

SHAWNEE NATIONAL FOREST

**REVIEW OF NEW INFORMATION
RELATED TO WHITE-NOSE SYNDROME
AND OCCURRENCE ON THE FOREST
OF THE INDIANA BAT AND GRAY BAT**

February, 2012

This documents the Shawnee National Forest (Forest) review of new information (RONI) that has become available since publication of the 2006 Forest Land and Resource Management Plan and the Final Environmental Impact Statement (FEIS) on the Plan. The Forest completed a White-Nose Syndrome (WNS) RONI in July, 2008 (USDA FS 2008). This RONI addresses the epidemiology, transmission, and spread of WNS, the documented bat mortality rates, and actions the Forest has taken to monitor and minimize the introduction and spread of WNS into southern Illinois since 2008. This document satisfies the requirements of Forest Service Handbook (FSH) 1909.15 18.1—Review and Documentation of New Information Received after Decision Has Been Made.

The Council on Environmental Quality regulations for implementing the National Environmental Policy Act (NEPA) (40 CFR 1502.9[1]) require an agency to prepare a supplement to either a draft or final EIS if:

- (I) The agency makes substantial changes in the proposed action that are relevant to the environmental concerns; or
- (II) There are significant new circumstances or *information relevant to environmental concerns* and bearing on the proposed action or its impacts (emphasis added).

In accordance with FSH 1909.15(18.1), the Forest formed an interdisciplinary (ID) team to consider and document the review of new information related to WNS and determine whether or not the standards and guidelines of the Forest Plan are adequate in the face of the threat of WNS to Forest hibernacula, or caves and mines that harbor hibernating bats.

Considerable scientific information has come to light pertaining to the methods of transmission and causes of mortality related to WNS, as well as to bat mortality rates since the 2008 WNS RONI. WNS has spread to more states, several of which border Illinois, increasing the risk that bat populations on the Forest may contract WNS in the future. The Forest ID team reviewed new information regarding the spread of WNS and its local and range-wide effects on bat species listed by the U. S Fish and Wildlife Service (USFWS) as either endangered or threatened, classified by the Forest Service Eastern Region as Regional Forester sensitive species, as well as any other non-listed bat species exhibiting moderate to high mortality rates from exposure to WNS. The interdisciplinary team consisted of Rod McClanahan, Forest Wildlife Biologist, Matthew Lechner, Natural Resources Program Manager, and Elizabeth Shimp, Supervisory Natural Resources Specialist.

WNS Background

Information used in the preparation of this document update was derived from recent research publications, the best available science, and multiple state, federal, and university sources, including the USFWS website: <http://www.fws.gov/WhiteNoseSyndrome>, and the U.S. Geological Survey National Wildlife Health Center website: http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/index.jsp.

History and Rate of Infection and Mortality

WNS was first observed in the United States during the winter of 2006-2007 in caves and mines in upstate New York. By the close of the 2007 winter, WNS was documented in five states. During the three subsequent winters, large die-offs of bats were observed in zones radiating from upstate New York into multiple states. The rapid spread of WNS in bat populations southward and westward has been unprecedented. In 2008, WNS was documented in nine states and 88 hibernacula. By 2010, WNS had spread to 13 states and two Canadian provinces, affecting over 160 hibernacula, a linear distance of about 2200 km (1370 miles) from the initial epicenter in New York. As of January, 2012, WNS is suspected or confirmed in 19 states and 4 Canadian Provinces, affecting over 200 hibernacula and resulting in the first sustained, rapidly spreading disease affecting bats (Frick et al. 2010).

Since the 2008 RONI was prepared, WNS has been confirmed or suspected in ten more states, including Missouri, Kentucky, Tennessee, Indiana, Ohio, and Maine. Three of these states border Illinois—Indiana, Missouri, and Kentucky—with the site in western Kentucky about 150 miles from the nearest bat hibernacula in southern Illinois. Wildlife biologists from the Forest and the Illinois Department of Natural Resources (IDNR), in partnership with researchers from Ball State University (BSU) and Western Illinois University (WIU), have been aggressively monitoring hibernacula in southern Illinois annually since 2009. To date, this monitoring has not confirmed the presence of *Geomyces destructans*, the fungus associated with WNS, in Illinois. How soon it will be when WNS appears in southern Illinois is unknown; but, given the rate of spread thus far, many bat researchers think it will only be a year or two.

As of 2011, the species known to be susceptible to WNS include the Indiana bat (*Myotis sodalis*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), tri-colored bat (*Perimyotis subflavus*), eastern small-footed bat (*Myotis leibii*), and big-brown bat (*Eptesicus fuscus*). Three additional bat species tested positive in 2010 for the presence of *G. destructans*, but none demonstrated the infection characteristic of the disease. These species, the gray bat (*Myotis grisescens*), cave myotis (*Myotis velifer*), and southeastern myotis (*Myotis austroriparius*), were found in Missouri, Oklahoma, and Virginia. This discovery could portend the spread of WNS into new bat species and new parts of the southeastern and western United States in subsequent years. All cave-roosting bats are potentially susceptible to exposure to WNS and subsequent mortality.

Biologists estimate that, as of January, 2012, roughly 5.7-6.7 million bats have died from the effects of exposure to WNS since the original outbreak. This mortality rate far exceeds the rate and magnitude of any previously known natural or human-caused mortality events in bats (Cryan et al. 2010). Winter bat-population declines in five states that have been hit extremely hard by

the effects of WNS—New York, Vermont, Pennsylvania, West Virginia and Virginia—have reported hibernating-bat population mortality ranging from 68 percent (in Virginia) to 98 percent (in Pennsylvania). Species mortality rates range from a low of 12 percent in eastern small-footed bats to a high of 98 percent in northern long-eared bats. In Virginia, researchers have documented population declines as high as 97 percent in *M. lucifugus*. Using the mortality rates documented thus far, some researchers project a 99-percent chance of regional extinction of the little brown bat in the northeast within the next 16 years (Frick et al. 2010).

Epidemiology

WNS was named for the visible presence of a white, filamentous fungal growth observed on the muzzle, ears, and wing membranes of affected bats. As the cause of WNS, scientists positively identified a previously unknown species of cold-loving fungus, *Geomyces destructans*, as a consistent pathogen causing skin infection in bats at affected sites. This fungus thrives in low temperatures (40-55 degrees F) and high levels of humidity (greater than 90 percent), conditions characteristic of caves and mines used by large numbers of winter roosting bats. The same characteristic skin infection and associated lesions occur on bats in Europe, but without the associated high mortality rates observed in the US.

The most recent research into the epidemiology of WNS suggests that different species of cave-roosting bats have differing resistance to WNS. Evidence suggests that bat species that typically select warmer and more humid portions of caves and mines for hibernation appear to incur higher mortality rates than those species that select colder and drier winter-roosting sites. It is also possible that some species, such as the tri-colored bat, which enters winter hibernation early and emerges late, are more affected by WNS due to a longer exposure time during winter torpor. Some species initially appear to have a greater resistance to the effects of WNS. Researchers have proven that bats have lower immunity levels to pathogens during winter torpor, possibly making them more susceptible to *G. destructans*.

Unlike other skin-related, fungal pathogens of warm-blooded animals that cause superficial infections, *G. destructans* is capable of invading, eroding and digesting the skin of hibernating bats. The white material on the skin of hibernating bats with WNS results from the prolific production of fungal spores and is the most obvious field manifestation of WNS on affected bats (Cryan et al. 2010). The skin of bat wings is the most significant target of *G. destructans*. Bats have four to eight times more exposed skin along their arms, digits, and tail than on other parts of the body. These disproportionately large areas of exposed skin play critical roles in maintaining the inner stability of bats and thus in day-to-day survival (Cryan et al. 2010).

The natural cycle of hibernation has allowed *G. destructans* to become a highly successful emergent pathogen of bats. Hibernation, characterized by long cycles of deep torpor and intermittent arousal, is a strategy of warm-blooded animals such as bats for maximizing survival during seasonal periods of harsh conditions, food shortage, and/or water limitations (Cryan et al. 2010). During hibernation, immune function and metabolism are dramatically reduced and possibly inhibited, with an accompanying drop in body temperature. The hibernation temperature of bats is within the range of maximal growth of *G. destructans*. In addition to physiological changes, different species of bats have evolved behavioral strategies to maximize survival during hibernation, such as selection of humid areas of hibernacula or dense clustering

to conserve energy and decrease moisture loss. These behaviors could further enhance fungal colonization and spore growth by elevating humidity, as well as increasing the infection rate and dispersal of *G. destructans* through increased bat-to-bat contact (Cryan et al. 2010). In addition, the natural reduction of immune function in hibernating bats is likely to allow *G. destructans* to invade normally healthy body tissue without confronting an immune response, making the hibernating bat an excellent host that provides nutrients, ideal environmental conditions, and little or no resistance to an expanding infection (Cryan et al. 2010). Researchers suspect that the extensive mortality of bats from exposure to WNS is caused by *G. destructans*, which causes unsustainable dehydration in water-dependent bats, triggers thirst-associated arousals, causes significant circulatory and thermoregulatory disturbance, disrupts respiratory gas exchange, and destroys wing structures essential for flight control and necessary for effective foraging (Cryan et al. 2010).

Researchers have demonstrated that the spores of *G. destructans* can be transmitted bat-to-bat and from the surfaces of clothing, helmets, ropes, clipboards, headlamps, and other gear typically used in cave environments, and can be viably passed through the digestive tract of bats. Bats are susceptible to picking up *G. destructans* through preening and physical contact with each other, with the walls of caves and mines, with feces, and with researchers who have previously handled bats carrying spores, as well as possibly from inhalation. When temperatures rise above around 55 deg. F, *G. destructans* can persist in the spore stage for an extended period of time. As temperatures reach the range of 40-55 deg. F, the fungus will return to the active-growth stage.

To determine if *G. destructans* can persist on the surface of caves and be transmitted to bats, biologists in New York transplanted healthy little brown bats from the upper Midwest into a cave in upstate New York previously documented as infected with WNS and with previously reported bat mortality. Within the first winter after release, all of the little brown bats showed gross lesions of WNS and died, providing strong evidence that once a cave or mine becomes infected with *G. destructans*, the cave/mine can continue to be a source for re-infection each winter. Evidence suggests that *G. destructans* can persist on the walls, in the sediment, and in the air in caves and mines for years once the fungus enters the cave/mine. How long it can persist is not known at this time. Recent evidence suggests that, oftentimes, bats survive the initial infection with lower mortality rates. However, as they return to hibernate in the infected hibernacula and contact *G. destructans* the second year, they become re-infected and mortality rates climb significantly. Bat mortality rates are reported to be much higher after the first year of initial exposure to *G. destructans*.

Population Status-Trend and Range of Indiana Bat and Gray Bat in Illinois

Both the Indiana bat and the gray bat are protected under the Endangered Species Act (ESA). They range across much of the eastern United States. They are the only species of federally listed bat that occur in Illinois.

Indiana Bat

WNS has been documented affecting Indiana bats, with varying reported mortality rates. Mines and caves where WNS was discovered initially, in upstate New York, Pennsylvania, Vermont, Virginia and West Virginia, reported a 72-percent decline in wintering Indiana bat numbers in

2011. Indiana bats may be less susceptible to the more adverse effects from WNS because they typically select portions of caves and mines that are colder and have lower humidity levels than do other bats that are exhibiting significantly higher mortality levels, such as the little brown bat, northern long-eared bat, and tri-colored bat. As of May, 2011, 58 Indiana bat hibernacula in North America were affected by WNS, approximately 33 percent of the national population (based on USFWS 2009 hibernacula survey numbers). In terms of potential impacts on priority hibernacula, WNS is confirmed or suspected in 5 Priority One hibernacula, 6 Priority Two hibernacula, 21 Priority Three hibernacula, and 22 Priority Four hibernacula. Two of these hibernacula—in western Kentucky and southern Indiana—represent new occurrences in 2010. These new occurrences lie less than 100-200 miles from the southern border of the Forest.

Indiana bats occur in southern Illinois both in summer and winter. They utilize caves and mines in southern Illinois, with some of these also used as summer roost sites for bachelor males and non-reproductive female Indiana bats. Approximately 13 percent of the range-wide population of Indiana bats hibernates in Illinois during the winter (based on 2011 USFWS survey numbers). The Midwest—Indiana, Missouri, Illinois, Ohio, and Michigan—hosts 71 percent of the total Indiana bat winter population of approximately 424,700 (based on 2011 USFWS survey numbers), while Illinois hosts approximately 20 percent of the Midwest's winter population (based on 2009 USFWS survey numbers). Illinois is located in the USFWS Indiana Bat Ozark-Central Recovery Unit, which includes Illinois, Missouri, Arkansas, and Oklahoma. The Forest has 16 known or historical Indiana bat hibernacula within its boundaries. The majority of the hibernacula are either on National Forest System (NFS) land, or in close proximity. The USFWS has designated no Indiana bat critical habitat on the Forest.

Table 1 lists the 18 hibernacula in counties with Forest lands; six of which occur on the Forest, in Alexander, Union, Saline, and Pope Counties. Of the 18, 1 is a Priority One, 4 are Priority Two, and 13 are Priority Three and Four. Table 1 also shows the winter population-trends of Indiana bats that utilize caves and mines in southern Illinois. While the winter population-trend has been somewhat decreasing nationwide, winter populations in southern Illinois have been stable to increasing. Possible reasons for this include the abandonment of hibernacula in Missouri, the presence of higher-quality winter roosting-sites in Illinois, and the availability of minimally disturbed winter roost-sites (e.g., caves and mines having “bat-friendly” entrance structures). Sixty-one percent of the hibernacula have either some type of entrance-structure or are strictly controlled by private landowners. Reduced access by the public to caves and mines used by Indiana bats as winter roost-sites theoretically should reduce the likelihood of *G. destructans* being inadvertently introduced by people.

To date, only five Indiana bat maternity-colonies are recorded in the central hardwoods region of southern Illinois, three of which are on NFS lands in Union (Bluff Lake), Jackson (Oakwood Bottoms) and Gallatin Counties (on the Saline River). The latter colony was located by researchers during the summer of 2011. A fourth, of unknown size, is located on private land in Saline County, northwest of Harrisburg, and a fifth, located by Forest Service wildlife biologists in the summer of 2011, is on Cypress Creek National Wildlife Refuge in Pulaski County.

Table 1. Priority One to Four Indiana Bat Hibernacula, Population Trends, and Bat Gates.

Hibernacula	Ownership	County	Hibernacula Priority	Most Recent Population Numbers	Previous Avg. Population	Entrance Gate-Yes/No
Barney Grace	Federal	Union	P3	10	341	Y
Magazine Mine	Private	Alexander	P1	45,159	35,929	Y
Jason Mine	Federal	Union	P4	14	35	Y
Mine 30	Private	Alexander	P2	3736	3109	Y
Rhymer 1	Private	Alexander	P4	0	1	N
Mine 26	Federal	Alexander	P3	266	318	Y
Mine 25	Private	Alexander	P4	1	0	Y
Birk 2	Private	Alexander	P4	1	1	N
Birk 3	Private	Alexander	P4	27	27	N
Equality Cave	Federal	Saline	P4	2	0	Y
Ellis Cave	Federal	Pope	P2	4248	3313	N
Brasher Cave	Federal	Pope	P3	1	3	Y
Griffith Cave	Private	Hardin	P2	623	1500	N
Rich's Cave	Federal	Union	P4	35	19	Y
Cave Springs Cave-Hardin Co.	Private	Hardin	P3	555	80	N**
Toothless Cave	Private *	Jackson	P4	49	310	Y
Gutherie	Private	Hardin	P2	1000	1000	N
Guthrie	Private	Union	P4	1	1	N

* Forest Service currently involved in acquiring.

** Access strictly controlled by landowner.

Each year, Dr. Tim Carter and graduate students from BSU monitor the maternity colonies at Bluff Lake and Oakwood Bottoms for the Forest. The size of both colonies appears to be stable to increasing, with approximately 400-500 females, based on roost tree exit counts in 2006 (Feldhammer et al. 2006). Both sites are substantially high quality and productive summer habitat due to an abundance of insects and standing dead trees as summer roost-sites. There are also four summer colonies using caves and mines in the Forest. These are populated by about 9,800 males and non-reproductive females (Kath 2005). Forest biologists have been banding Indiana bats in the hope that researchers will observe a banded bat roosting in hibernacula outside of southern Illinois. Bat researchers familiar with summer bat-habitat conditions in southern Illinois strongly suggest that additional summer colonies most likely are present along the larger, wooded, riparian systems in southern Illinois, such as along Big Creek, Bay Creek, lower Lusk Creek, Grand Pierre Creek, and the Saline River, but are difficult to document due to the preponderance of extensive river-swamp habitats along tributaries of the Ohio River (e.g., Bay Creek, Lusk Creek, and Grand Pierre Creek).

Since 2009, in addition to population-monitoring, Forest Service biologists, in partnership with BSU, IDNR and WIU, have been monitoring Indiana bat hibernacula for the presence of WNS. Additionally, we examine bats captured during summer mist-net surveys and fall swarming surveys for possible lesions suggestive of previous exposure to WNS. Thus far, these extensive monitoring efforts have failed to confirm the presence of WNS in Illinois, and Indiana bat populations appear to be WNS free, healthy, and stable to increasing. We realize the importance of monitoring bat populations annually for the presence of WNS so as to provide data from which to project the rate of spread of WNS throughout the United States and to maximize the options available to land managers to slow the spread of WNS into the Midwest.

Gray Bat

The most recent winter-population estimate for gray bats in the U.S. is approximately 3 million (based on USFWS 2009 winter survey numbers). Gray bat population numbers have been increasing steadily, prompting the USFWS at one point to give consideration to down-listing the species. However, with the occurrence of WNS, the reported mortality rates in other winter-roosting bat species that use some of the same caves for winter roosting as the gray bat, and the fact that approximately 80 percent of the gray bat population occurs in nine caves, gray bats appear extremely vulnerable to the effects of exposure to *G. destructans*. WNS has been found present on gray bats at two winter-roost sites in eastern Missouri (PCR positive), although there has been no positive histological confirmation at these sites, no documented mortality, and the Missouri Department of Conservation has not detected the presence of *G. destructans* at these sites. The fact that gray bats travel long distances between summer and winter roost-sites, their tendency to be found in the same winter-roost sites as Indiana bats, and their habit of roosting in extremely dense and large clusters increase the likelihood of their becoming carriers of *G. destructans* into Midwestern hibernacula.

There currently are no known gray bat hibernacula in southern Illinois, even though one to several are found from time to time using hibernacula during the winter. Gray bats have been found (less than five) in Ellis Cave and Cave Springs Cave in Hardin County during the winter months and in Ellis Cave during late winter/early spring (less than 15). Researchers from BSU and Forest biologists documented one gray bat using Cave Springs Cave as a winter roost in January, 2011. During the summer of 2011, researchers recorded gray bat call files in upland sites and along the Saline River in Gallatin County, suggesting that gray bats forage along the Saline River during the summer months.

Forest biologists have captured and banded gray bats during the summer on NFS lands along Grande Pierre Creek (Pope County), with banded bats being recaptured during fall swarming surveys at Cave Springs Cave, so it is apparent that gray bats extensively utilize portions of the Forest during the summer for foraging and travel between summer roost-sites and feeding-sites. Banded gray bats from Cave Springs Cave have been recovered wintering in Coach Cave and Jesse James Cave in central Kentucky. This summer-winter linkage further increases the likelihood of WNS being introduced eventually into southern Illinois hibernacula.

No caves or mines on the Forest are known to be used by gray bats to any significant extent as either summer or winter roost sites, even though it is known that gray bats use areas of the Forest near larger streamcourses, such as Grand Pierre Creek and the Saline River, as travel corridors and for foraging. In 2011, the Forest acquired Ellis Cave, known to be used occasionally by one to a few gray bats (<15) in the winter, spring and summer, but with no sustained consistency. The highest number of gray bats found using Ellis Cave—12—was in April, 2011, even though none was found when the cave was surveyed in January, 2011. It is theorized that male gray bats may use the cave for brief periods during late winter and early spring as a transitional roosting site after emergence from winter hibernacula in Kentucky. The Forest is currently preparing an agreement with Bat Conservation International to construct a steel cupola-gate across the entrance to Ellis Cave in order to protect it from unauthorized public access, disturbance, and the inadvertent introduction of *G. destructans*.

Only one gray bat summer maternity-colony is known in Illinois—Cave Springs Cave in Hardin County. There are no caves or mines in Illinois recognized by the USFWS as gray bat hibernacula. Historical counts of the gray bat summer maternity-colony in Cave Springs Cave were 10,000 in 1958-1961 (Hall and Wilson 1966) and 1,000-2,000 in 1974 (Whitaker 1975). Cave Springs Cave was surveyed in June, 2010 by Forest and IDNR biologists and BSU researchers. Approximately 3,500 gray bats were documented, as well as a few Indiana bats and southeastern myotis. Most of this number was adult females and young of the year, with a few adult males. This survey's findings represent a substantial increase in the size of this maternity colony since 1974. Surveys conducted in Cave Springs Cave in January, 2011 found only one gray bat, indicating that the cave is not a hibernaculum for gray bat. Warm winter temperatures throughout most of the cave strongly suggest that it is too warm to serve as a gray bat winter roost site.

Cave Springs Cave is owned by a mining company that allows access to only state and federal biologists and researchers to monitor bat populations in the cave. Consequently, this cave is relatively secure from disturbance or vandalism and the inadvertent introduction of *G. destructans* by the public. However, the mining company is actively mining limestone aggregate from their property very near the cave. Some bat researchers have suggested that past blasting activity has had adverse effects on the cave, such as warming the internal temperatures and increasing the amount of water flowing through the cave.

Forest and IDNR biologists, as well as researchers from BSU and WIU, work cooperatively with the owner of Cave Springs Cave to monitor the gray bat population. This includes fall swarming surveys, banding, collection of wing swab samples, and wing punch tissue samples to monitor for the presence of *G. destructans*. The most recent WNS monitoring occurred during the late summer/early fall of 2010. Laboratory analysis failed to detect the presence of *G. destructans* at the cave so, at the present time, this gray bat population appears to be free of the presence of *G. destructans*. At the request of the USFWS, no WNS monitoring of this cave was conducted during late summer/early fall of 2011. Because of the difficulty in accessing this cave and the need to minimize potential exposure to *G. destructans*, monitoring of Cave Springs Cave is not conducted on an annual basis.

Population Status-Trend and Range of Other Bat Species

Bats Listed by the Forest Service Eastern Region as Regional Forester Sensitive

Six bat species in southern Illinois and on the Forest are currently listed by the Eastern Region of the USDA Forest Service as Regional Forester Sensitive: The eastern small-footed bat (*Myotis leibii*), southeastern myotis (*Myotis austroriparius*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), tri-colored bat (*Perimyotis subflavus*), little brown bat (*Myotis lucifugus*) and northern long-eared (*Myotis septentrionalis*). (The IDNR also lists the eastern small-footed bat, southeastern myotis and Rafinesque's big-eared bat as either threatened or endangered.)

Eastern small-footed bat

Eastern small-footed bats were not documented in Illinois until 2006, when IDNR summer interns found two individuals—a male and a female—roosting under rocks in somewhat open glade habitat at Fink Sandstone Barrens in Johnson County. (This species typically utilizes

mines, caves, rock shelters, and talus areas to winter roost.) Since 2006, none has been found in caves or mines in southern Illinois. During the summer of 2011, a cooperative survey involving Forest personnel and BSU researchers documented 23 individuals roosting under rocks in open cedar-sandstone glades in Johnson and Pope Counties, suggesting that the population may be more extensive than initially believed. Adult females and juveniles were found in the summer of 2011, suggesting the presence of a summer maternity colony. Additional surveys are planned for the summer of 2012 to determine the extent of this population in southern Illinois. Securing valid winter-population numbers for these bats is difficult, since the species has been reported roosting in caves under large rocks on floors and in cracks and crevices, making them difficult to observe and survey.

Southeastern myotis

Five caves and a mine are used as hibernacula by southeastern myotis in southern Illinois. Three of these caves—Brasher, Equality and Dutchman/Jug Springs—and the Jason Mine are located on NFS lands. The privately-owned Griffith and Cave Springs Caves are within the Forest proclamation boundary. Equality and Dutchman Caves are new hibernacula for this species. Table 2 displays winter population-trends for all five hibernacula: In general, winter numbers have been on an upward trend. Cave-closure structures have been installed at four of the five hibernacula, with only Griffith Cave unprotected from disturbance.

Table 2. Population trends for southeastern myotis in southern Illinois caves and mines

Hibernacula	Ownership	County	Most Recent Population Numbers	Previous Ave. Population	Entrance Gate-Yes/No
Dutchman Cave	Federal	Johnson	2	0	Y
Jason Mine	Federal	Union	81	12	Y
Equality Cave	Federal	Saline	123	24	Y
Brasher Cave	Federal	Pope	295	179	Y
Griffith Cave	Private	Hardin	162	0	N

Forest and IDNR biologists and university researchers have documented the presence of southeastern myotis in the summer along several major streams in southern Illinois, including Bay Creek, the Saline River, the Cache River and Grand Pierre Creek. Southeastern myotis typically utilize hollow trees as roosts during the summer, and bachelor males and non-reproductive females will use caves and mines. Forest biologists have documented between 500-600 southeastern myotis using Brasher Cave during the summer.

Rafinesque’s big-eared bat

Southern Illinois lies in the northern-most reach of the range of this very uncommon bat species. Several summer records exist in Johnson, Pulaski, Pope and Alexander Counties. The highest number of occurrence records for this species is along the Cache River in Alexander and Pulaski Counties. Rafinesque’s big-eared bats have been reported summer-roosting in hollow trees, under concrete bridges, in abandoned buildings, in wells and cisterns, and in other man-made structures. So far, this species has not been found in caves or mines in southern Illinois, and there are no known hibernacula for this species in southern Illinois.

Tri-colored bat

The tri-colored bat remains very abundant, using mines and caves throughout southern Illinois, especially caves and mines that, in whole or part, are warmer and have higher levels of humidity. Some researchers suggest that the propensity of this species to select warmer and wetter hibernacula makes them more vulnerable to exposure to WNS. Recent research indicates that tri-colored bats summer-roost in the canopies of live trees, so suitable tri-colored bat habitat is abundant across the Forest. The caves and mines in southern Illinois that harbor the highest number of wintering bats include Magazine Mine, Mine 30, Barney Grace, Jason Mine, Rhymer 1, Mine 26, Mine 25, and Ava and Equality Caves.

Little brown bat

Little brown bat populations historically have never been high in southern Illinois, even though little brown bats are commonly captured during summer mist-net surveys near larger bodies of water, such as rivers and lakes. Hibernacula harboring the greatest number of these bats include Magazine Mine, Mine 30, Rhymer 1, Mine 26, and Griffith and Rich's Caves. The only little brown bat maternity colonies known within the Forest proclamation boundary are at Oakwood Bottoms and Bluff Lakes, where 400-800 little brown bats can routinely be found utilizing bat boxes. The number of little brown bats using these boxes has continued to climb since the boxes were erected. The Forest began monitoring bat-use of these boxes in the summer of 2011 and will continue monitoring annually in order to track any changes in little brown bat summer maternity-colony numbers. During the summer of 2011, biologists from the Forest and the Mark Twain National Forest documented a new little brown bat summer maternity-colony at Cypress Creek National Wildlife Refuge. The population of this colony is in the range of 100-150 bats, based on the number of bats observed emerging from identified roost trees.

Northern long-eared bat

Deriving reliable winter-population numbers for the northern long-eared bat is somewhat difficult since these bats typically do not winter-roost in colonies and will embed themselves deep in cracks and crevices in mines and caves, making it difficult to observe the bats and derive consistent population-trend numbers. The northern long-eared bat remains one of the most commonly captured bats during summer mist-net surveys in southern Illinois.

For the most part, and with the exception of southeastern myotis, winter-population numbers of these regionally-listed bats have remained somewhat stable over the past seven years, suggesting no visible population reductions attributable to effects from exposure to WNS. Populations of southeastern myotis appear to be increasing throughout southern Illinois.

Bat Species Not Listed by the USFWS or the Eastern Region of the Forest Service

There are many caves and mines throughout southern Illinois, both on and off the Forest, that harbor substantial numbers of winter-roosting, non-listed bats. There are more than 23 caves identified on the Forest or within the Forest proclamation boundary (Whitaker 1975), many harboring moderate to large numbers of non-listed bats. Others in southern Illinois probably harbor at least a few hibernating, non-listed bats of one or more species.

While numbers of big brown bats utilizing caves and mines in southern Illinois have never been high, all indications are that the population is stable. Big brown bats also utilize old, abandoned buildings and other man-made structures during the winter months, so monitoring the number of big brown bats in caves and mines only may not serve as an accurate population-trend indicator.

During January 2012, Forest biologists responded to a report by a private citizen of a new cave along Chalk Bluff in Jackson County. A survey found 161 big brown bats, as well as five tri-colored bats using the cave as a hibernaculum, confirming a new big brown bat hibernaculum in Illinois.

Relationship of Bat Habitat Requirements to Forest Plan Direction

Because WNS was not found prior to the winter of 2006-2007, its potential impact upon bat populations and cave resources was not considered during development of the 2006 Forest Plan. However, the importance of maintaining the integrity of cave environments was recognized as an integral part of maintaining Forest ecosystems (USDA FS 2006, pages 42, 48, and 287-292). Other, non-cave, components of bat habitat were also recognized as important elements of Forest management in providing suitable and productive bat habitats across the Forest (USDA FS 2006, pages 42, 48, and 387-292). Since WNS has only been documented in caves and mines to date, and not in other roosting habitats, this RONI, like the RONI conducted in July, 2008, primarily focuses on cave habitats as the key element in dealing with WNS.

Standards and guidelines in the Forest Plan were developed to protect cave integrity and to manage cave habitats for threatened, endangered and uncommon or unique species. Of most immediate relevance to the WNS issue are the following standards and guidelines that deal with control of unauthorized human access to caves so as to minimize disturbance to roosting bats:

- All caves are to be closed to recreational use from August 31 through April 15 unless allowed by the Forest Supervisor or specified official. This is to protect migrating and hibernating bats from direct and indirect harassment by humans (USDA FS 2006, p. 197).
- In caves and mines with documented summer use, prohibit access as necessary to prevent disturbance of bats between March 15-October 31 and, in those with documented winter use, prohibit access as necessary to prevent disturbance between September 15 and April 30 (USDA FS 2006, p. 286).

The Forest Supervisor issued a closure order in 2009 prohibiting unauthorized access to all caves and mines on the Forest known to harbor roosting bats. This closure order has been renewed as needed and currently is in effect through 2017. The current order also lists all the caves and mines covered in the order to ensure enforceability. This closure order is intended to aid in slowing the spread of WNS by reducing the likelihood of an inadvertent introduction into Illinois of *G. destructans* on the equipment, boots, clothing and other materials used by recreational cavers. The Forest also fully implements the most current USFWS WNS decontamination protocol, further reducing the inadvertent introduction of *G. destructans* into caves and mines on the Forest.

With the exception of the recently-acquired Ellis Cave, the Forest Service has installed bat-friendly gates at all Indiana bat hibernacula on the Forest. To date, one hibernaculum requires a high-security fence surrounding its back entrance. However, monitoring of unauthorized use suggests little to no use of the cave since its two entrances were gated—in 2010 in partnership with Bat Conservation International—and potential users can no longer travel from one end of the cave to the other. This cave is suitable for only experienced cavers due to its complexity. Two bat-friendly gates were installed at the other two entrances to this hibernacula in partnership with BCI in 2010.

The Forest has partnered with Unimin Minerals to implement mine-entrance stabilization-projects at all Indiana bat Priority 1, 2, and 3 hibernacula that are mines. We have closed to unauthorized access all mines with documented use by bats. The Forest is working cooperatively with the IDNR to enlist the support of the owner of Griffith Cave to allow construction of a bat-friendly gate at the entrance to that cave (a Priority 2 hibernaculum).

- The Forest Service will continue to enter into cooperative agreements to conduct surveys of Forest cave resources to determine those that require implementation of additional protective measures due to their association with threatened, endangered, or sensitive species. The need for additional protection will be determined through site specific analysis (USDA FS 2006, p. 197).
- Consider acquisition of caves or abandoned mines found to contain populations of Indiana bat and/or gray bats, and those caves determined to be of regional significance within the Forest proclamation boundary (USDA FS 2006, p. 286).

The Forest acquired Ellis Cave (Priority 2 Hibernacula) in 2011, and is engaged in negotiations with the owner of Toothless Cave (Priority 4 Hibernacula).

- Continue monitoring occupied Indiana bat hibernacula and maternity colonies on the Forest to assess changes in population numbers, variations in microclimate, and the effectiveness of protective closure structures that have been installed (USDA FS 2006, p. 290).

All gates and mine-entrance stabilization structures erected at Indiana bat and/or southeastern myotis hibernacula and summer roosting-sites are monitored at least annually for possible public vandalism, breaching of structures, and/or any changes in cave/mine microclimate conditions. Devices to monitor temperature and humidity within hibernacula have been placed in the majority of hibernacula on the Forest. Placement of bat-friendly gates, or entrance-stabilization projects, does not appear to be having any adverse effects on cave/mine microclimates or roosting bat populations. Bat populations appear to be stable at the current time.

Measures taken by the Forest to minimize human disturbances of hibernating and summer roosting bats appear thus far to be working effectively. The construction of a bat-friendly gate at Equality Cave led to significant increases in southeastern myotis numbers (from approximately 25 bats in 2007 to approximately 123 bats in 2011), as well as numbers of non-listed bats. Two Indiana bats were documented using Equality Cave in 2011. The bats are able to enter and

complete hibernation in secure conditions, to bear and raise their young, and to use the cave in summer without human harassment.

All known Indiana bat hibernacula within the Forest proclamation boundary are monitored at least every two years, and most often annually in partnership with IDNR and Dr. Tim Carter of BSU. A representative sample of Indiana bat hibernacula is monitored each year for the presence of WNS, employing both active and passive monitoring methodology.

Indiana bat maternity colonies are monitored at least every two years under an agreement with Dr. Tim Carter, BSU. Summer mist-net surveys and radio-tracking are used to determine the location of the colonies, foraging areas, and colony size. Forest biologists will begin monitoring the new Indiana bat maternity colony in Gallatin County on a two-year rotation.

The microclimate within caves and mines can have a significant bearing on species and numbers of bats using caves and mines as hibernacula. Caves having less stable internal temperature and humidity levels are most often avoided by most winter-roosting bats. Temperatures within caves and mines can become too high to serve as winter-roost sites. The most recent research on *G. destructans* strongly suggests that hibernacula with higher temperature and humidity levels seem to provide conditions more conducive to the establishment of *G. destructans*. Any actions that result in a change in the microclimate conditions within caves and mines can have a bearing on the establishment of *G. destructans*, bat use, and bat survival. The following Forest Plan standards and guidelines address the management of forested habitat around cave entrances and over known cave passages in order to maintain microclimates and provide immediately available roost trees and swarming/staging habitat in close proximity to winter-roost sites:

- Prohibit any significant disturbance within approximately 100 feet of a cave entrance or open, abandoned mine entrance when occupied by bats (USDA FS, 2006, p. 286).

There have been no Forest Service activities in recent years that could constitute a disturbance to roosting bats, with the exception of cave-gating and mine-entrance stabilization. Biological evaluations were conducted for all of these projects to document potential effects on bats listed by the USFWS and the Eastern Region of the Forest Service. These activities took place during the summer months and were of short duration so as to have the least possible effects on bats using the caves/mines. Bat populations have been monitored pre- and post-implementation in order to document any impacts on those using the cave/mine and no appreciable impacts have been documented thus far. Devices have been placed in all caves and mines where gates or mine-entrance stabilization structures have been installed in order to monitor any impacts on microclimate.

Researchers conduct hibernacula surveys on a two-year rotation so as to minimize disturbance frequency. Since July, 2008 the Forest has conducted no vegetation treatments within 100 feet of the entrance to any hibernaculum and none are planned in the near future. No prescribed burning has taken place within 100 feet of the entrance to any hibernaculum.

The Forest is presently in the preliminary planning stages for a landscape-scale hardwood restoration project in southern Pope and Massac Counties that may include selective harvesting of non-native pines and dormant-season prescribed burning. Brasher Cave, an Indiana bat and southeastern myotis hibernaculum used in summer and winter, is within the preliminary project boundary. During the summer the cave serves as a roosting-site for bachelor males and non-reproductive females. No timber-harvesting activities would take place within at least 100 feet of the cave entrance. Only pine is being proposed for removal so as to restore the area to a mixed hardwood forest, which should improve the area as summer bat-roosting and foraging habitat in the long term. Informal consultation on this proposed project has been initiated with the Marion, Illinois Field Office of the USFWS.

Recently the Forest completed environmental analysis of proposed dormant-season prescribed burning in the Cave Hill Natural Area, which includes Equality Cave (aka Cave Hill Cave). Equality Cave is known to be used year-round by southeastern myotis. Although Indiana bats had never been found using the cave as a hibernaculum, in January, 2011 Forest biologists and BSU researchers documented two Indiana bats—a male and a female—winter-roosting in the cave. Burning will take place well beyond 100 feet of the entrance to the cave to prevent smoke from entering. An amended biological evaluation will be completed in February, 2012 to reflect this new information, followed up by consultation with the Marion Office of the USFWS. No other burning has taken place, or is planned in the near future, within 100 feet of the entrance of any known Indiana bat or gray bat hibernaculum.

Dormant-season prescribed burning is proposed around cedar-sandstone glade habitats in Pope County known to be occupied by eastern small-footed bats. A biological analysis and evaluation were completed for this project, concluding that implementation of the proposal may impact individuals with no impact to population viability. Mitigation measures were built into the proposed action as design criteria so as to reduce the likelihood of the burning having any direct or indirect adverse impacts on the bats. Burning should improve habitat quality surrounding the occupied glades by reducing vegetative clutter and opening up the sandstone barrens to more solar radiation.

- Retain a forested corridor between caves or abandoned mines utilized by bats and foraging areas (e.g. stream, creeks, rivers or reservoirs) (USDA FS 2006, p. 286).

Forested corridors that currently link all known hibernacula or summer roosting caves and mines to foraging areas are being maintained. Standards and guidelines are currently in place (see below) and are being followed that maintain forested corridors in the vicinity of hibernacula. No Forest Service activities have taken place since 2008 that would alter these forested corridors, nor are any planned.

- During site-specific project planning, the effects of management on suitable roosting and foraging habitat within a five-mile radius of known hibernacula and maternity colonies must be considered, and such habitat must be maintained or enhanced in that area. The maintenance or enhancement of Indiana bat habitat can be accomplished through implementation of Indiana bat standards and guideline and/or additional site-appropriate measures (USDA FS 2006, p. 290).

Most of the Big Muddy River Habitat Improvement Project area falls within five miles of known Indiana bat maternity colonies and hibernacula. The Forest consulted with the USFWS on this project in 2007 and received a biological opinion. The Forest has been implementing this project in full compliance with the protection measures detailed in the biological opinion so as to minimize potential direct effects on Indiana bats. Dr. Tim Carter and graduate students from BSU monitor the Indiana bat maternity colonies each year and have detected no impacts to the Indiana bat maternity colony from the implementation of the project decision.

In 2010, the Forest completed an environmental analysis and NEPA decision for implementation of dormant-season prescribed burning within several natural areas, including the Cave Hill Natural Area. A biological evaluation and biological assessment of this project outlined mitigation measures required to avoid smoke-related impacts on southeastern myotis and other bats that utilize Equality Cave. The Marion Illinois Office of the USFWS concurred with the effects determination on federally-listed species. At that time, as was stated in the biological evaluation/biological assessment there was no record of Indiana bats using Equality Cave.

However, in January, 2011 Forest biologists and BSU researchers conducting a hibernaculum survey of Equality Cave found two Indiana bats roosting there. This information was communicated within 24 hours to Joyce Collins, Assistant Field Supervisor for the Marion Illinois Field Office of the USFWS. An amendment to the original biological evaluation/biological assessment is being prepared to reflect this new information, and informal consultation will be initiated with the USFWS on the potential effects to the Indiana bat. We believe that adequate mitigation measures are in place in the original decision to provide protection from fire-related impacts to Indiana bats using Equality Cave since the biological evaluation/biological assessment evaluated the potential effects from conducting prescribed burning within a five-mile radius of Equality Cave.

The Forest is currently in the preliminary planning stages for a landscape-scale hardwood restoration project in southern Pope and Massac Counties that may include selective harvesting of non-native pines and dormant-season prescribed burning. Brasher Cave, an Indiana bat and southeastern myotis hibernaculum used in summer and winter, is within the preliminary project boundary. During the summer the cave serves as a roosting-site for bachelor males and non-reproductive females. The environmental analysis will evaluate the potential effects on Indiana bat and southeastern myotis habitat within a five-mile radius of Brasher Cave. Informal consultation with the Marion Field Office of the USFWS has been initiated, and is continuing at this time.

Several prescribed burns are done on the Forest each year within a five-mile radius of known Indiana bat hibernacula or maternity colonies, for which environmental consideration and decisions were completed prior to 2008. The Forest consulted with the USFWS and the burns are being implemented in full compliance with the Forest Plan and the terms and conditions of 2006 Biological Opinion, as well as with any additional mitigation requirements identified in any Tier Two consultation.

Since 2008, no other NEPA decisions have been made that would permit activities with the potential to adversely affect Indiana bat habitat within a five-mile radius of any known Indiana bat hibernacula or maternity colonies. No other activities are planned for the foreseeable future that would occur within a five-mile radius of any known Indiana bat hibernacula. The Forest is currently consulting with the USFWS on the proposed exchange of a parcel of NFS land in Gallatin County for three parcels elsewhere. The NFS parcel is being used by a newly-discovered Indiana bat maternity colony documented in the summer of 2011 by Eco-Tech using a secondary roost tree on the parcel. We are also conferring with other recognized bat researchers, including Dr. Tim Carter of BSU and Virgil Brack, Jr.

- Within five miles of known roosts or hibernacula, known roost-trees will not be removed through harvesting. Management of forested areas should maintain a diversity of age-, size- and species- classes of potential roost trees. It should also include the maintenance of existing forested landscapes, snag and live trees retention, riparian-corridor and hibernacula protection, and improvement projects. When removal of dead trees or trees with exfoliating bark from these areas is required for safety or to accomplish project objectives between April 1 and November 15, the areas must be evaluated for bat-usage prior to removal, including exit surveys if necessary. Potential roost trees cannot be removed during this period unless they are evaluated and/or surveyed to confirm non-use by roosting bats, and documented in a biological evaluation. Surveys could include mist-netting of sale areas, exit surveys for individual trees, or other surveys approved by the US Fish and Wildlife Service (USDA FS 2006, p. 287).

No occupied suitable Indiana bat summer roost trees within five miles of known roosts or hibernacula have been removed anywhere on the Forest between April 1-November 15 since approval of the 2006 Forest Plan and adoption of the above standards. Some hazard trees have been removed less than five miles from known maternity roosts and hibernacula during the April to September bat-roosting periods since approval of the 2006 Forest Plan and since completion of the July 2008 RONI. The overall number of hazard trees removed has been very small and all were surveyed prior to removal. No bats were found exiting from the hazard trees and all were removed within 72 hours of the time the exit surveys were completed.

Timber stand improvement (TSI) in the Big Muddy Habitat Improvement Project area has been done since 2008. In areas identified for TSI treatments, all potential roost trees (existing dead trees and live trees greater than nine inches dbh or with visible cavities) are either confirmed to be not affected (dead trees-not cut) or are girdled (live trees) rather than cut down during the April-November use-periods and, thus, no removal of any potential roost trees takes place.

- Greater than five miles from known hibernacula and maternity roost areas, potential roost-trees, including live hardwood trees with exfoliating bark, should not be removed during the roosting period-April 1 to September 30-unless necessary for human safety or to accomplish project objectives. Removal of these trees during the roosting period requires evaluation and/or surveys to determine non-use by roosting bats. Surveys could include the mist-netting of sale areas, exit surveys for individual trees, or other surveys approved by the US Fish and Wildlife Service (USDA FS, 2006, p. 287).

No potential (unoccupied, suitable) roost trees greater than five miles of known roosts or hibernacula have been removed between April 1-November 15 since approval of the 2006 Forest Plan and adoption of the above standard anywhere on the Forest unless they were surveyed for potential bat occupancy prior to removal and no bats were found. Some hazard trees greater than five miles from known maternity roosts and hibernacula have been removed during the April to September bat-roosting periods since the signing of the 2006 Forest Plan and since completion of the July 2008 RONI. These overall number of trees removed has been very small and all were surveyed prior to removal. No bats were found exiting from the hazard trees and all were removed with 72 hours of the time when exit surveys were completed.

- In all project areas where large overstory hardwood trees could be cut, mist-netting surveys, exit surveys, or other surveys approved by the US Fish and Wildlife Service, must be done to identify known roosting habitats prior to harvest or cutting. Mature leave-trees in areas where the shelterwood or shelterwood-with-reserves harvest methods are applied (including the uplands) should include mixtures of tree species preferred by Indiana bats for roosting: Silver maple (*Acer saccharinum*), bitternut hickory (*Carya cordiformis*), shellbark hickory (*Carya laciniosa*), shagbark hickory (*Carya ovata*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), eastern cottonwood (*Populus deltoids*), white oak (*Quercus alba*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*), black locust (*Robinia pseudoacacia*), American elm (*Ulmus americana*), and slippery elm (*Ulmus rubra*) (USDA FS, 2006, pp. 287-288).

Since 1995, there has been no removal of large overstory, hardwood trees on the Forest as part of timber harvests or wetland restorations. Some planning for the shelterwood removal of non-native pine plantations has occurred since 1992 and a few acres of pines have been removed. All areas have been surveyed for the presence/absence of Indiana bats prior to decisions and/or implementation of any removals. To date, no Indiana bats have been found in pine plantation areas during surveys.

The Forest has completed environmental analysis of the removal of approximately 200 acres of non-native pines in the Harris Branch project area. The area was surveyed for the presence or absence of Indiana bats prior to the project decision and will be re-surveyed prior to the implementation of any pine harvests. Surveys were and will be done by mist-netting following the USFWS Indiana bat mist-netting protocol. To date, no Indiana bats have been found in pine plantations during surveys. This project has not yet been implemented and no pine has been removed; but the pine sale is expected to occur this year.

The removal of pine is being contemplated in the south Pope and Massac Counties project mentioned above. The Forest has informally consulted with the Marion Field Office of the USFWS on this project. We will obtain concurrence from the USFWS on this project, or any similar project, before pine removal occurs on the Forest.

- Burns conducted within .25 miles of any Indiana or gray bat hibernacula shall be conducted under conditions that reduce or eliminate the dispersal of smoke into the hibernacula (USDA FS, 2006, p. 48).

All prescribed burns since 2006 have been conducted in such a manner so as to avoid the dispersal of smoke into hibernacula. The Natural Areas Prescribed Fire Decision, which includes burning in the Cave Hill Natural Area, within which Equality Cave is located, included specific mitigation and smoke-monitoring requirements designed to avoid the dispersal of smoke into the hibernaculum and to monitor smoke-particulate levels near the cave. All terms and conditions of the 2005 USFWS Biological Opinion will be fully implemented.

Any burning that might be done in the south Pope and Massac Counties area, within which Brasher Cave is located, will have specific mitigation and smoke-monitoring requirements designed to avoid the dispersal of smoke into the hibernaculum and to monitor smoke-particulate levels near the cave. All terms and conditions of the 2005 USFWS Biological Opinion will be implemented. All future prescribed burns done within five miles of any known hibernacula will be carried out in such a manner so as to avoid the dispersal of smoke into hibernacula. All terms and conditions of the 2005 USFWS Biological Opinion will be implemented.

Actions Taken by the Forest to Date to Slow the Spread of WNS

Upon learning of the rapid spread of WNS westward from the epicenter in the Northeast, the Forest consulted with the USFWS and the IDNR regarding the need to close to unauthorized public access all caves and mines on the Forest used by bats. Subsequently, in 2009, the Forest Supervisor signed a closure order prohibiting unauthorized access to all caves and mines on the Forest known to harbor roosting bats. This closure order has been renewed as needed and currently is in effect through 2017.

Researchers have proven that *G. destructans* can be transmitted from bat to bat, and that spores of *G. destructans* can be translocated unintentionally by people from an infected cave to an uninfected cave via boots, clothing, cameras, clipboards, binoculars, backpacks, and any other hard surface. The USFWS and IDNR have expressed to the Forest that the closing of all bat hibernacula on the Forest to unauthorized public access should assist in slowing-the-spread of WNS by reducing the likelihood of *G. destructans* being unintentionally introduced into hibernacula on the Forest. The IDNR has also instituted a closure on its caves. During cave or mine entries by biologists, the Forest fully implements the most current USFWS WNS decontamination protocol, further reducing the likelihood of *G. destructans* being inadvertently introduced into bat caves and mines on the Forest.

WNS Monitoring

The Forest is currently assisting the development of an Illinois WNS Monitoring Strategy, in partnership with the USFWS, IDNR, BSU and WIU. The Forest has had in place for many years an active bat monitoring and survey program carried out in cooperation with the IDNR, the University of Illinois, SIU, BSU, the Illinois Natural History Survey and the USFWS, well in advance of the development of the WNS issue. BSU and SIU researchers have been partnering with the Forest in monitoring Indiana bat summer maternity colonies, as well as assisting in hibernacula surveys. The Forest also established a partnership with WIU and the IDNR to implement a WNS monitoring program, which is currently on-going.

Upon discovery of WNS in the Northeast, the Forest implemented an aggressive WNS monitoring program. Forest biologists have been examining at least a representative sample of all hibernacula each year to monitor for the presence of WNS in southern Illinois caves and mines. Forest biologists and BSU and WIU researchers collect wing swab samples and wing punch tissue samples each year from hibernacula in southern Illinois. Each fall, Forest biologists conduct swarming surveys from which wing punch tissue samples and wing swab samples are collected. Samples are collected from gray bats, Indiana bats, little brown bats, northern long-eared bats, tri-colored bats and southeastern myotis. Wing swab samples and wing punch tissue samples are sent to Dr. Andrea Alfaro, fungal molecular biologist at WIU for analysis. Wing swab samples and wing punch tissue samples are also collected from bats captured during the summer months during mist-net surveys. Sediment samples are collected from all hibernacula each winter and analyzed by WIU researchers for the presence of *G. destructans*. Any bats found possessing gross lesions consistent with WNS, or dead bats, are submitted to WIU, or another laboratory authorized to conduct WNS analysis.

In January, 2012 the “White-nose Syndrome National Plan—Draft Disease Surveillance Implementation Plan” was published by the USFWS with input from and peer-reviewed by the leading WNS researchers in North America. The plan was developed to provide managers with a list of methods for disease surveillance and bat-population monitoring, with the advantages and disadvantages included for each method. Forest WNS monitoring activities are consistent with the methods recommended in the national plan for monitoring for the presence of WNS and for monitoring bat populations in caves and mines.

Analysis

Within a five-year period, WNS has spread rapidly from the original epicenter in New York, northward into Canada and Maine, southwest into western Tennessee and Kentucky, and westward into Oklahoma. As WNS advances at an unabated pace, a multitude of state, federal, university and private research organizations have been studying the disease aggressively, and have learned much about the epidemiology of this fungal agent that is new to North America. In 2008, when the Forest’s first WNS RONI was prepared, very little was known about the causative agent of the disease, *Geomyces destructans*, a fungus new to North America. In four years, resource professionals have documented WNS-related bat mortality rates of 90-99 percent. The science clearly indicates that once a cave or mine is infected with *G. destructans*, it has the potential to remain a source for the continual re-infection of any bats that enter it. Resource professionals understand that, at the present time, there are no biologically acceptable methods for effectively disinfecting bats or cave environments. However, numerous researchers are looking into this as a feasible WNS control method.

Today, resource managers also have a much better understanding of the potential means of transmission of the fungus, which can occur from bat-to-bat, as well as unintentionally by humans. Researchers have developed somewhat effective means for decontaminating equipment and personnel handling bats so as to reduce the likelihood of the spread of the spores. In spite of the USFWS’s “slow the spread” strategy, it has become plainly clear that there are very limited options available to state and federal agencies to prevent the spread of WNS into their jurisdictional areas.

The strategy with the best chance of succeeding in sustaining viable populations of bats on NFS lands in southern Illinois consists of three parts:

A. Reduce the likelihood of WNS being prematurely introduced into southern Illinois roosting sites and bat populations:

1. Maintain the closure of caves and mines on the Forest to unauthorized access. Monitor annually, with active and passive methods, to insure that access-control structures are effective in keeping out unauthorized users. Install cave-closure devices (e.g. bat-friendly gates) at all hibernacula on NFS lands.
2. Rigidly restrict entry into hibernacula to conduct essential population surveys, WNS monitoring and banding.
3. Require strict adherence by authorized state-federal-university-private organizations to the most current and effective USFWS WNS disinfecting protocol when conducting hibernacula surveys and WNS monitoring;
4. Continue to implement the USFWS WNS National Action Plan, the WNS National Plan-Draft Disease Surveillance Implementation Plan, and the Illinois Monitoring Strategy.
5. Require strict compliance with the most current USFWS disinfecting protocol when conducting summer mist-net surveys.
6. Continue to cooperate with IDNR and WIU in collecting wing swab samples and wing punch tissue samples from all cave-roosting bats.
7. Implement research and banding to determine migrational pathways and summer maternity areas of Indiana bats from hibernacula in southern Illinois. This includes: a) a migration study of adult female Indiana bats from Magazine Mine and Ellis Cave and, b) banding as many Indiana bats and little brown bats as possible with the hope that other researchers will recover banded bats on summer maternity areas.
8. Continue to monitor hibernacula to ensure that gates and mine-opening stabilization-structures remain effective in reducing unauthorized entry, and maintain proper air flow to perpetuate suitable internal microclimate conditions conducive to use by winter-roosting bats.

B. Maintenance of High-Quality Summer, Transitional and Winter-Roosting Habitats:

1. Continue to monitor hibernacula to ensure that gates and mine-opening stabilization-structures remain effective in reducing unauthorized entry, and improve air-flow/internal microclimate conditions in selected hibernacula to be more suitable to use by winter-roosting bats.
2. Implement a research project with BSU to determine the biological feasibility of sustaining population refugia for bat populations that are somewhat *G. destructans*-free. This involves selection of several Unimin Minerals minor mines to experiment with being able to sustain disinfected hibernacula in order to maintain viable bat populations.
3. Implement watershed restoration projects to improve summer and transitional bat-habitat productivity. This can include: a) implementing timber thinning and prescribed burning projects across the Forest, focusing special attention initially within five miles of hibernacula and maternity sites, the objective being the reduction of canopy density and improvement of foraging-habitat conditions; b) characterizing summer bat-habitat

- conditions within five miles of hibernacula and maternity roosting-sites; and, c) characterizing summer bat-habitat conditions within five miles of maternity colonies.
4. Conduct a landscape-scale habitat evaluation project surrounding all Indiana bat hibernacula and gray bat summer maternity-colonies. This should include: a) spatial analysis of habitat types, suitable summer roosting-habitat, transitional roosting and foraging habitat, habitat connectivity and habitat patch size.
 5. Work cooperatively with private landowners who own Griffith Cave and Cave Springs Cave-Hardin County to implement restrictive access policies or to implement bat-friendly gates.
 6. Continue to convert existing pine stands on the Forest to mature hardwood or mixed mature-hardwood/pine stands using thinning and/or shelterwood methods, minimizing the use of the clearcut method, in conjunction with dormant-season prescribed burning. Retain summer roost-trees within harvest units. Provide for the availability of suitable summer roost-trees within timber treatment areas. Monitor use of treated areas for summer bat use.
 7. Complete a silvicultural strategy for Oakwood Bottoms designed to provide for sustaining mature bottomland hardwood forest while at the same time meeting Indiana bat summer roosting-habitat needs.

C. Continue to monitor winter and summer bat populations, focusing on cave-roosting bats:

1. Implement research and banding to determine migrational pathways and summer maternity areas of Indiana bats from hibernacula in southern Illinois. It is important to know where Indiana bats wintering in southern Illinois hibernacula are traveling to find summer maternity areas. Banding has shown that it is likely that bats using hibernacula in southern Missouri travel to northern Missouri and/or Iowa for maternity areas. No one really knows where Indiana bats or little brown bats that winter in southern Illinois go for their summer maternity areas. This has implications for determining the likelihood of WNS being introduced into Illinois. This can include: a) conducting a migration study of adult female Indiana bats from Magazine Mine and Ellis Cave; and, b) continuing to try to band as many Indiana bats and little brown bats as possible with the hope that other researchers will recover banded bats on summer maternity areas.
2. Conduct hibernacula surveys on one-half of hibernacula each year to reduce potential disturbances, rigidly complying with the latest USFWS WNS decontamination protocol.
3. Conduct monitoring of Indiana bat maternity colonies every two years, including colonies at Oakwood Bottoms, Upper Bluff Lake, and Gallatin County.
4. Monitor little brown bat maternity colonies each year using bat boxes at Oakwood Bottoms and Bluff Lakes. Erect additional bat boxes at Oakwood Bottoms and Bluff Lakes, as well as other wetland areas.
5. Continue to cooperate with IDNR in monitoring the sole gray bat maternity colony in Illinois.
6. Implement a program to determine the distribution and abundance of eastern small-footed bat on NFS lands in southern Illinois.
7. Erect Rafinesque's big-eared bat "condos" in suitable habitats, and monitor numbers of bats. Possible priority areas for erecting condo's are Grantsburg Swamp, Turpen Swamp, and along Bay Creek.

8. Focus summer mist-net surveys in major drainage and tributaries of Bay Creek, Lower Lusk Creek, Grande Pierre Creek, Big Creek, the Saline River and Upper Cache River areas to determine the presence of Indiana bat summer maternity colonies.
9. Continue to conduct acoustical monitoring transects, expanding the use of stationary monitoring stations along Grande Pierre Creek, Lusk Creek, Bay Creek and Big Creek.
10. Work cooperatively with the Cypress Creek National Wildlife Refuge and Crab Orchard National Wildlife Refuge to conduct acoustical monitoring transects.
11. Work cooperatively with IDNR to establish acoustical monitoring transects on IDNR properties.
12. Work cooperatively with IDNR, USFWS and Bat Conservation International (BCI) to install “beak-break technology” at major Indiana bat hibernacula.

D. Seek Acquisition of Indiana Bat and Gray Bat Roosting Sites:

1. Actively work to secure Forest ownership of Toothless Cave and any other hibernacula that may become available for acquisition.
2. Work cooperatively with the IDNR and USFWS to develop a “Habitat Management Plan” for Cave Springs Cave-Hardin County.
3. Provide support and possible assistance that will lead to the construction of a bat-friendly gate at Griffith Cave.
4. Investigate reports of possible new Indiana bat hibernacula, working cooperatively with local speleological organizations.

Conclusion

A careful examination of the current information referenced and background information shows that the Forest considered impacts to forest and cave-roosting bats in preparing the Final Environmental Impact Statement (EIS) for the 2006 Forest Plan and the Biological Assessment of the 2006 Forest Plan. However, pathogens were not considered at that time to represent a major threat and WNS had not yet occurred in the U.S. or in North America.

A WNS RONI was prepared in July 2008 to address this new threat and evaluate if there was a need to make modifications in Forest Plan standards and guidelines. The 2008 WNS RONI determined that the new information regarding discovery of a fungus that appeared to be responsible for the mortality of thousands of bats in the Northeast would have no bearing on continued implementation of the 2006 Forest Plan, or impacts not already considered. Furthermore, a correction of, supplement to or revision of the EIS on the Forest Plan was not considered necessary at that time. It was decided that Forest staff would continue to monitor this issue, and work with the USFWS, IDNR and the caving community to take actions necessary to slow the spread of WNS and to address this threat to bats and cave resources in appropriate agency documents.

Since this decision much has been learned about WNS, including the cause of mortality, as well as a much better projection as to rates of spread of the fungal agent and anticipated bat mortality rates. Bat researchers have projected that WNS will most likely occur in Illinois by 2012 or 2013. Additionally, WNS is now confirmed in three states adjacent to Illinois—Missouri, Indiana and Kentucky—with an outbreak in a hibernaculum in western-central Kentucky less

than 100-200 miles from Illinois. Given this, it is no longer an issue of “if” but rather “when” WNS will be confirmed in Illinois.

It is my determination that a Forest Plan amendment, a supplemental EIS, or a reopening of formal consultation with the USFWS regarding WNS is not necessary at this time for the following reasons:

- a. The IDNR and USFWS are to date taking no new action in Illinois as a result of information regarding WNS.
- b. WNS has not been found in Illinois, even though it has been found in several adjacent states.
- c. Measures are already in place, or are planned to be in place in the very near future, to protect known Priority 1 and 2, and most Priority 3 Indiana bat and southeastern myotis hibernacula on the Forest from unauthorized human entry and disturbances, reducing the potential for humans to unintentionally introduce *G. destructans* into Forest hibernacula. There are no additional protection measures that the Forest could implement that would provide a greater degree of protection, given that the disease can be spread by bat-to-bat contact. There are no further mitigation measures that the Forest could implement that would reduce the likelihood of the spread of WNS into Illinois resulting from bat-to-bat transmission. The Forest has required that all researchers, including Forest personnel, conducting bat research/surveys to fully comply with all elements of the most current USFWS WNS decontamination protocol, which should further reduce the likelihood of WNS being inadvertently introduced in Forest hibernacula.
- d. The Forest will continue to cooperate with the IDNR and USFWS in implementing national and state WNS monitoring and “slow-the-spread” strategies and cooperative monitoring programs with the IDNR, WIU, BSU, and USFWS.
- e. The Forest already has a thorough and effective monitoring strategy in place to monitor the occurrence of WNS in southern Illinois. This includes monitoring of Indiana bat maternity colonies, Indiana bat winter populations, as well as Regional Forester Sensitive and non-listed bat populations. The Forest will continue to cooperate with implementing an Illinois WNS Monitoring Strategy.
- f. Monitoring in 2009-2010 found no incidental take of Indiana bats and implementation of only a very small fraction of the allowable take of Indiana bat habitat.
- g. Forest management activities envisioned in the 2006 Forest Plan, in conjunction with compliance with the USFWS Biological Opinion terms and conditions, in the long term should improve the overall quality of summer bat habitat by reducing stand densities, which should improve summer foraging and roosting habitat.

- h. The probability that incidental take would occur from implementation of management activities on the Forest is very low. The terms and conditions of the 2005 USFWS Biological Opinion were designed to minimize the probability of incidental take, and those measures appear to remain valid and effective at this time.
- i. Forest staff will continue to monitor this issue and, cooperatively with the IDNR and USFWS, take any actions necessary to address this threat to bats and important cave resources.

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