factors are ranked in the middle risk categories then a 'C' or 'B' outcome was assigned. For SBRC, habitat abundance was rated rare, causing an outcome of 'C'. For RBC, all factors were in middle risk categories.

The most important aspect of the species viability evaluation is whether any alternative resulted in a different overall outcome than the current evaluation for an individual species, particularly a lower outcome, which would indicate a downward trend. For all of the species evaluated, the outcomes by alternative were the same as the current ratings, indicating that management strategies under all alternatives should not result in a downward trend in viability.

Table TE-10 – Viability Outcomes by Alternative from Fine-filter Species Viability Evaluations

Species	Current Rating	Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Running buffalo clover	C	The outcome is the same for all alternatives: C – The species has low abundance and/or is distributed in a patchy pattern of disjunct occurrences. For species associated with unique habitats, low abundance and patchy distribution may be the natural condition. Many occurrences are isolated, whereas others are still able to interact as metapopulations.				
Small whorled pogonia	E	The outcome is the same for all alternatives: E – The species has a very low abundance and is distributed as isolated occurrences. Many occurrences have a strong potential for extirpation, and metapopulation interactions are not possible.				
Shale barren rockcress	C	The outcome is the same for all alternatives: C – The species has low abundance and/or is distributed in a patchy pattern of disjunct occurrences. For species associated with unique habitats, low abundance and patchy distribution may be the natural condition. Many occurrences are isolated, whereas others are still able to interact as metapopulations.				
Virginia spiraea	E	The outcome is the same for all alternatives: E – The species has a very low abundance and is distributed as isolated occurrences. Many occurrences have a strong potential for extirpation, and metapopulation interactions are not possible.				

Running Buffalo Clover

Although much potential habitat appears to exist on the MNF, specific light and disturbance requirements needed for RBC survival and spread are not always found with the proper soil and forest type components of its habitat.

Effects to Habitat – Modeled projections indicate a substantial increase in potential habitat for this species under all alternatives. Similar trends are expected on private land. Thus, the cumulative trend is an overall increase in potential habitat, with Forest management activities potentially contributing to a large portion of that increase.

Effects to Individuals – Timber harvest and associated road building have the potential to both negatively and positively affect population occurrences. Given harvest trends on private lands versus projected harvest levels on NFS lands, Forest management activities have the potential to make a substantial contribution to cumulative effects to this species. However, survey, mitigation, and monitoring requirements on NFS lands should provide adequate protection for any known or discovered populations on the Forest. Potential cumulative effects to this species would still include competition from non-native invasive species and altered natural disturbance regimes.

Small Whorled Pogonia

SWP is considered to have a large range, and the central Appalachians are well within that range. However, the viability outcome was based on the extremely limited distribution of the plant within what seems to be large areas of potential habitat. The rarity of this plant may suggest unknown micro-habitat requirements not reflected in the habitat ratings used for this evaluation.

Effects to Habitat – It is projected that there would be no substantial change from current levels in the overall amount of old and mature mixed mesophytic forest under any alternative. Hemlock forest may decrease due to wooly adelgid infestations, but reductions would not be the result of management strategies under any alternative. Therefore, little or no cumulative effects from management-related activities are expected to the available amount of potential habitat. Micro-habitat requirements are not well understood, and there is potential for changes in habitat structure as these forests age over time. What effects this would have on habitat potential are unknown, but they would occur on both NFS and private lands, with NFS land having a large contribution to the overall cumulative trend. This trend would be similar under all alternatives. There would be somewhat different levels of old forest under the alternatives, but not enough to vary the SVE habitat rating.

Effects to Individuals – The only known occurrence of this species is on NFS land in an area where timber harvest and associated activities are not allowed under any alternative. Thus, there is no potential for these activities to contribute to cumulative effects to this population under any alternative. Potential cumulative effects to this species would still include herbivory by deer, and collecting and damage from research activities.

Shale Barren Rockcress

SBRC is an endemic to shale barrens, a very rare community type, so low abundance and patchy distribution are likely the natural condition for this plant. The viability outcome of C was given over D due to known occurrences in habitat that are not imminently threatened.

Effects to Habitat and Individuals – See *General Effects to T&E Plant Species and Habitat* section, above. Because Forest-wide protection of shale barren areas under all alternatives would greatly reduce the potential for impacts to this species, there would be little or no potential for management-related impacts to this species or its habitat under all alternatives. Potential cumulative effects to the species still include deer herbivory and competition from non-native invasive species. Insect pollinators are vulnerable to Dimilin spraying for gypsy moth control.

Virginia Spiraea

Virginia spiraea is an endemic species with a relatively small range. Habitat connectivity is a concern for this plant since its distribution is limited to riparian areas. The viability outcome reflects its extremely limited distribution within potential habitat.

Effects to Habitat and Individuals - See *General Effects to T&E Plant Species and Habitat* section, above. Because Forest-wide protection of riparian areas under all alternatives would greatly reduce the potential for impacts to Virginia spiraea along streams and rivers, there would be little or no potential for management-related impacts to this species or its habitat under all alternatives. Potential cumulative effects to the species would still include large scouring floods, competition from native and non-native plants, and clearings made by recreationists.

Cumulative Effects for T&E Animal Species

For analysis of cumulative effects, both National Forest System lands and lands of other ownership within the Forest proclamation boundary were considered. Past, present, and reasonably foreseeable actions on all lands were also considered.

The assumption is made that the Endangered Species Act and consultation processes will be followed for any projects implemented under the Forest Plan. Biological Assessments and Evaluations would be completed on all federal actions with the potential to affect T&E species or their habitats.

Outcomes from Terrestrial Wildlife Species Viability Evaluation

Estimates of viability related to the potential impacts of management were made based on the following viability factors: habitat abundance, habitat distribution and connectivity, and population factors. Ratings for each component were made along with confidence ratings for the viability factors. The outcomes for the five T&E animal species are given in Table TE-11.

Table TE-11. Viability Outcomes for T&E Animal Species by Alternative

Species	Current Rating	Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Virginia big-eared bat	C	The outcome is the same for all alternatives: C – Habitat is not projected to decline measurably in the foreseeable future, but ultimate habitat potential is limited by cave availability, physical structure, and microclimate. Overall outcome reflects low abundance and inherent risk posed by dependence of most of the area population on 11 major caves. Movement between caves should be possible for metapopulation.				
Indiana bat	D	The outcome is the same for all alternatives: D – The outcome reflects the high risk associated with having almost all of the regional hibernating population concentrated in one hibernaculum. Favorable foraging and roosting habitat conditions are projected to increase substantially under all alternatives. However, potential abundance ultimately is limited by availability of suitable hibernacula.				

Species	Current Rating	Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
WV northern flying squirrel	C	The outcome is the same for all alternatives: C – The outcome reflects low abundance and presumed fragmentation of high-elevation habitat. Habitat is expected to increase substantially under all alternatives due to specific Plan land allocation and management direction for protection.				
Cheat Mountain salamander	D	The outcome is the same for all alternatives: D – The outcome reflects the limited species range and dramatic reduction in historical habitat. Habitat is expected to increase substantially under all alternatives due to specific Plan land allocation and management direction for protection, but substantial uncertainty exists over the species' ability to colonize new habitat.				
Bald eagle	D	The outcome is the same for all alternatives: D – Although populations are recovering nationwide, the low outcome reflects very low breeding density on the Forest. Riparian forests are protected by Plan direction, and suitability for nesting should increase as these forests grow older and large trees become more abundant. Foraging habitat availability is not expected to change much.				

The important aspect of the viability evaluation is whether the evaluation for any alternative resulted in a different overall outcome than the current evaluation for an individual species, particularly a lower outcome, which would indicate a downward trend. For all of the species evaluated, the outcomes by alternative were the same as the current ratings, indicating that management strategies under all alternatives should not result in a downward viability trend.

Virginia Big-eared Bat

Effects to Habitat – The majority of Virginia big-eared bat foraging area is private land that is a mixture of habitats consisting of forests, pastures, and other agricultural uses. Data contained in the *Census of Agriculture* (USDA 2004, 1999) suggest that there has been little recent change in the acreage of agricultural land in the counties that contain the MNF. For private forest land, data from the Forest Service's Forest Inventory and Analysis database suggest a slightly increasing trend in sawtimber acreage and a slightly decreasing trend in poletimber and seedling/sapling acreage (data from FIA website). Combined with the projected small changes in herbaceous openings and the projected small increases in seedling/sapling forest on NFS land, no major cumulative change in foraging habitat is expected in the foreseeable future under any alternative.

Vandalism and cave visitation has resulted in destruction of habitat and disturbance to individuals for many bat colonies (USFWS 1984). Habitat reduction may also occur after natural disasters (flooding, cave subsidence), cave commercialization, and alterations of airflow into caves due to poorly designed and installed cave gates or naturally caused blockages in cave passages. Increased popularity of spelunking on private land could create a shift to increased use of MNF caves. Increased recreational use of MNF caves could contribute to the cumulative effects of cave habitat alteration, though the potential extent and severity of such alteration is difficult to predict. However, hibernacula and summer colonies on NFS lands are protected by closure orders, Forest Plan direction, and the Cave Resources Protection Act, so National Forest management and authorized recreational use contributions to these cumulative effects are considered extremely unlikely for all alternatives.

Effects to Individuals – Hibernating and summer-roosting Virginia big-eared bats, especially females with young, are at risk from human disturbance. During hibernation, disturbances can cause bats to expend fat reserves with no opportunities to replenish during the winter months. During maternity season, young are at risk if the colony is disturbed. Although important hibernacula and summer colonies are gated and closed to protect imperiled bats, gating every potential hibernaculum in the state would be logistically and legally impossible. Thus, unrestricted spelunking across West Virginia could have negative effects on Virginia big-eared bats in the future. However, Forest-wide direction for all alternatives prohibits public entry into major Virginia big-eared bat caves when the bats are present. Therefore, given these standards, there is little potential for authorized recreational activities on the MNF to contribute to these cumulative effects.

Historic collecting, handling, banding and counting individuals during hibernation or maternity season also have contributed to population declines over the years (USFWS 1984). Continued scientific activities, such as hibernacula/maternity surveys, mist netting, and trapping, have the potential to harm bats. Forest Plan direction for all alternatives requires Forest Supervisor approval and the appropriate USFWS permits for scientific studies in caves during closed periods, and the ESA and its implementing regulations require permits and use of qualified personnel for mist netting and trapping. It is expected that such approvals and permits will make contributions by the MNF to such cumulative effects extremely unlikely.

Several animals—including cats, owls, hawks, raccoons, skunks and snakes—are known to prey on bats. Many such small and medium-sized predators are known to frequent edge habitats such as those created by agriculture or forest management activities. However, under all alternatives plan direction prohibits most vegetation management within 200 feet of Virginia big-eared bat cave entrances, which is expected to make MNF contributions to such effects extremely unlikely. Gates and barriers used to prevent human access to caves can also contribute to predation by causing bats to slow down and circle prior to entering the cave. Methods have been devised to avoid this problem, such as moving gates a short distance inside the cave entrance so the circling occurs in an area that is too dark to allow successful predation. Therefore, any new gates or barriers are not expected to make a measurable contribution to the cumulative effects of predation.

Currently there are three private quarries operating near occupied Virginia big-eared bat caves. Expansions of these quarries, new quarries, or other private mineral developments have the potential to adversely affect Virginia big-eared bat individuals or their habitat. Forest-wide direction for all alternatives prohibits surface occupancy for federal mineral operations within 200 feet of Virginia big-eared bat caves. Plan direction also limits seismic exploration and use of explosives to those areas where such activities will not adversely affect Virginia big-eared bats or their cave habitat. This direction is expected to eliminate the potential for the MNF to contribute to the cumulative effects of mineral exploration and development.

Wind power development on private land could result in harm or mortality to Virginia big-eared bats. The existing threat is believed to be low because the only currently operating wind generation facility in the vicinity of the MNF is not located near any Virginia big-eared bat hibernacula or summer colonies. However, a proposed facility outside the MNF in Pendleton

County falls within the 6-mile foraging habitat circles associated with several Virginia big-eared bat caves, including Minor Rexrode Cave, which serves as a bachelor colony and hibernaculum for hundreds of Virginia big-eared bats. Other permitted (but not yet constructed) wind power facilities in Grant County would not fall within any of the foraging habitat circles that overlap the MNF proclamation boundary. There have been no formal proposals for wind energy development on MNF land, so foreseeable MNF activities would not contribute to cumulative harm and mortality due to wind power development. The 2006 Forest Plan does not specifically restrict wind power, although plan direction for special uses would apply to any proposed wind power development on MNF land. Because there is no existing or proposed wind energy development on the MNF, and because the 2006 Forest Plan contains no goals or objectives for wind energy, any attempt to analyze the effects at the programmatic level would be speculative.

Indiana Bat

Effects to Habitat – Based on MP allocations and management direction, all Forest Plan alternatives would have the potential to maintain or improve foraging and roosting conditions in Indiana bat primary range. Given harvest trends on private lands versus projected harvest levels and special protections for Indiana bats on NFS lands, Forest management activities have the potential to make a positive cumulative contribution to maintenance and enhancement of habitat for this species.

Vandalism of caves and cave gates has the potential to damage hibernacula. Damage to hibernacula may also occur due to natural disasters (flooding, cave subsidence), cave commercialization, and alterations of airflow into caves due to poorly designed and installed cave gates or naturally caused blockages in cave passages. Increased popularity of spelunking on private land could create a shift to increased use of MNF caves. Increased recreational use of MNF caves could contribute to the cumulative effects of alterations to cave habitat, though the potential extent and severity of such alteration is difficult to predict. However, hibernacula on NFS lands are protected by closure orders, Forest Plan direction, and the Cave Resources Protection Act, so there is little or no potential for National Forest management and authorized recreational use to contribute to these cumulative effects.

Effects to Individuals – Hibernating Indiana bats are at risk from disturbance by many of the same agents discussed above for Virginia big-eared bat, including recreational disturbance, scientific disturbance, predation, and mineral development. On NFS land, Indiana bats are protected from these agents by direction similar to that for Virginia big-eared bats. This plan direction is expected to eliminate or minimize the MNF's potential to contribute to the cumulative effects of these agents.

In addition to risks associated with activities near hibernacula, there is a risk of bat injury or mortality posed by tree felling and prescribed fires. The 2006 Forest Plan would provide areas where little or no vegetation management would occur; the risk of bat injury or mortality from management-related activities would be minimal or nonexistent in these areas. Continued Forest-wide monitoring of Indiana bats, along with plan direction to protect maternity colonies, roost trees, and many potential roost trees, would help to identify and protect maternity colonies and roost trees in areas where active vegetation management occurs. This protection further

reduces the potential for harm or mortality of individuals. In contrast, vegetation management on private lands typically has few safeguards to minimize take, so it is expected that, per acre harvested or burned, private management actions have a much greater potential for harming or killing roosting Indiana bats. However, the expected amount of timber harvest on private land cannot be estimated. Also, Indiana bats in the vicinity of the MNF are known to use a wide variety of live and dead trees as roosts, and the density of roosting bats is not known. Therefore, it is not possible to estimate reliably the cumulative number of Indiana bats that are expected to be harmed or killed.

Wind power development on private land could result in harm or mortality to Indiana bats. The existing threat is believed to be low because the only currently operating wind generation facility in the vicinity of the MNF is not located near any Indiana bat hibernacula. However, a proposed facility outside the MNF in Pendleton County would be very near the southern edge of the primary range circle associated with Trout Cave. The northern edge of this primary range circle includes a small amount of NFS land and additional non-NFS land within the proclamation boundary. Other permitted (but not yet constructed) wind power facilities in Grant County would not fall within any of the primary range circles that overlap the MNF proclamation boundary. As noted above in the Cumulative Effects section for Virginia big-eared bat, the 2006 Forest Plan contains no goals or objectives for wind energy, and any attempt to analyze the effects at the programmatic level would be speculative.

West Virginia Northern Flying Squirrel

Effects to Habitat – Because most WVNFS habitat is on NFS lands on the MNF, timber harvests and other development outside the MNF would have limited effects on WVNFS habitat. However, negative effects due to development or timber harvest could occur on the small fraction of habitat on private land. Due to protections for suitable habitat under all alternatives, MNF management activities have little or no potential to make a measurable contribution to any such negative cumulative impacts.

Continued acid and heavy metal deposition due to industrial activities outside the MNF could reduce future spruce abundance or change soil pH enough to alter fungal growth and availability (a primary food source for WVNFS). MNF activities do not contribute to these pollution sources, and protections for suitable habitat under all alternatives would greatly limit the potential for timber removal from NFS lands to contribute to any nutrient depletion associated with atmospheric deposition.

Suitable habitat is expected to increase substantially due to continued maturing of second growth forests, land allocation to MP 4.1 spruce restoration areas under the action alternatives, and Forest-wide direction for protection of suitable habitat. Thus, Forest management activities should have overall positive cumulative effects on WVNFS habitat.

Effects to Individuals – Effects to individuals generally involve direct harm or mortality in association with activities that alter or destroy occupied habitat. Because NFS lands on the MNF contain a large majority of habitat for the squirrel, activities on non-NFS lands have limited potential for affecting individuals. However, such effects could occur in conjunction with

development or timber harvest on the small fraction of habitat that is not on NFS lands. Due to protections for suitable habitat in all plan alternatives, MNF management activities have little or no potential to make a measurable contribution to any such negative cumulative impacts.

Cheat Mountain Salamander

Current levels of Cheat Mountain salamander populations are likely a result of the extensive logging of their spruce habitat in the early 1900s. With an estimated 88 percent of populations within the MNF boundary (Pauley pers. comm. 1999), timber harvesting and other activities on non-NFS land would have limited potential for broad-scale effects on Cheat Mountain salamander habitat and populations. However, negative effects to habitat and populations on non-NFS lands could occur, particularly due to residential/resort development and timber harvesting on private land. Other sources of cumulative effects to habitat or individuals include competition from other plethodontids, predation, and altered soil chemistry due to acid deposition. Because of the protections contained in the 2006 Forest Plan, MNF management would not have the potential to make a measurable contribution to these cumulative negative effects.

Bald Eagle

Activities off of NFS land have the potential to affect bald eagle habitat and individuals. Timber harvest and land development for a variety of uses have the potential to degrade or eliminate potential nesting and foraging habitat. Passive management on private land also has the potential to improve nesting and foraging habitat. ESA take prohibitions protect nest sites even on private land, but the potential for negligent or malicious destruction of nest sites still exists. Direct harassment or harm to individuals, both negligent and intentional, also could affect bald eagles on all land ownerships despite ESA take prohibitions. Taken cumulatively, all of these activities have the potential to negatively affect bald eagle habitat, individuals, and populations. However, given the protections contained in Forest Plan direction, which are likely to reduce potential adverse direct and indirect effects of MNF management to a negligible level, MNF management has little or no potential to contribute to cumulative negative effects. Conversely, MNF protection of nest sites, potential riparian nesting habitat, and aquatic foraging areas would likely make a substantial contribution to beneficial cumulative effects.

Summary

Implementation of the alternatives would result in various levels of timber harvest, road construction, road reconstruction, road abandonment, recreational development and use, and non-commercial manipulation of vegetation. Taken alone or together, these actions could have effects on T&E species and their habitats, both negative and positive. However, protection of T&E populations and their habitats is a priority in the 2006 Forest Plan. This protection is achieved through surveys for individuals, management requirements and mitigation measures designed to avoid or minimize effects, special designations and management strategies for known habitat, monitoring of potential effects, and consultation with the US Fish and Wildlife Service. With implementation of these resource protection methods, any cumulative adverse effects to the T&E species described in this section should be avoided or minimized.