BIOLOGICAL OPINION

Effects to the
Northern Long-eared Bat
from ongoing activities on the
Green Mountain National Forest, Vermont
and the
White Mountain National Forest, New Hampshire and Maine

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INTRODUCTION

An informal programmatic consultation on the Green Mountain National Forest (GMNF) forest management plan was completed in 2006 for the federally endangered Indiana bat (*Myotis sodalis*), endangered eastern cougar (*Puma concolor*) and threatened Canada lynx (*Lynx canadensis*). An informal programmatic consultation on the White Mountain National Forest (WMNF) was completed in 2005 for the federally endangered Indiana bat (*Myotis sodalis*), threatened small whorled pogonia (*Isotria medioloides*), endangered eastern cougar (*Puma concolor*), threatened Canada lynx (*Lynx canadensis*) and the candidate New England cottontail (*Sylvilagus transitionalis*). Since the U.S. Forest Service (USFS) determined that all activities addressed in their Biological Assessment (BA) (U.S.D.A. Forest Service 2015) have had prior section 7 consultation for all other federally listed species that are present on the GMNF and WMNF, this Opinion only addresses one species, the northern long-eared bat (NLEB) (*Myotis septentrionalis*).

This Opinion is based on information provided in the BA which is herein incorporated by reference. A complete administrative record of this consultation is on file at the Service's New England Ecological Services Field Office (with respect to projects on the GMNF and WMNF) at 70 Commercial Street, Suite 300, Concord, New Hampshire 03301-5087 and the Service's Maine Ecological Services Field Office (with respect to projects on the WMNF) at 17 Godfrey Drive, Suite 2, Orono, Maine 04473. A complete consultation history can be found in Appendix A.

Interim 4(d) for the Northern Long-eared Bat

On April 2, 2015, the Service published a species-specific rule pursuant to section 4(d) of the Endangered Species Act (ESA) for the northern long-eared bat (80 FR 17874; U.S. Fish and Wildlife Service 2015a). Section 4(d) of the ESA states that:

> *Whenever any species is listed as a threatened species ... the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species* (16 U.S.C. 1533(d)).

The Service's interim 4(d) rule for the northern long-eared bat exempts the take of northern long-eared bat from the section 9 prohibitions of the ESA, as follows:

(1) Take that is incidental to forestry management activities, maintenance/limited expansion of existing rights-of way, prairie management, projects resulting in minimal (<1 acre) tree removal, provided these activities:
   a. occur more than 0.25 mile (0.4 km) from a known, occupied hibernacula;
   b. avoid cutting or destroying known, occupied roost trees during the pup season (June 1–July 31); and

c. avoid clearcuts (and similar harvest methods, *e.g.*, seed tree, shelterwood, and coppice) within 0.25 (0.4 km) mile of known, occupied roost trees during the pup season (June 1–July 31).

(2) Removal of hazard trees (no limitations).

(3) Purposeful take that results from

a. removal of bats from and disturbance within human structures; and

b. capture, handling, and related activities for northern long-eared bats for 1 year following publication of the interim rule.

Thus, any take of northern long-eared bat occurring in conjunction with these activities that complies with the conservation measures, as necessary, is exempted from section 9 prohibitions by the interim 4(d) rule, and does not require incidental take authorization. Note that no conservation measures are required as part of the interim 4(d) in areas with no known roost trees and no known hibernacula.

However, the interim 4(d) rule does not afford exemption from the ESA's section 7 procedural requirements. Therefore, consultation remains appropriate when actions (even those within the scope of the interim 4[d] rule) are funded, authorized or carried out by a Federal agency. This is because the purpose of section 7 consultation is broader than the mere evaluation of take and issuance of an Incidental Take Statement; such consultations fulfill the requirements of section 7(a)(2) of the ESA, which directs that all Federal agencies insure that their actions are not likely to jeopardize the continued existence of any listed species, or result in the destruction or adverse modification of designated critical habitat.

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DESCRIPTION OF THE PROPOSED ACTION

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas." 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." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present Federal, State, or private activities, as well as the cumulative effects of reasonably certain future State or private activities within the action area.

The USFS reviewed all of their ongoing actions and determined that a total of 14 projects were likely to continue beyond the time when the northern long-eared bat was listed. They then reviewed these projects, including their previous consultation documents, to determine how these projects would affect the northern long-eared bat. The USFS included conservation measures to minimize potential adverse impacts of various activities as part of their project description. The

Service has analyzed the effects of the proposed actions, considering that the projects will be implemented as proposed (including all conservation measures).

The following project background and area descriptions are summarized from the BA. Additional information on the GMNF and WMNF backgrounds and descriptions can be found in the BA (pages 29 through 37 and Appendix 1) and is incorporated by reference.

Projects/Actions that Are Likely to Adversely Affect the Northern Long-eared Bat

The USFS determined that 14 projects are likely to adversely affect the northern long-eared bat as listed in Tables 1and 2 (WMNF) and Table 3 (GMNF) below. All but one of these projects involve prescribed fire in forested areas and/or tree removal outside of the hibernation period, and thus have the potential to adversely affect roosting and/or foraging habitat for the northern long-eared bat, as well as adversely affect individual bats. Projects are expected to be initiated in 2015 and may be implemented through 2020.

Tree removal may occur throughout much of the year. Seasons for timber management are identified as follows. Winter clearing is conducted from December 15 through March 15 when the ground is frozen and bats are not expected to be present. Best management practices preclude timber harvests in spring from March 15 through May 31 because the soils are generally too wet. Timber harvests in summer and early fall may occur from June 1 through October 15 (although June logging is only conducted during unusually dry years) and could impact bats since that is the time of year when they are active. Two projects on the WMNF proposed primarily for summer clearing (June 15 - August 15) will overlap with the time of year that non-volant (unable to fly) pups are present (June 1 through July 31). Fall to early winter timber harvests occurring from October 15 through December 15 are not likely to overlap with the fall swarming and migration periods and would avoid direct adverse effects. The Farwell and Black Mountain prescribed burn acreage will occur during the time of year when bats are active. These prescribed burn projects are proposed for relatively small areas but include a larger contingency area in order to evaluate effects if the fire spreads beyond the target area. Generally when this occurs, it is over a few additional acres, not the full contingency area. Project-specific details are provided in the tables below.

Table 1. Ongoing timber harvest projects on the WMNF (BA page 30).

Project #	Project name	State	Project acres (summer acres)	Season of implementation	Comment summary
WM8	Four Ponds Timber Sale	ME	147 (0)	Fall/Winter 2015-2019	No summer units, but harvest in stand where northern long-eared bat found and patch cuts adjacent.
WM9	Basin Timber Sale	NH	450 (≤74)	Summer/Fall/ Winter 2015-2019	Not surveyed. Harvest during non-hibernation season and close to wetland.
WM11	Whitetail Timber Sale	NH	264 (≤177)	Summer/Fall/ Winter 2015-2019	Not surveyed. Harvest during non-hibernation season and close to wetland.
Total all WMNF timber harvests				**861 acres (251)**	

Table 2. Ongoing prescribed burn projects on the WMNF (BA page 35).

Project #	Project name	State	Project acres (summer acres)	Season of implementation	Comment summary
WM3	Farwell Mountain prescribed burn	ME	10 acres target amount + 85 acres contingency (95)	April-Oct. 2015-2018	Not surveyed. Potentially large project area; burn likely to occur when pregnant bats or flightless young are present.
WM4	Batchelder Brook (Hillock) prescribed burns	NH	16 acres (2 units)	April-June/ Sept-Nov. 2015-2018	Not surveyed. Medium project area; next to Basin timber sale; within 1 mile of several wetlands; burns likely to occur when pregnant bats are present.
WM5	Black Mountain prescribed burn	NH	52 acres target amount, 270 acres maximum	April-June/ Sept-Nov. 2015-2018	Not surveyed. Relatively large project area; next to Basin timber sale; within 0.5 mile of wetland; burn may occur when pregnant bats are present.
Total all WMNF prescribed burns			**78 acres (381 acres max)**		

Table 3. Ongoing timber harvest on the GMNF (BA pages 29 and 30).

Project #	Project name	State	Project extent (extent during summer)	Season of implementation	Comment summary
GM2	Country Road Sale-Nordic IRP	VT	85 (≤12)	Summer/Fall/ Winter 2015-2016	NLEB present; ≤ 14 acres of clearcut and single tree-group selection harvest could be during summer, including non-volant season.
GM6	Pumphouse West Sale-Dorset-Peru IRP	VT	467 (≤246)	Summer/Fall/ Winter 2015-2017	Not surveyed yet; ≤ 246 acres of harvest ranging from clearcut to single-tree selection could be during summer, including non-volant season.
GM7	Mad Tom Sale--Dorset-Peru IRP	VT	401 (≤120)	Summer/Fall/ Winter 2015-2017	NLEB present; ≤ 120 acres of harvest ranging from clearcut to single-tree selection could be during summer, including non-volant season.
GM10	Beech Ridge Sale-Dorset-Peru IRP	VT	164 (≤111)	Summer/Fall/ Winter 2015-2017	Not surveyed yet; ≤ 111 acres of timber harvest ranging from clearcut to single-tree selection could be during summer, including non-volant season.
GM11	Grouse Sale – UWR IRP	VT	480 (≤93)	Summer/Fall/ Winter 2015-2017	Not surveyed yet; ≤ 93 acres of timber harvest ranging from clearcut to single-tree selection could be during summer, including non-volant season.
GM12	Upper White River Sale-UWR IRP	VT	88 (≤36)	Summer/Fall/ Winter 2015-2017	Not surveyed yet; ≤ 138 acres of timber harvest ranging from clearcut to single-tree selection could be during summer, including non-volant season.
GM14	Tucker Brook Sale-UWR IRP	VT	89 (≤71)	Summer/Fall/ Winter 2015-2017	Not surveyed yet; ≤ 30 acres of shelterwood harvest, ≤ 42 acres of thinning could be during summer, including non-volant season.
GM18	Timber Sale Improvement /Pre-Commercial Thinning	VT	475 (475)	Summer/Fall/ Winter 2015-2018	Pre-commercial removal of saplings and trees ranging between ½-6" dbh; non-merchantable species greater than 6" dbh may also be removed for stand improvement. No timber management activity from April 15-October 30 in one stand within 5 miles of Indiana bat hibernaculum.
Total all GMNF timber harvest			**2,249 acres (1,164)**		

In summary, eleven projects in the combined two National Forests will involve tree removal that may include a variety of timber management methods such as clearcut, single- or group-tree selection, shelterwood or thinning harvest techniques. Three projects on the WMNF will include areas managed by prescribed fire through under burns to remove the competing hardwood understory while leaving the over-story intact. A combined 3,491 acres of potential or known

(presence verified through acoustic surveys) northern long-eared bat habitat may be affected through the various forest management activities proposed to be implemented on the GMNF and WMNF. Northern long-eared bats may be directly adversely affected during active season tree removal or prescribed burns or indirectly affected through off-season roost tree removal (project WM8) affecting their summer roosting and foraging habitat.

Conservation Measures

Conservation measures are those actions taken to benefit or promote the recovery of the species. These actions taken by the Federal agency serve to minimize or compensate for project effects on the species under review and are included as an integral portion of the proposed action.

To be in compliance with the interim 4(d) rule for northern long-eared bat, the USFS has committed to the following conservation measures as part of the project description:

> 1) All proposed activities will occur more than 0.25 mile (0.4 km) from a known, occupied hibernacula.
>
> 2) The USFS will avoid cutting or destroying known, occupied roost trees during the pup season (June 1–July 31).
>
> 3) The USFS will avoid clearcuts (and similar harvest methods, *e.g.*, seed tree, shelterwood, and coppice) within 0.25 (0.4 km) mile of known, occupied roost trees during the pup season (June 1–July 31).

Through implementation of the respective existing Land and Resource Management Plans (Forest Plans), the WMNF and GMNF will continue to provide a diverse, productive, healthy, and sustainable forest that is resilient to natural and human-caused disturbances. Non-native invasive species are at low levels and do not alter ecosystem processes. Vegetation composition and structure objectives provide a wide range of plant and animal habitats, including habitat for the northern long-eared bat. This is accomplished by managing different land areas (management areas) that promote various management types (*e.g.*, semi-primitive vs. developed recreation, wilderness, forestry), as well as by implementing a range of silvicultural practices (*e.g.*, even-aged and uneven-aged harvest prescriptions; promoting hardwoods, softwoods, and unique communities such as aspen-birch and oak-pine; providing both mature and early successional stages for structural diversity, etc.). Through the implementation of diverse management, the WMNF and GMNF provide a wide array of habitat conditions that are continually renewed through prescribed activities that provide a long-term benefit to the northern long-eared bat.

Forest Plans for the GMNF and WMNF include standards and guidelines that contribute to reducing the risk of adverse effects to northern long-eared bats. Forest Plan standards and guidelines were developed to protect soils, riparian habitats, and water quality. The following

standards and guidelines taken from the respective GMNF and WMNF forest plans address snag tree and wildlife reserve tree retention that will maintain potential northern long-eared bat roost trees.

GMNF Wildlife Reserve Trees

S-1 -- Uncut patches totaling five percent of the harvested area shall be retained during forest management activities of five acres or greater where harvest reduces the basal area of a stand below 30 square feet per acre.

S-2 -- At least five wildlife trees shall be retained per acre harvested during forest management activities outside potential Indiana bat maternity roosting habitat (as defined below) where harvest will leave basal area above 30 square feet per acre.

S-3 -- Wildlife reserve trees shall include two cavity or snag trees of the largest available dbh [diameter breast height], live trees with exfoliating bark, den trees, nest trees, or yellow birch and red maple >26 inch dbh considered "cull" or unacceptable growing stock. In areas lacking such cavity trees and snags, retain at least two trees of the largest available dbh with defects likely to lead to cavity formation.

S-4 -- All hard snags and den trees and two mast trees per acre shall be retained within 300 feet of ponds, lakes, beaver ponds, wetlands, permanent upland openings greater than five acres, and within riparian zones of all streams as shown on USDA Forest Service 1:24,000 topographic maps. If hard snags, mast trees, and den trees are not available in these areas, retain at least six replacement trees per acre.

S-5 -- All shagbark hickory trees shall be retained unless they pose a safety hazard.

G-1 -- Patches of retained trees should be at least one-quarter acre in size and located to encompass as many wildlife trees as possible, including nest or den tees; trees with exfoliating bark; snags greater than or equal to eight inches dbh; other trees with cavities or broken tops; and mast trees such as oaks, bear-clawed beech, hop hornbeam, hickories, apple, and black cherry.

G-2 -- Patches of retained trees should be located along the edge of openings or riparian corridors where possible.

GMNF Snags

G-1 -- All soft snags should be retained unless they pose a safety hazard.

G-2 -- Evidence of wildlife use for feeding, roosting, nesting, or denning should be used to prioritize snags for retention.

GMNF Den & Nest Trees

G-1 -- Den trees with cavities or openings that are not prone to collecting water should be retained whenever possible.

WMNF Wildlife Reserve Trees

S-1 When harvest reduces the basal area of a stand below thirty square feet per acre, uncut patches totaling five percent of the harvested area must be retained, with each at least one quarter acre in size.

S-2 *When timber harvest will leave basal area above thirty square feet per acre, at least six cavity and/or snag trees per acre must be retained. These leave trees should include at least one wildlife tree and three trees exceeding twelve inches dbh per acre when feasible. In areas lacking such cavity trees and snags, trees of the largest available diameters with defects likely to lead to cavity formation should be retained.*

G-1 *Uncut patches retained under S-1 should be located to encompass as many wildlife trees, snags greater than or equal to nine inches dbh, other trees with cavities or broken tops, and bear-clawed beech as possible. A wildlife tree or snag greater than eighteen inches dbh may be used as a nucleus. In areas lacking suitable cavity trees and snags, trees of the largest available diameters with defects likely to lead to cavity formation should be retained.*

G-2 *When possible, uncut patches retained under S-1 and leave trees retained under S-2 should be placed within three hundred feet of open wetlands, ponds, riparian areas, or wildlife openings greater than five acres in size.*

G-3 *Existing standing dead, and dead-and-down woody material, should be retained and not damaged during forest management activities unless they are considered a safety hazard or the area is being permanently removed from a forest condition (for example, parking lot construction). This applies especially to large (greater than or equal to eighteen inches dbh) hollow or rotten logs and rotten stumps.*

Currently, there are no known occupied hibernacula or occupied roost trees within the action area. Implementation of the interim 4(d) rule conservation measures and the additional conservation measures described above would reduce any potential adverse effects, should hibernacula or known, occupied roost trees be later identified as occurring within the action area.

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 Opinion, the action area includes the entire GMNF and WMNF, which encompass approximately 446,000 and 793,000 acres respectively. The GMNF is located primarily in Addison, Bennington, Rutland, Washington, Windham and Windsor Counties in Vermont. The WMNF is located primarily in Carroll, Coos, and Grafton Counties in New Hampshire and Oxford County in Maine.

STATUS OF THE SPECIES

Refer to the final rule (80FR 17974; U.S. Fish and Wildlife Service 2015a) for the best available information on northern long-eared bat life history and biology, threats, distribution and overall status. The following text is summarized from that rule.

Life History and Biology

The northern long-eared bat is a temperate, insectivorous, migratory bat that hibernates in mines and caves in the winter and spends summers in wooded areas. The key stages in its annual cycle are: hibernation, spring staging and migration, pregnancy, lactation, volancy/weaning, fall migration and swarming. Northern long-eared bats generally hibernate between mid-fall through mid-spring each year. Spring migration period likely runs from mid-March to mid-May each year, as pregnant females depart shortly after emerging from hibernation to migrate to their summer maternity areas. Young northern long-eared bats are typically born in late May or early June, with females giving birth to a single offspring. Lactation then lasts three to five weeks, with pups becoming volant (able to fly) between early July and early August. Fall migration likely occurs between mid-August and mid-October.

Summer habitat and ecology

Suitable summer habitat[1] for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel, and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts, as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure.

Many species of bats, including the northern long-eared bat, consistently avoid foraging in or crossing large open areas, choosing instead to use tree-lined pathways or small openings (Patriquin and Barclay 2003; Yates and Muzika 2006). Furthermore, the wing morphology of northern long-eared bats suggests that they are adapted to moving in cluttered habitats. Thus, isolated patches of forest may not be suitable for foraging or roosting unless the patches are connected by a wooded corridor.

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies. Northern long-eared bats actively form colonies in the summer (Foster and Kurta 1999) and exhibit fission-fusion behavior (Garroway and Broders 2007), where members frequently coalesce to form a group (fusion), but composition of the group is in flux, with

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[1] See the Service's current summer survey guidance for our latest definitions of suitable habitat.

individuals frequently departing to be solitary or to form smaller groups (fission) before returning to the main unit (Barclay and Kurta 2007). As part of this behavior, northern long-eared bats switch tree roosts often (Sasse and Pekins 1996), typically every 2 to 3 days (Foster and Kurta 1999; Owen *et al.* 2002; Carter and Feldhamer 2005; Timpone *et al.* 2010). Northern long-eared bat maternity colonies range widely in size, although 30-60 individuals may be most common (Service 2015a). Northern long-eared bats show some degree of interannual fidelity to single-roost trees and/or maternity areas. Male northern long-eared bats are routinely found with females in maternity colonies. Northern long-eared bats use networks of roost trees often centered on one or more central-node roost trees (Johnson *et al.* 2012). Northern long-eared bat roost networks also include multiple alternate roost trees and male and non-reproductive female northern long-eared bats may also roost in cooler places, like caves and mines (Barbour and Davis 1969; Amelon and Burhans 2006).

Northern long-eared bats roost in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh). Northern long-eared bats are known to use a wide variety of roost types, using tree species based on presence of cavities or crevices or presence of peeling bark. Northern long-eared bats have also been occasionally found roosting in structures such as barns and sheds (particularly when suitable tree roosts are unavailable).

Migration

Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat some distance from their hibernaculum. The northern long-eared bat is not considered to be a long distance migrant (typically 40-50 miles). Migration is an energetically demanding behavior for the northern long-eared bat, particularly in the spring when their fat reserves and food supplies are low and females are pregnant.

Winter habitat and ecology

Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (*e.g.* abandoned or active mines, railroad tunnels). There may be other landscape features used by northern long-eared bats during the winter that have yet to be documented. Generally, northern long-eared bats hibernate from October to April, depending on local climate (November-December to March in southern areas and as late as mid-May in some northern areas).

Hibernacula for northern long-eared bats typically have significant cracks and crevices for roosting, relatively constant, cool temperatures (0-9 degrees Celsius) with high humidity, and minimal air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

Northern long-eared bats tend to roost singly or in small groups (Service 2015a), with hibernating population sizes ranging from just a few individuals to around 1,000 (Service,

unpublished data). Northern long-eared bats display more winter activity than other cave species, with individuals often moving between hibernacula throughout the winter (Griffin 1940; Whitaker and Rissler 1992; Caceres and Barclay 2000). Northern long-eared bats have shown a high degree of philopatry to the hibernacula used, returning to the same hibernacula annually.

Spring staging and fall swarming habitat and ecology

Upon arrival at hibernacula in mid-August to mid-November, northern long-eared 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 caves during the day. Swarming continues for several weeks and mating occurs during the latter part of the period. After mating, females enter directly into hibernation but not necessarily at the same hibernaculum where they had mated. A majority of bats of both sexes hibernate by the end of November (by mid-October in northern areas).

After hibernation ends in late March or early April (as late as May in some northern areas), most northern long-eared bats migrate to summer roosts. Females emerge from hibernation prior to males. Reproductively active females store sperm from autumn copulations through the winter. Ovulation takes place after the bats emerge from hibernation in the spring. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs. This period can be as short as a day for an individual, but not all bats emerge on the same day.

In general, northern long-eared bats use roosts in the spring and fall similar to those selected during the summer. Suitable spring staging/fall swarming habitat consists of the variety of forested/wooded habitats where they roost, forage, and travel, which is most typically within 5 miles of a hibernaculum. This includes forested patches as well as linear features such as fencerows, riparian forests and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1,000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow.

Threats

No other threat is as severe and immediate for the northern long-eared bat as the disease white-nose syndrome (WNS). It is unlikely that northern long-eared bat populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2007 (later biologists found evidence from 2006 photographs), WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast. Population numbers of northern long-eared bats have declined by 99 percent in the Northeast, which along with Canada, has been considered the core of the species' range. Although there is uncertainty about how quickly WNS will spread through the remaining portions of this species' range, it is expected to spread throughout the entire range at some time in the future. In general, the Service

believes that WNS has significantly reduced the redundancy and resiliency of the northern long-eared bat.

Although significant northern long-eared bat population declines have only been documented due to the spread of WNS, other sources of mortality could further diminish the species' ability to persist as it experiences ongoing dramatic declines. Specifically, declines due to WNS have significantly reduced the number and size of northern long-eared bat populations in some areas of its range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual northern long-eared bats sickened or struggling with infection by WNS may be less able to survive other stressors. Second, northern long-eared bat populations impacted by WNS, having smaller numbers and reduced fitness among individuals, may be less able to recover and more likely to be prone to extirpation. The status and potential for these impacts will vary across the range of the species.

Bats affected but not killed by WNS during hibernation may be weakened by the effects of the disease and may have extremely reduced fat reserves and damaged wing membranes. These effects may reduce their capability to fly or to survive long-distance migrations to summer roosting or maternity areas.

In areas where WNS is present, there are additional energetic demands for northern long-eared bats. For example, WNS-affected bats have less fat reserves than non-WNS-affected bats when they emerge from hibernation (Reeder *et al.* 2012; Warnecke *et al.* 2012) and have wing damage (Meteyer *et al.* 2009; Reichard and Kunz 2009) that makes migration and foraging more challenging. Females that survive the migration to their summer habitat must partition energy resources between foraging, keeping warm, successful pregnancy and pup-rearing, and healing and may experience reduced reproductive success. In addition, with wing damage, there may be an increased chance of WNS-affected bats being killed or harmed as a result of the proposed action. Again, this is particularly likely if timber harvest or burns are conducted early in the spring (April–May) when bats have just returned, have damaged wings, and are exposed to colder temperatures when torpor (temporary unresponsive state) is used more frequently.

Over the long term, sustainable forestry benefits northern long-eared bats by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on the northern long-eared bat, depending on the quality, amount, and location of the affected habitat, and the time of year of the activity. Contingent on forest characteristics and location, forested areas can function as summer maternity habitat, staging and swarming habitat, migration or foraging habitat, or sometimes, combinations of more than one habitat type. Impacts from tree removal to individuals or colonies would be expected to range from indirect impact (*e.g.*, minor amounts of forest removal in areas outside northern long-eared bat summer home ranges or away from hibernacula), to minor (*e.g.*, largely forested areas, areas with robust northern long-eared bat populations), to significant (*e.g.*, removal of a large percentage of summer home range, highly fragmented landscapes, areas with WNS impacts).

Lastly, there is growing concern that bats, including the northern long-eared bat (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Mortality of northern long-eared bats has been documented at multiple operating wind turbines/farms. The Service is now working with wind farm operators to avoid and minimize incidental take of bats and assess the magnitude of the threat.

Rangewide Status

The northern long-eared bat ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993; Caceres and Pybus 1997; Environment Yukon 2011) (Figure 1). In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east through the Gulf States to the Atlantic Coast (Whitaker and Hamilton 1998; Caceres and Barclay 2000; Amelon and Burhans 2006). The species' range includes the following 37 states (plus the District of Columbia): Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in Canadian Provinces, Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000). However, throughout the majority of the species' range, it is patchily distributed, and historically was less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006).

Although they are typically found in low numbers in inconspicuous roosts, most records of northern long-eared bats are from winter hibernacula surveys (Caceres and Pybus 1997). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula contain only a few (1 to 3) individuals (Whitaker and Hamilton 1998). Known hibernacula (sites with one or more winter records of northern long-eared bats) have been documented in: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (3), Illinois (21), Indiana (25), Kentucky (119), Maine (3), Maryland (8), Massachusetts (7), Michigan (103), Minnesota (11), Missouri (more than 269), Nebraska (2), New Hampshire (11), New Jersey (7), New York (90), North Carolina (22), Oklahoma (9), Ohio (7), Pennsylvania (112), South Carolina (2), South Dakota (21), Tennessee (58), Vermont (16), Virginia (8), West Virginia (104), and Wisconsin (67). Northern long-eared bats are documented in hibernacula in 29 of the 37 states in the species' range. Other states within the species' range have no known hibernacula (due to no suitable hibernacula present, lack of survey effort, or existence of unknown retreats).

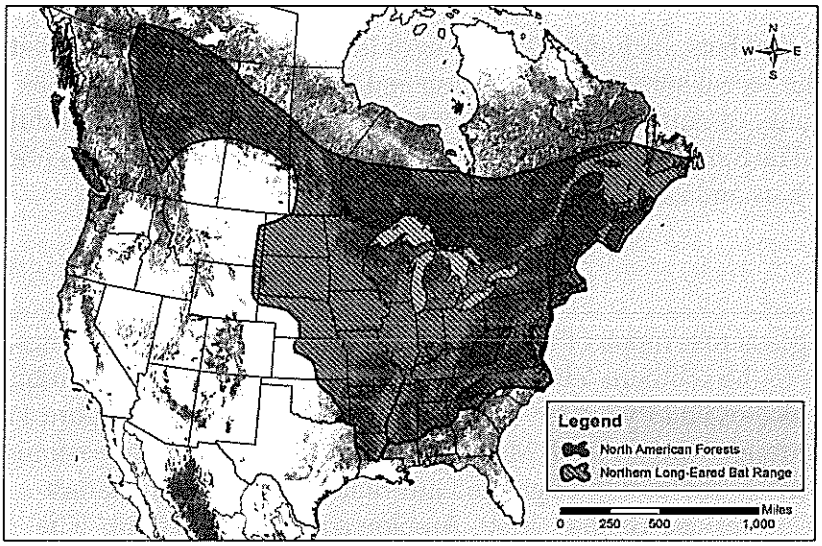

Figure 1. Range of the northern long-eared bat.

The current range and distribution of northern long-eared bats must be described and understood within the context of the impacts of WNS. Prior to the onset of WNS, the best available information on northern long-eared bats came primarily from surveys (usually focused on Indiana bat or other bat species) and some targeted research projects. In these efforts, the northern long-eared bat was very frequently encountered and was considered the most common Myotid bat in many areas. Overall, the species was considered to be widespread and abundant throughout its historic range (Caceres and Barclay 2000).

WNS has been particularly devastating for northern long-eared bats in the Northeast, where the species was believed to be the most abundant. There are data supporting substantial declines in northern long-eared bat populations in portions of the Midwest due to WNS. In addition, WNS has been documented at more than 100 northern long-eared bat hibernacula in the Southeast, with apparent population declines at most sites. WNS has not been found in any of the western states to date and the species is considered rarer in the western extremes of its range. We expect further declines as the disease continues to spread across the species' range.

Status of the Northern Long-eared Bat in Vermont, New Hampshire and Maine

Historically, the northern long-eared bat was widely distributed in the eastern part of its range (Caceres and Barclay 2000). Prior to documentation of WNS, northern long-eared bats were consistently caught during summer mist-net surveys and detected during acoustic surveys in the eastern United States (Service 2014, unpublished data). Northern long-eared bats continue to be distributed across much of the historical range, but there are many gaps within the range where bats are no longer detected or captured or where their occurrence is sparse. Similar to summer distribution, northern long-eared bats were known to occur in many hibernacula throughout the Northeast. Frick *et al.* (2015) documented the local extinction of northern long-eared bats from

69 percent of sites included in their analyses (468 sites where WNS has been present for at least 4 years in Vermont, New York, Pennsylvania, Maryland, West Virginia and Virginia). Since WNS has been documented, surveys of multiple hibernacula in Vermont, New Hampshire and Maine indicate northern long-eared bats are no longer present (Darling S. Vermont Department of Fish and Wildlife (VTFWD), pers. comm.; Preston 2015, unpublished data). Moreover, most of the mines serving as hibernacula in these states are generally small and lack deep cracks, fissures or piles of rocks enabling surveyors to conclude that northern long-eared bats are now absent.

In Vermont, the northern long-eared bat was once one of the State's most commonly mist-netted bats, but is now its rarest (VTFWD 2014, in litt.). Prior to 2009, an annual average of 458 northern long-eared bats was found in 16 hibernacula, although this is thought to be an underestimate due to the species' preference for hibernating in hibernacula cracks and crevices (Service 2015a). WNS was confirmed in Vermont in the winter of 2007-2008. According to the VTFWD, it is believed that all of the State's bat hibernacula are infected with WNS. Statewide hibernacula, summer mist-net, acoustic and fall swarm data collected in 2010 documented a 93-100 percent decline in the northern long-eared bat population post-WNS (Service 2015a). In most recent surveys, a few northern long-eared bats were found in three hibernacula in 2012-2013; however, no individuals were found in any surveyed hibernacula in the 2013-2014 winter surveys. Prior to WNS detection, summer capture data (from 2001-2007) indicated that northern long-eared bats comprised 19 percent of bats captured, and were considered the second most common bat species in the State (Darling and Smith 2011).

In New Hampshire, northern long-eared bats were known to inhabit at least nine mines and two World War II bunkers and were consistently found in summer surveys (Preston 2015, unpublished data). The northern long-eared bat was one of the most common species captured (27 percent of captures) in the White Mountain National Forest in 1993 and 1994 (Sasse and Pekins 1996). WNS was confirmed in New Hampshire in the winter of 2008-2009. Bats with WNS were confirmed on the WMNF in March 2010 near the base of Mount Washington when they were collected after emerging from an unknown hibernaculum. Data from both hibernacula surveys and summer surveys have shown a dramatic decline (99 percent) in northern long-eared bat numbers compared to pre-WNS numbers (New Hampshire Fish and Game [NHFGD] 2013, unpublished data.). Results from surveys conducted at four of New Hampshire's hibernacula in 2014 found no northern long-eared bats; previous to WNS infection, the species was found in relatively high numbers (*e.g.*, 75 to 127 individuals) in most of these small hibernacula. Furthermore, Moosman *et al.* (2013) conducted mist-net surveys over 7 years pre- and post-WNS (2005-2011) at Surry Mountain Lake in Cheshire County, New Hampshire, and found a 98 percent decline in the capture rate of northern long-eared bats.

In Maine, three bat hibernacula were sporadically surveyed prior to WNS, and northern long-eared bats were documented in all of these sites. WNS was first confirmed in the State in the winter of 2010–2011. Prior to WNS, the northern long-eared bat was found in numbers greater than 100 at two of the three regularly surveyed hibernacula; however, in 2013, only one northern

long-eared bat was found during surveys conducted at all three of the State's primary hibernacula (Maine Department of Inland Fisheries and Wildlife [MDIFW] 2013, in litt.).

Northern long-eared bats were documented as summer residents in Acadia National Park (Service 2015a), and considered to be fairly common mist-net captures during surveys conducted in 2009 and 2010. Over the two-year period, 242 northern long-eared bats were captured, comprising 27 percent of the total captures for the areas surveyed (U.S. National Park Service 2011, unpublished data). Recent findings from Acadia National Park now show a precipitous decline in the northern long-eared bat population in less than 4 years, based on mist-net surveys conducted pre-WNS (2008, 2009) and post-WNS (2010 through 2014) (Service 2015a). Acoustic surveys corroborate the decline of the northern long-eared bat documented in mist-net and hibernacula surveys. The northern long-eared bat was infrequently found in summer acoustic surveys conducted in Maine in 2013, which contrasts with widespread, frequent acoustic detections of *Myotis* species (MDIFW 2015, in litt.) prior to the onset of WNS.

Critical Habitat

Critical habitat has not been proposed for the northern long-eared bat.

Conservation Needs of the Species

The species' conservation needs define what is needed in terms of reproduction, numbers, and distribution to ensure the species is no longer in danger of extinction. The conservation needs should be defined in the species' recovery outline or plan. Since there is no recovery plan or recovery outline available at this time, we will outline the conservation needs based on our current understanding of the species.

We find that the primary conservation need of the northern long-eared bat is to reduce the threat of WNS. This includes minimizing mortality in WNS-affected areas, and slowing the rate of spread into currently unaffected areas. In addition, northern long-eared bats that continue to exist within WNS-affected areas need to be able to continue to survive and reproduce in order to stabilize and/or increase the populations. This can be done by reducing the other threats to the species, as listed above. Therefore, efforts to protect hibernacula from disturbances need to continue. This should include restricting human access to hibernacula, particularly during the hibernation period, constructing and maintaining appropriately designed gates, and restoring microhabitat conditions in hibernacula that have been altered. Efforts should also be made to protect and restore (in some cases) adequate fall swarming habitat around hibernacula. Known maternity habitat should be maintained, and the removal of known roost trees, particularly when pregnant females and/or young are present, should be reduced. Research to identify important hibernacula and summer areas and to delineate the migratory relationship between summering and wintering populations should also be pursued.

ENVIRONMENTAL BASELINE

The Environmental Baseline analyzes the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and the ecosystem within the action area. Additional information can be found on pages 6-23 of the BA.

Status of the Species in the Action Area

Population Status on the GMNF

The GMNF conducted mist-net trapping for bats between 1999 and 2006 in the Middlebury, Manchester and Rochester Districts. Mist-net trapping captured a total of 597 bats with 187 net nights of trapping effort during the four trapping seasons, or a rate of 3.19 bats per net night. The number of bats captured per net night varied considerably from a low of 1.43 in 2000 to a high of 7.62 in 2001. Although many net sites were sampled repeatedly, the selection of sampled sites varied considerably each year and no individual site was sampled every year.

Northern long-eared bats represented an average of 11.4 percent of the captured bats (68 of 597 bats). During individual seasons, the proportion of northern long-eared bats ranged widely from about 4 percent (2001 and 2006) to 50 percent (2000) of the captured bats. Certainly, the selection of individual trapping sites and the corresponding habitats that were sampled in any given year would influence the species composition of captured bats. It is likely that the number of northern long-eared bats captured in any given year was largely a function of net-site selection. No comparable mist-net data are available for the GMNF post-WNS, since mist-netting was not conducted.

Since 2009, the GMNF has conducted 110 vehicle-based acoustic bat surveys along eight different driving routes during June and July. Surveys began in 2009, after WNS already had decimated populations of hibernating bats in Vermont, and are conducted annually. No comparable pre-WNS data are available for the GMNF. Three routes are located on the Middlebury and Rochester Ranger District and five are on the Manchester Ranger District. Based on in-house analysis using EchoClass v2, the GMNF determined that a single call sequence of northern long-eared bat calls were identified in each of only nine of the 110 surveys.

From 2004 to 2008, the GMNF deployed Anabat acoustic recording devices adjacent to and in conjunction with mist-net capture activities. Northern long-eared bats were captured at these sites between 2001 and 2006. The GMNF also conducted several acoustic surveys in 2008 that were not associated with mist-net trapping. An analysis of all calls collected during these efforts identified only two probable northern long-eared bat calls, one each from two different sites.

The GMNF conducted fixed-site acoustic surveys at 23 sites across the GMNF in 2010 and 14 sites on the Manchester District in 2012. Based on the in-house analysis using Echoclass v2, northern long-eared bats were detected with high likelihood at one site on the Middlebury

District, and with possible detections at three other sites on the Middlebury and Manchester Districts in 2010. On the Manchester District in 2012, northern long-eared bats were detected with high likelihood at one site and possible detection at three other sites. These surveys suggest that there is a low presence of northern long-eared bats on the landscape in the GMNF post-WNS.

The GMNF conducted fixed-site project-specific acoustic surveys at 22 sites across five different timber project areas on the Manchester District in 2014. Acoustic surveys focused on timber harvest areas where soil conditions are suitable for summer operation. Survey equipment included a mix of zero-crossing (*e.g.*, Anabat SD-2) and multi-spectrum (*e.g.*, Pettersson D500X) recorders as opposed to the zero-crossing equipment used during prior surveys. Northern long-eared bats were positively detected at six survey sites in three timber sale areas. The detection rate is similar to the rates observed at fixed-site acoustic surveys conducted in 2010 and 2012. One cluster of three sites was located at elevations of 2,100 to 2,200 feet. The other cluster was located at an elevation of about 1,500 feet. For post-WNS data, it is estimated that the detection rate for northern long-eared bats on the GMNF is approximately 24 percent, based on all acoustic surveys combined.

Population Status on the WMNF

Northern long-eared bats have been identified at a number of locations during surveys conducted on the WMNF. In 1992 and 1993, Krusic *et al.* (1996) conducted a general woodland bat survey in a variety of WMNF habitats. Northern long-eared bats made up twelve percent of the individual bats of all species captured in mist nets or harp traps, the second highest proportion of the total, after little brown bats (56 percent). Chenger (2002) conducted general mist net surveys at ten locations in New Hampshire, including five sites on the WMNF. A total of 202 bats of four species were captured throughout New Hampshire, including northern long-eared bats (23 percent of total captures). Totals from WMNF mist net locations were proportional to other survey regions in the study, and northern long-eared bats were captured at all five WMNF sites. Two years later, Chenger (2004) conducted mist net surveys at eight sites in New Hampshire and captured six species of bats. Northern long-eared bats represented seven percent of the total captures, and were captured at seven of the eight sites.

Vehicle-based acoustic surveys were conducted from 2009 through 2013 (BA pages 17 and 18). Five transects were surveyed in 2009, with four additional transects added in 2010. Data were not identified to species, but were grouped based on whether the characteristic frequencies of the calls were high, medium or low. Virtually all bats in the high frequency category belong to four of the five species affected by WNS syndrome on the WMNF: little brown bat, northern long-eared bat, eastern small-footed bat, and tri-colored bat. When viewed as a group, this category of bats has declined by 93 percent in the five-year period between 2009 and 2013. The WMNF conducted stationary bat acoustic surveys between 2009 and 2013 in various locations across the forest. Data from vehicle-based and stationary acoustic surveys were analyzed and a total of eight independent locations were identified as having northern long-eared bats present in 2009 or

2010; no locations were identified as having northern long-eared bats present in 2011, 2012 or 2013. Acoustic surveys were conducted in the fall of 2010 and 2011 in an attempt to find a suspected hibernaculum thought to occur on the western side of Mount Washington. The vast majority of recorded calls were from the little brown bat. Two locations were identified using Kaleidoscope Pro (v. 2.2.1) and Echoclass (v. 2) where northern long-eared bats may have been present. One site is located at an unusual water feature on the Ammonoosuc Ravine Trail at approximately 3,500 feet, most likely served as a foraging location (and not fall swarming). The other northern long-eared bat location is adjacent to the Ammonoosuc River at 2,900 feet, also most likely a foraging location.

During the summer of 2014, acoustic surveys were conducted at 153 locations to assess possible presence in future timber sale locations. Acoustic survey work focused on areas where trees might be cut during the bat's active season (approximately April 1–October 31). Additionally, acoustic surveys were conducted at three sites located at two previously documented maternity colonies identified by Sasse (1995). Northern long-eared bats were confirmed at 14 of the 153 sites, including all three sites from the two historic maternity colonies, suggesting a nine percent detection rate.

Number of potential individual northern long-eared bats and colonies on the GMNF and WMNF

The exact number of individual northern long-eared bats and summer colonies on the GMNF and WMNF is unknown. We have estimated that there may be at least 42 colonies of northern long-eared bats on the GMNF and at least 29 colonies of northern long-eared bats on the WMNF, based on the calculations shown below (as presented in the Biological Opinion on Ongoing Activities for the Mark Twain National Forest (Service 2015b). In addition, an unknown number of male northern long-eared bats are expected to occur on both the GMNF and the WMNF.

GMNF

- There are 446,000 acres on the GMNF.
- Three percent of this area does not provide habitat (*i.e.*, open areas and wetlands) for northern long-eared bats: 446,000 acres x 97 percent = 432,620 acres of forested habitat available to the species.
- 2.47 acres/ha; 432,620/2.47 = 175,150 ha of forested habitat.
- Between 2010 and 2014, the average detection rate on the GMNF for northern long-eared bat was 24 percent; 24 percent x 175,150 = 42,036 ha where northern long-eared bats would be predicted to occur.
- Average group size of northern long-eared bat = ~ 5 bats/group (Johnson *et al.* 2012).
- Average colony size of northern long-eared bat = ~ 60 (Service 2015a).
- 60/5 = 12 northern long-eared bat groups.
- Average colony size in Vermont is unknown; based on literature from Owen *et al.* (2003), Carter and Feldhammer (2005), Broders *et al.* (2006), and Lacki *et al.* (2009), the average home range for a colony of northern long-eared bats ranges from as low as 17.7

ha (43.7 acres) to as high as 186.3 ha (460.4 acres). To determine an estimated colony home range of an individual/group on the GMNF, we averaged the ranges in the references above and calculated it to be approximately 83 ha/group.

- 12 groups x 83 ha/group = 996 ha for the average home range of a colony.
- 42,036 ha/996 ha = 42 colonies.

Number of potential individual northern long-eared bats/colonies potentially exposed to ongoing projects involving timber removal:

- acres subject to timber management activities: 2,551 acres;
- 2,551 acres/2.47 acres per ha = 1,033 ha;
- 1,033 ha/996 ha = 1 colony; and
- estimated number of northern long-eared bat colonies on the GMNF exposed to timber management activities associated with nine ongoing projects = one colony from timber management.

WMNF

- There are 793,000 acres on the WMNF.
- Four percent of this area does not provide habitat for northern long-eared bats: 793,000 acres x 96 percent = 761,280 acres of forested habitat available to the species.
- 2.47 acres/ha; 761,280/2.47= 308,210 ha.
- Between 2010 and 2014, the average detection rate on the WMNF for northern long-eared bat was 9 percent; 9 percent x 308,210 = 27,738 ha where northern long-eared bats would be predicted to be detected.
- Average group size of northern long-eared bat = ~ five bats/group (Johnson *et al.* 2012)
- Average colony size of northern long-eared bat = ~ 60 bats (Service 2015a).
- 60/5 = 12 northern long-eared bat groups.
- Average colony size in New Hampshire is unknown; based on literature from Owen *et al.* (2003), Carter and Feldhammer (2005), Broders *et al.* (2006), and Lacki *et al.* (2009), the average home range for a colony of northern long-eared bats ranges from as low as 17.7 ha to as high as 186.3 ha. To determine an estimated colony home range of an individual/group on the WMNF, we averaged the ranges in the references above and calculated it to be approximately 83 ha/group.
- 12 groups x 83 ha/group = 996 ha for the average home range of a colony.
- 27,738 ha/996 ha = 28 colonies.

Number of potential individual northern long-eared bats/colonies potentially exposed to ongoing projects involving timber removal:

- acres subject to timber management activities: 861 acres;
- 861 acres/2.47 acres per ha = 349 ha;
- 349 ha/996 ha = 0.35 colony; and

- estimated number of northern long-eared bat colonies on the WMNF exposed to timber management activities associated with three ongoing projects is approximately one colony from timber management. Given that the estimated number is less than one theoretical colony, the Service anticipates one colony would be exposed.

Number of potential individual northern long-eared bats/colonies potentially exposed to ongoing projects involving prescribed fire:

- acres subject to timber management activities: 381 acres;
- 381 acres/2.47 acres per ha = 154 ha;
- 154 ha/996 ha = 0.15 colony; and
- estimated number of northern long-eared bat colonies on the WMNF exposed to prescribed fire activities associated with three ongoing projects is approximately one colony from prescribed fire. Given the estimated number is less than one theoretical colony, the Service anticipates one colony would be exposed.

Habitat Conditions in the Action Area

Habitat Status on the GMNF

Winter Habitat

The VTFWD tracks and conducts periodic hibernaculum counts at approximately 30 caves and mines across Vermont. Of these, 14 are located within approximately 5 miles of the GMNF. Approximately 82,000 acres (20 percent) of GMNF lands lay within 5 miles of the 14 known bat hibernacula (see Figure 17, page 26 of the BA). Total numbers of bats in these 14 hibernacula range from a few individuals in Williams Mine to thousands in Aeolus (Dorset) Cave (VTFWD 2014, unpublished data; Trombulak *et al.* 2001). Only one hibernaculum, the Greely Talc Mine, is located on GMNF lands. The Greely Talc Mine is gated and locked year-round to prevent human access. Prior to WNS, the Greely Talc Mine housed up to 200 to 300 northern long-eared bats, in addition to as many as 700 to 800 bats of four other species. By 2010, northern long-eared bats were no longer documented at the Greely Talc Mine (Darling and Smith 2011). Winter surveys at most of the other hibernacula historically found fewer than 50 northern long-eared bats per hibernaculum (VTFWD 2014, unpublished data). Post-WNS hibernaculum counts are greatly reduced and highly variable (VTFWD 2014, unpublished data).

Summer Habitat

The GMNF includes more than 400,000 acres of National Forest System lands in central and southern Vermont. No information is available about northern long-eared bat summer habitat, specifically roosting and foraging habitat on the GMNF. Lacking specific field data for the GMNF, we assume that habitat use on the GMNF is generally similar to that on the WMNF (*e.g.*,

Sasse 1995; Sasse and Pekins 1996). Considering the widespread distribution of northern long-eared bats documented on and around the GMNF prior to WNS, we assume that the forest management that has been implemented over recent decades provided and continues to provide appropriate habitat conditions for the northern long-eared bat.

The surrounding landscape is rural with numerous farms and forest lands intermixed with low-density, rural, residential development, and small historical villages and towns. Approximately 97 percent of the GMNF is forested and composed of: 79 percent northern hardwoods, 10 percent mixed-woods, 7 percent softwoods, and 1 percent oak. Wetlands and open lands, some of which are maintained in early-successional stages of vegetation to provide wildlife habitat, each account for about 1-2 percent of the GMNF. Only 12 percent or less of the GMNF is classified as young forest (10 to 40 to 60 years old, depending on the tree species), and 1 percent or less is classified as being in regeneration (0 to 10 years old). A majority of the GMNF (about two-thirds) is less than 100 years old (USFS 2015).

The GMNF includes several rivers and many streams and brooks ranging in size and flow, as well as seasonality. The GMNF also includes many small lakes, ponds, and other bodies of open water. Numerous beaver impoundments and marshy areas are scattered across the GMNF. Consequently, access to open water for the northern long-eared bat is not restrictive for almost the entirety of the GMNF.

The GMNF is centered along the spine of the Green Mountains, but also includes some lands within the Taconic Range in southwestern Vermont. Elevations on the GMNF range from about 600 feet to 4,200 feet above sea level. Although Sasse (1995) concluded that northern long-eared bats preferred lower elevations (below 1,500 or 2,000 feet), the GMNF detected northern long-eared bats acoustically at three sites located at about 2,200 feet during summer surveys. Most northern long-eared bat acoustic detections on the GMNF have been at elevations of 1,500 feet or less.

Habitat Status on the WMNF

Winter Habitat

There are 15 confirmed hibernacula in New Hampshire, more than half of which are in Grafton County (none located on the WMNF, although one is suspected). Compared to other states, New Hampshire's hibernacula are quite small; the largest had less than 1,800 bats in 2008 prior to WNS. Less than half of the known hibernacula supported more than 100 bats in the three years of survey prior to 2008 (NHFGD 2013, unpublished data); however, the State's geology lends itself to numerous cracks, crevices, and other rocky openings that could support wintering bats. On the WMNF, there is one potential hibernaculum on Mt. Washington, although occurrences of northern long-eared bats using that location have not been confirmed. The site is well protected from human disturbance, located some distance from any hiking trails and on a steep, talus slope just below treeline.

Maine has few caves or mines suitable for hibernacula. In 2009, two mines were surveyed: Zircon Mine in Litchfield, located approximately 13 to 14 miles from the WMNF, and Whitecap Mine near Rumford, both in Oxford County. Neither mine showed any evidence of WNS at that time. Maine's first confirmed cases of WNS occurred in 2010 in Oxford County. Similar to New Hampshire, Maine's hibernacula are fairly small in terms of bat numbers and size. Biologists in Maine also believe there are many unknown rock crevices or other natural geologic formations that provide additional suitable hibernacula sites. For example, bats were documented during the winter exhibiting abnormal behavior (daytime flying) and dying on the landscape near Acadia National Park, indicating a nearby hibernaculum (J. DePue, MDIFW, pers. comm.).

Summer Habitat

Sasse (1995) found northern long-eared bats and little brown bats seem to prefer lower elevations. Despite 40 percent of mist net effort at elevations greater than 1,444 feet (440 meters), only 7 percent of female northern long-eared bats were captured above this elevation. This may be partly because hardwoods, generally found at lower elevations, typically provide more large-diameter snags than softwoods, and may offer more opportunities for roosting. On the WMNF, snag data shows only 9 percent of softwood snags are at least 9 inches dbh in size, while 21 percent of hardwoods are at least 9 inches dbh. High elevation spruce-fir trees are also often spaced very close together, with perhaps fewer opportunities for solar radiation on a potential maternity roost. In New Hampshire, Sasse and Pekins (1996) noted that northern long-eared bats appear to prefer roost trees that are not softwood species. Twenty-six northern long-eared bats were followed to 46 roost trees that consisted almost exclusively of deciduous species: 14 beech, 13 sugar maple, 8 yellow birch, 6 red maple, 2 bigtooth aspen, and 1 each of black cherry, paper birch, white ash, and hemlock.

Potential roost trees are not considered a limiting factor on the WMNF. Potential roosts could occur in snags, rough culls and rotten culls. Snag trees (standing dead trees) are estimated to occur at a density of 59 snags per acre. WMNF has an estimated 47,700,000 rough culls, which would include trees with splits, large cracks, lightning strikes or other defects. There are an estimated 4,900,000 rotten culls, which include live trees where more than two-thirds of the merchantable bole is defective and at least half of this is due to the tree being rotten. Rotten culls are usually trees with large hollow sections. WMNF estimates that there are an average of 125 potential roost trees per acre (not counting non-forested lands) that are at least three inches dbh. On average, potential roost trees make up approximately 22 percent of the forested landbase on the WMNF.

Anecdotal evidence also suggests that ponds or wetlands, especially beaver flooded wetlands, are attractive to northern long-eared bats. All of the known maternity roosts on the WMNF were found within 1 mile of these features, as do all but one of the northern long-eared bat mist net or acoustic detections recorded over the last 20 years. Size of the wetland may not be critical; a

wetland associated with one of the two historic maternity colonies on the WMNF is relatively small, last estimated as five acres (Sasse and Pekins 1996). The second historic maternity colony was located near a significantly larger wetland, at least 200 acres in size. Over 600 wetlands of at least 5 acres in size occur on or adjacent to the WMNF, totaling over 13,000 acres.

Conservation Needs of the Species in the Action Area

The conservation needs of the species in the action area are similar to the needs rangewide. The GMNF and WMNF provide suitable habitat for swarming, migrating, summering and potentially hibernating northern long-eared bats. As previously discussed, northern long-eared bats on the GMNF and WMNF have been affected by WNS, as demonstrated by significantly reduced numbers documented during post-WNS summer surveys, and nearby hibernacula that have been reduced to single wintering bats or none at all. Within the action area, the conservation needs include: 1) reduction in WNS-related mortality and injury; 2) maintenance of suitable conditions within hibernacula and protection of hibernating bats from disturbance; 3) maintenance of suitable habitat conditions for northern long-eared bat swarming, foraging, and roosting activities; 4) maintenance of suitable habitat conditions in identified maternity areas by avoiding or reducing the removal of known roost trees; 5) surveys for maternity and hibernation activity; and 6) research of the migration patterns of northern long-eared bats that use the project area during the summer or winter.

EFFECTS OF THE ACTION

This Opinion evaluates the anticipated effects of 14 projects on the GMNF and WMNF. These projects will affect a total of 3,491 acres of potential northern long-eared bat habitat on the GMNF and WMNF, including 3,110 acres from timber harvest, and 381 acres from prescribed fire. Potential effects to the northern long-eared bat include direct and indirect effects. Direct effects occur when bats are present while the activities are being conducted; indirect effects are caused by or result from the proposed action but occur later in time. Effects will vary based on the type of the proposed activity.

Our analysis of effects for northern long-eared bat entails the following: (1) evaluating individual northern long-eared bat exposure to action-related stressors and response to that exposure; (2) integrating those individual effects (exposure risk and subsequent response) to discern the consequences to the populations to which those individuals belong; and (3) determining the consequences of any population-level effects to the species rangewide.

Direct and Indirect Effects

Effects to Hibernating Bats and/or Hibernacula

No direct or indirect effects are anticipated to wintering northern long-eared bats or their hibernacula from the proposed action because no projects will be implemented in proximity to known hibernacula.

Effects to Bats during Spring/Summer/Fall and/or Spring/Summer/Fall Habitat

Potential effects to the northern long-eared bat may occur during their active season in spring, summer and fall and to their spring, summer and fall habitat and may include direct and indirect effects. Implementation of the 15 ongoing projects could impact a total of 3,491 acres due to tree removal activities associated with timber management (3,110 acres) and prescribed fire (381 acres).

Tree Removal Associated with Timber Harvest and Other Activities

Death/Injury

Risk of death or injury of individual northern long-eared bats from timber harvest or other tree removal varies depending on the timing of activities, the location, type of harvest, and extent of removal. The timing of forest management activities greatly influences the likelihood of exposure and the extent of impacts on individual bats and their populations. Female northern long-eared bats typically roost colonially, with their largest population counts occurring in the spring, presumably as one way to reduce thermal costs for individual bats (Foster and Kurta 1999). While bats do have the ability to flee their roosts during tree removal, removal of occupied roosts during the active season while bats are present (spring through fall) will also likely cause injury or mortality to those roosting bats. Bats are likely to be injured or killed from tree removal during the spring months when bats often use torpor to survive cool weather and low prey availability. Bats are further likely to be killed or injured during early-to-mid-summer (approximately June-July) when flightless pups or inexperienced flying juveniles are present during tree removal. Removal of trees outside these periods is less likely to result in direct injury or mortality when the majority of bats can fly and are more dispersed.

The location of timber harvest activities also influences the likelihood and extent of impacts. Timber harvest activities outside of northern long-eared bat summer home ranges or away from hibernacula will not result in death or injury to individuals. The greatest risk of take is associated with projects within known northern long-eared bat home ranges (calculated from radio telemetry or estimated based on capture or detection of northern long-eared bat [see Service 2015a]) where no or few roost trees have been located. This is because occupancy has already been established; but it is unclear where the core roosting area is located, and these areas are not protected from in-season removal. The risk of death or injury of bats from timber harvest

or other tree removal within known home ranges with documented roost trees is less, as some of the trees occupied by roosting bats should be left undisturbed during the pup season as a result of conservation measures established to protect known roost trees.

Lastly, the likelihood and extent of impacts are influenced by the type and scope of the timber harvest and other tree clearing activities relative to the amount of remaining suitable roosting and foraging habitat. Within a given home range, northern long-eared bats use multiple roosts throughout the season. As a result, only a certain number of roosts are anticipated to be occupied in any given day and within any given year. Therefore, the risk of encountering roosting northern long-eared bats during a given forest treatment is associated with the percentage of home range impacted and the type of forest treatment. Larger acreages of treatment have greater risk than smaller acreages. Similarly, clearcuts have greater risk than selective harvest treatments (individual or group) because more trees in a given treatment area will be removed.

In summary, direct effects from timber harvest and other tree clearing activities (*e.g.*, pre-commercial thinning) on the GMNF and WMNF could cause injury or death to northern long-eared bats if trees are cut during the active season. Because there are no winter-only harvests proposed, we assume a worse case basis that all tree removal would occur within the active season and have calculated the acreage accordingly. Based on the proposed action, the GMNF may implement tree removal activities (tree harvests and thinning) on up to 2,249 acres during the spring/summer/fall season when bats may be present. WMNF timber harvests would occur on up to 861 acres during the same time frame. We calculated that up to two colonies in total could be affected by tree removal projects reviewed in this Opinion: one colony on the GMNF and one colony on the WMNF. Risk of death or injury of individual northern long-eared bats from timber harvest or other tree removal will vary depending on the timing of activities, the location, type of harvest, and extent of removal.

Response to Removal or Alteration of Roosting/Foraging Habitat

The best available data indicate that the northern long-eared bat shows a varied degree of sensitivity to timber harvesting practices so long as there are sufficient roosts available for their use (Menzel *et al.* 2002; Owen *et al.* 2002). In central Arkansas, the three classes of mixed pine-hardwood forest that supported the majority of the roosts were partially harvested or thinned, unharvested (50–99 years old), and group selection harvest (Perry and Thill 2007). Forest size and continuity are also factors that define the quality of habitat for roost sites for northern long-eared bats. Lacki and Schwierjohann (2001) stated that silvicultural practices could meet both male and female roosting requirements by maintaining large-diameter snags, while allowing for regeneration of forests.

In addition to impacts on roost sites, timber harvest practices can also affect foraging and traveling habitat, and thus, northern long-eared bat fitness. In southeastern Missouri, the northern long-eared bat showed a preference for contiguous tracts of forest cover (rather than fragmented or wide open landscapes) for foraging or traveling and different forest types

interspersed on the landscape increased likelihood of occupancy (Yates and Muzika 2006). Similarly, in West Virginia, female northern long-eared bats spent most of their time foraging or travelling in intact forest, diameter-limit harvests (70–90 year-old stands with 30–40 percent of basal area removed in the past 10 years), and road corridors, with no use of deferment harvests (similar to clearcutting) (Owen *et al.* 2003). In Alberta, Canada, northern long-eared bats avoided the center of clearcuts and foraged more in intact forest than expected (Patriquin and Barclay 2003). On Prince Edward Island, Canada, female northern long-eared bats preferred open areas less than forested areas, with foraging areas centered along forest-covered creeks (Henderson and Broders 2008). In general, northern long-eared bats prefer intact mixed-type forests with small gaps (*i.e.,* forest trails, small roads or forest covered creeks) in forests with sparse or medium vegetation for foraging and traveling rather than fragmented habitat or areas that have been clearcut.

Timber harvest activities do not typically lead to permanent losses of suitable roosting, foraging, or traveling habitat for northern long-eared bats. On the contrary, timber harvest activities are expected to maintain a forest over the long term for the species. Many timber harvest regimes will result in minimal change in terms of providing suitable roosting or foraging habitat for northern long-eared bats. For example, selective harvest regimes are not anticipated to result in alterations of forests to the point where northern long-eared bats would be expected to significantly alter their normal behaviors. This is because the treatment areas will still be forested with small openings. Similarly, small patch cuts, wildlife openings, and forest roads would be expected to serve as foraging areas or travel corridors. Therefore, the only impacts of concern from these forest treatments are the potential for death or injury during active season tree removal.

However, localized long-term reductions in suitable roosting and/or foraging habitat can occur from various forest practices. For example, large clearcuts (that remove a large portion of a known or assumed home range) would result in a temporary "loss" of forest for northern long-eared bats. In these cases, "temporary" would be for many years (amount of time to reproduce suitable roosting/foraging habitat). Foraging would be possible prior to roosting depending on the juxtaposition of cuts to other forest regimes.

As stated above, northern long-eared bats have been found in forests that have been managed to varying degrees and as long as there is sufficient suitable roosting and foraging habitat within their home range and travel corridors between those areas, we would expect northern long-eared bat colonies to persist in managed landscapes.

In addition to the type of timber harvest, the extent of impact from timber harvest-related habitat modifications is influenced by the amount of suitable habitat available within and near northern long-eared bat home ranges. Some portions of the northern long-eared bat's range are more forested than others. In areas with little forest or highly fragmented forests (*e.g.,* western United States edge of the range, central midwestern states; see Figure 1), impact of forest loss would be disproportionately greater than similar-sized losses in heavily forested areas (*e.g.,* Appalachians

and northern forests). Also, the impact of habitat loss within a northern long-eared bat's home range is expected to vary depending on the scope of removal. Silvis *et al.* (2014) modeled roost loss of northern long-eared bats and Silvis *et al.* (2015) removed known northern long-eared bat roosts during the winter in the field to determine how this would impact the species. Once removals totaled 20–30 percent of known roosts, a single maternity colony network started showing patterns of break-up. As explained in the Status of Species section, sociality is hypothesized to increase reproductive success (Silvis *et al.* 2014); thus, smaller colonies are expected to have lower reproductive success.

Longer flights to find alternative suitable habitat and colonial disruption may result from removal of roosting or foraging habitat. Northern long-eared bats emerge from hibernation with their lowest annual fat reserves, and return to their summer home ranges. Since northern long-eared bats have summer home range fidelity (Foster and Kurta 1999; Patriquin *et al.* 2010; Broders *et al.* 2013), loss or alteration of forest habitat may put additional stress on females when returning to summer roost or foraging areas after hibernation. Females (often pregnant) are forced to seek out new roosts or foraging areas and must expend additional, but limited, energy. Hibernation and reproduction are the most energetically demanding periods for temperate-zone bats, including the northern long-eared bat (Broders *et al.* 2013). Bats may reduce metabolic costs of foraging by concentrating efforts in areas of known high prey profitability, a benefit that could result from the bat's local roosting and home range knowledge and site fidelity (Broders *et al.* 2013). Cool spring temperatures provide an additional energetic demand, as bats need to stay sufficiently warm or enter torpor (state of mental or physical inactivity). Entering torpor comes at a cost of delayed parturition; bats born earlier in the year have a greater chance of surviving their first winter and breeding in their first year of life (Frick *et al.* 2009). Delayed parturition may also be costly because young of the year and adult females would have less time to prepare for hibernation (Broders *et al.* 2013). Female northern long-eared bats typically roost colonially, with their largest population counts occurring in the spring, presumably as one way to reduce thermal costs for individual bats (Foster and Kurta 1999). Therefore, similar to other temperate bats, northern long-eared bats have multiple high metabolic demands (particularly in spring), and must have sufficient suitable roosting and foraging habitat available in relatively close proximity to allow for successful reproduction.

In summary, timber harvests could have both adverse and beneficial effects on habitat suitability for the northern long-eared bat. The approximately 3,110 acres of habitat that will be affected by these activities are scattered throughout the 446,000-acre GMNF and 793,000-acre WMNF (see Figure 2 and Figure 3), therefore there will be large amounts of unaffected, intact forested habitat adjacent to each treatment area. Timber removal projects will impact up to 2,249 acres of potential habitat on the GMNF and up to 861 acres on the WMNF. These projects will potentially impact up to 0.5 percent of available habitat on the GMNF and up to 0.1 percent of available habitat on the WMNF. The potential for effects from timber harvest and other tree removal will be minimized by the standards and guidelines for wildlife reserve trees, snags, and den and nest trees, which are included in GMNF and WMNF Forest Plans. As a result, we

conclude that the overall habitat suitability or availability within the action area should be minimally affected by timber harvest under the proposed action.

Prescribed Burning

Over the next four fire seasons, the WMNF proposes to conduct prescribed burns at three locations during spring and fall in areas where northern-long eared bats may be present. In total, the proposed projects will occur on a minimum of 78 acres of suitable roosting habitat, although the total impact area may reach up to 381 acres of suitable roosting habitat if the fire spreads beyond the target area (see Table 2).

Death or Injury

Conducting prescribed fires outside of the hibernation period could result in direct mortality or injury to northern long-eared bat by burning, heat exposure, or smoke inhalation. Bats also may be exposed to elevated concentrations of potentially harmful compounds within the smoke (*e.g.,* carbon monoxide and irritants) (Dickinson *et al.* 2009). Exposure risk depends on a variety of factors, including height of roosts, timing and behavior of fire, winds, and proximity of fire to roosts. Risk of direct mortality and injury to bats from prescribed fire is low as long as fire intensity and crown scorch height are low (Dickinson 2010). Scheduling prescribed fires until temperatures are warmer in the spring (prior to birthing) reduces the likelihood that bats will be in torpor and should allow northern long-eared bats to more easily flush (Dickinson 2010). Avoiding burns during June and July will prevent loss of pups. Due to the anticipated timing of the burns, torpid adults and/or non-volant young will not be present during the majority of the burns and most bats should be mobile during the burning activities. In summary, we expect minimal lethal take from prescribed fires, although northern long-eared bats may be forced to flee from roosting and foraging areas. These adverse effects are expected to be short-term, localized, and non-lethal.

Response to Removal or Alteration of Roosting/Foraging Habitat

Indirect effects from prescribed burns may include short-term loss of roost trees and decreases in prey abundance, followed by long-term increases in roost abundance and suitability, and in prey abundance (Boyles and Aubrey 2006; Dickinson 2010; Dickinson *et al.* 2009; Johnson *et al.* 2009; Johnson *et al.* 2010; Lacki *et al.* 2009; Timpone *et al.* 2010). These types of adverse and beneficial effects have been noted for both the Indiana bat and the northern long-eared bat. While there are some differences in roosting and foraging habitat preferences between these two species, these species have considerable overlap in their habitat usage. In most cases, general conclusions based on research on one species will also be applicable to the other.

Prescribed fire can create a greater abundance of potential roost trees for northern long-eared bats because fires can cause bark of live trees to peel away from the sapwood, creating the sloughing bark that is often used for roosting (Johnson *et al.* 2010). The availability of suitable

roosts (including roosts with cavities and exfoliating bark) is greater in burned areas compared to unburned areas (Boyles and Aubrey 2006; Dickinson *et al.* 2009, Johnson *et al.* 2010). Northern long-eared bats have been found to use roosts extensively in burned habitats immediately after prescribed burning (Lacki *et al.* 2009), with roosts shifting from primarily beneath bark before burning to inside cavities after burning.

Tree species that consistently form high quality bat roosts include shellbark hickory (*Carya laciniosa*), shagbark hickory (*C. ovata*), and white oak (*Quercus alba*). Regeneration of white oak and hickory increases as a result of low-intensity fires and/or repeated fires below open canopies (Johnson *et al.* 2010; Dickinson *et al.* 2009). Similarly, fire creates canopy gaps that allow for regeneration of shade-intolerant species such as black locust, a preferred roost tree species for the northern long-eared bat in some locations (Dickinson *et al.* 2009; Johnson *et al.* 2009). Therefore, after a period of regeneration and extending into the long term, prescribed fire is anticipated to increase the abundance of tree species that form high quality northern long-eared bat roosts.

Fires can also create a more open canopy structure that can improve roost quality by increasing the amount of solar radiation reaching the roost. Canopy light penetration was higher and canopy tree density was lower in burned forest than in unburned forest (Boyles and Aubrey 2006). Additionally, canopy gaps in the burned area are associated with slightly higher maximum daily temperatures at roost trees (Johnson *et al.* 2009). Higher roost temperatures could facilitate more rapid growth of developing juvenile bats (Johnson *et al.* 2009). As a result, the abundance of trees with characteristics suitable for roosting, and the percentage of the forested area with suitable bat roosts, should be increased after fires (Boyles and Aubrey 2006). Studies in West Virginia found that the northern long-eared bat responded favorably to prescribed fire by using new roost trees that were located in canopy gaps created as a result of the fire (Johnson *et al.* 2009). Conversely, fire may also destroy or accelerate the decline of existing roost trees, particularly of older snags, by burning the bases of the trees and weakening their structure, causing them to fall over more quickly (Johnson *et al.* 2009; Dickinson *et al.* 2009). One study found that up to 20 percent of existing standing snags were lost post-fire, and that few new snags were created (Lacki *et al.* 2009).

In summary, prescribed fire may result in both adverse and beneficial effects on roosting habitat through immediate loss of existing roosts and creation of some new roosts, followed by short-term increases in the suitability of remaining and created roosts, and long-term changes in forest composition towards a greater abundance of trees likely to create suitable roosts in the future. Unfortunately, existing data are insufficient to fully quantify or compare the relative impact of these adverse and beneficial effects. For instance, the long-term tradeoff between roost creation and roost loss in mixed oak forests under burning regimes is unknown (Dickinson *et al.* 2009). One research project concluded that prescribed fire, at minimum, provoked no response from the Indiana bat in terms of roost tree selection, and in some cases may create additional roost resources (Johnson *et al.* 2010). As a result, we conclude the overall effect of the prescribed fire portion of the proposed action on roost availability may be neutral to potentially beneficial.

Prescribed fire may affect foraging habitat by changing the structure of the forest and by changing the abundance of prey within the area (Dickinson *et al.* 2009). Northern long-eared bats have shown a preference for foraging in heavily forested mid-slope areas, regardless of burn condition, suggesting these bats feed in and around closed canopies and are likely clutter-adapted (Lacki *et al.* 2009). These studies suggest that the reduction in canopy closure as a result of prescribed burning could have a negative effect on foraging suitability for the northern long-eared bat. However, that same data do not indicate that bats avoid foraging in or around areas that have been burned. For example, the size of female northern long-eared bat home ranges and core areas did not vary between bats radio tracked before and after fires, and the home ranges of these bats were located closer to burned habitats following fires than to unburned habitats (Lacki *et al.* 2009). The researchers for this study suggest that northern long-eared bats responded to habitat alterations resulting from prescribed fires by shifting the location of their foraging areas to take advantage of changes in insect prey availability (Lacki *et al.* 2009). Immediately after fires, insect abundance typically declines (Lacki *et al.* 2009); therefore, fires conducted in the late winter and early spring may reduce abundance of bat prey during critical periods when bats are coming out of hibernation, are migrating, or are pregnant (Johnson *et al.* 2009). However, over a longer term (within 1 year), abundance of coleopterans (beetles), dipterans (flies), and all insects combined has been shown to increase following prescribed fires (Lacki *et al.* 2009). These increases can last for up to 16 years post-burn. Because lepidopterans (moths and butterflies), coleopterans, and dipterans are important groups of insect prey for *Myotis* species, researchers have concluded that fire does indeed improve foraging conditions in the long term by increasing prey quantity in the form of insects attracted to post-fire dead wood (Lacki *et al.* 2009; Dickinson 2010). As a result, we conclude that prescribed fire may have a short-term adverse and long-term beneficial effect on prey abundance, and thus foraging habitat suitability in the action area.

Given the northern long-eared bat's frequent use of live trees and snags, multiple roosting structures, ability to arouse and move during fires, and positive or neutral response for roosting and foraging within burned areas, northern long-eared bats are expected to experience minimal impacts from the prescribed fire proposed on the WMNF.

In summary, the three prescribed burns may impact a minimum of 78 acres and a maximum of 371 acres of potential habitat on the WMNF. Although prescribed burns may occur any time between April and November, in New England, the appropriate conditions for the proposed underburns most often occur in mid-to-late May. Therefore, the potential for effects from prescribed fire will be minimized by conducting most fires in late spring when mean temperatures will often be sufficiently high that roosting northern long-eared bats would be expected to come out of torpor and escape oncoming smoke and pups will not have been born. Fall burns would also minimize effects because young will be volant and able to respond to oncoming smoke. However, burns that occur in late May or June may result in non-volant young being harmed or killed. Because of the wide range in dates when prescribed burns may occur that exclude non-volant young, we expect minimal lethal take from prescribed fires. Northern

long-eared bats may be forced to flee from roosting and foraging areas, resulting in adverse effects by exposing the animal to potential predation or additional stress. However, these adverse effects are expected to be short-term and localized.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Any actions conducted on GMNF or WMNF lands will either be conducted by the USFS or will require approval by the USFS and thus will require separate section 7 consultation. Therefore, cumulative effects, as defined in the ESA, are not expected to occur on GMNF or WMNF lands.

Summary of Effects

Impacts to Individuals

Potential effects of the action include direct effects to northern long-eared bats present within the action area when activities are being conducted, and indirect effects as a result of changes in habitat suitability. Direct effects include mortality, injury, harm, or harassment as a result of removal or burning of roost trees.

Overall, the potential for direct mortality of northern long-eared bats from prescribed burns associated with the proposed action will vary depending on the time of year when the burns are implemented. Should a prescribed burn occur at the end of May, there is a greater potential that non-volant young will be present. During other times of the year, the anticipated mortality will be low since bats will most likely leave the tree if disturbed by the heat or smoke. The potential for direct effects, including mortality, from timber harvests is greater during spring and early summer when bats return from hibernation, since cool spring temperatures result in periodic use of torpor, especially if bats impacted by WNS have additional energetic demands and reduction in flight ability. Non-volant young may be present and subject to mortality if the tree they are in is felled between late May and July.

Indirect effects from the action may result from habitat modification and primarily involve changes to roosting and foraging suitability. Timber harvests could have both adverse and beneficial effects on habitat suitability for the northern long-eared bat by removing occupied roost trees (adverse) or increasing solar gain and enhancing suitable roost trees (beneficial). Foraging habitat may be adversely affected through removal of protective cover and alteration of prey base (adverse) or increasing habitat diversity and prey base (beneficial). Prescribed fire may also result in both adverse and beneficial effects on roosting habitat through both loss and creation of existing roosts, and long-term changes in forest composition towards a greater abundance of suitable roosts in the future. Prescribed fire may also have a short-term adverse

and long-term beneficial effect on prey abundance, and thus foraging habitat suitability in the action area. Based on the literature, we conclude that the overall effect of the prescribed fire portion of the proposed action on habitat suitability may be neutral to potentially beneficial.

While none of the proposed actions will alter the amount or extent of mortality or harm to northern long-eared bats resulting directly from WNS, the proposed action can be neutral, negative, and/or beneficial to bats. We anticipate that there will be some impact to the roosting habitat of northern long-eared bats in the spring, summer and fall seasons and during the fall swarming period if any project occurs near an unknown hibernaculum. Forest Plan standards and guidelines to protect wildlife reserve trees that may serve as roost trees for northern long-eared bats are anticipated to minimize the effects of the loss of potential roost trees. Given the scope and duration of the projects in relation to the overall action area (that 0.5 percent of suitable habitat on the GMNF will be impacted by tree removal and 0.2 percent of suitable habitat will be impacted by tree removal or prescribed burns), these projects will not substantially alter the overall availability or suitability of northern long-eared bat roosting or foraging habitat on either the GMNF or the WMNF.

No cumulative effects are expected.

While analyzing the effects of the proposed action, we identified the life stages that would be exposed to the stressors associated with the proposed action, and analyzed how those individuals would respond upon exposure to the stressors. From this analysis, we determined that:

1) there is no proposed critical habitat for the northern long-eared bat, and thus, none will be adversely affected;
2) no known hibernating bats nor their hibernacula will be exposed to the project stressors as there are no hibernacula within the vicinity of the action area; and
3) during the spring through fall period, northern long-eared bats will be exposed to various project stressors and are likely to adversely respond to some of them. As stated in the environmental baseline, we believe that approximately three maternity colonies and an unknown number of adult males occur in the action area.

We considered the possibility for exposure to northern long-eared bats at currently unknown roost sites in the vicinity of forest management activities. If this should occur, we anticipate minor effects and possibly harassment of northern long-eared bats that may flush during daylight and temporarily or permanently abandon their roosts (which may have pups). In addition, mortality of pups is possible from timber harvest and inhalation of smoke for those activities occurring when non-volant pups are present. In summary, there will be impacts to individual bats in either their annual survival or reproductive rates. We anticipate that the proposed action may impact up to three maternity colonies of unknown sizes.

Impacts to Populations

As we have concluded that individual bats are likely to experience reductions in either their annual or lifetime survival or reproductive rates, we need to assess the aggregated consequences of the anticipated reductions in fitness (*i.e.,* reproductive success and survival) of the exposed individuals on the population(s) (winter and/or maternity colony) to which these individuals belong.

The GMNF and WMNF's previous and ongoing efforts have served to identify areas of northern long-eared bat activity. After completion of the proposed action, the action area will continue to provide suitable habitat conditions for northern long-eared bat foraging and roosting during the spring, summer and fall swarming period. While there is potential for direct take of the species, given the small-scale of the proposed action in relation to the action area, and the current distribution and abundance of the northern long-eared bat on the GMNF and WMNF (as described in the Environmental Baseline), the northern long-eared bat should be able to continue to survive and reproduce on the GMNF and WMNF.

We recognize the potential for a small amount of lethal take of adults and/or pups and reduced reproductive success, but we believe the northern long-eared bat colonies affected should be able to sustain the worst-case losses discussed above.

Impacts to the Species

Reductions in the fitness of maternity colonies and associated wintering populations are unlikely to occur. In fact, we find that many of the proposed actions of the USFS are likely to result in benefits to the species over the long term due to the maintenance of a mosaic of forest types. Thus, no component of the proposed action is expected to reduce the reproduction, numbers, or distribution of the northern long-eared bat rangewide. While we recognize that the status of the species is uncertain due to WNS, given the environmental baseline, and the intensity, frequency, and duration of the project impacts, we find that the proposed project is unlikely to have population-level impacts, and thus, is also unlikely to decrease the overall reproduction, numbers, or distribution of the northern long-eared bat. Therefore, we do not anticipate a reduction in the likelihood of both survival and recovery of the species as a whole.

Based on the analysis above, despite the anticipated population impacts, the proposed action should not decrease the reproduction, numbers, or distribution of the northern long-eared bat in a way or to the extent that would cause an appreciable reduction in the likelihood of both survival and recovery of the species as a whole.

CONCLUSION

After reviewing the current status of this species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the northern long-eared bat. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR § 17.3). Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). 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 ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

On April 2, 2015, the Service published an interim species-specific rule pursuant to section 4(d) of the ESA for the northern long-eared bat (80 FR 17974). The Service's interim 4(d) rule for the northern long-eared bat exempts the take of northern long-eared bat from the section 9 prohibitions of the ESA, when such take occurs as follows (see the interim rule for more information):

(1) Take that is incidental to forestry management activities, maintenance/limited expansion of existing rights-of way, prairie management, and projects resulting in minimal (<1 acre) tree removal, provided these activities:
    a. occur more than 0.25 mile (0.4 km) from a known, occupied hibernacula;
    b. avoid cutting or destroying known, occupied roost trees during the pup season (June 1–July 31); and
    c. avoid clearcuts (and similar harvest methods, *e.g.*, seed tree, shelterwood, and coppice) within 0.25 (0.4 km) mile of known, occupied roost trees during the pup season (June 1–July 31).
(2) Removal of hazard trees (no limitations).
(3) Purposeful take that results from
    a. removal of bats from and disturbance within human structures; and

b. capture, handling, and related activities for northern long-eared bats for 1 year following publication of the interim rule.

The incidental take that is carried out in compliance with the interim 4(d) rule does not require exemption in this Incidental Take Statement. Accordingly, there are no reasonable and prudent measures or terms and conditions that are necessary and appropriate for these actions because all incidental take has already been exempted. All activities proposed on the GMNF and WMNF are covered by the interim 4(d) rule under *forest management activities*, including timber harvest and prescribed fire.

AMOUNT OR EXTENT OF TAKE

If northern long-eared bats are present or utilize an area proposed for timber harvest or prescribed fire, incidental take of northern long-eared bats could occur. The Service anticipates incidental take of the northern long-eared bat will be difficult to detect for the following reasons: (1) the individuals are small and occupy summer habitats where they are difficult to find; (2) northern long-eared bats form small, widely dispersed maternity colonies under loose bark or in the cavities of trees, and males and non-reproductive females may roost individually, which makes finding the species or occupied habitats difficult; (3) finding dead or injured specimens during or following project implementation is unlikely; (4) the extent and density of the species within its summer habitat in the action area is unknown; and (5) in many cases, incidental take will be non-lethal and undetectable.

Monitoring to determine actual 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 northern long-eared bat is present in an area proposed for harvest or prescribed burn. Inspecting individual trees is not considered by the Service to be a practical survey method and is not recommended as a means to determine incidental take. However, the areal extent of potential roosting and foraging habitat affected can be used as a surrogate to monitor the level of take.

The Service anticipates that no more than 3,491 acres of potential northern long-eared bat habitat will be disturbed as a result of these ongoing project activities on the GMNF and WMNF, including 3,110 acres from timber harvest and 381 acres from prescribed fire. The 3,491 acres of impact from timber management and prescribed burn activities and all associated incidental take is exempted under the 4(d) rule. The exact number of maternity colonies potentially impacted by the management activities associated with these 14 projects is unknown, but estimated to be approximately three colonies, based on the overall size of the action area, the expected detection rate, and the average colony size for northern long-eared bats.

EFFECT OF THE TAKE

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the northern long-eared bat. No critical habitat has been designated for northern long-eared bat, so none would be impacted.

REASONABLE AND PRUDENT MEASURES

Since all anticipated incidental take will be from activities addressed by the 4(d) rule and is therefore already exempted, no reasonable and prudent measures will be required.

TERMS AND CONDITIONS

Since all anticipated incidental take will be from activities addressed by the 4(d) rule and is therefore already exempted, no terms and conditions will be required.

REPORTING REQUIREMENTS

1. The USFS shall provide a report summarizing the activities (and acreages) described in this Incidental Take Statement upon completion of the project(s).

2. The USFS shall make all reasonable efforts to educate personnel to report any sick, injured, and/or dead bats (regardless of species) located on GMNF immediately to John Sease (802-362-2307, extension 237; jsease@fs.fed.us). The USFS point of contact will subsequently report to the Service's New England Field Office (NEFO) to the attention of Susi von Oettingen (603-227-6418). On the WMNF, immediately report any sick of injured and/or dead bats to Leighlan Prout (603-536-6223; lprout@fs.fed.us). The USFS point of contact will subsequently report to the Service's New England Field Office to the attention of Susi von Oettingen (603-227-6418) and/or the Service's Maine Field Office (MEFO) to the attention of Wende Mahaney (207-866-3344, extension 1118). No one, with the exception of trained staff or researchers contracted to conduct bat monitoring activities, should attempt to handle any live bat, regardless of its condition. If needed, NEFO or MEFO will assist in species determination for any dead or moribund bats. Any dead bats believed to be a northern long-eared bat will be transported on ice to NEFO or MEFO. If a northern long-eared bat is identified, NEFO or MEFO will contact the appropriate Service law enforcement office. Care must be taken in handling dead specimens to preserve biological material in the best possible state. In conjunction with the care of sick and injured fish or wildlife and the preservation of biological materials from dead specimens, the USFS has the responsibility to ensure that information relative to the date, time, and location of the northern long-eared bat, when found, and possible cause of injury or death of each is

recorded and provided to the Service. In the extremely rare event that someone has been bitten by a bat, please keep the bat in a container and contact the local health department.

CONSERVATION RECOMMENDATIONS

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

The Service has identified the following actions that, if undertaken by the USFS, would further the conservation of the northern long-eared bat. We recognize that limited resources and other agency priorities may affect the ability of the USFS to conduct these activities at any given time.

1. Assist with WNS investigations, where feasible. For example:
    a. monitor the status/health of known colonies;
    b. collect samples for ongoing or future studies; and
    c. allow USFS staff to contribute to administrative studies (on or off of USFS lands).

2. Monitor pre- and post-WNS distribution of the northern long-eared bat on the National Forest:
    a. search for hibernacula within the National Forest;
    b. conduct inventory surveys;
    c. conduct radio telemetry to monitor status of northern long-eared bat colonies; and
    d. participate in North American Bat Monitoring Program (NABat, a national effort to monitor and track bats) through submission of survey data.

3. Encourage research and administrative studies on the summer habitat requirements of the northern long-eared bat on the National Forest that:
    a. investigate habitat characteristics of the forest in areas where pre- and post-WNS northern long-eared bat occurrences have been documented (acoustically or in the hand) (*e.g.* forest type, cover, distance to water); and
    b. investigate northern long-eared bat use (acoustics, radio telemetry) of recently managed areas of different prescriptions.

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 conservation recommendations carried out.

REINITIATION NOTICE

This concludes formal consultation for the USFS's actions outlined in their request dated April 13, 2015. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over an 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.

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APPENDIX A – CONSULTATION HISTORY

February 10, 2014. Staff from the GMNF, WMNF and the Service's New York Field Office (NYFO) and NEFO met to discuss forest management effects.

March 6, 2014. Staff from the WMNF and NEFO met to discuss the conferencing process under section 7 of the ESA.

April 7, 2014. A conference call among staff from the GMNF, WMNF, NYFO, NEFO and MEFO was held to discuss the Albany South project as a specific example of a forest management project currently undergoing NEPA analysis (but a project not included in this Opinion), as well as to discuss a strategy for completing programmatic conferencing on both the GMNF and WMNF forest management plans.

September 19, 2014. A conference call was held among staff of the GMNF, WMNF, NEFO and MEFO to further discuss specific project effects for ongoing forest activities.

November 7, 2014. Staff from the GMNF and WMNF met with staff from NEFO to discuss summer survey results and strategize how to complete ongoing project conferencing.

December 17, 2014 and February 12, 2015. The strategy to conference all ongoing projects was reviewed with all three field offices during conference calls.

March 6, 2015. The GMNF and WMNF submitted a combined request for a formal conference for all ongoing projects accompanied by a Biological Assessment.

April 13, 2015. Following the final listing of the northern long-eared bat, the GMNF and WMNF submitted a request for formal consultation. This request referenced the original March 5, 2015 Biological Assessment.

May 15, 2015. The WMNF notified MEFO and NEFO via electronic transmission that two projects on the WMNF, Dolly Copp Campground (WM85) and Four Ponds wood addition (WM13), were withdrawn from the BA.

June 18, 2015. NEFO and MEFO provided the GMNF and WMNF the draft Opinion for review and comment.

June 22, 2015. The GMNF notified MEFO and NEFO via electronic transmission that one timber harvest addressed in the BA was completed in late winter/early spring and should be removed from the project description.

June 22, 2015. The GMNF and WMNF relayed comments on the Opinion via electronic transmissions.

A number of other individual contacts by both telephone and email have been made between parties since the proposed listing was announced.