United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

December 16, 2005

READER

Mr. Michael Rains, Station Director
Northeast Research Station
11 Campus Boulevard, Suite 200
Newtown Square, Pennsylvania 19073

Re: Final Biological Opinion, Northeast Research Station

Dear Mr. Rains:

This document transmits the U.S. Fish and Wildlife Service's (Service's) final biological opinion (BO) on the proposed five year plan of research activities scheduled on the U.S. Department of Agriculture's Fernow Experimental Forest (FEF) located in Parsons, West Virginia, and its effects on federally listed species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). This final BO is based on information provided in the December 2004 biological assessment (BA), the April 2005 environmental impact statement; discussions between our respective offices; and other sources of information.

CONSULTATION HISTORY

A previous formal consultation for the 2000 to 2005 research plan was completed on November 28, 2000. In the summer/fall of 2004, Service biologists met with representatives from the FEF numerous times either in person or by phone to discuss conceptual project plans, ongoing research activities, and results of previous studies. The BA for the project was received on December 15, 2004. Subsequent discussions between staff from the FEF and the Service resulted in the FEF sending a letter requesting initiation of formal consultation on April 25, 2005. This request for formal consultation was received on May 2, 2005. The Service sent a letter confirming initiation on May 25 2005. The Service submitted a draft BO on September 23, 2005. The Service and staff at the FEF discussed potential revisions to the draft BO in electronic mail correspondence dated September 28-29 and October 4, 14 and 17, 2005. On November 18, 2005 the Forest Service sent a letter requesting a final version of the BO. This BO addresses the potential adverse effects of the proposed project the Indiana bat (*Myotis sodalis*). In addition, the information provided below documents measures that will be implemented to avoid adverse effects to running buffalo clover (RBC) (*Trifolium stoloniferum*).

RUNNING BUFFALO CLOVER

The Service listed the RBC as endangered on July 6, 1987, and completed a revised recovery plan in 2005. RBC formerly grew over a broad area from the western Allegheny Mountains across the Upper Ohio Valley westward to Missouri and Kansas (Cusick 1989). Once widespread the species range is now restricted to West Virginia, Kentucky, Indiana, Missouri, and Ohio. RBC frequently occurs in disturbed habitats, including stream banks, deer trails, grazed woodlots, mowed paths, old logging roads, and skidder trails (Bartgis 1985, Homoya et al. 1989, Harmon 1996, Madarish and Schuler 2002). This species does not appear to grow in full sun. RBC has a high affinity for calcium-rich soil, which is abundant in the eastern portion of the FEF where the Greenbrier Limestone formation is exposed. Past RBC declines have been attributed to habitat loss from forest canopy closure, buffalo (*Bison bison*) herd extirpation, habitat clearing, disease from other clovers, pollinator loss, and fire regime changes, increased herbivory from white-tailed deer (*Odocoileus virginianus*) and eastern cottontail rabbits (*Sylvilagus floridanus*), and competition from other exotic plants.

Initial discovery of RBC on the FEF occurred in June 1993. This species was found on several compartments, mainly along existing skidroads that are disturbed approximately once every 10 years during timber removal. A study plan to assess the importance of disturbance to RBC populations in accordance with the Recovery Plan was approved and initiated in 1994. The FEF has sent annual updates on the study to Service since 1997. The FEF was also the site for a RBC nitrification study that was initiated in 1993 and completed in 1995. An application for a Recovery Permit to continue RBC disturbance research was submitted to the Service on August 28, 2000. In November 2000, the Service issued a Biological Opinion, approving the FEF BA for proposed projects during the 2000-2005 fiscal years. In February 2003, Dr. Thomas Schuler, U.S. Forest Service Northeastern Research Station Project Scientist, was appointed to the RBC Recovery Team.

The results of the research described above have helped evaluate the response of RBC to various disturbance regimes and appear to illustrate the disturbance-dependent population dynamics for this species. RBC in areas with no ground disturbance increased in density the second growing season, but began to decline by the third season. In disturbed areas, results after 10 years of monitoring indicate that 2 years following timber removal, previously declining RBC populations began to increase in density. Several years after disturbance, population density peaks and then begins a decline. Following a subsequent disturbance, population density declines initially but then rebounds within one or two growing seasons. It appears no action associated with existing populations of RBC is equivalent to allowing local populations to decline (Madarish et al. 1999). The results of this study suggest that controlling the intensity of ground disturbance combined with a reduction in canopy density, such as that associated with uneven-aged harvests, may help sustain populations of RBC (Madarish and Schuler 2002). Monitoring efforts in RBC compartments on the FEF document an increasing population of this species, especially in lightly disturbed areas. Analysis of FEF data by Dr. Schuler concluded that using count based data and the diffusion approximation approach, population viability analysis of the FEF RBC population has a very low probability of extinction (POE) (POE = 0.005) during the next 20 years.

Under the new five-year plan starting in 2005, silvicultural activities, including timber harvesting, in compartments containing RBC would proceed under a similar schedule as was previously implemented during the research period. While direct effects of these activities may include damaging individual plants with timber harvesting equipment, the indirect and cumulative effects of timber harvesting should benefit RBC as documented by the research cited above. The cumulative effect of management of the FEF over the past 50 years on FEF has apparently maintained a refugium for RBC, and allowed the overall population to increase. The continued study of RBC (including the associated silvicultural activities) taking place on FEF is consistent with the objectives of the RBC Recovery Plan, and should help to define limiting factors that regulate wild populations and develop appropriate habitat management techniques that can be applied throughout the species' range.

As noted in our May 25, 2005 letter, the Service recommended that the proposed project should have a long-term beneficial effect on this species. In order to ensure that populations of RBC are not adversely affected, the FEF has agreed to implement the following measures. If these measures are incorporated, we will conclude that the project *may affect, but is not likely to adversely affect* this species.

1. Personnel at the Northeastern Research Station's Timber and Watershed Laboratory shall continue to monitor RBC populations on the FEF to gain new insights into the ecology and the effects of management on this species. May and June will be the desired months for RBC census activity but counts may also occur in July and August if necessary due to time consuming nature of the census. For the period of 2005 through 2010, the Forest Service shall continue to do a 100% census on 50% of the compartments where RBC exists each year. In other words, the Forest Service shall do a 100% census of each compartment where RBC exists or has been known to exist previously once every two years.

2. Annual reports will be completed each year by January 15th documenting the previous summer's activity. Reports will be sent to the Service's West Virginia Field Office (694 Beverly Pike; Elkins, WV 26241) and the Ohio Field Office (6950 Americana Pkwy, Ste. H; Reynoldsburg, OH 43068). Each report shall include, at a minimum, the following information:

A. Counts of RBC rooted crowns and flowers observed by each compartment where census work occurred during the field season. General conditions of RBC subpopulations will be submitted for compartments not censused during the year. An estimate of the total population will be provided using the census data for the current year and the previous year.

B. A description of any research or management activity that occurred during the year in compartments containing RBC.

C. The number of seeds or flowers collected per season.

D. The presence of any invasive species that is occupying the same habitat as RBC. Of special concern is Japanese stiltgrass (*Microstegium vimineum)* which is known to exist on the FEF, but has not yet become a major competitor in habitats where RBC is known to exist.

3. Because the FEF RBC population seems to be self-perpetuating under the disturbance regime that has persisted on the FEF for the past half-century, any significant deviation of these activities and the activities described in the Biological Assessment dated December 2004, will warrant further consultation with the Service.

4. Skid roads where RBC is known to exist will not be seeded following disturbance from forest management activities. These skids roads have been and should continue to be allowed to re-vegetate naturally. Seeding may introduce non-native or non-endemic species that could displace RBC. As has been done in the past, landings will continue to be seeded to prevent erosion following research and/or forest management activities.

5. No herbicides would be applied in areas where running buffalo clover is present, unless coordinated and concurred with by the Service.

6. All preventative, conservation, and mitigation measures described in the BA and FEIS will be implemented.

In summary, the FEF will reinitiate consultation with the Service if (1) any of the measures listed above are not implemented; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; or (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion.

In addition, the FEF has proposed to implement the following voluntary conservation recommendations. The Service supports the implementation of these measures which will benefit the recovery and management of the species.

1. The Northeastern Research Station's Timber and Watershed Laboratory staff, specifically Research Forester Dr. Thomas Schuler, will continue to support the recovery of RBC by serving on the Service's RBC Recovery Team.

2. As warranted, preparation of manuscripts related to RBC ecology and management will continue to be developed. In the past three years, three peer reviewed journal articles directly related to RBC have been authored or co-authored by Northeastern Station personnel located at the Timber and Watershed Laboratory. These published papers represent a significant advancement in the information available regarding this species.

INDIANA BAT BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The FEF encompasses 4,615 acres near Parsons, Tucker County, West Virginia. The FEF is administered by the Northeastern Research Station, Timber and Watershed Laboratory of the Forest Service. The current mission of the FEF is to explain the role of natural and human-induced factors on the sustainability of central Appalachian forest ecosystems, and to provide guidelines for managing central Appalachian forests for a range of products and benefits while maintaining the productivity and diversity of soil, water, wildlife, and forest resources. The purpose of the proposed project is to continue important long-term research on the effects of various silvicultural practices on forest productivity, species composition and diversity, wildlife populations, and ecosystem processes.

The proposed action details activities proposed through 2010 and includes many projects that are repeat treatments in on-going long-term research studies. Silvicultural treatments, which include some level of harvesting, would be applied on a total of 960 acres. Single-tree selection would be applied to 169.8 acres, the diameter-limit method applied to 32.7 acres, patch clearcuts applied to 23.2 acres, the financial rate of return method applied to 189.9 acres, and the shelterwood method applied to 77.1 acres. Prescribed fire would be used in combination with the shelterwood method to promote oak regeneration, and in a new study, 376.1 acres would be treated with a combination of prescribed fire and overstory mortality treatments (herbicides or girdling) to enhance Indiana bat summer habitat and oak restoration. Additionally, an 84.7 acre watershed would be treated with ammonium sulfate fertilizer to induce artificial watershed acidification.

Conservation Measures

The FEF proposes to incorporate the following threatened and endangered species protection and conservation measures into their proposed project:

Continue to manage and protect established Indiana bat hibernacula by closing and gating Big Springs Blowing Cave between September 1 and May 15.

Tree cutting would only be conducted between October 1 and April 30 to reduce direct impacts to the Indiana bat.

In order to protect and maintain potential Indiana bat roosting habitat, hickory trees would be left where possible, unless doing so would compromise the integrity of the research studies.

Streamside management zones would be established along perennial and intermittent streams in order to protect Indiana bat foraging habitat, in accordance with the Standards and Guidelines and the Prescription 8.5 in the Monongahela National Forest Management Plan (Revised). No new roads would be constructed within the streamside management zones, and no herbicides would be used within these strips. Logging equipment is restricted in this area to existing roads, or to designated stream crossing points.

Monitoring of Indiana Bat activity at the mouth of Big Springs Blowing Cave, and across the landscape of the FEF, would be conducted annually during swarming periods, using Anabat II detectors.

As described above, the FEF has developed research silvicultural treatments that could enhance Indiana bat summer habitat within the FEF.

Action Area

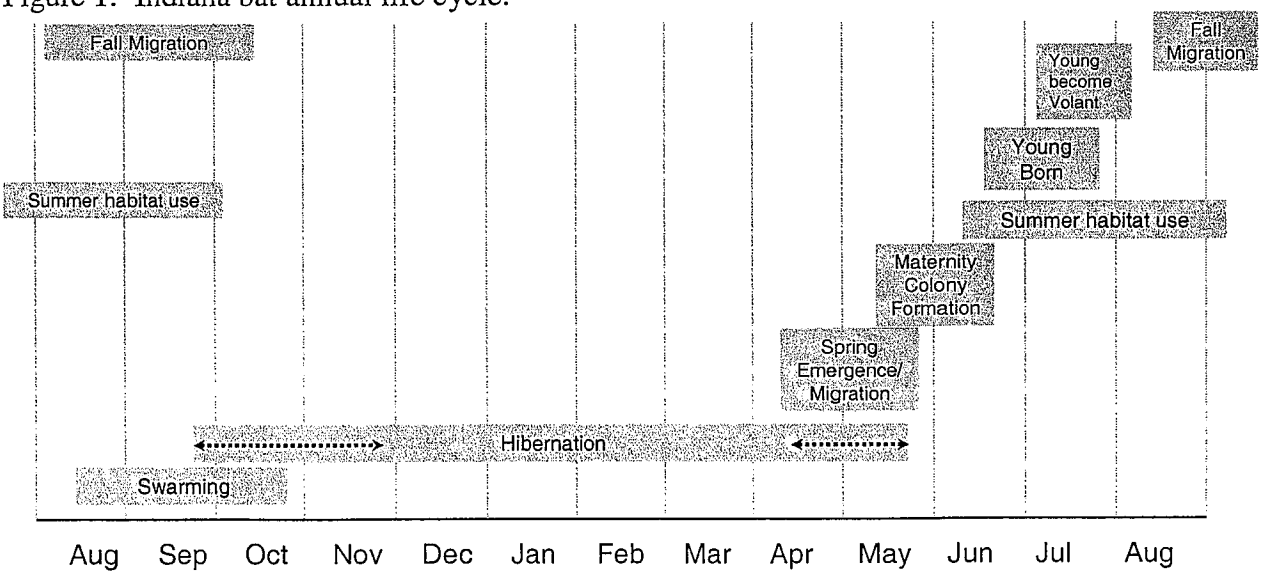
The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. For the purposes of this BO, the action area includes the boundaries of the FEF, and any Indiana bat hibernacula located either within or outside the FEF, that has at least a portion of the FEF located within a five-mile radius (swarming zone) of the cave. Therefore, Big Springs Blowing Cave and Two Lick Cave are also included in the action area.

STATUS OF THE SPECIES

General Biology and Life History of the Species

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

Figure 1. Indiana bat annual life cycle.



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

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

Indiana bats must store sufficient fat to support metabolic processes until spring. Fat supplies for male Indiana bats are replenished as they forage in the vicinity of the hibernaculum during the fall swarming period (Brack, personal communication 2005). Female Indiana bats generally arrive in condition ready to hibernate. They spend little time foraging near the hibernaculum since they enter hibernation soon after mating (R. Clawson, Missouri Department of Conservation, personal communication 2005). Occasionally, bats will leave the vicinity of the hibernaculum or re-enter the hibernaculum on one or more occasions (Gumbert, 2001; Brack, personal communication 2005). A possible explanation for male bat movements away from the fall swarming area may be the need for these males to find prime foraging habitat to replenish their energy reserves. Conversely, these males could be traveling to other nearby hibernacula to mate (Brack, personal communication 2005).

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

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

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

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

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

Missouri, and Virginia (Hobson and Holland, 1995; Rommé et al., 2002). However, other males leave the area entirely upon emergence in spring and have been captured throughout various summer habitats.

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

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

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

Summer Life History and Behavior

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

less is known about the summer habits of males and non-reproductive females; therefore, the following section is primarily focused on summer life history aspects of reproductive females.

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

Colony Formation

As the summer season progresses, female Indiana bats begin to congregate and form colonies. A single Indiana bat maternity colony can vary greatly in size and colony members may be dispersed among various roosts at any given time (Kurta, in press). While most of the documented maternity colonies contained 100 or fewer adult bats (Harvey, 2002), as many as 384 bats have been reported emerging from one maternity roost tree in Indiana (Lori Pruitt, USFWS, personal communication, 2004). Recent counts at well-studied colonies (with at least three years of data) in Indiana and Vermont resulted in maximum emergence counts of 104 and 270 adult females, respectively (Indianapolis Airport Authority 2003; K. Watrous, University of Vermont, unpublished data, 2005). Whitaker and Brack (2002) indicated that average maternity colony size in Indiana was approximately 80 adult bats. The mean maximum emergence count after young began became volant at 12 study areas (Kurta, in press) was approximately 119 bats, indicating 60-70 adults in a primary roost at any given time.

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

Maternity Roosts

Indiana bat maternity roosts can be described as "primary" or "alternate" based upon the proportion of bats in a colony consistently occupying the roost site (Kurta et al., 1996, 2002; Callahan et al., 1997). Maternity colonies typically use 10–20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (Callahan, 1993; Callahan et al., 1997). Before the young are volant, the composition of a

colony at a primary roost is fluid, as individual bats leave and return (Barclay and Kurta, personal communication, 2005). Kurta et al. (2002) observed that certain maternity roost trees were occupied by a "quasi-stable number of Indiana bats for days or weeks" at a time. During their observations of these roost trees, individuals (based on radio-telemetry data) were found to move consistently into and out of the trees.

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

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

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

Roost Tree Selection

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

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

Reproduction

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

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

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

Site Fidelity

Recent research indicates that Indiana bats exhibit site fidelity to their traditional summer maternity and foraging areas. A number of studies documented female Indiana bats annually returning to the same general area to establish maternity colonies (Humphrey et al., 1977; Gardner et al., 1991a, 1991b; Gardner et al., 1996; Callahan et al., 1997; Butchkoski and Hassinger, 2002; Kurta and Murray, 2002; Indianapolis Airport Authority, 2003, 2004). Gumbert et al. (2002) differentiated between roost tree and roost area fidelity in Indiana bats, and found that bats are faithful to both areas and particular trees within those areas. Roost trees, although ephemeral in nature, may be reoccupied by a colony for a number of years until the trees are no longer available or suitable. Roost tree reoccupation of between two to six years has been documented in a number of studies (Gardner et al., 1991b; Gumbert et al., 2002; Watrous, unpublished data, 2005; Barclay and Kurta, in press).

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

Food Habits

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

opportunistic. Hence, Murray and Kurta (2002a) suggest that the Indiana bat may best be described as a "selective opportunist," as are a number of other Myotis species (Fenton and Morris, 1976).

Foraging Behavior

Indiana bats begin emerging from a roost to forage shortly after sunset, although there is considerable variation in timing within a colony that is not related to light level, ambient temperature, or number of bats inside (Gardner et al., 1991a; Viele et al., 2002). Observations of light-tagged animals and bats marked with reflective bands indicate that Indiana bats typically forage in closed to semi-open forested habitats and forest edges (Humphrey et al., 1977; LaVal et al., 1977; Brack, 1983). Radiotracking studies also indicate that foraging usually occurs in various types of forest, including flood plain, riparian, lowland, and upland forest (Garner and Gardner, 1992; Murray, 1999; Butchkoski and Hassinger, 2002; Murray and Kurta, 2002b; Watrous, unpublished data, 2005). Indiana bats hunt primarily around, not within, the canopy of trees, but they come down to subcanopy and shrub layers on occasion. In riparian areas, Indiana bats primarily forage around and near riparian and flood plain trees, solitary trees and the forest edge on the flood plain (Belwood, 1979; Cope et al., 1974; Humphrey et al., 1977; Clark et al., 1987).

Murray (1999; Murray and Kurta, 2002b) identified 13 foraging areas used by pregnant and lactating Indiana bats in southern Michigan: 5 were used only by pregnant bats; 4 used only by lactating bats; and 4 used by both pregnant and lactating bats. Individual females visited 1 to 4 foraging areas each night. When 2 or 3 bats were radio-tracked simultaneously, they seldom used the same foraging area and were found in different areas over three miles apart.

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

Home range

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

home range size of 11 Indiana bats to be 144.7 hectares. Watrous (unpublished data, 2005) has tentatively calculated approximately 287 hectares as a mean summer home range for Indiana bats in Vermont.

Linear distances between roosts and foraging areas for females range from 0.3 to 5.2 miles, although most distances were less than half the maximum distance (Murray and Kurta, 2004; Sparks et al., in press). Murray and Kurta (2004) and Sparks et al. (in press) speculate that the variations in distances to forage areas were due to differences in habitat type, inter-specific competition, and landscape terrain. In Canoe Creek, Pennsylvania, an area with significant changes in elevation, reported distances between roost and foraging areas ranged between 1.5 to 2.8 miles with an average distance of 2.1 miles (Butchkoski and Hassinger, 2002).

Fall migration

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

Review of Endangered Species Information

The Indiana bat was listed as endangered by the Service pursuant to the Endangered Species Preservation Act on March 11, 1967 (32 Federal Register 4001). Listing was warranted based primarily on large-scale habitat loss and degradation, especially at winter hibernation sites, and significant population declines that continue today. From the time that the species was listed, the range-wide population of the Indiana bat has declined from approximately 883,300 Indiana bats for 1960/1970 to 387,301 in 2003/2004, or approximately 56 percent (Clawson 2002; Lori Pruitt, personal communication, 2004).

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

While recent winter hibernacula monitoring shows Indiana bat populations are decreasing in portions of their range, estimated winter populations in West Virginia have been increasing since the early 1980's (WVDNR, 2004). Since 1990, hibernating populations in West Virginia have almost doubled from an estimated 6,500 to 12,677 in 2004. Increases in the number of bats hibernating in Hellhole have accounted for most of this growth. Protection measures limiting access to the cave occurred when the entrance to Hellhole was fenced in 1985. Most other significant caves in West Virginia have also been gated or fenced, to protect Indiana bat populations.

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

Reasons for Decline and Continued Threats

Because disturbance to hibernacula is a major threat to the Indiana bat, protection of hibernacula is a management priority. Arousal of the bats following disturbance (e.g., spelunkers, scientists, predators) can be detrimental (Hall 1962, Myers 1964, LaVal et al. 1976, Humphrey 1978, LaVal and LaVal 1980). Therefore, entry into Indiana bat hibernacula should be prohibited from September through May (Humphrey 1978, LaVal and LaVal 1980, Clawson 1984). Improperly designed cave gates that alter cave airflow patterns (particularly trapping warm air) may reduce, and in some instances destroy, hibernacula suitability (Tuttle 1977, Humphrey 1978, Richter et al. 1993, Tuttle and Kennedy 1999). In addition to population threats from human disturbance, hibernating Indiana bats are also vulnerable to natural disturbances, and destruction of any hibernacula can have a tremendous impact on the population because of the limited number of hibernacula (Hall 1962). While many hibernacula have been protected, disturbance to hibernacula continues. For example, the largest hibernacula in Indiana (50,941 Indiana bats in 2003) is not gated, and based on data from electronic monitors in the cave, unauthorized visits to this cave occur during critical life stage periods. Also, at the only large hibernacula in Ohio (9,436 Indiana bats in 2004), there are still tours, as well as other commercial activities, taking place in the cave during the hibernation period.

Land use practices have also been identified as a suspected cause in the decline of the Indiana bat, particularly because habitat in the bats' maternity range has changed dramatically from pre-settlement conditions. Indiana bats exhibit site fidelity to their traditional summer maternity and foraging areas, and are known to return to the same general area to establish maternity colonies from year-to-year (Humphrey et al. 1977; Gardner et al. 1991a, b; Callahan et al. 1997; Indianapolis Airport Authority 2003, 2004; Kurta and Murray 2002; Butchkoski and Hassinger 2002; Gardner et al. 1991a, Gardner et al. 1996). Roosting/foraging area fidelity may serve to increase the probability of successful reproduction, and to maintain social interactions between members of the population. Bats using familiar foraging and roosting areas may have decreased

susceptibility to predators, increased foraging efficiency, and an improved ability to switch roosts if impacts occur to the original roost (Gumbert et al. 2002). In turn, site fidelity may also inhibit the ability of Indiana bats to pioneer new areas (Sparks *in* Service 2004). Due to the ephemeral nature of roosting sites, bats are probably not dependant on the continued suitability of an individual tree. However, landscape level alterations in traditional maternity habitats may adversely affect Indiana bat survival and reproductive success.

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

ENVIRONMENTAL BASELINE

Winter Populations

The FEF is located within a five-mile radius of two Indiana bat hibernacula, Big Springs Blowing Cave and Two Lick Cave. Winter surveys for Indiana bats in Big Springs Blowing Cave, which is located on the FEF, have been conducted periodically since 1952. In order to protect this hibernacula, the cave was gated in 1973. Despite the cave gate, the population of Indiana bats at Big Springs Blowing Cave started to decline in 1977, most likely due to continued human disturbance. The 1973 gate was a flat bar design, and the bars were readily bent, enabling human access. In the summer of 1986, a new cave gate with a round bar design was installed. Since the installation of the new gate, the Indiana bat population at Big Springs Blowing Cave has increased and has remained relatively stable since 1993 (Table 1). Surveys in the winter of 2004/2005 documented 243 Indiana bats using the cave.

Table 1. Indiana bats documented during winter surveys at Big Springs Blowing Cave

Date	#Bats
Winter 1952	~ 150
Winter 1953	119
Winter 1972	~130-150
December 1973	~130-150
January 1976	~150
March 1982	~150
March 1984	5
January 1985	78
January 1987	82
January 1989	77
January 1991	112

January 1993	176
January 1995	254
February 1996	183
February 1997	200
January 1999	210
December 2000	240
January 2003	199
January 2005	243

Dr. Mark Ford, Northeastern Research Station Wildlife Research Scientist, has monitored spring emergence dates and fall entrance dates for bats at Big Springs Blowing Cave during 2001-2004 in order to gather data regarding pre- and post-hibernation activity. The monitoring data from Big Springs Cave reveals that bats are entering the cave later then October 1 in the fall, and emerging from the cave earlier then April 30 in the spring.

Two Lick Cave, located to the south of the FEF on the Monongahela National Forest, had a small hibernating population in the winter of 1999/2000 of only 3 Indiana bats. Seven Indiana bats were noted in the 2001/2002 surveys and no Indiana bats were documented using this cave during the winter 2003/2004 surveys (WVDNR 2004).

Summer and Fall Populations

When the 2000 BO for the FEF was drafted, evidence was inconclusive as to whether female Indiana bats utilized any part of West Virginia to bear and rear their offspring. Since that time at least 3, and potentially 4, Indiana bat maternity colonies have been documented in West Virginia. In 2003, 2 post-lactating female Indiana bats were captured at a location in Boone County, West Virginia. Additional surveys have documented that a colony of at least 70 bats is present at that site. (Joel Beverly, Apogee Environmental Consultants, LCC, personal communication, 2005). In 2004, a second maternity colony of approximately 25 bats was confirmed in Lower Glady, in Tucker County, approximately 6 miles from the FEF (D. Arling, USFS, pers. comm.). This site is located within 2 miles of Cave Hollow/Arbogast cave. That same summer, 3 male Indiana bats were captured on another site on the MNF in Pendleton County. These bats were tracked to a roost tree and subsequent emergence counts on that tree revealed 23 bats. Although, maternity activity (through the presence of female Indiana bats) was not confirmed at this site, data suggest that this site may also support a maternity colony. In 2005, an additional colony of at least 40 bats was located in another location in Boone County (Jeremy Jackson, Compliance Monitoring Labs Inc., personal communication, 2005).

In addition to these potential or confirmed maternity colonies, individual male Indiana bats have been captured during the summer at a number of locations throughout the state in the following counties: Tucker, Preston, Clay, Nicholas, Fayette/Nicholas County line, Randolph, Pendleton, Pocahontas, and Raleigh. Captures of both male and female bats confirm that the Indiana bat uses forested habitats throughout the state for summer foraging and roosting.

During the summer and fall of 1995, the WVDNR conducted a survey on the FEF to determine presence or absence of Indiana bats. The FEF was selected because it contains a known hibernaculum (Big Springs Blowing Cave), and potential summer habitat (roost trees, upland forest, and riparian forest). Mist nets were used to capture bats moving along travel corridors and a harp trap was placed at the entrance to Big Springs Blowing Cave. One thousand fifty-four bats of 9 species were captured during 11 trapping sessions. The first summer record of the Indiana bat in West Virginia was documented with the capture of 1 male in June and 5 males in July. No females were captured until August. It was therefore concluded that the FEF was not being used as a maternity area at that time. Sixty-nine Indiana bats were captured during the study, of which five were females. The majority of the Indiana bats (64 of 69) were captured at the cave entrance, and only a few of these appear to have been trapped as they exited the cave in the evening. Therefore, it was assumed the bats were apparently using the cave as a night roost. The locations of the bats' day roosts were not known at that time (Stihler 1996). This study indicates that some male Indiana bats stay near their winter hibernaculum through the summer months.

The WVDNR also conducted a study of male Indiana bat roost selection on the FEF in September 1997 by attaching transmitters to 4 male Indiana bats. Additionally, in June 2000, scientists at the FEF and West Virginia University attached a radio transmitter to a single, adult male Indiana bat (Ford et al. 2002). Both living and dead trees were selected by the Indiana bats for day roosting. These included northern red oak, red maple, black cherry, yellow poplar, shagbark hickory, white ash, and slippery elm. Shagbark hickory, sugar maple, slippery elm, and white ash are already documented as preferred roost tree species for Indiana bats. Northern red oak, black cherry and yellow poplar (especially standing dead) display the roost tree characteristics described within the recovery plan. However, stand structure data demonstrate that these preferred tree species are not regenerating on the sites currently used by roosting Indiana bats. Even though the FEF currently contains the tree species preferred by Indiana bats for roosting, much of the regeneration (sapling and pole-size trees) is in red maple, sugar maple, and American beech. Indiana bats used these species less than expected based upon their availability in the forest.

During the summers of 2001-2003, researchers at the FEF, in conjunction with other cooperators, used Anabat acoustical equipment throughout the FEF to relate bat species presence to habitat conditions and structure (Ford et al. 2004). The study found that foraging and traveling Indiana bats were more often associated with riparian than upland areas. Additionally, the probability of Indiana bat presence increased with the percent forest canopy cover along those riparian areas (Ford et al. 2004).

In spring 2005, scientists at the FEF conducted studies to assess post-hibernation dispersal from Big Springs Blowing Cave. Six Indiana bats were radio tagged, including 1 female. Within a few hours after release, biologists were unable to locate the radio tagged female, despite extensive search efforts within the FEF. It is assumed that the female almost immediately began migration to her maternity area which was somewhere outside the FEF. Both male bats that were tracked to their day roosts used overstory shagbark hickory trees either within the FEF or in a private woodlot that had been recently timbered and was located close to Forest Service property.

In summary, both male and female Indiana bats use the FEF for swarming and hibernation. While male Indiana bats are known to be present throughout the year, there is no evidence that the FEF currently supports any Indiana bat maternity activity.

Forestry conditions

Within the FEF, the topography is mountainous with elevations ranging from 1750 to 3650 feet above sea level. Mountainous slopes ranging from 20 to 50 percent cover most of the area. The FEF is dominated by closed canopy mixed mesophytic forests (Braun 1950, Schuler and Fajvan 1999 in FEIS). Characteristic tree species include, but are not limited to northern red oak, yellow-poplar, black cherry, sugar maple, bitternut hickory, black birch, red maple, and American beech. Of the 4615 acres composing the FEF, approximately 845 acres are under even-aged management, 1120 acres are under uneven-aged management, 355 acres are biological controls (monitored but not manipulated), and the remaining acres are neither manipulated nor within an existing study. Most of the forest (98%) is in uneven-aged management, control, or unmanaged which results in closed overstory canopies. Within a five-mile radius of Big Springs Blowing Cave on the FEF, a 100-foot buffer around roads, permanent openings, and regeneration areas less than 10 years of age, shows the landscape is 83.9% closed forest. There are currently fewer than 120 acres in open condition (i.e. less than 70% overstory closure). Of these 120 acres, there are 27.2 miles of graveled haul road on the FEF, and approximately 53 acres of non-forested openings such as logging decks, weir sites, skid roads, and parking areas.

The FEF has approximately 35 miles of streams, 9 artificial ponds (8 of which are weir ponds), and a reservoir. The FEF incorporates part of the Stonelick Run watershed and the headwaters of the Sugarcamp Run and Canoe Run watersheds. Elklick Run drains into the Black Fork River, and Stonelick, Canoe Run and Sugarcamp Run all drain into the Shavers Fork River. These 2 rivers join to form the Cheat River just north of Parsons. Streamside Management Zones (SMZ) are established along perennial and intermittent streams. Buffer strips 100 feet wide are maintained along each side of perennial streams, such as Elklick Run. No timber harvesting can take place along perennial stream banks, and 75% canopy cover must be maintained in the SMZs. Intermittent streams will have a 50 ft. buffer zone along each side of the stream, and 50% canopy cover must be maintained in the SMZs. These habitat conditions provide excellent foraging habitat for Indiana bats.

EFFECTS OF THE ACTION

The FEF proposes to conduct logging and prescribed fire activities on approximately 960 acres over the next 5 years. Most of the projects are part of ongoing research initiated in the 1950s and later. The action involves tree removal activities on approximately 493 acres (11% of FEF), and prescribed fire on approximately 460 acres (9.9 % of FEF). These activities could potentially result in take of Indiana bats through direct mortality or injury or indirectly through harm and harassment. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing normal behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral patters such as breeding, feeding, and sheltering. However, the likelihood and severity of this potential take depends on site-specific conditions including available data on Indiana bat activity in the action

area, the timing of the action, the type of habitat modification proposed, and characteristics and amount of habitat remaining available after the proposed activity is conducted.

Tree Removal Activities – Direct Effects

The FEF is unable to commit to clearing all trees during the hibernation period because 1) they have limited staff available to conduct the work; 2) weather conditions and other uncontrollable factors often restrict their ability to work; and 3) the research designs often control the timing of particular cuts. The amount of tree clearing conducted during these 2 time periods varies year-to-year based on a number of factors including weather conditions. Based on activities conducted during the previous 5 years, it is estimated that approximately 25% of each year's tree clearing activities will conducted during the non-hibernation period.

Tree removal during the non-hibernation period (April 1 - November 14) may result in mortality (direct take) of roosting Indiana bats, if a tree is removed intentionally or felled accidentally that contains a roosting bat or a maternity colony. If a bat using a roost tree that is removed is not killed during the removal, the roosting bat would be forced to find an alternative tree, potentially expending a significant amount of energy that would result in harm or harassment of the individual. The effects of cutting potential Indiana bat roost trees will vary depending on the timing of the activity. If the trees are cut early in the maternity period, when the females are pregnant and within established home ranges (May – June), "adult females are faced with finding suitable maternity sites at a time when they are already stressed from the rigors of hibernation, migration, and the increased energy costs of pregnancy" (Garner and Gardner 1992). This increased energy expenditure could also cause decreased: fitness, reproductive success, or survival of young. If trees are cut during the lactation portion of the maternity period when young are not volant (June to early July), young would likely be injured or killed during the felling. Tree cutting during these 2 times of year potentially have the most severe direct effects. While it should be noted that existing data do not provide evidence that Indiana bats are using the FEF for maternity activity, the FEF proposes to cut trees only between the dates of October 1 – April 30, thereby avoiding activities during the times of year that would have the most severe effects in the event that Indiana bats are found using the area for maternity activity at some point in the future.

Existing data confirm that male Indiana bats may be present within the FEF throughout the year, and that both male and female bats use the FEF for fall swarming activity. The monitoring data from Big Springs Blowing Cave reveals that some bats are emerging from the cave earlier then April 30 in the spring and are entering the cave later than October 1 in the fall. Therefore conducting timber clearing activities outside the Indiana bat hibernation period in the early spring (March 31 to April 30) and in the late fall (October 1 to November 15) may disrupt bats engaging in spring emergence and fall swarming and roosting behavior. Bats could potentially be killed or injured, or be forced to flee if an occupied roost tree was cut. Female Indiana bats in the non-maternity season and/or males typically have numerous suitable day-roosts available and they frequently roost-switch. At this time of year, bats often roost individually, rather than in groups. While the potential to cut an occupied roost tree does exist, given the large amount of forested habitat within the FEF, and the localized and relatively small scale of tree clearing

activities that will occur during the spring and fall periods, the Service concludes that the likelihood has been minimized, and that any harm and harassment to the bats would be short-term and localized.

Tree Removal Activities – Indirect Effects

Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Removal of living trees or snags that have the potential to serve as roosts for maternity colonies or individual bats, or reduction of density of mature trees and overstory canopy could result in the loss or reduction in suitability of the summer (roosting and foraging) and pre-hibernation (fall foraging) habitat. Overall, the proposed tree removal activities within the FEF fall into three general categories that can be related to severity of impacts to the Indiana bat: light thinning, extensive thinning, and regeneration harvests/clearcuts. A total of 493 acres (11% of the FEF) are proposed to undergo at least one of these silvicultural treatments (tree removal activities) over the next 5 year period, however, less then 1% would be subject to complete overstory removal.

Light thinning, including single-tree selection and some diameter limit harvests, are proposed on 362 acres (7.7% of the FEF). The conditions created by the proposed light thinning are not expected to decrease the long-term suitability of these areas as Indiana bat roosting habitat. Conversely, light thinning will create openings in the forest canopy that could improve foraging as well as roosting conditions. Indiana bat primary roosts are usually not surrounded by closed canopy and are often warmed by solar radiation, which provides a favorable microclimate for growth and development of young during normal weather. Humphrey *et al.* (1977) hypothesized that roost trees were usually located in openings within the forest because they provided the necessary thermoregulatory characteristics. This is supported by the analysis conducted at several maternity sites by Romme' (1995) who found that most roosts were located in areas that had a canopy closure of 60 to 80%. The proposed thinning will also increase the solar exposure of the remaining trees within the harvest area, thus potentially making them more suitable for Indiana bat roosting habitat.

Since it appears that Indiana bats utilize many different habitat types when foraging, the opening of the overstory as a result of these treatments would not change the abundance of foraging habitat on the landscape. Owen et al. (2004) found that areas subject to these types of treatment still approximate usable foraging habitat for Myotis species. Additionally, Callahan et al. (1997) stated that even-aged and uneven-aged management could be used in conjunction with Indiana bat management when snags and shagbark hickories are retained, and management favors oak species. Shagbark hickory is a protected tree species on the FEF, and several proposed research studies state oak restoration and regeneration as one of their objectives. Areas affected by these types of activities should remain suitable for Indiana bat foraging and roosting habitat.

Extensive thinning, including shelterwood harvests and heavy diameter limit harvests, are proposed for 104.3 acres (2.2% of the FEF). Because greater numbers of trees are removed and canopy closure is significantly reduced when compared to light thinning, these areas may have sub-optimal characteristics when compared to existing Indiana bat habitat suitability indexes. Areas affected by extensive thinning activities will have reduced suitability for Indiana bat foraging and roosting habitat.

Regeneration/clearcut harvests will be conducted on 23.2 acres (0.5% of the FEF). Regeneration harvesting would affect potential foraging and roosting habitat and travel corridors by reducing canopy cover below suitable levels (Romme' 1995). All potential roost trees would be removed and future roost tree availability would be reduced, making these areas unsuitable for Indiana bat roosting. The effect of potential roost tree loss would last several decades until trees in the regenerated areas reach roost tree size. Therefore, the effects of clearcut harvesting are more severe and last for a greater duration than the other proposed silvicultural activities.

Less than 3% of the FEF will be affected by silvicultural activities that will significantly reduce or eliminate their suitability for Indiana bat foraging and roosting habitat. When project impacts are considered in conjunction with baseline conditions, a total of approximately 3.6% of the project area would consist of non-forest or openings that are not suitable Indiana bat habitat, and the remaining project area (96.4%) would consist of suitable forested habitat with a mixed composition of age classes.

The FEF proposes to implement Riparian Management Guidelines for all activities proposed in the project area. Indiana bats often preferentially use forested riparian areas for foraging. (Belwood 1979; Cope et al. 1978; Humphrey et al. 1977; Clark et al. 1987; Gardner et al. 1991*b*). The recent work of Owen et al. (2004) illustrates and further supports the biological importance of forested riparian habitats to bats in the Appalachians. Protection of riparian corridors will help ensure that high quality and preferred Indiana bat foraging habitat will be maintained.

Given that 96.4% of the project area will be maintained as potentially suitable Indiana bat foraging and/or roosting habitat; that preferred foraging habitat will be protected; and activities will not be conducted during the most sensitive times of year; the Service concludes that the action area will remain able to support Indiana bats after completion of the proposed action, and that the potential direct and indirect adverse effects caused by proposed tree clearing activities have been appropriately minimized.

Prescribed Fire

Prescribed fire would be used on a total of approximately 460 acres (10% of the FEF). Fire management techniques would be conducted according to West Virginia Department of Forestry regulations, and would ensure fuel consumption at 1-5 ft/min. Conducting prescribed burning outside the hibernation period could result in direct mortality or injury to the Indiana bat caused by burning or smoke inhalation, especially death to young bats that are not able to fly. The likelihood of this happening, however, is reduced due to the proposed method and timing of the burning. Prescribed fire would only be conducted in the spring prior to May 31, which is prior to the time that most young are born or in the fall after October 1, which is after all young are volant. While little to no research is available to document the potential direct effects of fire on Indiana bats, anecdotal information suggests that, Indiana bats might be capable of escaping burning roost trees when necessary and if volant. In Tucker County, West Virginia on MNF land, a myotid bat flew out of a burning snag during a prescribed fire and into an unburned forested area during the spring 2001 (Rodrigue and Schuler, personal communication). Additionally, two red bats (*Lasiurus borealis*) were observed flying from another prescribed

burn unit into an unburned area during another prescribed fire (Rodrigue et al. 2001). Because the proposed burns will be slow moving, most bats should have time to move out of the affected area. As a result, the Service anticipates that the likelihood of direct mortality from prescribed burning is minimized.

Indirect effects in the form of harm or harassment of Indiana bats may result from loss of potential roost trees, or by forcing the bats to abandon active roost trees. However, the FEF has incorporated measures that should minimize these impacts. The proposed method of burning should ensure that the proposed fires are relatively cool and it is not anticipated that whole large trees or snags that are suitable for Indiana bat roosts will be consumed/combusted. In addition, the FEF is maintaining most of the action area as forested habitat. Female Indiana bats in the non-maternity season and/or males typically have numerous suitable day-roosts available and they frequently roost-switch; therefore in the event that a bat is forced to flee from a burn area where it is roosting, other day-roosts are likely present on the area nearby, and available for Indiana bats to use.Based on these factors, the Service anticipates that while the potential for take in the form of harm and harassment of individual Indiana bats as a result of prescribed burns does exist, the potential for and the severity of these impacts has been minimized.

While prescribed burns could have some negative effects on the Indiana bat, as described above, overall prescribed fire will likely improve Indiana bat foraging and roosting habitat. Prescribed burning most often results in some degree of midstory mortality to small-diameter trees and shrubs, producing more open understory conditions. Opening of the midstory may improve foraging and roosting habitat conditions. Individual mortality to trees would increase the number of snags and create scattered canopy gaps, which would improve roosting. Increased insect populations produced in burned areas for foraging is also likely to occur in successional years. Carter et al. (2000) state that additional potential roost cavities and snags can be created in forested stands by utilizing prescribed fire, depending on fire intensity, increase the availability of snags. Snags could be created either directly by fire mortality or indirectly by making them more susceptible to insect attacks or pathogens (Bull et al. 1997). Depending on the tree species, live trees subsequently killed by fire activity would remain as suitable potential roost trees until such a time that peeling/lost bark renders them unsuitable as summer roost sites. The Indiana bat maternity colony discovered in the summer of 2004 in Lower Glady, Tucker County, West Virginia was located in an area subjected to a wildfire during the spring of 2002 (D. Arling, USFS, pers. comm.). This site is located in close proximity to an Indiana bat hibernacula, and to the FEF. It is likely that Indiana bats are using this area as a maternity site as a result of its close proximity to a hibernacula and the abundance of roost trees that were created as a result of forest fires. The FEF proposes to conduct a study that would replicate these conditions and evaluate the response of Indiana bats. This research has the potential to develop improved management recommendations to the benefit of the species not only within the FEF, but also throughout its range.

Ammonium nitrate fertilization and Herbicide Application

Ammonium sulfate fertilizer pellets would be applied three times a year to an 84.7 acre watershed. Herbicide application would be used on 2.5 acres to control the spread of Japanese stiltgrass, and on individual trees on an as-needed basis. The Service concurs that, as described in the BA, these proposed activities are not likely to adversely affect the Indiana bat.

Implementation of conservation measures
The implementation of project-specific protection and conservation measures, along with the terms and conditions associated with reasonable and prudent measures requested by the Service below, will minimize any adverse direct and indirect effects of the project and would ensure that this action area would remain suitable to support Indiana bats in the future by: 1) protecting a known Indiana bat hibernacula; 2) retaining Indiana bat travel corridors and foraging habitat by protecting riparian corridors; 3) maintaining and providing adequate Indiana bat roosting habitat; 4) creating and/or enhancing potential Indiana bat summer habitat within the FEF; and 5) conducting monitoring and research for the benefit of the Indiana bat. If future monitoring or research conducted on the FEF identifies evidence of Indiana bats utilizing the project area for summer maternity habitat, the FEF would consult with the Service and the WVDNR to develop, as appropriate, additional protective measures in accordance terms and conditions outlined below.

CUMULATIVE EFFECTS

Cumulative effects include the combined effects of any future state, local, or private actions that are reasonably certain to occur within the action area covered in this BO. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Future federal, State, local and private actions that are reasonably certain to occur within the action area, i.e., the MNF, will either be carried out by, or will require a permit from, the Forest Service. These actions will therefore require a section 7 consultation. The Service is not aware of any future state, local, or private actions that could occur within the action area that would not be subject to a section 7 review. Therefore, cumulative effects, as defined in the ESA, are not expected to occur within the action area and will not be addressed further in the BO.

CONCLUSION

After reviewing the current status of Indiana bat, the environmental baseline, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that implementing the FEF's proposed activities consistent with the preferred alternative (Alternative C), as proposed, is not likely to jeopardize the continued existence of the Indiana bat. Critical habitat has been designated for this species, however none will be affected by this action.

INCIDENTAL TAKE STATEMENT

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

agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

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

Level of Take

The Service anticipates that incidental take of Indiana bats as a result of the Forest Service's research activities implemented on the FEF will be difficult to quantify and detect due to the bat's small body size, widely dispersed individuals under loose bark or in cavities of trees, and unknown areal extent and density of their summer roosting populations range within the FEF. However, any incidental take of Indiana bats is expected to be in the form of killing, harming, or harassing. Tree removal during the non-hibernation season period (April 1 – November 14) may result in harm or mortality to roosting Indiana bats. Smoke and fire generated during prescribed burns that occur during the non-hibernation period could also cause roosting bats distress or death. Burning may cause an individual roosting bat to abandon a traditionally used roost tree.

Monitoring to determine take of individual bats within an expansive area of forested habitat is a complex and arduous task. Unless every individual tree that contains suitable roosting habitat is inspected by a knowledgeable biologist before management activities begin, it would be impossible to know if a roosting Indiana bat is present in an area proposed for harvest. It would also be impossible to evaluate the amount of incidental take of Indiana bats unless a post-harvest inspection is immediately made of every tree that has been removed or disturbed. Inspecting individual trees is not considered by the Service to be a practical survey method and is not recommended as a means to determine incidental take. However, the areal extent of potential roosting habitat affected can be used as a surrogate to monitor the level of take. Although, to the best of our knowledge, no individually roosting Indiana bats have been incidentally taken during tree removal or other habitat modifying activities on the FEF, the possible removal of undiscovered occupied roost tree(s) may result in incidental take of this species. The Service believes that if roosting individuals are present in an area proposed for timber harvest or other disturbance, incidental take of Indiana bats could occur. However, implementation of the terms and conditions associated with the reasonable and prudent measures provided below by the Service, will significantly reduce the potential of incidental take.

This incidental take statement anticipates the taking of a presently unquantifiable number of Indiana bats from timber harvest, road construction and prescribed burning occurring during the non-hibernation season (April 1 - November 14) on the FEF. The FEF proposes to conduct tree removal activities on a total of 493 acres over the next 5 years. It is estimated that 25% of these activities will be conducted during the non-hibernation period. Therefore, approximately 124

acres of suitable Indiana bat habitat will be affected by timber harvest and road construction activities that might result in take of Indiana bats. In addition, a total of 466 acres of prescribed burning may affect an unquantifiable number of Indiana bats. Depending on climatic conditions, all or a portion of the proposed prescribed burning may occur during the non-hibernation period. Therefore, the incidental take statement is based on the timber harvest and road construction activities occurring on a maximum 124 acres and prescribed burning on a maximum of 466 acres over the next 5 year period.

However, implementation of the terms and conditions associated with the reasonable and prudent measures will reduce the impact of the potential for incidental take. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FEF must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures. Research or other activities on the FEF that would increase the number of acres harvested or otherwise affected by tree removal or burning during the non-hibernation season would be considered to affect this determination and would require reinitiation of formal consultation.

REASONABLE AND PRUDENT MEASURES

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

RPM 1: Proposed research activities shall be planned, evaluated and implemented consistent with measures developed to protect the Indiana bat and reduce adverse impacts from prescribed burns and the removal of potentially occupied roost trees.

1.1 Retain all shagbark hickory on the FEF except where such trees present a safety hazard.

1.2 Protect all known roost trees on the FEF until such time as they no longer serve as roost trees (e.g. loss of exfoliating bark or cavities, blown down or decay).

1.3 Conduct timber harvests during the non-hibernation period in mesic, cooler habitats on the FEF, as proposed.

1.4 Conduct all timber harvesting (tree cutting) on the FEF between October 1 and April 30 each year, as proposed. Conducting timber harvests between October 1 and November 15 shall be avoided to the extent practicable.

1.5 Conduct all prescribed burns on the FEF between October 1 and May 31.

1.6 Establish and maintain streamside management zones along perennial and non-perennial streams to protect streams, aquatic health and riparian zones on the FEF, as proposed.

1.7 If evidence of a maternity colony is discovered on the FEF, the Forest Service will coordinate with the Service and WV DNR to establish any necessary additional habitat protection and monitoring measures not aforementioned.

RPM 2: The Forest Service shall monitor the status of the Indiana bat on the FEF during the non-hibernating season.

2.1 Monitor Indiana bat activity numerous times throughout the non-hibernating period using Anabat II detectors at 4 permanent survey sites on the FEF (Fork Mountain Pond, Big Springs, Wier Pond 1, and Elklick Run) to establish within and among-year variation in Indiana bat presence and activity on the FEF.

2.2 Additional Indiana bat monitoring will occur in conjunction with the study: "Prescribed burning and variable intensity overstory mortality for enhanced wildlife habitat structure and long-term oak restoration (Study number yet to be assigned)" to assess effectiveness of accelerated roost-tree creation where likely day-roosts will be created by assessing relative activity levels indicative of either foraging or roost exit/emergence. These levels also will be compared to those in unburned, control stands. Potential day-roosts created though experimental activities should be quantified. A monitoring plan shall be coordinated and approved by the Service and the WVDNR. The monitoring plan should be reviewed and updated as needed, on an annual basis.

2.3 Monitor Indiana bat activity using Anabat II detectors in the spring and the fall at Big Springs Blowing Cave to determine dates of emergence and hibernation to establish long-term trends regarding dates of entry and exit.

2.4 The FEF will provide the Service and the WVDNR with an annual report of the results of the monitoring conducted under 2.1-2.3 by January 15 of each year.

RPM 3: The Forest Service shall monitor timber harvest and other activities on the FEF to determine whether mitigation measures to protect threatened, endangered and sensitive species, and the terms and conditions of the BO are being implemented.

3.1 The number of acres of prescribed burns and trees harvested during the non-hibernation seasons must be monitored on an annual basis. Information on the previous year's activities shall be provided to the Service no later than January 15 of each year.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to

minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following:

1) Under cooperation with the Service and the WVDNR, the FEF should develop and implement a program to radio-track Indiana bats. To the extent practicable, Indiana bats of both sexes should be outfitted with radio-transmitters and tracked to day-roosts used during 1) immediate post-hibernation emergence; 2) summer-maternity season; and 3) early- to mid-fall swarm periods.

2) Continue to develop outreach programs that disseminate information about eastern woodland bat species and their conservation needs. Primarily, this program should target federal, state, and private land managers and natural resource professionals. Opportunities to provide such information to the general public would also be encouraged.

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

REINITIATION NOTICE

This concludes formal consultation for the FEF proposed activities under Alternative C. As required by 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such a take must cease, pending reinitiation.

The Service appreciates the opportunity to work with the Forest Service in fulfilling our mutual responsibilities under the Endangered Species Act. If you have any questions regarding this letter, please contact Ms. Barbara Douglas of my staff at (304) 636-6586 ext. 19, or at the letterhead address.

Sincerely,

Thomas R. Chapman
Field Supervisor

cc:
Mary Beth Adams – FEF
Dan Arling – MNF
Craig Stihler - WVDNR
Project File
Reader File
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