United States Department of the Interior

FISH AND WILDLIFE SERVICE
East Lansing Field Office (ES)
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823-6316

September 15, 2015

Ms. Leslie Auriemmo
Forest Supervisor
Huron-Manistee National Forests
1755 South Mitchell St.
Cadillac, Michigan 49601-8533

Re: Formal Section 7 Consultation on the Bigelow-Newaygo Project on the Huron-Manistee National Forests – Log #10-R3-ELFO-06

Dear Ms. Auriemmo:

This letter transmits the U.S. Fish and Wildlife Service's Biological Opinion for the Bigelow-Newaygo project on Huron-Manistee National Forests' (HMNF) in accordance with Section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The HMNF determined that the proposed actions were "Likely to Adversely Affect" the Karner blue butterfly (*Lycaeides melissa samuelis*) and northern long-eared bat *(Myotis septentrionalis).*

We base the enclosed Opinion on information provided in several documents, including your Biological Assessment and Environmental Assessment, the Programmatic Biological Assessment and Opinion for the HMNF's Land and Resource Management Plan, and our May 1, 2015, Biological Opinion for NLEB from Ongoing and Planned Activities on the HMNF. Other sources of information include previous telephone conversations, e-mails, and meetings. A complete administrative record of this consultation is on file at our East Lansing Field Office.

After reviewing the current status of Karner blue butterfly and northern long-eared bat, 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 these species.

With respect to the Act's compliance, all aspects of the project description are binding. Reasonable and prudent measures and the accompanying Terms and Conditions provided within the enclosed biological opinion are nondiscretionary and are designed to minimize incidental take of listed species.

We appreciate the opportunity to cooperate with the Huron-Manistee National Forests in conserving endangered species. If you have any questions, please contact Tameka Dandridge of this office at 517-351-8315 or tameka_dandridge@fws.gov.

Sincerely,

Scott Hicks
Field Supervisor

cc: Ms. Jennifer Szymanski, USFWS, Onalaska WI

BIOLOGICAL OPINION
for the
Bigelow-Newaygo Project on the
Huron-Manistee National Forests

Submitted to the U.S. Forest Service
September 2015

Prepared by:
U.S. Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823

Introduction

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO; opinion) on the Bigelow-Newaygo Project in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C., 1531 et seq.). The Huron-Manistee National Forests (HMNF) determined that the proposed project was "likely to adversely affect" Karner blue butterfly *(Lycaeides melissa samuelis*; KBB*)* and northern long-eared bat (*Myotis septentrionalis*; NLEB). We received the HMNF's request for initiation of formal consultation on March 2, 2015.

We base this opinion on information provided in several documents, including the HMNF Biological Assessment (BA) and Environmental Assessment (EA) for the Bigelow-Newaygo Project (Project), Programmatic BA and Opinion for the HMNF Land and Resource Management Plan, and Biological Opinion for NLEB from Ongoing and Planned Activities on the HMNF. Other sources of information include telephone conversations, e-mails and meetings with the HMNF. A complete administrative record of this consultation is on file at the Service's East Lansing Field Office (ELFO).

On March 2, 2006, the Service issued a programmatic Biological Opinion (programmatic BO) for the HMNF revised 2006 Land and Resource Management Plan (Forest Plan) (USFWS 2006). In the programmatic BO, we evaluated the effects of HMNF Forest Plan activities on bald eagle *(Haliaeetus leucocephalus),* Kirtland's warbler (*Setophaga kirtlandii*), piping plover *(Charadrius melodus)* and its critical habitat, Pitcher's thistle *(Cirsium pitcheri),* Indiana bat *(Myotis sodalis),* and Karner blue butterfly *(Lycaeides melissa samuelis).*We concurred that implementation of the Forest Plan was *likely to adversely affect* these species, but *not likely to adversely affect* piping plover critical habitat. The programmatic BO concluded that the Forest Plan was *not likely to jeopardize* these listed species.

The programmatic BO established a two-level consultation process for activities completed under the Forest Plan. Evaluation of the Forest Plan at the plan level represented a Level 1 consultation and all subsequent project-specific evaluations for future actions completed under the Forest Plan are Level 2 consultations. Under this approach, the Level 1 programmatic opinion established guidelines and conditions that each individual future project must adhere to and operate within to remain consistent with the scope of the Level 1 opinion; these individual projects are subject to Level 2 consultations. Projects that are *likely to adversely affect* listed species or designated critical habitat are reviewed to determine: (1) whether they were contemplated in the Level 1 programmatic opinion and (2) if they are consistent with the guidelines established in the Level 1 programmatic opinion and whether the reasonable and prudent measures and terms and conditions provided in the incidental take statement are applicable. This ensures that the effect of any incidental take resulting from individual projects is minimized. In response, a Level 2 opinion is prepared and appended to the original programmatic opinion. Future projects that are likely to adversely affect listed species or critical habitat, and do not adhere to the guidelines and conditions evaluated during the programmatic consultation, or any future projects that are considered to be outside the scope of the proposed action or Forest Plan, may require separate formal consultations.

While the proposed action incorporates and maintains consistency with the applicable standards and guidelines as outlined in the Forest Plan as provided in your BA, the Programmatic BO did not address effects of the Forest Plan on NLEB. Therefore, this consultation is not considered a Level 2 project-level consultation; instead, it is a "stand-alone" consultation.
The Service published a final rule on April 2, 2015, listing the NLEB as threatened under the Act. In addition, the Service published a species-specific interim 4(d) rule pursuant to section 4(d) of the Act for NLEB (80 FR 17974). Section 4(d) of the ESA states the following:

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 4(d) rule for NLEB exempts the take of NLEB 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)
   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 NLEB for one year following publication of the interim rule.

Thus any take of NLEB occurring in conjunction with these activities that complies with the conservation measures, as necessary, is exempted from section 9 prohibitions by the 4(d) rule, and does not require incidental take authorization. We distinguish these activities from other actions throughout the accompanying BO.

However, 4(d) rules do not afford exemption from the Act's section 7 procedural requirements. Therefore, consultation remains appropriate when actions (even those within the scope of a 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 Act, which directs that all Federal actions 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.

Consultation History

March 2, 2006	A Programmatic Biological Opinion for the HMNF's Forest Plan was completed, establishing a two-level consultation process. KBB was addressed. NLEB was not listed or proposed at this time.
March 2, 2015	The Service received the BA and EA for the Bigelow-Newaygo Project.
July 6, 2015	The USFWS ELFO sent a letter to the HMNF acknowledging receipt of formal section 7 consultation initiation.

July–August 2015	A conference call was held between ELFO (Tameka Dandridge and Chris Mensing) and the HMNF (Heather Keough and Pamela Repp) to discuss proposed activities in the BA and conservation measures for NLEB. Subsequent telephone conversations and email correspondences followed.
September 2, 2015	Final draft of BO submitted to USFS
September 15, 2015	Final BO submitted to USFS

Description of the Proposed Action

Action Area

The Bigelow-Newaygo Project Area (project area) is located in the Michigan counties of Mecosta, Montcalm, and Newaygo, within the Baldwin-White Cloud Ranger District of the HMNF (Figure 1). Both private and federal lands are contained within the proposed action area; however, no proposed activities would occur on private lands. Federal lands comprise approximately 7,700 acres of the total 32,000-acre project boundary. Proposed activities will occur on approximately 2,800 acres. The project area is also located within the Newaygo Recovery Unit, as designated in the Karner Blue Butterfly Recovery Plan (USFWS 2003), and contains the Bigelow Metapopulation Area (BMA) and adjacent subpopulations of KBB.

Project Description

The Baldwin-White Cloud (BWC) Ranger District of the HMNF has proposed various management activities on National Forest System (NFS) lands within the project area. The HMNF proposes to conduct vegetative, wildlife, road system, and other activities described in Table 1.

Table 1. Activities proposed as part of the Bigelow-Newaygo Project.

Treatments			
Vegetative	**Wildlife vegetative**	**Road system**	**Other**
Red pine thinning	Mechanical & manual woody vegetation removal	Road construction	Instream structure maintenance
Overstory removal harvesting	Woody vegetation herbicide treatment	Road reconstruction	Riparian planting
Opening creation	Prescribed burning	Road closures	Road-stream crossing improvements
Opening restoration/maintenance	Native plant seeding		Repair resource damage
Savanna restoration	Site preparation		Non-native invasive plants herbicide treatment
Broadcast burning	Habitat protection measures		

The proposed treatments are intended to accomplish the following objectives:

- Restore and maintain savannas, prairies, dry grasslands, and mesic grasslands where they were known to previously occur for habitat diversity and to meet species viability needs;
- Manage wildlife and fisheries habitat and plant communities to maintain viable populations of existing native and desired non-native species;
- Reduce life-threatening and property-damaging wildfire potential; and
- Provide recreational opportunities while protecting the unique ecosystem characteristics of the project area.

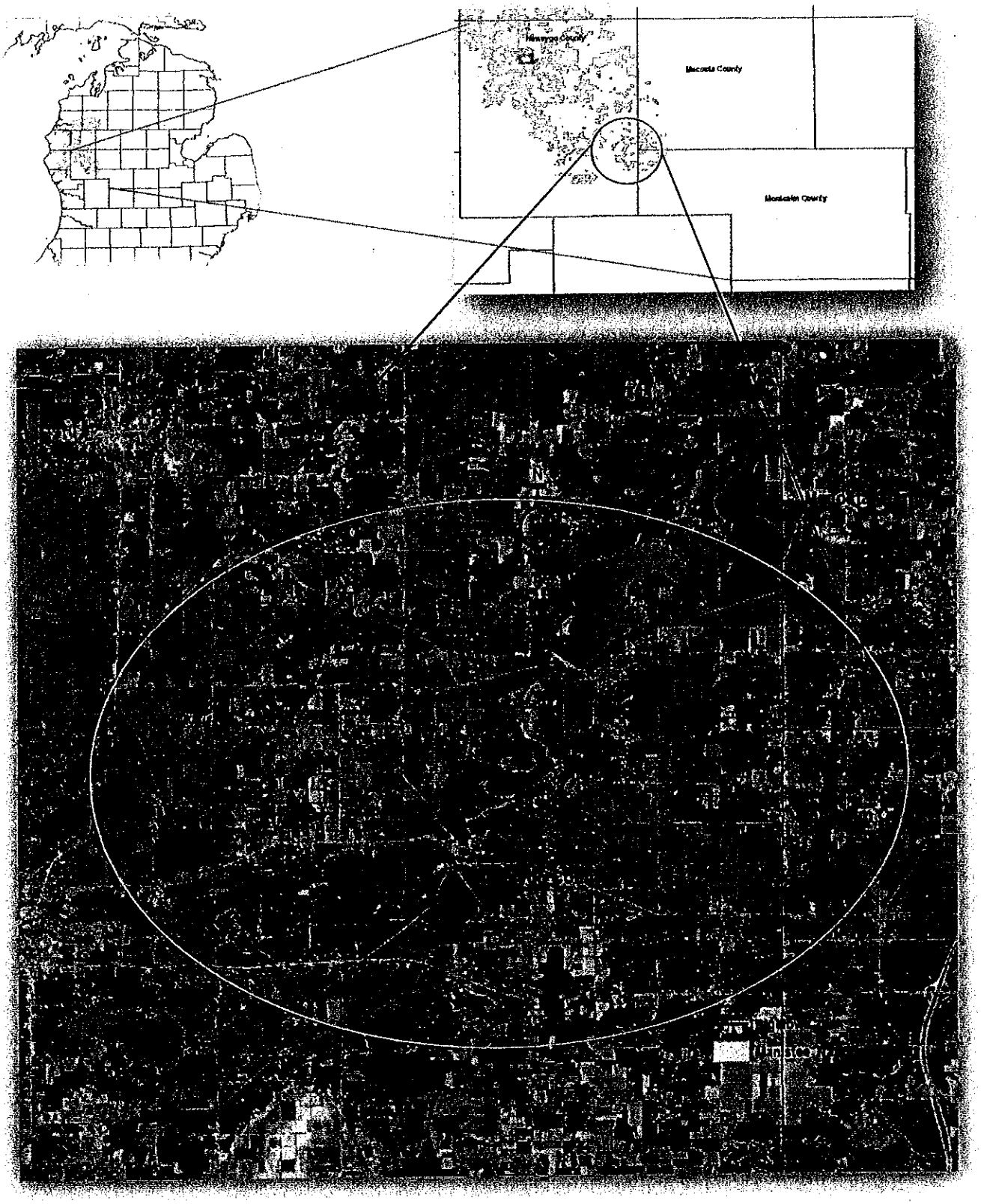

Figure 1. Map of project area.

Table 2. List of actions and affected acres; not all treatments will be used on all acres

Activity	Affected acres
Pine thinning: conifer timber harvest / non-commercial cutting	1,412
Conifer overstory removal harvesting: Conifer timber harvest / non-commercial cutting	45
Opening creation	102
Opening restoration and maintenance	345
Savanna restoration	485
Broadcast burning	696
Mechanical or woody vegetation removal	Up to 932*
Woody vegetation herbicide treatment	Up to 100
NNIS herbicide treatment	108
Prescribed fire	Up to 932*
Native plant seeding	Up to 242
Site preparation	Up to 100
Habitat protection measures	Up to 932
Road construction/reconstruction	5.5
Road closure	3.9 miles
Maintenance of Bigelow Creek instream structures	Up to 28 each
Riparian planting	17
Road/stream crossing improvements	9 each
Repair resource damage	180

*The maximum numbers of acres treated – multiple treatment types may occur on the same acreage not to exceed 932 acres.

Conservation measures

Conservation measures are part of the proposed action; therefore, we consider them in the analysis of effects. The BA includes the following conservation measures to minimize adverse effects on KBB and NLEB:

1. Project activities occurring adjacent to or within dispersal distance of occupied KBB habitat:
    a. With the exceptions of prescribed fire, activities will be conducted outside of the two flight periods for KBB. The District's wildlife biologist will be consulted prior to implementing activities to determine appropriate project start and end dates.
    b. Occupied habitat will have a 50-meter forested buffer placed around the occupied area of the stand during timber management activities. Consult the District's wildlife biologist prior to conducting activities, when monitoring results indicate managed openings or savannas provide high-quality KBB habitat, to develop living corridors between these areas and adjacent occupied KBB sites to promote dispersal.
    c. Herbicide application will occur after August 15 once mature wild lupine plants have senesced and the KBB second flight period has passed.
    d. Herbicide application may occur between April 1 and August 15 only when the wind is not blowing toward occupied habitat and there is a minimum buffer of 200 meters between the habitat and treatment area.

2. Project activities occurring within occupied KBB habitat:
    a. Due to the current population status of KBB on the District, prescribed fire/burns will not occur within occupied sites. Prescribed fire will be restricted to burning around occupied portions of stands.

    b. Habitat management will occur between August 16 and March 14.

    c. Landings, logging roads, and skid trails are not permitted, except for identified portions of Oak Road and FS 9208.

    d. Hand-cutting vegetation:
        i. Piled slash created from hand-cutting vegetation will not exceed 20 percent of an occupied site. Anything in excess of 20 percent must be placed outside of occupied sites.
        ii. Slash will not be placed in areas containing concentrations of wild lupine.
        iii. Trucks or tractors with trailers may be used to remove hand-cut slash/woody debris within occupied habitat. Trucks not larger than a double axel dual tire may be used. Tractors less than 8,000 pounds and trailers not larger than dual axel single tire may be used. A four-year return frequency will be applied for trucks with a trailer.
        iv. Removal of slash/wood debris would occur on no more than half of an occupied site each season.
        v. Access routes will be minimized to the extent possible and avoid wild lupine, nectar sources, and KBB eggs.
        vi. Cut vegetation that may contain eggs would be left unless the cut vegetation is collected and placed in another suitable habitat.

    e. Mowing:
        i. Sites will be divided into at least two treatment areas, each of which supports wild lupine and nectar sources.
        ii. Treatment will be conducted first on the most degraded half of a site, as determined by the highest concentration of wild lupine and provision of lupine in shaded areas where female KBBs prefer to lay eggs.
        iii. A four-year return frequency will be used.
        iv. Cut vegetation that may have eggs will remain on site, unless the cut vegetation is collected and placed in another suitable habitat site.
        v. Mower blade will be set at least six inches above the ground and eight inches where wild lupine occurs.
        vi. Mow after all second-flight females have laid their eggs and died and wild lupine has set seed. This usually occurs after September 1.
        vii. Avoid ant mounds.
        viii. If possible, mow under frozen ground conditions.

    f. Herbicide application:
        i. Will occur after August 15 once mature wild lupine plants have senesced and the KBB second flight period has passed.
        ii. Hand-operated equipment would be used to apply herbicides.
        iii. Mark and avoid locations of wild lupine during application.

    g. Soil scarification/site preparation:

i. Expose mineral soil to aid seeding of native nectar plants on up to ten percent of an occupied site.
ii. Will not occur in areas containing concentrations of wild lupine and other nectar plants and wild lupine in shaded areas where female KBBs prefer to lay eggs
iii. Use an approximate four-year return frequency

h. Locally-based genotype seeds will be used during seeding and planting activities when possible.

i. Prescribed burning:
   i. Will not occur, unless the status of KBB changes on the District and District wildlife biologist determines an occupied site has a population that is capable of recovering from a burn.
   ii. If a site is allowed to burn, the following will be implemented:
   iii. Site will be divided into at least three burn units with no more than one unit (i.e., one-third of a site) burned in any one year. The most degraded unit will be treated first.
   iv. Plan burns so that treated occupied sites occur within ¼ mile of a least two unburned occupied sites to aid in recolonization.
   v. Use an approximated four-year return frequency.
   vi. Patchy burns designed with irregular shapes and small-scale unburned vegetation-skips will be used.
   vii. Fire lines and fuel breaks will be created outside of occupied habitat.
   viii. When possible, rehabilitate and seed fuel breaks and fire lines.
   ix. Install habitat protection measures where fuel breaks and fire lines are providing motorized access.
   x. A combination of hand-cutting, mowing, herbicide application, site scarification/site preparation, and/or seeding/planting may occur following a prescribed burn on one-third of an occupied site, as long as treatments occur within the burned unit during the same year that the area was burned, and abide by the conservation measures listed for each treatment type.

j. Habitat protection and repair resource damage:
   i. Signs requesting the public to stay on roads and trails and to camp outside of occupied sites will be posted along roads and trails within or adjacent to occupied sites and areas being managed to provide suitable KBB habitat.
   ii. Installation of physical barriers and temporary closure orders may be instituted if damage from human activities is noted.

k. Transportation management:
   i. Road construction and road reconstruction will not occur within occupied KBB sites, except for identified portion of Oak Road and FS 9208, which will be designed with the District wildlife biologist to minimize the removal of KBB habitat.

3. Implement the NLEB Interim Conference and Planning Guidance (USFWS 2014).
   a. With the exception of prescribed fire and road construction and reconstruction, all activities that would fell trees larger than three inches dbh would be prohibited during the summer occupancy period between May 1 and August 31.

b. Reserve snags, den trees, and trees that have features beneficial to the NLEB such as cavities, crevices, and loose or sloughing bark.
c. Conduct low to moderate intensity prescribed burns when possible.
d. Retain burning snags by extinguishing fire rather than felling when possible.

4. Prescribed fire
    a. To the extent practicable, all prescribed fires would be conducted outside the non-volant period of June 15 to August 1.
    b. If burning needs to occur during the non-volant period, prescribed burns will be conducted in non-hardwood or mixed forest habitat types when possible.

Status of the Species

KARNER BLUE BUTTERFLY

The primary sources of information for this section are the Karner Blue Butterfly Recovery Plan (USFWS 2003), 2006 USFS Forest Plan, Biological Opinion for the USFS Baldwin-White Cloud Ranger Savanna Ecosystem Restoration Project (USFWS 2010), HMNF KBB reports to the Service 2008–2014 (USDA FS 2008b, 2009b, 2010, 2011, 2012b, 2013; Keough 2014), and KBB recovery team meeting notes from 2013–2015.

Species Description

Karner blue butterfly is a member of the Lycaenidae family. Adults are small with a wingspan measuring between 2.2 and 3.2 centimeters. The upper side of the male wing is a violet blue with a black margin and white-fringed edge. The female upper side ranges from dull violet to bright purplish blue near the body and central portions of the wings, and the remainder of the wing is a light or dark gray-brown, with marginal orange crescents typically restricted to the hind wing. Both sexes are a grayish fawn color on the ventral side. Near the margins of the underside of both wings are orange crescents and metallic spots.

Life History

The species has two broods, or adult flight periods, each year. In typical years, first brood larvae hatch from overwintered eggs in mid- to late April and begin feeding on wild lupine, the only known larval food source. Larvae feed for about three to four weeks, while passing through four developmental stages or instars. They then pupate and adult butterflies begin emergence in late May with the flight extending to early June. During this time, mating occurs and females lay eggs primarily on lupine plants or on nearby plants and leaf litter. These eggs are now the second brood, which hatches in five to ten days.

Larvae feed on lupine leaves and flowers from early June through late July, while being tended by ants. They then pupate and second brood adults emerge from early to mid-July and fly from until mid- to late August. This flight of females lays its eggs close to the ground, primarily on grasses and sedges, other plant species, leaf litter near lupine stems, and occasionally on lupine; these eggs do not hatch until the following spring. Usually, by late August, no adults remain. There are generally about three to four times as many adults in the second brood compared to the first brood. Cold and/or rainy weather can delay the two flight periods of the butterfly, while extended warmer temperatures can lead to larval emergence before lupine growth.

Immature stages (eggs, larva, and pupae) of KBB have a mutualistic relationship with ants. Larvae tended by ants have a higher survival rate, grow relatively rapidly, and gain weight more rapidly per amount of food eaten. The ants benefit from this relationship by using a liquid that is secreted by the larvae as food.

In addition to wild lupine, KBB requires tall grass for late afternoon basking and overnight roosting, some shading vegetation to prevent overheating, a source of water, and nectar sources for the adults. A variety of understory plants serve as nectar sources for the adults.

Population dynamics

The historic habitat of the butterfly was the savanna/barrens ecosystems. Much of that habitat has been destroyed by development, fragmented, or degraded by succession. Because such habitats can be lost to succession, KBB persistence is linked to disturbance and/or management that renews or creates these necessary habitats. Literature on the historic distribution of KBB suggests that this species occurred as shifting clusters of populations distributed across a vast fire-swept landscape covering thousands of acres. While the fires resulted in localized extirpations, vegetative succession following these fires maintained suitable habitat and allowed rapid population expansion or repopulation (Schweitzer 1989).

KBB is an example of a species for which suitable habitat occurs in relatively small areas (or patches) distributed over larger areas. Like other species whose habitat occurs in patches rather than large continuous tracts of land, populations of KBB exist as dynamic collections of subpopulations genetically interconnected by dispersal. Collectively these interconnected subpopulations make up a metapopulation. Metapopulations continually shift in distribution across the landscape as habitat patches change from suitable to unsuitable habitat due to varying stages of disturbance and succession. No one theoretical metapopulation structure is advocated for the KBB; rather, the recovery plan focuses on those factors that would restore healthy metapopulations including sufficient suitable habitat, connectivity of subpopulations, and management. Persistence of metapopulations is governed by the balance between extirpation of subpopulations and recolonization of unoccupied sites with suitable habitat.

To preserve species with patchy distributions, it is necessary to maintain existing patches of suitable habitat, the processes that create new habitat patches, and the corridors that allow a species to migrate between habitat patches (Harrison et al. 1988). Open linear areas such as road and railroad rights-of-way, utility corridors, and forest roads and trails can serve as dispersal corridors for the KBB, allowing them to recolonize or colonize wild lupine patches. Research has shown dispersal of the KBB to range from about 600 feet (183 meters) to about 2 miles (3.2 kilometers).

Status and Distribution

Historically, KBB occurred in a narrow geographic area that extended from eastern Minnesota, across portions of Iowa, Wisconsin, Illinois, Indiana, Massachusetts, Michigan, Ohio, Pennsylvania, New York, New Hampshire, Maine, and the province of Ontario, Canada. The historical range of the KBB in the United States has not changed although changes in the distribution of the KBB within its historic range have occurred since listing. The current range of KBB includes seven states: Minnesota, Wisconsin, Michigan, Indiana, Ohio, New York and New Hampshire. Range-wide, Wisconsin supports the largest and most widespread populations of KBB. Populations in Minnesota and Indiana may be extirpated.

The historic KBB range in the Oak Openings of northwest Ohio and southeast Michigan are now occupied by small KBB populations as a result of ongoing reintroductions. KBBs occurred in the province of Ontario, Canada until about 1991 when they were likely extirpated (USFWS 2003). Within the last few years there has been renewed interest in starting a recovery program for the butterfly in the province of Ontario, Canada (Elaine Williams, Wildlife Preservation Canada, pers. comm. 2011).

The range-wide status of the KBB is considered stable. There have been recent declines in the Midwest in Michigan and Wisconsin, while populations in the northeast have experienced increases. Although the Midwest populations have decreased overall, numbers have risen slightly at certain sites (Jill Utrup, USFWS, pers. comm. 2015).

Conservation Status

KBB was listed as endangered on December 14, 1992. No critical habitat is designated for this species. A final recovery plan was published in the Federal Register on September 19, 2003 (USFWS 2003). In general, the recovery strategy for this species is to perpetuate viable metapopulations of the KBB in the major ecological regions throughout its geographic range. Thirteen ecological regions are identified in the KBB Recovery Plan (called "recovery units" [RUs]), based on known variation in physiography, climate, and vegetation, and potential geographic genetic variation in KBB populations. Wisconsin and western Michigan harbor the largest, and most widely spread KBB metapopulations within the geographic range of the species. The goal for these areas is to stabilize and maintain, and in some cases, expand, the populations that now occur. Because of the significance of these two states as the centers of KBB abundance, more RUs and more metapopulations are established in these areas than in other parts of the range. These multiple RUs should protect the species against wide scale declines in either state.

The RUs in Minnesota and Indiana, which are possibly extirpated, and some sites in Michigan have imperiled populations. The goal for these areas is to protect existing habitat (both occupied and unoccupied sites) and to increase, stabilize, and maintain the existing populations. Fewer metapopulations are established in these RUs.

Finally, seven potential recovery units (PRUs) are identified. These PRUs are nonessential for recovery, but it would be beneficial to the species if viable metapopulations were recovered in these units. PRUs within Region 3 of the Service are located in the states of Illinois, Michigan, Minnesota, Ohio, and Wisconsin. The PRUs in Michigan and Ohio have established reintroduced KBB populations.

Habitat management, including restorations and enhancements, occur throughout the range of the species. Many sites have improved as a result of management or habitat expansion. The KBB population is considered relatively stable across the species' range (J. Utrup, pers. comm. 2015). Population numbers at most recovery sites across the range appear stable or have increased from 2009-2010. However, from 2010 to 2014, population numbers in the northeast (New York and New Hampshire) have increased, while those in the Midwest (Ohio, Michigan, Indiana, Wisconsin, and Minnesota) have experienced declines, especially those in Minnesota and Indiana, which have been on a downward trend for several years.

Of the 29 KBB metapopulation sites across the range, the annual recovery criteria for KBB population numbers (3,000 for a Viable Population and 6,000 for a Large Viable Population) were met (or likely met) at five sites in Wisconsin and one in New York. Presence/absence surveys conducted on the

HMNF in 2009 and 2010 found KBB at 74% of sites monitored in 2010 compared to 38% of sites monitored in 2009. Specifically, KBB counts at the White River, Otto and Hayes, MI metapopulations were significantly higher in 2010 than in 2009. Reintroduction and augmentations are on-going at six KBB metapopulation sites at Concord, New Hampshire; Albany Pine Bush, New York; Toledo, Ohio; West Gary and Indiana Dunes National Lakeshore, Indiana; and Petersburg State Game Area, Michigan. Populations at several of these sites are considered stable or increasing, with the exception of Indiana. While several KBB populations across the species range have increased, these increases are within the expected natural population fluctuation levels for the butterfly. Therefore, considering the population information and the threat level, the status of KBB range-wide is considered stable.

Threats

The most significant threat to KBB is habitat loss, alteration, and destruction. This has been accompanied by increased fragmentation of the remaining suitable habitat. Originally, barrens and savanna were widespread in the central United States. There has been a precipitous decline in these habitats. Remaining barrens and savanna usually consist of isolated patches, which persist because of droughty soils, insects and disease, and human disturbance such as mowing, light grazing and intermittent prescribed or wild fires. Habitat loss has resulted in a reduction in the number of KBB subpopulations, habitat fragmentation, and smaller-sized occupied sites. Habitat degradation has reduced the abundance and quality of KBB's food resources (lupine and nectar plants) and microhabitat diversity. A major contributor to habitat degradation is the disruption of the natural dynamic processes that maintain the quality of KBB habitat. Human use of KBB habitat and adjacent areas is the primary cause of disturbance suppression.

Incompatible management practices threaten some populations of KBB, such as poorly timed or poorly located use of herbicides, insecticides, and mowing; management that promotes high densities of deer and ruffed grouse; and frequent use of high intensity prescribed fire. Even on areas with concordant management goals, too vigorous a pursuit of these goals has been detrimental to the butterfly. For example, while mowing can be an effective management tool some precautions are warranted. Mowing can directly crush eggs or larvae, damage or reduce the density of lupine plants, eliminating food for larvae, and decrease nectar sources. Similarly, prescribed fire can threaten KBB populations if the burning is conducted on the majority of the available habitat, or if high-intensity fires are used at frequent intervals.

Environmental Baseline

Status of the Species within the Action Area

The Bigelow Metapopulation Area (BMA) and adjacent subpopulations of the Newaygo Recovery Unit lie within the action area. The BMA is made up of four subpopulations on about 81 acres in the HMNF. Currently, there are 25 openings and savannas covering about 454 acres within the BMA that have documented occurrences of KBB (USDA FS 2015b). KBBs are also documented in 23 openings and savannas, covering approximately 430 acres, adjacent to the BMA (USDA FS 2015b). However, most (88%; approximately 778 acres) of the documented occurrences are located on non-NFS lands, with only 5% (approximately 106 acres) occurring on NFS lands within the BMA (USDA FS 2015b).

Annual presence/absence surveys were conducted on the HMNF. Beginning in 2007, quantitative surveys and monitoring were added to estimate population size. Both the number of occupied sites and observed individuals has declined in recent years but appears to be stabilizing. Numbers have also

increased at some sites while decreasing in others [(Tables 3 and 4 and HMNF KBB monitoring reports (USDA FS 2008b, 2009b, 2010, 2011, 2012b, 2013; Keough 2014)].

Table 3. The number of KBB occupied subpopulations (subpops) out of the total subpopulations monitored within and adjacent to the Bigelow metapopulations.

Metapopulation area	Number of occupied subpops out of total subpops 2008	Number of occupied subpops out of total subpops 2009	Number of occupied subpops out of total subpops 2010	Number of occupied subpops out of total subpops 2011	Number of occupied subpops out of total subpops 2012	Number of occupied subpops out of total subpops 2013	Number of occupied subpops out of total subpops 2014*
Bigelow	3 out of 3	4 out of 4	2 out of 3	4 out of 4	3 out of 3	2 out of 2	2 out of 2
Adjacent to Bigelow	1 out of 4	1 out of 4	0 out of 3	3 out of 5	2 out of 5	2 out of 5	2 out of 5

Table 4. The number of KBB observed within and adjacent to the Bigelow metapopulation.

Metapopulation area	Number of KBB observed in 2007	Number of KBB observed in 2008	Number of KBB observed in 2009	Number of KBB observed in 2010	Number of KBB observed in 2011	Number of KBB observed in 2012	Number of KBB observed in 2013	Number of KBB observed in 2014*
Bigelow	0	0	0	0	2	4	11	126
Adjacent to Bigelow	1	0	0	0	8	6	2	3

*USFS monitoring for Consumers Energy sites (both tables)

East of the BMA, there are four KBB subpopulations that occur on a total of about 22 acres. These subpopulations lack connectivity (are isolated), occur at least 3.3 kilometers away from one another, and 7.6 kilometers from the nearest subpopulations within the Bigelow metapopulation. Population numbers here have ranged from a low of zero in 2008 to a high of 93–130 in 2006 (2007: 46–64 KBBs). When monitoring was conducted in 2009, only one of the four subpopulations was occupied; average relative abundance was estimated to be 0.3 KBB/km (0.62 mile); and distance sampling estimated overall KBB abundance to be one butterfly (USFWS 2012a).

Between 2008 and 2013, the HMNF, along with its partners, and volunteers, monitored the four subpopulations within the BMA and eight subpopulations adjacent to the BMA (USDA FS 2015b). According to the BA (2015), monitoring results indicate that the BMA has not met the goals listed in the recovery plan, which is a minimum of two large viable populations or at least 6,000 individuals. The BA also advises that none of the monitored subpopulations have sufficient wild lupine cover and cover of other KBB nectar plants to support a persistent metapopulation.

Factors Affecting the Species Environment within the Action Area

KBB subpopulations in and adjacent to the BMA currently occupy marginal habitat (USDA FS 2015b). The habitat consists of lupine cover and KBB nectar plants in amounts and densities that are less than what is required to support a persistent metapopulation. Woody vegetation density has also

increased. Occupied sites are now smaller in size, isolated, lack connectivity, and not well distributed across the landscape (BA 2015).

Two other metapopulations within the Newaygo RU (Brohman and Hayes), but outside the project area, are also declining in population numbers of KBB and occupied acres (USDA FS 2015b). In fact, KBB may be extirpated from the Brohman metapopulation Area, as the butterfly has not been observed within monitored subpopulations since 2005. The HMNF believes that the following factors may be responsible for the apparent KBB declines within these metapopulations (USDA FS 2006, USDA FS 2013).

- Habitat loss due to natural succession is continuing despite past treatments that have attempted to prevent woody encroachment into suitable KBB habitat. The number of acres of suitable KBB habitat experiencing woody encroachment is greater than the number of acres of suitable KBB habitat treated annually.
- Deer browsing of wild lupine, which may reduce KBB larval survival, may be increasing within suitable KBB habitat.
- Weather conditions have shifted between drought conditions, very wet and cold springs and summers, and unseasonably warm summers followed by several spring frosts. Variations in temperature and precipitation and the occurrence of spring frosts can reduce over-winter survival of eggs, reduce the availability of nectar plants, and lead to changes in nectar plant phenology, subsequently leading to a decrease in KBB populations.
- Topography of these metapopulation units has low depressional areas, which increases the occurrence of growing-season frost pockets that may damage wild lupine and other nectar plants.
- Vehicle/ORV use, dispersed camping, and horseback riding occurs within suitable KBB habitat, which may inadvertently kill KBB and/or damage wild lupine and other important nectar plants. Road closures and the development of designated non-motorized trails implemented under the Forest Plan's management direction for the White River Special Area, and camp site closures in occupied KBB habitat that have been implemented under Forest Plan Standards and Guidelines have reduced these impacts in some metapopulation areas (USDA FS 2012a).

Other activities that have had an impact on the KBB within the action area are discussed below.

Previous Section 7 consultations

- *Cooperative Gypsy Moth Suppression Project, Michigan*

  In 1996, the USFS State and Private Forestry Division formally consulted on a proposed gypsy moth suppression project for 22,579 acres in Mecosta, Muskegon, Newaygo, and Oceana counties. The proposed action was to aerially apply the biological insecticide *Bacillus thuringiensis* var. *kurstaki* (Btk) to private residential and public recreational lands. Many of the properties proposed for treatment were on non-Federal lands within the HMNF administrative boundary. The Btk is lethal to KBB larvae as well as gypsy moth larvae, and if KBBs occurred within a spray block, mortality was expected.

  In a May 31, 1996 biological opinion, we analyzed the effects of the proposed action and determined that the project, as proposed in 1996, was not likely to jeopardize the continued existence of the KBB. Survey indicated that the KBB occupied approximately 20 percent of

areas with suitable soil types (LTA 1) on the HMNF. Therefore, we assumed that KBB could occur on up to 20 percent of the project treatment acreage within suitable soil types. Incidental take was authorized for the 20 percent of the treatment acres with the potential to support the species that may be occupied; this number was equivalent to 1,097 acres. In addition, the terms and conditions stipulated that no more than 50 percent of any area known to be occupied by KBBs may be treated with Btk and no area shall be treated in consecutive years. All areas with lupine were assumed to support KBB.

Portions of at least two, possibly four, of the proposed treatment blocks were known to be occupied by KBB. It is not known, however, exactly what portion of the suitable habitat that was authorized for take was actually occupied by KBB. It is possible that there were treatment blocks of suitable KBB habitat that were not occupied, and thus take did not reach the authorized amount. We expect that some level of take did occur, however, since some areas of known occupied habitat were included in the treatment blocks. Because it is impossible to quantify the actual amount of take that occurred, it is prudent to assume incidental take occurred on all authorized 1,097 acres, although it was likely less than this. There are a total of 131,694 acres of potential habitat within the HMNF, based on areas with LTA 1 classification (USDA FS 2003b). Given the estimated occupancy rate of 20 percent in potential habitat, we can assume that KBB may occur on up to 26,338 acres within the HMNF. Furthermore, laboratory studies approximated an 80 percent mortality rate of KBB caterpillars treated with Btk (Herms 1996). It is likely that a portion of the KBB in a spray block would be pupae, adults, or eggs and may not be affected by the Btk. Based on this information, it is unlikely that any KBB population was eliminated with any single application of Btk. Thus, the amount of take authorized in 1996 was likely less than four percent of the total potential occupied habitat in the action area, and did not appreciably diminish the potential of long-term KBB survival and recovery in the action area.

In 1999, consultation for this project was reinitiated as new information became available. The 1999 gypsy moth suppression project consultation considered treatment of 5,087 acres of suitable KBB habitat in Allegan and Muskegon counties. Most of the proposed spray blocks with potential to affect the KBB were private or State lands within or near the HMNF boundaries. These areas were proposed for treatment with Btk or Gypcheck©, a newly developed virus for biological control specific to gypsy moths, that does not affect KBB. Following informal consultation, the USFS agreed to apply Gypcheck© in place of Btk on all spray blocks within one mile sections adjacent to sections with a known KBB occurrence. Using this application strategy, known occurrences of KBB within proposed spray blocks would not be sprayed with Btk, and unknown occurrences within one mile of known occurrences will also be avoided. No known KBB occurrences were proposed for treatment with Btk; however, we again believed that unknown occurrences might be sprayed with Btk and the USFS entered into formal consultation. In the May 6, 1999 biological opinion, we analyzed the effects of the proposed action and determined that the project was not likely to jeopardize the continued existence of the KBB. Based on the same reasoning used in the previous biological opinion, we determined that unknown KBB occurrences may be present on about 20 percent of the 5,087 acres with a soil type suitable for lupine, and authorized take for no more than 1,017 acres.

When the project was continued in 2000, the USFS determined that it was "not likely to adversely affect" the KBB. In the previous biological opinions, we concluded that unknown KBB occurrences may be present on about 20 percent of LTA 1. This was reconsidered in

2000, however, because further analysis determined that no data existed to support this conclusion. Based on the following parts of the USFS 2000 proposed action: 1) all occupied sites and sites adjacent to occupied sites were treated with Gypcheck©, which is not toxic to KBBs, and 2) none of the Btk treatment areas were known to have KBBs present. Therefore, no adverse effects from the project were expected. Based on the best available data, no known or unknown occurrences of KBB were likely to be adversely affected by the proposed action and thus, it was not possible to identify any incidental take of the species that was reasonably certain to occur. In addition, based on this analysis, it is unlikely that there were any adverse effects from this proposed action in 1999, and the incidental take authorized for 1,017 acres was not likely realized. In a May 10, 2000 letter, we concurred with the "not likely to adversely affect" determination made by the USFS and rescinded the May 6, 1999 biological opinion.

Informal consultation with the Service takes place annually for this project. The HMNF, in consultation with the Service, has cancelled proposed Btk treatments or replaced Btk with Gypcheck© on or near occupied KBB habitat. The availability and use of Gypcheck© continues to provide a reasonable, safe alternative to Btk, and ongoing Michigan Cooperative Gypsy Moth Suppression Projects are not likely to result in adverse effects or incidental take of KBBs.

- *Intra-Service Section 7 Consultation on Issuance of Section 10(a)(1)(B) Permit to Michigan Department of Natural Resources Section for KBB*

  An incidental take permit (ITP, Permit #TE213404-0) was issued July 1, 2010 to the Michigan Department of Natural Resources (DNR) (expires December 31, 2030). Two types of take were permitted under the ITP: (1) short-term take associated with habitat and vegetation management, and conservation and recovery activities; and (2) take associated with permanent loss of habitat. A Habitat Conservation Plan (HCP) was developed by the DNR to minimize and mitigate the effects to KBB as a result of activities associated with habitat management, utility and transportation right-of-way maintenance, and development. These activities were proposed to occur throughout approximately 2,700 acres of state and privately owned lands in Michigan where occupied KBB habitat is known to occur. However, no more than one-third of occupied habitat would be adversely affected in a single year and no more than 540 acres of permanent habitat loss would occur over the 20-year term of the permit. Permanent losses of occupied habitat would be mitigated via habitat restoration and creation and therefore not result in loss of total habitat acres.

- *Section 7 Consultation for USFS Savanna/Barrens Restoration Project and Karner Blue Butterfly Habitat Restoration Project on the HMNF*

  Current treatments to restore savanna for KBB are occurring on 365 acres within the White River Metapopulation Area under the Savanna/Barrens Restoration Project (USFS 2008a). Treatments to restore occupied KBB openings are also occurring on 431 acres within the White River and Otto Metapopulation Areas under the Karner Blue Butterfly Habitat Restoration Project (USFS 2009a). Informal consultations were completed on these two projects on March 27, 2008 and January 5, 2009, respectively. It was determined that these projects were "not likely to adversely affect" KBB and that any affects from the project would be discountable or beneficial to the species. The proposed action complements these two restoration efforts by expanding the acreage to be treated for savanna creation and opening restoration, and increasing the number of treatment techniques that can be used to meet restoration goals.

- *Section 7 Consultation for USFS Savanna Ecosystem Restoration Project on the HMNF*

  In 2010, the USFS formally consulted on a proposed savanna creation and KBB habitat opening restoration project within the White River and Otto metapopulations of the Muskegon RU in Muskegon and Oceana counties. The proposed actions included various land and KBB habitat management activities, including forest conversion to savanna, prescribed burning, manual, chemical, and mechanical removal of vegetation, and road and recreational projects. The objectives were to reduce the amount of tree/shrub canopy cover and undesired vegetation within treated areas to promote growth of wild lupine, nectar plants, and native grasses. Additionally, motorized camping was limited, certain roads were closed, and trails were designated for recreational activities outside potential and occupied habitat.

  Management in occupied KBB habitat could be detrimental to individual butterflies. However, lack of management allows for vegetation encroachment, which eventually leads to a site no longer providing suitable habitat for the species. As such, conservation measures were designed to minimize and reduce adverse effects to KBB. Restoration techniques were developed to achieve restoration goals in a more efficient and effective manner.

  In the October 22, 2010 biological opinion, we analyzed the effects of the proposed action and determined that the project, as proposed, was not likely to jeopardize the continued existence of KBB. Due to the difficulty in detecting incidental take of actual eggs, larvae, or adult KBB, we assumed that all individuals occupying an area during treatment would be taken. Therefore, we anticipated the taking of all KBB associated with restoration of up to, but no more than, 3,061 acres of KBB habitat on the HMNF for the 10-year duration of the proposed action. At the time, only 519 acres were known to be occupied. In the future, however, as restoration efforts progress, the occupied acreage should significantly increase. Incidental take was authorized for 3,061 acres of occupied KBB habitat.

- *Other natural and human caused factors*

  Some privately-owned lands in the action area that formerly supported KBB populations have been lost to succession, agricultural conversion, forestry, and development. Furthermore, activities such as ORV use, pesticide use, and mowing and burning are known to occur in privately-owned KBB habitat (USFS 2003a; Heather Keough, USFS, pers. comm. 2010). While this has resulted in lost habitat, KBB is known to occupy disturbed areas, such as powerlines and gas pipeline corridors, old fields, forest openings, roadsides, and lightly stocked oak stands (USFS 2003a). It is likely that human activities have reduced the extent and quality of KBB habitat in the action area.

Status of the Species

NORTHERN LONG-EARED BAT

Species Description

The NLEB is a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

It 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. Throughout the species' range, the NLEB will hibernate between mid-fall through mid-spring each year. The spring migration period likely runs from mid-March to mid-May each year, as females depart shortly after emerging from hibernation and are pregnant when they reach their summer area. Young are typically born in late May or early June, with nursing continuing until weaning, which is shortly after young become volant in mid- to late July. Fall migration likely occurs between mid-August and mid-October. These dates are variable depending on weather conditions and latitude.

Summer habitat and ecology

Suitable summer habitat for NLEB 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. NLEBs seem to be focused in upland, mature forests (Caceres and Pybus 1997) with occasional foraging over forest clearings, water and along roads (van Zyll de Jong 1985). However, most NLEB hunting occurs on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001; LaVal et al. 1977).

Many species of bats, including the NLEB, consistently avoid foraging in or crossing large open areas, choosing instead to use tree-lined pathways. Further, wing morphology suggests that the species is 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. For purposes of this consultation, the NLEB's summer occupancy period is defined as the time when bats are reasonably expected to be present at their summer home range. In Michigan, the summer occupancy period is between May 1 and September 1 in the Lower Peninsula (LP) and between May 15 and September 1 in the Upper Peninsula (UP).

Maternity colonies and roosts

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies. Colonial roosting is a requisite behavior for reproductive success. NLEB maternity colonies range widely in size, although 30-60 bats/colony may be most common (USFWS 2013). Maternity colonies contain networks of approximately 10-20 roost trees often centered around one or more primary or central-node roost trees. NLEB show some degree of inter-annual fidelity to single roost trees and/or maternity areas. Male and non-reproductive female NLEBs may also roost in cooler places, like caves and mines. NLEB roost in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically $\geq$3 inches dbh). The 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 and have also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable).

Reproduction

Throughout the species' range, young NLEB are typically born in late-May through mid-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. In Michigan, the non-volant period occurs between June 15 and August 1.

Migration

Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat some distance from their hibernaculum. NLEB are not considered to be a long-distance migrant, typically migrating up to 40-50 miles. However, some NLEB detections have been documented in areas further than 100 miles from any known hibernacula. Migration may be stressful for NLEB, 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 being used by NLEB during the winter that have yet to be documented. The species hibernates from October to April depending on local weather conditions (November-December to March in southern areas and as late as mid-May in some northern areas). In Michigan, hibernation typically occurs from October 15 to May 15 in the LP and from October 1 to May 31 in the UP.

Hibernacula for NLEB typically have significant cracks and crevices for roosting, relatively constant, cool temperatures (0-9 degrees Celsius), 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.

NLEB tend to roost singly or in small groups (USFWS 2013), with hibernating population sizes ranging from a just few individuals to around 1,000 (USFWS unpublished data). NLEB 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). NLEB 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, NLEBs "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. 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 bats migrate to summer roosts. Female emerge from hibernation prior to males. Reproductively active females store sperm from autumn copulations through winter. Ovulation takes place after the bats emerge from hibernation in 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, NLEB 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 five 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.

Spring staging in Michigan occurs between April 1 and May 15 in the LP and between April 15 and May 31 in the UP. Fall swarming occurs between August 15 and November 1 in the LP and between August 15 and October 15 in the UP.

Threats

No other threat is as severe and immediate for NLEB as the disease white-nose syndrome (WNS). It is unlikely that NLEB populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2006, WNS has spread rapidly to 29 states and four Canadian Provinces throughout the Northeast, to the Midwest and the Southeast. Population numbers of NLEB have declined by up to 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 these species' ranges, it is expected to spread throughout their entire ranges. In general, the Service believes that WNS has significantly reduced the redundancy and resiliency of the NLEB.

Although significant NLEB 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. Impacts to hibernacula (e.g., human disturbance, changes in the hibernacula's microclimate) and loss or degradation of summer habitat (e.g., highway and commercial development, timber harvest, forest management) are additional stressors that may affect NLEB on two levels. First, individual NLEBs sickened or struggling with infection by WNS may be less able to survive other stressors. Second, NLEB populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less able to recover making them more 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. Affected bats may also be more likely to stay closer to their hibernation site for a longer time period following spring emergence.

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 proposed action, particularly if timber harvest or burns are conducted early in the spring (April – May).

Over the long-term, sustainable forestry benefits NLEB by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on the NLEB depending on the quality, amount, and location of the lost habitat, and the time of year of clearing. Depending on their 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 NLEB summer home ranges or away from hibernacula) to minor (e.g., largely forested areas, areas with robust NLEB 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 NLEB (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Mortality of NLEB 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.

Species Status and Distribution

The NLEB 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). In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to the Florida panhandle (Whitaker and Hamilton 1998, Caceres and Barclay 2000, Wilson and Reeder 2005, Amelon and Burhans 2006). The species' range includes the following 37 States and 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).

More than 1,100 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) include: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (3), Illinois (21), Indiana (23) Kentucky (119), Maine (3), Maryland (8), , Massachusetts (7), Michigan (103), Minnesota (11), Missouri (more than 269), Nebraska (2), New Hampshire (9), New Jersey (8), New York (58), North Carolina (22), Oklahoma (7), Ohio (7), Pennsylvania (112), South Carolina, (2), South Dakota (7), Tennessee (58), Vermont (14), Virginia (8), West Virginia (104), and Wisconsin (67). NLEB 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).

The current range and distribution of NLEB must be described and understood within the context of the impacts of WNS. Prior to the onset of WNS, the best available information on NLEB came primarily from widespread surveys and research projects, primarily focused on Indiana bat (*Myotis sodalis*) or an array of other bat species. In these efforts, NLEB 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 NLEB in the northeast, where the species was believed to be the most abundant. There are data also reporting substantial declines in NLEB populations in portions of the Midwest due to WNS. In addition, WNS has been documented at more than 100 NLEB 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.

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 NLEB 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, NLEB 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.

Critical Habitat

Critical habitat has not been proposed for the NLEB.

Environmental Baseline

Status of the NLEB in the Action Area

The project area is within the summer range of NLEB. Although we lack specific knowledge of NLEB occurrences within the action area, we can assume that based on the species' habitat requirements and its status in the LP of Michigan, there is suitable habitat within the project area to support summer roosting. Tippy Dam, located within Manistee Ranger District of the HMNF, provides winter hibernacula for NLEB. It is also the only known winter roost on the HMNF and is the nearest hibernacula at greater than 50 miles north of the project area.

In the Northern LP, NLEB appear to occur at somewhat lower densities than those found in the UP, but are still commonly detected at certain sites. During 1910–1939, the University of Michigan collected 3 NLEB specimens from two Northern LP counties (Cheboygan and Charlevoix), and to date, Michigan State University collected a total of 14 specimens from seven northern LP counties (Alpena, Antrim, Grand Traverse, Iosco, Kalkaska, and Roscommon). In the Manistee National Forest, NLEB represented 6% (22 of 389) of the total bats captured during the summers of 1998 and 1999, and 27 NLEB roost trees were identified in Lake, Manistee and Wexford Counties (Kurta 2000). Additionally, mobile acoustic surveys conducted in the Huron-Manistee National forest yielded NLEB detections during 2011-2012, although the results are considered preliminary.

A majority of NLEB roosts reported were in deciduous (i.e., hardwood) forest types (e.g., Mumford and Cope 1964, Sasse 1995, Foster and Kurta 1999, Lacki and Schwierjohann 2001, Schultes 2002, Broders and Forbes 2004, Jackson 2004, Carter and Feldhamer 2005, Ford et al. 2006, Bales 2007, Winhold 2007, Garroway and Broders 2008, Kurta 2008, Dickinson et al. 2009, Johnson et al. 2009, Lacki et al. 2009, Krynak 2010, Timpone et al. 2010, Silvis et al. 2012, Sinander 2012, Bohrman and Fecske 2013, Brown 2013, Lereculeur 2013, Badin 2014). Broders and Forbes (2004) reported that female NLEB roosts in New Brunswick were 24 times more likely to be in shade-tolerant, deciduous trees than conifers. These data suggest that hardwood trees most often provide the structural and microclimate conditions preferred by maternity colonies and groups of females, which have more specific roosting needs than solitary males (Perry and Thill 2007), although softwood snags may occasionally offer more suitable roosting habitat for both sexes than hardwoods (Perry and Thill 2008, Cryan et al. 2001).

Additionally, it has been suggested that NLEB does not often forage in intensively managed stands (Patriquin and Barclay 2003, Ford et al. 2005, Sheets et al. 2013). However, Owen et al. (2002) and Menzel et al. (2002) concluded that intensively managed hardwood forests in the central Appalachians provide adequate roosting habitat for NLEB. Badin (2014) found that NLEB roosted at greater abundances in undisturbed forest (n = 65) than harvested forests, with a few roosts in patch-cuts (n = 4), and none in larger clear-cuts. When using disturbed areas, NLEB were found to use plots with more trees (i.e., vegetative clutter) than random locations (Cryan et al. 2001, Owen et al. 2002, and O'Keefe 2009).

NLEB are consistently found hibernating in Tippy Dam, a hydroelectric facility in Mason County, comprising an estimated 2.6% of the approximately 19,000 bats that hibernate there (Kurta et al. 1997). NLEB were 11.9% (203) of bats captured swarming at Tippy Dam during August 1995 and 3% (30) of the bats captured in September of the same year (Kurta et al. 1997). During 12 nights of sampling in the fall of 1998 and 1999, NLEB were 12.26% (1,037) of the total bats captured near the dam (Kurta 2000). In addition to Tippy Dam, NLEB have been observed hibernating in a surge tunnel in Rockport Quarry, an abandoned limestone quarry in Alpena County (Slider and Kurta 2011), although they appear to use the hibernaculum in relatively low numbers (Travis 2014).

Manistee National Forest

In the Manistee National Forest in the northwestern LP, NLEB represented 6% (22 of 389) of the total bats captured during the summers of 1998 and 1999; moreover, 27 NLEB roost trees were identified in in Lake, Manistee and Wexford (Kurta 2000). In addition, mobile acoustic surveys conducted within the Manistee National Forest during 2011-2012 yielded several potential NLEB detections, although the results are considered preliminary. In 2014, NLEB captures totaled 6% of bats (7 of 115) at one study site in Wexford County on the Manistee National Forest. During subsequent radio-tracking, 13

additional roost trees were identified in 2014, including several maternity roosts (George and Kurta 2014).

Southern Lower Peninsula (south of 44°N latitude)

In the southern LP, NLEB are considered relatively uncommon (Winhold 2007). During 1910–1939, a single NLEB specimen was collected from Washtenaw County for the University of Michigan Museum, and Michigan State University has collected an additional 20 specimens from four southern LP counties (Berrien, Calhoun, Eaton, and Kent) to date. In Eaton County, NLEB were 1.8% (4 of 223) of bats captured along the Thornapple River during 1978-1979, 3% (4 of 120) of bats captured along the River in 1982 (Brack et al. 1984), and 4.6% (10 of 217) of bats captured there during 1993-1994 (Winhold 2007). Additionally, 32 NLEB roost trees were identified in Eaton County during 1993-1994 (Foster and Kurta 1999), including several large maternity roosts. During the summers of 2004-2006, NLEB represented only 0.6% (6 of 948) of bats captured in mist nets at 75 rural sites in Michigan's southern four county tiers (Winhold and Kurta 2008b, Winhold 2007). However, in 2007, NLEB were 11% (50 of 457) bats captured in Lenawee County (Kurta 2007), and during 2007-2008, 35 NLEB were tracked to a total of 78 roost trees along Bear Creek, Black Creek, and the River Raisin in Lenawee County (Kurta 2008). Moreover, NLEB comprised 24.4% of the bats captured at Bear Cave (a tufa cave in Berrien County) on two nights in September 1978 and five nights in September 1979 (Kurta 1980), and were 55.8% (91 of 163) of bats captured outside the hibernaculum in August of 2005 (Kurta et al. 2007, Winhold 2007). In addition to Bear Cave, one additional potential hibernaculum has been identified in the Southern LP (Silas Doty Cave in Hillsdale County), although inspections in the fall of 2004 and spring of 2006 revealed a high degree of human disturbance and did not contain bats (Winhold 2007).

WNS was first confirmed in Michigan in the winter of 2013-2014. As of March 25, 2015, mortality has been documented at hibernacula in at least five counties (Alpena, Dickinson, Keweenaw, Mackinac, and Ontonagon); however, mortality has not been specifically confirmed for NLEB. Additionally, evidence of WNS was discovered in Tippy Dam in the winter of 2014–2015 and a case of WNS in a big brown bat (*Eptesicus fuscus*) was recently confirmed in Clare County.

Factors Affecting the NLEB Environment within the Action Area

Habitat within the action area consists of a patchwork of private and public lands with prairie and savanna primarily existing as remnants as a result of lands being converted to agricultural and residential uses, and natural succession. Soil types that supported the historical habitat types of grasslands, prairies, and savannas are still present. At the interface of developed and undeveloped lands, there is increased human use and as such, increased potential for both human-induced and natural caused fires.

Within the project area, stands of primarily red pine plantations are over-crowded and are areas where wildfires could become hard to control. Recreational opportunities are also available, including trails and other road systems for horseback riding, biking, ORVs, hiking, camping, and snowmobiling. Unapproved ORV use also occurs and has resulted in resource damage and degradation of rare habitat types, such as grasslands and prairies. A portion of Bigelow Creek flows through the northern part of the project area.

The Bigelow-Newaygo project area is composed of approximately 3% aspen/birch, 27% high site oak, 19% low site oak, 1% short-lived conifer, 33% long-lived conifer, 2% northern hardwood, 3% lowland hardwood and conifer, 2% barren and savanna, and 10% are openings (USDA FS 2015a). Approximately 6,937 acres (90%) of the project area is forested. Some of the non-forested habitat

consists of aquatic habitats of open and emergent wetlands, savannas, and grasslands. The entire project area is comprised of glacial sediment and no karst geology is present. Aside from Tippy Dam, no other NLEB hibernacula are known to be on the HMNF. Within the Bigelow-Newaygo project area, foraging and roosting sites are unknown, but may be present; therefore, the FS is assuming presence of NLEB (USDA FS 2015b).

WNS has not been detected in the Bigelow-Newaygo Area or elsewhere on the HMNF; however, WNS has been detected at Tippy Dam. The fungus has been detected in six counties in Michigan and suspected in another, and mortality has been detected in six counties. It is likely the bat's population on the HMNF will experience significant declines over the next several years directly attributable to WNS. Therefore, within the action area the conservation needs include: (1) reducing WNS-related mortality and injury; (2) conducting research to discover ways to prevent bats from being infected with WNS or treat bats who are infected; (3) providing suitable habitat conditions for NLEB; (4) maintaining suitable habitat conditions in identified maternity areas and reducing the removal of occupied roost trees; (5) searching for previously unidentified areas of maternity and hibernation activity; and (6) conducting research to understand the migration patterns of NLEB that use the area during the summer or winter.

The Service believes the following State, local, and private actions are currently occurring within the Action Area and are likely to be adversely affecting some percentage of NLEB to variable degrees, and are likely to continue into the reasonably foreseeable future.

- *Loss and degradation of roosting and foraging habitat*: Most of the forest habitat within the Action Area is on Forest Service lands and is being maintained and available for use by NLEB. However, on lands outside of the Forest Service's ownership, an unknown amount of forest habitat is being lost and/or degraded by private and public, commercial and residential developments, which are converting, fragmenting, or otherwise degrading forest habitat available for roosting and foraging, especially near incorporated areas centers and along primary and heavily traveled secondary roadways and their main intersection.

- *Commercial and private timber harvesting*: Some private timbering likely occurs on private lands within the Action Area while bats are roosting. Therefore, some unknown number are likely exposed to this stressor and may be directly killed, harmed, or displaced as trees are felled in summer.

- *Cutting of snags*: While most primary and many alternate roost trees are dead snags that are ephemeral/short-lived, some small proportion are likely to be cut down before they would naturally fall in order to reduce safety risks (i.e., hazard tree removal), to provide firewood, or to improve aesthetics.

- *Degraded water quality*: Point and non-point source pollution and contaminants from agricultural, commercial, and residential areas are likely present in waterways within the Action Area and may at times reduce aquatic insect biomass that form a portion of the NLEB prey base and/or have direct or other indirect adverse effects on the bats themselves (e.g., females may have reduced reproduction in heavily contaminated areas).

Activities by other entities that have had an impact on the NLEB within the action area are discussed below.

Previous Section 7 Consultations

- *Section 7 Consultation for USFS Ongoing and Planned Activities on the HMNF*

  In early 2015, the HMNF formally consulted on ongoing and planned activities in response to the April 2, 2015 final rule listing the NLEB as a threatened species. The HMNF reviewed all their ongoing actions and determined that a total of 702 project activities and 814 special use permits were likely to continue beyond the time when the NLEB would be listed. They then reviewed these projects, including their previous consultation documents, to determine how these projects would affect the NLEB. The HMNF included conservation measures to minimize potential adverse impacts of various activities as part of their project description. The Service analyzed the effects of the proposed actions, considering that the projects will be implemented as proposed (including all conservation measures).

  Proposed and ongoing actions included 23 categories of actions including:
  - Timber harvest, non-commerical cutting, and timber stand improvement
  - Prescribed fire
  - Openings, barrens, savannahs, and fuel break maintenance
  - Site preparation
  - Firewood cutting, Christmas tree cutting, tree pruning, and hazard tree removal
  - Road closures
  - Minor activities with tree removal (e.g., special use permits, landline surveys, etc.)
  - Insect and disease destructive surveys and herbicide treatments
  - Building maintenance or demolition
  - Wildlife and fisheries structural habitat improvements

  In the May 1, 2015 biological opinion, we determined that the actions consulted on in the conference opinion, as proposed, were not likely to jeopardize the continued existence of the species. Due to the difficulty of detecting incidental take of NLEB, we used the areal extent of potential roosting and foraging habitat affected as a surrogate to determine the level of take that may occur from the proposed actions. Nearly 136,000 acres of potential NLEB habitat was determined to be adversely effected by the proposed actions. Approximately 131,000 acres was exempted from take through the interim 4(d) rule, and approximately 4,599 acres of take was authorized by an Incidental Take Statement.

EFFECTS OF THE ACTION

Effects of the Action on Karner Blue Butterfly

Effects of the action refer to direct and indirect effects of an action on the species, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. We are not aware of any actions that are interdependent or interrelated to the proposed action being considered in this Opinion.

Habitat management

The savanna/barrens ecosystem is disturbance-dependent. Specifically, fire is a dominant force shaping the ecosystem that provides KBB habitat. Without frequent fire, the savanna tends to become choked with woody vegetation and no longer provides suitable KBB habitat. The natural disturbance processes that maintained an open canopy have decreased since the time of European settlement, thus active management is now necessary to prevent canopy closure and the encroachment of invasive vegetation. Some management practices, such as prescribed fire and mowing for the targeted removal or suppression of trees, shrubs, and certain plants, are necessary for maintaining early-successional habitat.

The HMNF proposes to create and restore KBB habitat through a combination of hand-cutting, mowing, brush hogging, mechanical slash/woody debris removal, prescribed burning, herbicide application, soil scarification, and seeding/planting activities. Management for KBB can be detrimental to the species if not planned and executed properly. The timing, intensity, and frequency of management activities, particularly prescribed burns, can have detrimental effects on KBB through the killing of eggs, larvae, or adults. In addition, restoration activities can eliminate a KBB subpopulation if they are conducted on the majority of an occupied KBB stand, and there is no source of individuals outside and near the treated areas to allow for repopulation.

Disturbance from KBB opening restoration and savanna creation might displace or kill KBB within the project area. KBB have limited mobility and likely would not escape proposed management activities. Eggs and larvae are immobile and thus are particularly vulnerable and likely to be crushed during mechanical treatments, burned during prescribed burning, or trampled during hand-cutting. Proposed restoration activities also might damage or destroy wild lupine, reducing the availability of the sole food source for KBB caterpillars. In addition, since KBB eggs and larvae primarily occur in association with wild lupine, activities that damage or destroy wild lupine are more likely to destroy KBB eggs and larvae.

The proposed project includes conservation measures designed to minimize and reduce adverse effects to KBB. These conservation measures include:

- Seasonal restrictions on herbicide and pesticide treatments, manual tree/shrub cutting, mowing/brush hogging activities, prescribed burning, site scarification, and seeding/planting.
- Restriction on the placement of logging roads, skid trails, log yards, and slash piles.
- Signage and barriers to restrict access to KBB habitat, including utilizing a Forest Supervisor's closure order if needed.
- No prescribed fire within occupied KBB sites, due to current status of the species on the HMNF.
- Maintain a minimum forested buffer of 50 meters around occupied KBB sites that are adjacent to timber harvests

The HMNF also proposes to allow a combination of manual or mechanical tree/shrub removal, herbicide treatment, and/or seeding/planting to occur following a prescribed burn. By combining treatments, restoration goals for occupied KBB habitat might be achieved more efficiently and effectively, as long as all treatments occur within the same burn unit. Minimal additional adverse effects to KBB would likely occur since: (1) the site would have already been burned; (2) no more than one-third of an occupied site would be treated within a given year; (3) burns will be patchy; and (4) it represents the most degraded portion of an occupied site.

In addition, the HMNF proposes to utilize mechanical equipment of similar size and weight to a mower or brush hog to remove slash/woody debris within an occupied KBB opening. In occupied KBB openings that have experienced heavy woody encroachment, it is logistically unfeasible to remove slash/woody debris by hand after woody vegetation has been cut. Minimal additional adverse effects to KBB would likely occur since: (1) Mechanical removal would be prohibited between March 15 and August 15 and would occur on no more than half the stand each season unless there is a colonization source within one-fourth mile that has the capability to recolonize the opening; and (2) cut vegetation that might contain KBB eggs would be left unless the vegetation is collected and placed in another suitable KBB habitat site.

Although these restoration techniques are not specifically identified in the Forest Plan, they are consistent with the management suggestions proposed in the Forest Plan (USFS 2006), the KBB Recovery Plan (USFWS 2003), and the Draft KBB Habitat Management Strategy (USFS 2004a). When planned and executed appropriately, prescribed burning and mechanical treatments within occupied KBB habitat have been shown to have a net positive effect on wild lupine and KBB. Pickens (2006) compared KBB abundance in burned, mowed, and unmanaged sites and found no significant difference in male or female abundance during the first brood. In the second brood, there were significantly more females in burned areas compared to the other two treatments, and significantly more males in burned and mowed areas compared to unmanaged areas. In addition, King (2003) compared control, mowed, and burned treatment effects on KBB populations and cover of associated herbaceous plants, and found no treatment-related changes in KBB density or cover of wild lupine. Wild lupine responses also did not significantly differ among herbicide and mechanical treatments applied at annual, four and eight year intervals (Forrester et al. 2005).

In general, many methods for removing and suppressing tree and shrub canopy can have a net positive effect on wild lupine and KBB, and should be timed and carried out in ways that minimize harm to the butterfly, wild lupine, and nectar plants (USFWS 2003).

The use of herbicides can have adverse effects to KBB. Dermal or oral exposure with herbicides may kill KBB. However, toxicity and risk data suggest that the three proposed herbicides (glyphosate, triclopyr, imazapac) are generally safe to mammals, birds, and other wildlife if used in accordance with the manufacturer label (USDS FS 2015b). In addition, the proposed herbicides are not expected to bioaccumulate in the food chain. Improper use or poorly timed application of herbicides may kill or suppress wild lupine or important nectar plants. Application of herbicides in KBB occupied areas is best done after wild lupine and nectar plants senesce. Any adverse effects to KBB and its habitat will be minimized by prohibiting herbicide application in or adjacent to occupied KBB habitat between April 1 and August 15. Areas of wild lupine will also be avoided during herbicide application.

Recreation uses

ORV use, cross-country travel via foot or horseback, and dispersed camping might increase within areas proposed for savanna creation and KBB opening restoration. Increased recreational use might reduce the quantity and quality of potential and occupied KBB habitat by: damaging or disturbing KBB habitat elements; increasing the risk of vehicle collisions; increasing soil disturbance, erosion, and compaction and amount of bare ground; visitors directly harming, harassing, or killing KBB (all life stages); temporarily displacing, altering movement, or disrupting normal behavior of KBB; and/or increasing the risk of illegal collection and wildfires.

Horse use has also been reported as a contributing factor in the decline of several invertebrate species. Vaughan and Black (2002) reported that within one site occupied by the Taylor's checkerspot butterfly, 15–16 horses trampled much of the area containing Indian paintbrush (*Castilleja indivisa*) (the larval host plant) and may have played a role in the extirpation of the Taylor's checkerspot from the site. Recreation also has been found to disrupt the normal behavior of KBB and other listed butterfly species, potentially reducing availability of suitable habitat and reducing productivity. Hiking, jogging, and dog walking along trails in occupied KBB habitat at Indiana Dunes National Lakeshore was found to significantly disturb KBB (Bennett et al. 2010). Post-disturbance female KBBs flew for longer periods of time than male KBBs before returning to natural behavior, such as ovipositing, nectaring, host plant searching behavior and basking (Bennett et al. 2010). Empirical data suggests that if female KBB are frequently disturbed, they select host plants farther from trails, essentially degrading the quality of KBB habitat in proximity to trails and reducing the total amount of suitable habitat available to females (Bennett et al. 2010). These results have implications for female KBBs in terms of energy expenditure (potentially impacting their survival and egg production), their oviposition rate (potentially decreasing the number of eggs laid over an individual's flight period), and host plant selection (potentially limiting females from ovipositing on lupines near trails).

Potential adverse effects from recreational uses will be minimized by:

- Installing signs within KBB sites and managed areas explaining benefits of restoring native plant communities;
- Installing signs requesting visitors stay on roads and trails and camp outside of occupied habitat;
- If human damage is noted within KBB sites or managed areas, temporary closures or physical barriers may be installed;
- Closing 3.9 miles of Forest System roads; and
- Closing 0.4 miles of Forest System roads that occurs adjacent to or within occupied habitat.

Potential adverse effects from illegal off-trail use and camping would be minimized by the use of barriers and signs. Where these activities occur in occupied habitat, eggs, larvae and possibly adults may be crushed, causing death or injury. Any adverse effects that occur due to illegal activities are outside the jurisdiction and authority of the Forest Service and therefore not the responsibility of the Forest Service.

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 biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Increases in human populations and associated land development, road construction, and recreational uses are expected on private lands within the Bigelow-Newaygo action area. These activities would likely result in the degradation and permanent loss of KBB habitat and directly impact individual KBBs by:

- Increasing the level of disturbance (e.g., human activity, noise, and habitat degradation);
- Damaging wild lupine and other important KBB nectar plants, temporarily displacing, altering movement, or disrupting normal behavior of KBB; and
- Increasing the risk of vehicle collisions, wildfires, visitors directly harming, harassing, or killing KBB (all life stages), illegal collection, dispersed camping, and cross country travel.

Additional actions performed on private lands that may adversely affect KBB in the future within the action area are fire suppression, mowing and grazing, off-road vehicle use, application of pesticides, recreation on county roads, and timber harvest. In addition, mineral developments are reasonably certain to occur in the foreseeable future on private land within the HMNF and have the potential to cumulatively affect KBB and its habitat. Although land development activities may increase non-forested areas on private lands within the action area, herbaceous species favorable to KBB are not likely to increase proportionately. Overall, KBB habitat quantity and quality as well as KBB occurrences would likely decline on private lands within the action area. Consequently, suitable KBB habitat on federal lands within the HMNF is likely to become more important in the future.

Conclusion

Regulations define "jeopardize the continued existence of a species" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." We must analyze how the proposed action and potential effects could impact reproduction, number, and distribution of KBB.

Incidental take of actual eggs, larvae, or adult KBBs will be nearly impossible to detect. Finding a dead or impaired specimen is unlikely due to small body size, and losses may be masked by seasonal fluctuations in numbers or other causes. The level of take of this species can be anticipated by acreage of occupied habitat treated because habitat characteristics, particularly the presence of wild lupine, are adequately identifiable and actual presence of KBBs has been determined by surveys. Thus, for each acre of occupied habitat treated, we assume that all individuals occupying that acre were taken.

We anticipate the taking of all KBB associated with restoration and management of up to, but no more than, 932 acres of KBB habitat on the HMNF for the 10-year duration of the proposed action. Currently, 93 acres of occupied KBB habitat occur within the proposed treatment areas, and approximately 368 acres of occupied habitat occur adjacent to or within dispersal distance of areas that would be managed. In the future, however, as restoration efforts progress, the occupied acreage should significantly increase.

Disturbance of this habitat is expected to be short-term. Throughout any one season, prescribed burning will occur on only the most degraded third of a site, and manual or mechanical treatments will occur on only the most degraded half of a site. This temporal pattern of habitat management is designed to facilitate the re-colonization of KBB and wild lupine from adjacent, un-disturbed areas. Furthermore, the restoration and management activities proposed by the HMNF conform with current standards recommended by other sources of KBB management expertise, which are designed to minimize adverse effects. Thus, the expected net effect of restoration and management is improvement of the habitat conditions and overall status of the KBB in the action area.

KBB depends on early successional vegetation, primarily wild lupine. Historically, wild lupine was maintained by fire and other disturbances. The Bigelow-Newaygo project proposed by the HMNF attempts to mimic natural disturbances by the use of beneficial practices, such as prescribed burns, mowing, cutting, manual and chemical vegetation removal, soil scarification, and seeding and planting. Although those management measures will result in some incidental take of eggs, larvae, and adults, they are necessary to preserve, enhance, and create habitat for the KBB.

After reviewing the current status of KBB, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, we conclude that the proposed action is not likely to reduce reproduction, numbers, or distribution of KBB to such an extent as to reduce appreciably the likelihood of survival and recovery of the species. It is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the KBB. No critical habitat has been designated for the species; therefore, none will be affected.

Effects of the Action on NLEB

This BO evaluates the effects of proposed project activities within the project area. These projects will affect over 2,000 acres of potential NLEB in the project area. Potential effects to the NLEB include direct effects and indirect effects. Direct effects occur when bats are present while the activities are being conducted; indirect effects occur later in time. Effects will vary based on the type of the proposed activity.

We deconstructed the ongoing activities into its various project elements and determined the direct and indirect environmental consequences that NLEB would be exposed to. We conducted various exposure analyses for each proposed activity that may directly or indirectly affect the bats and determined the likely responses of the bats to each potential stressor.

While analyzing direct and indirect effects of the proposed action on NLEB, we considered the following factors:

- proximity of the action to known occupied or likely suitable habitat,
- distribution of the disturbances and impacts,
- timing of the effects in relation to sensitive periods in the species' lifecycle,
- nature of the effects - how the effects of the action may be manifested in elements of a species' lifecycle, population size or variability, or distribution, and how individual animals may be affected,
- duration of effects - short-term, long-term, permanent,
- disturbance frequency - number of events per unit of time, and
- disturbance severity - what is the relative impact in comparison to unimpacted individuals.

In addition, our analysis of effects for NLEB bat entails integrating those individual effects to discern the consequences to the populations to which those individuals belong, and determining the consequences of any population-level effects to the species rangewide. If, at any point, we demonstrate that the effects are unlikely, we conclude that the agency has insured that their action is not likely to jeopardize the continued existence of the species and our analysis is completed.

Table 5. Acres of tree removal and prescribed fire by forest type.

Stand type	Acres of tree removal & prescribed fire	Acres of prescribed fire only
Red and jack pine	1,261	0
Other forest types (hardwoods, mixed wood, & pines)	797	123
Openings	371	56
Upland shrubs	22	0
Lowland shrubs	15	0

Hardwoods – Timber Harvest/Non-commercial cutting

The actions that will be analyzed in this section include all commercial timber harvest and noncommercial tree felling that will occur in hardwood forest types. This action also includes the construction of temporary roads and landings for the removal of timber products.

Approximately 800 acres of hardwood forests are planned to be harvested or felled in the project area (Table 5 and Appendix A). Commercial timber harvest in the hardwood forest type includes all tree felling activities conducted on National Forest System lands by a purchaser, where trees are felled and removed. A number of silvicultural techniques may be used including clearcutting, thinning, shelterwood and seed tree harvest. These techniques are used most often to regenerate or manage a stand that will remain forested over the long term. Sometimes hardwood timber harvest is used to create openings, barrens and fuelbreaks, roads, or other permanent openings.

Non-commercial felling is occasionally used to accomplish the same vegetation management objectives described above without commercial harvest. Trees are felled non-commercially to meet specific forestry, wildlife habitat, or other resource management objectives.

To minimize effects to NLEB, the HMNF has developed the following design criteria to be incorporated into projects as feasible and prudent:

- Conduct felling outside of the summer occupancy period, which is after August 31 and before May 1.
- Reserve snags and den trees according to Forest Plan guidelines; focus on retaining trees with features beneficial to the NLEB.

Although the probability is relatively small (based on total forest size), some of the trees harvested or felled may be roosting habitat for the NLEB. While the probability of this is difficult to quantify, it may vary depending on the extent of trees removed (i.e., size of harvest area and treatment type, as well as age, size, and condition of tree). Trees may be felled in the spring, summer, and fall when NLEBs may be present. Harvesting or felling trees during this period may directly affect NLEBs because of the possibility of a tree containing roosting bats. Bats may leave a roost tree prior to it being felled due to the noise, vibration and disturbance from saws or other equipment. However, some bats might remain in a tree and could be injured or killed if the tree strikes the ground. If bats are present in trees adjacent to the tree being felled, these bats may be disturbed by the activity; however, the bats are not likely to be injured or killed unless the felled tree damages the roost site on the retained tree. The design criteria for retention of snags and den trees offer additional protection because many potential roost trees would be protected from cutting.

The unplanned non-commercial removal of trees would likely have very limited indirect effects on NLEBs due to the low number of trees removed. Trees that serve as roosts and maternity colony sites may be removed from the landscape; however, the limited tree removal likely would not disrupt social assemblages or home ranges. Additionally, prey bases should not be disturbed by this limited tree removal. Any effects should be short-term in nature and would most likely be mitigated by other surrounding habitat. The removal of a few trees could also be beneficial by creating an opening in the canopy that could serve as a foraging location.

Determination

Timber harvest and non-commercial cutting activities in hardwood forests are likely to adversely affect the NLEB because of potential adverse impacts to individuals due to injury and death from felling trees and harassment due to social structure changes and roost tree removals. Actions that are able to incorporate both design criteria are not likely to adversely affect the NLEB because trees would be felled outside the summer occupancy period.

Actions not likely to adversely affect NLEB: approximately 800 acres are proposed for treatment outside the summer occupancy period.

Hardwoods – Low to Moderate Intensity Prescribed Burning

This section analyzes all low to moderate intensity prescribed burning that will occur in hardwood forest types. Approximately 123 acres of hardwood forests are planned for low to moderate intensity prescribed burning on the project area (Table 5). In areas where trees are removed for conversion harvests, prescribed burns will be conducted 2–3 years after the harvests (H. Keough, pers. comm. 2015). The interval between treatments depends on how well the overstory and understory vegetation responds to the treatment (H. Keough, pers. comm. 2015).

Low to moderate intensity prescribed burning includes all prescribed burning activities conducted on National Forest System lands, where the flame lengths are generally two to four feet, and no greater than six feet. Low to moderate intensity prescribed burns are typically intended to consume ground level litter and vegetation, and usually have little to no impact on overstory trees.

A summary of NLEB roost trees (USFWS unpublished) shows a range of roost heights from 16 to 52 feet, well above the height of flames of a low to moderate intensity prescribed burn.

To minimize effects to NLEB, the HMNF has developed the following design criteria to be incorporated into projects as feasible and prudent:

- Conduct burning outside of the non-volant period.

Prescribed fire activities in hardwood forest types are used to improve forest health and restoration, reduce fuel loading, and conduct invasive species management and site preparation activities. Hardwood forests are important habitats that NLEB use for foraging, roosting, pup rearing and social interactions. Lacki et al. (2009) reported that although NLEB in Kentucky roosted preferentially in hardwoods, they foraged in or near pine-dominated stands more often than hardwood-dominated stands and in burned habitats more than unburned habitats. They argued that the lower subcanopy clutter observed in both pine stands and burned habitats were preferred for foraging. In a large majority of NLEB telemetry studies, roost tree species reported were hardwoods. In Newfoundland, even though approximately 83% of forests are dominated by coniferous species, female NLEB were tracked to nearly the same number of deciduous as coniferous roosts (Park and Broders 2012). However, these pooled data were skewed toward the preferences of reproductive female bats (which were targeted by most of the telemetry studies), and it appears that solitary male NLEB may use coniferous roosts to a greater extent (Broders and Forbes 2004, Jung et al. 2004, Henderson et al. 2008, Lausen 2009).

Trees potentially containing NLEB may be burned or felled as part of the preparation (fire line creation and maintenance) or burning process resulting in a direct effect on the bats. Areas may be treated at any time in the spring, summer, and fall when NLEBs may be present. When conducted in the summer

occupancy period, particularly the non-volant period, some pups might not be capable of flight or have enough experience to safely relocate from fire-related dangers.

Fire line creation or maintenance may include felling and cutting of standing woody materials greater than three inches. Burning during this period may also directly affect NLEBs primarily due to smoke, heat and possible flame length. Some bats may remain in the trees and may potentially be injured or killed. Additionally bats may leave a roost tree prior to the area being burned due to the noise, vibration and disturbance from chainsaws or other equipment. If bats are present in stands adjacent to an area being burned, those bats may be disturbed by the activity though the risk would be varied by factors such as wind direction and speed. Bats may also avoid the burned area for a short period after the burn, causing them to relocate to other suitable areas. Temporary relocation is not considered harmful because suitable habitat is not a limiting factor.

To meet the low to moderate intensity objectives within a prescribed burn prescription, burn plans allow burning only when weather and vegetation conditions are favorable. Conservation measures from the NLEB Interim Conference and Planning Guidance (D-5) states "direct effects to NLEB are minimized when prescribed burns are of low/moderate intensity during the summer maternity season" (USFWS 2014).

If a roost tree is rendered unusable by burning, it could cause a local loss of roosting habitat. The roost tree would no longer be available to NLEBs and cause the bats that were occupying it to find an alternate roost tree. Depending on the location and quantity of roost trees rendered unusable, the social structure of the NLEBs may also change. Additionally, if the burn area is large enough it could cause a temporary change in home range. Using simulations, researchers found that NLEB colony social structure is robust to fragmentation from small, random loss of roosts, suggesting >20% roost trees could be removed before network breakdowns occurred (Silvis et al. 2014). Loss of roost trees is unlikely though given the low intensity of the fire. The intended action is to remove low-level vegetation, not large structures like roost trees.

In the long term, burning in hardwood stands with low to moderate intensity fire may benefit the NLEB by making the stands less dense and improving stand structure for foraging (Humes et al. 1999, Menzel et al. 2002, Erickson and West 2003, Owen et al. 2003). Stand structure may be more conducive to NLEB foraging because of an expected increase in vegetative diversity that may improve insect diversity and abundance (Lacki et al. 2009). Burning may thin portions of hardwood stands, promoting larger trees, reducing stem density, and increasing solar exposure for potential roost trees. Some trees may be killed or damaged by fire; the exfoliating bark, crevices, cavity, or cracks in the damaged or dead trees could provide new roosting habitat. Lacki et al. (2009) reported a higher number of NLEB roosts in burned habitats in Kentucky (74.3%) after fires than in unburned habitats (25.7%). Similarly, Johnson et al. (2009) found that NLEB were more likely to establish maternity colonies in stands with a higher percentage of fire-killed stems than random trees, corresponding with their observation that suitable roosts were disproportionately higher in fire-treated areas.

Determination

Low to moderate intensity prescribed burning projects in hardwood forest without design criteria are likely to adversely affect the NLEB because of potential adverse impacts to individuals, especially non-volant bats, due to injury and death from smoke, heat, flame length, and felling roost trees, and harassment due to social structure changes and roost tree impacts. Actions that are able to incorporate

the design criteria are not likely to adversely affect the NLEB because activities would occur outside the non-volant period.

Actions likely to adversely affect NLEB: approximately 123 acres are planned for treatment and could occur during the non-volant period.

Conifer – Timber Harvest/Non-commercial felling

Actions analyzed in this section include all commercial timber harvest and noncommercial tree felling that will occur in coniferous forest types. This action also includes the construction of temporary roads and landings for the removal of timber products. Approximately 1,261 acres of coniferous forests are planned to be harvested or felled on the project area (Table 5).

Commercial timber harvest in the coniferous forest type includes all tree felling activities conducted on National Forest System lands by a contractor, where trees are felled and removed.

A number of silvicultural techniques may be used including clearcutting, thinning, shelterwood and seed tree harvest. These techniques are used most often to regenerate or manage a stand that will remain forested over the long term. Sometimes coniferous timber harvest is used to create openings, barrens and fuelbreaks, roads, or other permanent openings.

Non-commercial felling is occasionally used to accomplish the same vegetation management objectives described above without commercial harvest. Trees are felled non-commercially to meet specific forestry, wildlife habitat, or other resource management objectives.

To minimize effects to NLEB, the HMNF has developed the following design criteria to be incorporated into projects as feasible and prudent:

- Conduct felling outside of the non-volant period.
- Reserve snags and den trees according to Forest Plan guidelines; focus on retaining trees with features beneficial to the NLEB.

Timber harvest, non-commercial cutting, and timber stand improvement activities in coniferous forest are ongoing activities on National Forest System lands with the objective of supplying timber products, enhancing wildlife habitat, reducing fire risk and meeting other resource management objectives in Huron-Manistee National Forests' Land and Resource Management Plan (USDA Forest Service, 2006).

In a study of red pine plantations on the Manistee National Forest in Michigan, Tibbels and Kurta (2003) found that "red pine plantations, even after thinning, most likely are too structurally complex and have low insect abundance, making them a largely unsuitable habitat for bats." However, Lacki et al. (2009) reported that although NLEBs in Kentucky roosted preferentially in hardwoods, they foraged in or near pine-dominated stands more often than hardwood-dominated stands. Tibbels and Kurta (2003) believe that the lower vegetative clutter observed in pine stands improved foraging. Additionally, they suggested that coniferous habitats are likely to provide poor habitat for many species of bats. In their study, they found that the majority of bat activity was in openings within red pine plantations. Given the availability of deciduous trees in the action area that more commonly provide the structural features used by roosting NLEB, in particular maternity colonies, the likelihood of this species roosting in coniferous stands in the action area is relatively low.

Although a majority of NLEB roosts are reported to be deciduous, several studies reporting male NLEB roosts documented a preference for conifers (Broders and Forbes 2004, Perry and Thill 2007, Jung et al. 2004). These data suggest that hardwood trees most often provide the structural and microclimate conditions preferred by maternity colonies and groups of females, which have more specific roosting needs than solitary males (Perry and Thill 2007), although softwood snags may occasionally offer more suitable roosting habitat for both sexes than hardwoods (Perry and Thill 2008, Cryan et al. 2001). Of the few NLEB telemetry studies in which conifers represented a large proportion of roosts, most were reported as snags (Cryan et al. 2001, Jung at al. 2004, Perry and Thill 2007, Park and Broders 2012, Yates et al. 2012) with bark remaining.

Even though the probability is very small, NLEBs could occur in coniferous stands outside the hibernation period. Therefore, a remote possibility exists that felling trees in coniferous stands by timber harvest and non-commercial cutting may have a direct effect on individual NLEBs. If NLEBs are present, felling trees may affect individual NLEBs because of the possibility of a tree containing roosting bats. Although bats may leave the roost tree prior to it being felled due to the noise, vibration and disturbance from chainsaws or other equipment, some bats may remain in the tree and may be injured or killed when the tree strikes the ground or is mechanically processed. If bats are present in trees adjacent to the tree being felled, these bats may be disturbed by the activity, or they may be injured or killed if the roost tree is struck by the tree being felled. The design criteria for retention of snags and den trees offer additional protection because many potential roost trees would be protected from cutting.

Potential adverse effects are reduced during the spring staging and fall swarming periods. During spring staging, most bats would be expected to be staging near their hibernaculum or migrating to their summer range; and during swarming, most NLEBs would be expected to be migrating to or swarming near their hibernaculum.

Felling a roost tree any time of year may have an indirect effect on NLEB due to the local loss of roosting habitat. If a roost tree is felled any time of year, it would no longer be available and cause the bats that were occupying it to find an alternate roost tree. Depending on the location of the tree, the social structure of the NLEBs may also change; however, those effects are likely to be insignificant due to the small number of hazard trees removed in relation to the total number of roost trees that would remain available in the immediate project area. Silvis et. al. (2014) found that colony social structure is robust to fragmentation caused by random loss of small numbers of roosts.

In the short term, coniferous stands that are clearcut or have other types of regeneration treatments could have a minor indirect effect on NLEBs because of changes in forest structure. These stands would transition from poorly suited NLEB habitat to unsuitable habitat. In the long term, the coniferous stands that are clearcut would be regenerated and would mature in approximately 60 years. These stands would transition back from unsuitable habitat to poorly suited NLEB habitat and could offer some foraging or roosting habitat for the NLEB. Although retained snags would not last 60 years, retained live den trees could provide habitat over the long term.

Some areas of hardwood timber harvest used to create openings, barrens, fuelbreaks, roads or other permanent openings would not be reforested. These actions could result in a minor loss of roosting and foraging habitat over the long term. The impact depends on the size and density of the trees removed, and size and shape of the permanent openings created. Areas where the trees are large (> 3 inches dbh) and not densely stocked could be roosting and foraging habitat for NLEBs; hardwood timber harvest in

these areas may result in habitat loss. Harvest that creates large or wide openings could result in a loss of foraging habitat for NLEBs, while harvest that creates small or narrow openings could provide foraging habitat.

In the short term, thinning coniferous stands could improve NLEB habitat by making the stands less dense, improving forest structure for foraging. Retained snags and den trees could provide roosting habitat. In the long term, thinning coniferous stand would promote larger trees and an increase in vegetative diversity. This could have beneficial effects on NLEB habitat because the stand structure would be more conducive to NLEB foraging and the increase in vegetative diversity may improve insect diversity and abundance. Retained snags would not likely provide habitat in the long term because they would likely fall within 10 years of harvest. Live den trees could provide habitat in the long term.

Determination

Timber harvest, non-commercial cutting, and timber stand improvement activities in coniferous forest with no design criteria are likely to adversely affect the NLEB due to killing or injuring bats roosting in trees while being felled. Actions that are able to incorporate the design criteria are not likely to adversely affect the NLEB because activities would occur outside the non-volant period.

Actions not likely to adversely affect NLEB: approximately 171 acres are proposed for treatment during the non-volant period.

Conifer – Low/Moderate Intensity Prescribed Burning

The action that will be analyzed in this section include all low to moderate intensity prescribed burning that will occur in coniferous forest types. In areas where trees are removed for conversion harvests, prescribed burns will be conducted two to three years after the harvests (H. Keough, pers. comm. 2015). The interval between treatments depends on how well the overstory and understory vegetation responds to the treatment (H. Keough, pers. comm. 2015). Prescribed fire is not proposed in pine-dominated stands with standing trees; however, approximately 447 acres of previously cutting pine stands will receive prescribed fire to facilitate conversion (Table 5 and Appendix A).

Low to moderate intensity prescribed burning includes all prescribed burning activities conducted on National Forest System lands, where the flame lengths are generally two to four feet, and no greater than six feet. Low to moderate intensity prescribed burns are typically intended to consume ground-level litter and vegetation, and usually have little to no impact on overstory trees. These burns often occur in red pine plantations with the objective of reducing fuel loading, improving habitat for wildlife, and meeting other objectives in Huron-Manistee National Forests' Land and Resource Management Plan (USDA FS 2006).

To minimize effects to NLEB, the HMNF has developed the following design criteria to be incorporated into projects as feasible and prudent:

- Conduct burning outside of the non-volant period.

In a study of red pine plantations on the Manistee National Forest, Tibbels and Kurta (2003) found that "red pine plantations, even after thinning, most likely are too structurally complex and have low insect abundance, making them a largely unsuitable habitat for bats." Additionally, they suggested that

coniferous habitats are likely to provide poor habitat for many species of bats. In their study, they found that the majority of bat activity was in openings within red pine plantations. Given the availability of deciduous trees in the action area that more commonly provide the structural features used by roosting NLEB, in particular maternity colonies, the likelihood of this species roosting in coniferous stands in the action area is relatively low.

The literature suggests that coniferous trees (especially live, healthy ones) are rarely used as roosts by female NLEBs, with solitary male NLEB using them a greater extent (Broders and Forbes 2004, Jung et al. 2004, Henderson et al. 2008, Lausen 2009). Lacki et al. 2009 reported that although NLEB in Kentucky roosted preferentially in hardwoods, they foraged in or near pine-dominated stands more often than hardwood-dominated stands and in burned habitats more than unburned habitats. They argued that the lower sub-canopy clutter observed in both pine stands and burned habitats were preferred for foraging.

A summary of NLEB roost trees (USFWS unpublished) shows a range of roost heights from 5 to 16 meters, well above the height of flames of a low to moderate intensity prescribed burn. NLEB use of immature and mature jack pine is likely limited due to the high stem density and lack of flight corridors. Sheets et al. (2013) noted that forest stands that are "solid walls" of vegetation provide little usable habitat for the northern Myotis. This is especially true for stands that have been planted for Kirtland's warbler breeding habitat (Philip Huber, pers. comm. 2011).

Even though the probability is very small due to coniferous forest being poor habitat for NLEBs, the bats could potentially occur in coniferous stands outside the hibernation period. A remote possibility exists that low to moderate intensity prescribed burning in coniferous stands during this period may have a direct effect on individual NLEBs.

If NLEBs are present, burning may affect individual NLEBs because of the possibility of a tree within the burn area containing roosting bats. During the non-volant period, pups may not be able to leave a roost tree if heat and smoke from a burn are not tolerable. These individuals may be injured or killed. The risk to NLEBs is reduced substantially by design criterion that does not permit burning when pups are non-volant. Low to moderate intensity burning would only occur when all NLEBs are able to leave their roost trees if heat and smoke from a burn are not tolerable. According to Dickinson et al. (2009), radio-tracked bats (NLEB) were observed leaving their respective roosts well before harm from heat or smoke affected them. Most NLEBs utilized the prescribed burn as a foraging opportunity, gleaning insects forced up and out of the burn area from the heat and smoke plume. Furthermore, most bats in the study were found to roost in live oaks rather than dead snags that could catch fire and burn during the prescribed burn process.

To meet the low to moderate intensity objectives within a prescribed burn prescription, burn plans only allow burning when weather and vegetation conditions are favorable. Conservation measures from the NLEB Interim Conference and Planning Guidance (D-5) states, "direct effects to NLEB are minimized when prescribed burns are of low/moderate intensity during the summer maternity season" (USFWS 2014).

If a roost tree is rendered unusable by burning, it could cause a local loss of roosting habitat. The roost tree would no longer be available to NLEBs and cause the bats that were occupying it to find an alternate roost tree. Depending on the location of the tree and quantity of trees rendered unusable, the social structure of the NLEBs may also change. However those effects are likely to be insignificant due to the small number of trees affected in relation to the total number of roost trees that would

remain available in the immediate project area. Silvis et al. (2014) found that colony social structure is robust to fragmentation caused by random loss of small numbers of roosts.

In the long term, burning in coniferous stands with low to moderate intensity fire may benefit the NLEB by making the stands less dense and improving stand structure for foraging. Burning may thin portions of coniferous stands, promoting larger trees, reducing stem density, and increasing solar exposure for potential roost trees. Stand structure may be more conducive to NLEB foraging because of an expected increase in vegetative diversity that may improve insect diversity and abundance. Some trees may be killed or damaged by fire; the exfoliating bark, crevices, cavity, or cracks in the damaged or dead trees could provide new roosting habitat. Of the few NLEB telemetry studies in which conifers represented a large proportion of roosts, most were reported as snags (Cryan et al. 2001, Jung at al. 2004, Perry and Thill 2007, Park and Broders 2012, Yates et al. 2012). Therefore, increasing the number of dead or dying trees in a coniferous stand is likely to enhance habitat for NLEBs.

Determination

Low to moderate intensity prescribed burning projects in coniferous forest without design criteria are likely to adversely affect NLEB because of the possibility roosting bats may be injured or killed during prescribed burn activities. Actions that are able to incorporate the design criteria are not likely to adversely affect NLEB because (1) coniferous stands are poor habitat for NLEBs, and NLEBs are not likely to be present, (2) burning would not be conducted when the pups are non-volant, and (3) if NLEBs were present, they are likely to leave their roosts well before harm from heat or smoke affected them.

Actions likely to adversely affect NLEB: approximately 447 acres are proposed for treatment and could occur during the non-volant period.

Openings (i.e., Barrens, Savannas) and Fuel Breaks where Trees ≥3 inches DBH and in Areas with Trees <3 inches DBH will be Mowed, Felled or Burned

The actions analyzed in this section include implementing prescribed fire operations and using mechanical and hand tools to burn, mow, and fell vegetation in openings. Openings will be maintained to provide a diverse array of vegetative cover types from grass-herbaceous to shrub-brush land to barrens. A variety of methods could be used to stimulate native vegetation growth, release nutrients to the soil, and maintain areas in the desired conditions. The openings are divided into those with trees equal to or greater than 3 inches dbh and those with trees less than 3 inches dbh. Over 400 acres of existing openings are planned for maintenance activities in the action area (Table 4: openings, upland and lowland shrubs).

Pine barren, savanna, openings, and upland openlands are interchangeable terms used to describe complexes characterized by herbaceous and shrub cover, with scattered live and dead trees. Maintenance is directed towards fuels management and restoration of habitat. Since the areas are non-forested, very little large material or coarse woody debris is present. Large wood that is present will be left on site to decompose into the soil.

Management techniques will include activities such as:

- Prescribed fire,
- Mechanical maintenance (brush hog, roller-chop, disc, etc.),
- Hand tool use, such as axe, brush-saw and chainsaw or axe, and

- Site preparation and planting of native grasses, forbs, and seedlings.

A small tractor or other vehicle with rubber tires might be used to pull mechanical implements, such as a brush mower, seed drill, or seed harvester. Periodically, a larger machine might be used to operate a rotating drum cutter, or plow. Project areas will be accessed from the existing transportation system in the area. Therefore, no new road construction or reconstruction will occur.
To minimize effects to NLEB, the HMNF has developed the following design criteria to be incorporated into projects as feasible and prudent:

- Conduct mechanical maintenance outside the non-volant period, reserving snags and den trees according to Forest Plan guidelines where possible. Retain trees with features beneficial to the NLEB.
- Conduct burns outside of the non-volant period. Retain burning snags by extinguishing the fire, rather than by felling.

Maintenance occurs on Michigan National Forests with the objective of maintaining openings that will provide wildlife habitat and function as fuel breaks. Since fire frequency and extent have been reduced over time, active management is needed to restore fire-ecosystem components and maintain species viability. Openings provide important breeding and foraging habitat for many animal species, including the Kirtland's warbler, Karner blue butterfly, sharp-tailed grouse, sandhill crane, upland sandpiper, eastern bluebird, black-backed woodpecker, eastern wild turkey, and others. Openings could constitute suitable habitat for NLEB. Individual trees greater than or equal to 3 inches dbh may be considered habitat when they exhibit characteristics of roost trees and are within 1,000 feet of forested or wooded habitat (USFWS 2014). Bats have been documented to follow linear features on the landscape, such as an edge between forest and openings. The features of this interface may increase commuting and foraging opportunities, and afford greater protection from predators than crossing an open area (Erickson and West 2003).

In openings and fuel breaks, consisting of shrubs and trees less than 3 inches dbh and herbaceous cover, there would be minimal direct and indirect effects, since these areas are not considered to be roosting, maternity or winter habitat. However, they could function as foraging habitat, especially areas adjacent to forest boundaries. Mechanical maintenance, such as use of a mower or brush hog would have transient effects from noise and movements that may disturb bats roosting in nearby wooded edge or briefly affect insect availability. However, these effects are expected to be minimal and very short-term in duration to the point of not being measurable. Likewise for prescribed burning in areas devoid of snags and live trees greater than or equal to 3 inches dbh, smoke, radiant heat and convective heat might briefly disturb bats in adjacent wooded habitat and temporarily decrease insect abundance and alter foraging opportunities. However, the effects would be limited in area and duration.

In openings where trees greater than or equal to 3 inches dbh are present, conducting mechanical maintenance and burning outside of the non-volant period would limit impacts, since all bats would likely vacate roosting areas before individuals might be injured or killed from smoke, heat or mechanized operations. By reserving snags and den trees according to Forest Plan guidelines, and protecting trees with features beneficial to the NLEB, habitat would be retained in the area for future roosting and maternity use. Retaining snags that catch fire, by extinguishing the flames, rather than felling, would preserve the location for roosting and maternity purposes. These actions would reduce the duration of impacts to the short time period of the burn. Any risk of injury or mortality to

individual NLEBs is expected to be very low and discountable. Both the risk of injury and mortality to individuals, especially non-volant bats in the immediate project area would increase by not implementing design criteria where trees and snags greater than or equal to 3 inches dbh are present. Bats without flight capabilities could be injured or killed if maternity trees were burned, inundated with smoke or struck with heavy equipment. Roosting bats could also be affected if suitable trees are rendered unusable by burning or felled by mechanical equipment. The roost trees would no longer be available to NLEBs. Consequently, individual bats would be displaced and forced to find alternate roost trees. However, the magnitude of risks for all of the effects would be small in scale in any given year relative to the total habitat available for NLEB as foraging, roosting and maternity habitat.

Overall, adverse impacts caused by implementing mechanical treatments and prescribed burning would be small in scale and temporary. The beneficial impacts from maintaining openings across the forest system lands could be long-term. It is expected that maintaining openings will augment insect numbers and insect diversity which could lead to increases in NLEB fitness and greater productivity.

Determination

Implementing mechanical maintenance and burning where trees or snags greater than or equal to 3 inches dbh are present, while incorporating no temporal design criteria, is likely to adversely affect NLEB because of potential adverse impacts to individuals due to injury and death from felling trees, and heat and fire from burning vegetation.

Implementing mechanical maintenance and burning where trees greater than or equal to 3 inches dbh are present is not likely to adversely affect the NLEB if working outside of the non-volant period, extinguishing rather than felling snags, reserving snags and den trees according to Forest Plan guidelines, and retaining trees with features beneficial to the species. This is because the risk of injury or mortality to individual NLEBs is expected to be very low and discountable.

Implementing mechanical maintenance and burning where trees and snags less than 3 inches dbh are present, while using no temporal design criteria, is not likely to adversely affect NLEB because NLEBs are not likely to be present in the described areas.

Actions likely to adversely affect NLEB: approximately 371 acres are proposed for prescribed fire, which could possibly occur during the non-volant period.

Approximately 400 acres of existing openings and upland and lowland shrubs will be restored and/or maintained; prescribed fire is proposed for 371 of those acres (Table 5).

Site Preparation (including mechanical tree planting, roller chopping, chaining, trenching, scalping, raking, and other activities)

The actions that will be analyzed in this section include all site preparation activities including, but not limited to mechanical tree planting, roller chopping, chaining, trenching, scalping and raking. An estimated 100 acres of site preparation activities are planned to be implemented in the project area.

Site preparation is the act of preparing an area for artificial or natural regeneration of trees. It can also be used to reduce competition from undesirable vegetation to increase the survival and growth rate of the desired trees, treat slash and logging debris if the site has been harvested, and to prepare or modify the soil.

A variety of site preparation methods are employed on the HMNF. Mechanical tree planting is typically accomplished with a bulldozer pulling a planting machine. Roller chopping is usually accomplished with a bulldozer or skidder pulling a roller chopper, a large drum with blades to chop up slash and other remaining vegetation. Chaining is typically accomplished by pulling large anchor chains behind a piece of equipment to scarify the ground, and is often accomplished with roller chopping. Trenching creates furrows in the ground to expose mineral soil for the planting of trees. Trenching is usually accomplished with a skidder or bulldozer pulling a trencher. Scalping creates patches of bare ground, exposing mineral soil for tree planting. Scalping is usually accomplished with a skidder or bulldozer pulling a Bracke scarifier or a mounder. Raking usually is the piling of brush with a rake mounted on the front of a bulldozer. Sometimes a rake is used to scarify the soil, or remove roots and stumps.

Site preparation activities are ongoing actions on National Forest System lands, typically with the objective of regenerating harvested sites by planting trees, or preparing harvested sites for natural regeneration or planting. Most of these actions (~90%) occur after coniferous stands have been harvested, but may occasionally occur in hardwood stands. Most often, these stands have been clearcut, but have live reserve trees or areas, and standing dead snags.

Since NLEB is a forest-dwelling bat, the likelihood of individuals being present in these treatment areas is extremely low because the areas are typically large openings [>16 ha (40 ac)], with scattered live and dead trees. In addition, work specifications typically state that live reserve trees/areas and standing dead trees are to be avoided. However, the possibility exists that a few trees within a site preparation area may be knocked down by site preparation equipment. These trees are almost always dead conifer snags. No live hardwood trees would likely be impacted by these activities because the equipment would be damaged if these trees were struck. In addition, Tibbels and Kurta (2003) suggested that coniferous habitats are likely to provide poor habitat for many species of bats, and therefore the likelihood of individuals being present in these treatment areas in coniferous forest types is further reduced.

Northern long-eared bats could potentially occur in site preparation areas during the spring staging, summer occupancy, and fall swarming periods. However, the probability of the bats being inpacted by site preparation activities is extremely small. NLEBs would not likely be roosting in areas where site preparation activities occur because:

- Site preparation areas are usually open and not forested and do not typically provide NLEB roosting habitat;
- Live hardwood trees within the openings that could be potential roosts for NLEBs are not likely to be impacted by the activities because the equipment would be damaged if these trees were struck; and
- Work specifications usually state that dead coniferous trees that could serve as NLEB roost trees are to be avoided.

Nevertheless, a small probability exists that NLEBs could occur in live or dead trees with holes, cracks or loose bark within or near areas of high canopy closure. Therefore, a remote possibility exists that site preparation activities during these periods could have a direct effect on individual NLEBs. If NLEBs are present in a site preparation area, a remote possibility exists that a tree containing roosting bats may be knocked down by equipment. Although bats may leave the roost tree prior to it being knocked down due to the noise, vibration and disturbance from chainsaws or other equipment, some

bats may remain in the tree and may be injured or killed when the tree strikes the ground or is mechanically processed. If bats are present in trees adjacent to the tree being felled, these bats may be disturbed by the activity, or they may be injured or killed if the roost tree is struck by the tree being felled. However, the avoidance of snags and other live trees offers a substantial degree of protection for NLEBs because almost all potential roost trees would be protected.

If a roost tree is knocked down any time of year, it may have an indirect effect on NLEB due to the local loss of roosting habitat. If a roost tree is felled any time of year, it would no longer be available and cause the bats that were occupying it to find an alternate roost tree. Depending on the location of the tree, the social structure of the NLEBs may also change, however those effects are likely to be insignificant due to the small number of hazard trees removed in relation to the total number of roost trees that would remain available in the immediate project area. Silvis et al. (2014) found that colony social structure is robust to fragmentation caused by random loss of small numbers of roosts.

In the short term, stands that have had site preparation activities could have a minor indirect effect on NLEBs because of changes in forest structure. If a stand is habitat for NLEBs, some site preparation activities may improve foraging conditions. However, it is likely that these stands would transition from suitable NLEB habitat to unsuitable habitat because of the growth of young trees over time. In the long term, stands with site preparation treatments would likely regenerate and mature in 60 to 100 years. These stands would transition back from unsuitable habitat to poorly suited NLEB habitat and could offer some foraging or roosting habitat for the NLEB. Although retained snag would not last 60 years, retained live trees could provide roosting habitat over the long term. However, retaining snags would gradually create tree fall gaps and woody debris, enhancing vertical complexity and offering increased solar radiation to certain standing trees. These are features thought to be important for forest-dwelling bats (Badin 2004, Kalcounis et al. 1999, López-González et al. 2014).

Determination

Site preparation activities are not likely to adversely affect NLEB. The effects would be insignificant and discountable. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. The effects would be insignificant and discountable because: (1) site preparation areas are usually open and not forested and do not typically provide NLEB roosting habitat, (2) live hardwood trees within the openings that could be potential roosts for NLEBs are not likely to impacted by the activities because the equipment would be damaged if these trees were struck, and (3) work specifications usually state that dead coniferous trees that could serve as NLEB roost trees are to be avoided.

Actions not likely to adversely affect NLEB: approximately 100 acres are proposed for treatment.

Road Closures

Several means or processes exist to make roads unusable, including restricting access and decommissioning/obliteration. Access restriction may allow for future use of roads but targets exclusion of vehicles through gating, berms, felling or pushing over trees, or bouldering. Road decommissioning and obliteration on National Forest System lands is the process of converting roads with little or no future intended use back to a natural habitat state. This may be accomplished by passive means (allowing natural regrowth) or more active measures of felling trees, reseeding, soil scarification of road bed, or planting of herbaceous and woody materials. The majority of roads that are closed or decommissioned are temporary roads used in the timber harvest process and those actions are usually considered part of the overall harvesting effects.

Road closures accomplished outside of timber harvests are typically user-created roads that are not on the Forests' Motor Vehicle Use Map or system roads that are no longer needed. Annually, approximately 40 miles (range of 20–60 miles) of non-system roads are planned for closure or decommissioning on the HMNF. Over the estimated 10 years left in this Forest Plan, a maximum of 4 miles would be affected. Most of these closures do not involve tree felling (Scott Peedle, pers. comm.). A few trees are sometimes felled or pushed over at the closure site. On rare occasion, trees are felled or pushed over the entire length of the road.

To minimize effects to NLEB, the HMNF has developed the following design criteria to be incorporated into projects as feasible and prudent:

- Fell trees outside the non-volant period, when possible. For additional protection, fell trees outside of the summer occupancy period, when possible.

Roads are closed to help protect resources from unnecessary use or harm. Decommissioning roads helps in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1). Most of the roads across the Forest are low vehicle volume transport and/or haul roads with relatively narrow widths. The lack of traffic and general wooded state surrounding the roadways means NLEB may use trees and snags in ROWs or in adjoining areas for roost sites. If trees are felled to close or decommission a road, they are usually smaller diameter and within 12 feet of the road edge. Therefore, the maximum area affected would be approximately 4 miles. However, the actual area affected would likely be much less because most of the closures do not involve tree felling.

The responses of bats to roads appear to be largely dependent on road size and traffic levels (Sparks 2010, Bennett et al. 2013). Wide, busy roads may be a deterrent to bats, while minor roads, such as the type that exist on the HMNF are not. As a reference, Pauli (2014) defined a "major road" as one with traffic rates exceeding 2 cars/minute based on Bennett et al. (2013), who used simulation modeling to determine that roads acted as filters to Indiana bat movements when the rate of traffic was 10 vehicles/5 minutes and barriers to bat movements when the rate was 200 vehicles/5 min. Bats, including NLEBs, are expected to use the project area's roadways for foraging activities, and potentially roost in trees along roadsides or in adjoining habitat away from paved and unpaved roadways. Numerous studies have reported high NLEB activity on or near minor roads (e.g., Krusic and Neefus 1996, Lacki and Schwierjohann 2001, Owen et al. 2003, Broders et al. 2006, Brooks 2009).

Access restriction of roads may require the felling or pushing of trees near the start of a road, or along its entire length. These trees may be potential roost trees. Harvesting or felling trees during the summer occupancy period may directly affect NLEBs due to the possibility of a tree containing roosting bats. Bats may leave a roost tree prior to it being felled or contacted because noise, vibration and disturbance from saws or other equipment. However, some bats could remain in a tree and be injured or killed if the tree strikes the ground. If bats are present in trees adjacent to the tree felled, these bats may be disturbed by the activity; however, the bats are not likely to be injured or killed unless the felled tree damages the roost site on the retained tree. Trees felled during the non-volant period would have a higher potential for adverse effects than other periods because non-volant pups could be present and unable to avoid disturbances or physical harm. Direct effects could include displacement from active sites where roads are in the process of being closed. Displacement from a roost tree would not be expected to result in mortality, but could elevate short-term stresses. These risks may be slightly

higher during spring emergence when fat reserves can be low. Any NLEB flushed from a roost site would potentially face some additional exposure to climate, predators, or expenditure of energy. Within and near the action area, suitable roosting is considered abundant and widespread. Therefore the amount of time and effort needed for NLEB to relocate should be minimal. Restricting vehicle access may provide some benefits to NLEB by reducing disturbances from motorized vehicles.

Determination

Road closures conducted within the summer occupancy period and without design criteria is an activity that could result in adverse effects to the NLEB. Effects to NLEB could include adverse impacts to individuals in the form of injury and death, and/or harassment due to social structure changes and roost tree removals.

Actions not likely to adversely affect NLEB: approximately 4 miles are proposed for road closure. Trees greater than 3 inches will be felled outside the summer occupancy period.

Herbicide treatments of Non-native invasive plant species (NNIP) and Persistent Woody Vegetation

Approximately 108 acres of herbicide treatments are planned in the project area for control and removal of persistent woody vegetation and NNIP species. Herbicides will be applied using strip/patch or spot application methods (Table 6). Generally there would be one chemical application per site per year. It is anticipated multiple years of herbicide treatment might be required to gain adequate control or eradication at many sites. Only formulations labeled for use in aquatic areas for glysphosate and triclopyr would be used within 100 feet of lakes, wetlands, and riparian corridors. The timing of treatments will vary by NNIP species and to avoid negative impacts on non-target species. All herbicides will be applied according to label directions by applicators that hold a current Commercial Pesticide Applicator certification from the Michigan Department of Agriculture.

Herbicide use is an ongoing activity on National Forest System lands. Non-native invasive plants are not known to be adversely affecting NLEB on the Michigan National Forests. However, NNIP can be aggressive invaders of disturbed habitats and native plant communities. When left untreated, some NNIP may become the dominant component of the vegetative community, thus reducing native plant survivorship, dispersal and diversity, and impacting wildlife habitat, visual resources and future management of infested sites. Aggressive, nonnative shrubs in the forest can also reduce growth rates of native overstory trees (Hartman and McCarthy 2007). Infestations are generally treated once annually by licensed applicators, using approved chemicals and following label mixing and application directions. Applications are conducted during daylight hours. The majority of treatments are in upland herbaceous areas not considered NLEB habitat. However, some treatments may be in, or near, areas NLEB use for foraging, roosting, pup rearing and social interactions.

Table 6. Herbicides proposed for use, application methods, and targeted species.

Common chemical name	Some examples of trade names	Application methods & chemical selectivity	Example targeted NNIP species
Triclopyr	Garlon3A, Brush-B-Gone Habitat, Vine-X	Stump and/or basal bark treatment, foliar spot spray; broadleaf-selective	Buckthorn, barberry, honeysuckle, wild parsnip, crown vetch
Glyphosate	Roundup Pro, Roundup, Accord	Stump treatment, foliar spray; non-selective	Honeysuckle, buckthorn, barberry, garlic mustard, wild parsnip, St. Johnswort, crown vetch
Glyphosate aquatic formulation	Rodeo	Foliar treatment, weeds near open water; non-selective	Purple loosestrife, swamp thistle, reed canary grass, common reed grass, and any species near open water
Imazapic	Plateau, Plateau Eco-Pak, Cadre	Foliar treatment; non-selective	Leafy spurge

Tables 5 and 6 within the Final Huron –Manistee NLEB Biological Opinion (USFWS 2015) provide herbicide information relevant to NLEB and mammalian toxicity data for the above herbicides used on the Michigan Forests and risk assessments for NNIP control.

There is no herbicide use toxicity data specific to NLEB. Rather, the available data within those tables reflect the potential for toxicity to terrestrial mammalian wildlife exposed to areas treated with the herbicides. The data consist of LD50, LC50, and NOEL values. A LD50 (Lethal Dose50) represents the dose (amount supplied orally) to a test animal species in a controlled laboratory experiment that causes 50 percent mortality. An LC50 (Lethal Concentration50) represents the concentration causing 50 percent mortality when a test animal species is externally exposed to the chemical in a controlled laboratory experiment. A NOEL (No Observed Effects Level) represents the highest dose or concentration (expressed as mg per kg body weight per day) observed not to cause noticeable effects in a test animal in a controlled laboratory experiment. For all three parameters, a higher value indicates a safer (less toxic) chemical.

Data are presented for two categories of toxicity: acute and chronic. Acute toxicity results from exposure to the chemical for a short time, for example when an animal enters an area immediately after herbicide application when the foliage is still wet. Chronic toxicity results from continuous exposure to the chemical over an extended time, for example should an animal inhabit an area that is repeatedly sprayed with herbicide at regular intervals over multiple years. Because the proposed program would consist mostly of single applications, or at most, an initial application and one to three subsequent applications, over approximately five years, the acute toxicity data is most relevant. For each herbicide, separate rows of data are provided for the technical product (unformulated active ingredient) and for several common formulations. How a product is formulated can significantly affect its toxicity. Because it is the formulations and not the technical product that are used in the field, formulation data are more relevant, if available. While data based on exposure of mammalian test organisms are a useful predictor of toxicity to mammalian wildlife, they are less useful as a predictor of toxicity to birds, fish, and other wildlife whose physiology substantially differs from that of mammals.

The mammalian toxicological data presented in Table 5 of the Final Huron-Manistee NLEB Biological Opinion (USFWS 2015) suggests that the toxicity of the herbicides used to treat infestations would be low. Bats, and specifically NLEB, are insectivorous, capturing prey by hawking and gleaning behaviors (Ratcliffe and Dawson 2003). Gleaning behaviors could expose bats to chemicals or to insects treated with chemicals. Some research indicates that glyphosate is toxic to aquatic invertebrates at doses lower than those expected to be present in the environment and toxicity to aquatic invertebrates might have been underestimated in the past (Cuhra et al. 2013). Since NLEB may use aquatic insects as a food source, the information suggests that glyphosate may pose more of an indirect threat than previously assumed. Gleaning also increases NLEB's risk of pesticide exposure because they are thought to consume a particularly high proportion of spiders, in which chemical concentrations can accumulate to higher levels than in lower trophic-level invertebrates (Dodd et al. 2012). However, these risks are considered very small on Michigan National Forests since the low intensity of herbicide spraying, generally one application per site per year, points to a very low probability of NLEB exposure through food resources. Also, upland herbaceous plants are the frequent targets for spraying, not wetland plants and habitats or canopy trees and shrubs.

While herbaceous areas can be foraging locations, NLEB foraging is most likely to occur in upland and lowland woodlots and tree-lined corridors, where they catch insects in flight using echolocation and by gleaning insects from vegetation and water surfaces (USFWS 2014). Thus any risk from foraging exposure to chemicals is very low. Bats could theoretically experience dermal toxicity by brushing against recently treated NNIP foliage or through direct spray. However, as evidenced by the dermal LD50 data in Table 5, the dermal exposure pathway is of low hazard. Furthermore, NLEB would not be roosting in herbaceous areas where most treatments occur and would not be actively foraging until the crews depart for the day, giving the sprayed foliage a chance to dry. Because herbicides would be applied directly to target foliage in a manner that prevents drift or runoff (i.e., label directions), the risk of herbicides contaminating drinking waters sources for bats would be low. NLEB could potentially be affected if herbicide treatment results in a reduction in numbers of insects. However, in the low probability this were to occur, the effect is expected to be temporary, as insect populations would likely recover within a short period of time after treatment of an area. While there is no specific risk information for bats in Table 6, overall ecological risk of the studied herbicides at rates commonly used by the Forest Service pose little or no risk to terrestrial mammals. Control of invasive species would have the effect of preserving native plant diversity and abundance, which could be beneficial for retaining native insect populations consumed by NLEB.

Northern long-eared bats do not utilize any of the NNIP weed species or the plant species that they displace. None of the NNIP herbicide or bio-control treatments would fragment habitat for NLEB. No permanent human intrusions would result from the NNIP control program. The low level of vegetation change in suitable bat habitat would have no detectable impact on the NLEB.

Determination

Implementing herbicide treatment is not likely to adversely affect the NLEB. By using approved herbicides and following manufacturer's product label with application by Michigan certified personnel, the effects to NLEB would be insignificant and discountable because: (1) NLEBs are not likely to be present in these areas, and (2) if present, not likely to be exposed to the herbicide treatments either directly or indirectly through eating prey that has come in contact with the herbicide, and (3) if present in areas treated with bio-control insects would be unaffected by the activity. Additionally, no effects are anticipated to wintering NLEB or their hibernacula from the proposed action.

Actions not likely to adversely affect NLEB: approximately 108 acres are proposed for treatment.

Effects Related to White-nose Syndrome

This BO assumes that WNS will affect all NLEB present within the action area over the proposed life of the project. 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. Affected bats may also be more likely to stay closer to their hibernation site for a longer time period following spring emergence. One known NLEB hibernacula (Tippy Dam) occurs over 50 miles north of the action area and bats affected by WNS may use the action area for at least temporary foraging and roosting rather than migrating longer distances to established summer home ranges.

While none of the HMNF's proposed actions will alter the amount or extent of mortality or harm to NLEB resulting directly from WNS, the proposed action does have the potential to increase or decrease the chances that WNS-affected bats present in the action area will survive and recover. For example, WNS-affected bats roosting in the area immediately after emerging from hibernation may have damaged wings and therefore could be less able to quickly fly away from fire and smoke during a prescribed burn. As a result, there may be an increased chance of WNS-affected bats being killed or harmed as a result of the project, particularly if burns are conducted early in the spring (April –May). However, research into how WNS affects bat physiology and behavior is ongoing, and current information is not sufficient to quantify or predict the full range and scope of potential effects, or compare the relative likelihood and significance of the potential adverse and beneficial effects described above.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the act.

When considered with future State, county, tribal and private actions that are reasonably certain to occur in the future, the forest management and other actions listed in Table 1 would have a minor adverse cumulative effect on the NLEB. Non-federal tree cutting activities would have the greatest potential to have a cumulative effect on the NLEB because of potential for bats to be injured or killed during summer occupancy, loss of roost trees, or loss of forested habitat. Other public, tribal and commercial lands within the analysis area may or may not be managed similar to HMNF lands. Tree cutting activities on non-commercial private lands is estimated to be substantially lower than federal lands because many private landowners lack interest in forest management, small parcels may not be economical to manage, or activities remove very few trees annually (e.g., ROW maintenance). Therefore, when considering tree cutting activities on all ownership annually, it is estimated that no more than two percent of the analysis area would receive a treatment, providing substantial forest habitat and roost trees over the long term.

Non-federal tree cutting activities would have the greatest potential to have a cumulative effect on the NLEB because of potential for bats to be injured or killed during summer occupancy, loss of roost trees, or loss of forested habitat. Human populations and associated land development, road

construction, and recreational use are expected to increase on private lands within the HMNF. In addition, a change in land use from larger forested parcels to smaller parcels with more residential and commercial development is occurring on private ownerships and is expected to continue into the foreseeable future. These activities have the potential to reduce total forest cover, increase forest fragmentation, and increase human access to areas that are likely utilized by NLEB. Such activities that occur on non-USFS lands could result in a permanent loss of NLEB foraging and breeding habitat, remove, damage, or cause the abandonment of roost trees, reduce the quality and quantity of prey species, increase the risk of vehicle collisions and wildfires, and/or kill individual bats, especially non-volant pups, within the HMNF.

In addition, most timber harvest activities (58%, Mike Stimak, USFS, pers. comm.) on the HMNF would occur outside of the summer occupancy period, further reducing the risk NLEBs could be injured or killed while in a roost. Stimak believes this is true for most years, with small changes from year to year. Tree cutting activities on non-Federal lands may retain snags and den trees that could be roost trees for NLEBs. Snag creation activities may improve roosting habitat. Thinning of hardwood and conifer stands would likely improve NLEB foraging habitat. Furthermore, considerable areas on the HMNF exist where disturbance would be infrequent or absent. These areas also provide substantial forested habitat and roost trees for NLEBs over the long term.

Prescribed burning on other lands within the action area is estimated to be minor when compared to burning on the HMNF, and is almost always low intensity. Low intensity burning would pose a lower risk to roosting NLEBs because roosts generally occur much higher than flame heights. At the landscape level, prescribed burning would likely be a source of new roost trees for NLEBs because some trees within a burn area are likely to be killed by fire. Therefore, prescribed burning activities would have a minor cumulative effect on the NLEB.

Site preparation activities would have an extremely small adverse cumulative effect on the NLEB. State, county, tribal and private site preparation activities within the analysis area is estimated to be small when compared to Forest Service actions on an annual basis. As stated in the effects, the likelihood of NLEBs being impacted by site preparation activities on the HMNF would be remote and similar effects would be expected on State, county, tribal and private activities.

Herbicide use by non-federal entities within the action area likely equals or exceeds use by the Forest Service, primarily to control woody vegetation under powerlines and along roadways, and to control nonnative invasive species. Considering the size of the analysis area, the limited amount of herbicide used annually by the Forest Service and the non-federal entities, and the limited exposure of NLEBs, herbicide use would have minor adverse cumulative effects on NLEBs.

Many activities would implement design criteria that would help protect NLEBs. Therefore, when considered with future State, county, tribal and private actions that that have occurred in the past, those occurring in the present, and those that are reasonably certain to occur in the future, the forest management and other actions would have a minor adverse cumulative effect on the NLEB.

Summary of Effects

Potential effects of the action include direct effects to NLEB present within the action area when activities are being conducted, and indirect effects as a result of changes in habitat suitability. The conservation measures will serve to reduce the potential for direct effects to the NLEB. However, direct effects to NLEB, including mortality, injury, harm, or harassment, as a result of removal,

burning, or modification of occupied or established roost trees remain. The potential for direct effects to NLEB are greatest when activities are conducted during the species' non-volant period.

Indirect effects from the action may result from habitat modification and primarily involve changes to roosting and foraging suitability. Timber harvests and tree clearing associated with road-related activities could have both adverse and beneficial effects on habitat suitability for the NLEB. Prescribed fire may also result in both adverse and beneficial effects on roosting habitat through 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. The overall effect of the prescribed fire portion of the proposed action on habitat suitability may be neutral to potentially beneficial. Given the scope of the projects in relation to the overall action area, these projects will not substantially alter the overall availability or suitability of NLEB roosting or foraging habitat.

Throughout the course of conducting the above actions, the NLEB may also experience disturbance from other project-related activities, such as increased noise during the day, artificial lighting and increased noise at night, and increased presence of people. These effects are typically short-term and temporary in nature, and limited in size compared to the amount of available habitat and NLEB home range size. We expect that the response of NLEB to these disturbances to be minor (e.g., startle, alarm, and possible temporary abandonment of roost site) and do not anticipate that the level of disturbance would have a significant effect on individuals or the local NLEB population.

In any given year, less than 2% of the entire HMNF lands receive any type of treatment, and approximately 58% of all timber harvests occur outside the summer occupancy period. While the HMNF's proposed action will not alter the amount or extent of mortality or harm to NLEB resulting directly from WNS, the proposed action does have the potential to both increase and decrease the chances that WNS-affected bats present in the action area will survive and recover.

Based on the analysis above, the proposed action should not significantly reduce the ability of the action area to meet the conservation needs of the species. The proposed action will continue to provide suitable roosting and foraging habitat during the spring staging, summer occupancy, and fall swarming periods. While there is potential for direct and indirect effects to the species, given the small-scale of the proposed action in relation to the action area, and the current distribution and abundance of the NLEB on the HMNF, the NLEB should be able to continue to survive and reproduce on the HMNF.

There is no proposed critical habitat for the NLEB, and thus, none will be adversely affected.

CONCLUSION

WNS is the primary threat to NLEB's continued existence. All other non-WNS threats, including forestry management, did not lead to imperilment of the species. However, in those areas of the country impacted by WNS, the conservation measures in the interim 4(d) rule for NLEB, and adopted as a part of these proposed actions, focus on protecting individual bats in known roosts and hibernacula to minimize needless and preventable deaths of bats during the species' most sensitive life stages. Although not fully protective of every bat, these conservation measures help protect some roosting and hibernating individuals.

According to the interim 4(d) rule, the Service projected that forest management activities will affect approximately two percent of all forests in States within the range of NLEB (Boggess et al. 2014).

Further, only a portion of this forested habitat will actually be harvested during the NLEB active season (April–October), and a smaller portion yet would be harvested during the pup season. Given these estimated impacts to suitable habitat, the Service estimated that a number of NLEB will be directly affected by forest management activities during the active season. Implementation of the interim 4(d) rule's conservation measures should further reduce the take of those individual bats where there are known roost trees. When occupied roosts are cut during the active season (outside of the pup season) or if undocumented NLEB roosts are cut while occupied, some portion of these individuals will flee the roost and survive. The conservation measures will further protect known NLEB hibernacula, including a portion of the surrounding habitat. Thus, the Service, in the interim 4(d) rule, anticipated only a small percentage (estimated less than one percent) of NLEB will be directly impacted by forestry management activities.

In addition, according to the interim 4(d) rule, the Service anticipated that hazard tree removal, right-of-way maintenance, and minimal tree removal will have only a minimal impact on NLEB habitat and individuals. This activity will collectively impact only small percentages of NLEB habitat and individuals in the season during which they occur.

None of the proposed activities are exempted from take through the interim 4(d) rule. Forest cover types that could potentially be used by NLEB are present on approximately 4,000 acres of NFS lands within the project area (USDA FS 2015a, Figure 3-1, p. 3-5). The total amount of potential NLEB habitat affected by the activities is approximately 948 acres (Table 7). These activities include prescribed burning and forest road system construction and reconstruction that involve burning and felling trees larger than 3 inches dbh during the summer occupancy period.

Similar to the actions included in the interim 4(d) rule, the HMNF's conservation measures would look to limit the amount of habitat affected during the active season and pup season. When compared to the area of potential habitat affected by exempted activities and the amount of total available habitat throughout the action area that is not affected by project activities, only a very small percentage of NLEB habitat and individuals would be affected by activities not included in the interim 4(d) rule.

Table 7. Acreage affected by proposed management activities in the project area that may result in take of NLEB.

Proposed activity	**Acres of adverse effects**	**Acres exempted through interim 4(d) rule**	**Acres of incidental take**
Opening restoration	371	0 (fire may occur during non-volant period)	371
Prescribed fire in pine/hardwood dominated stands and existing openings	932	0 (fire may occur during non-volant period)	570
Road construction and reconstruction	7.3	0 (tree felling during non-volant period)	7.3
Approximate total	1,300	0	948

Impacts to NLEB through direct injury/mortality, loss of roost trees, and maternity colony structure changes are unlikely to result in net reductions in the number of maternity colonies as well as associated wintering population fitness. 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 NLEB 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 reproduction, numbers, or distribution of the NLEB.

Based on the analysis above and in the interim 4(d) rule, the proposed action should not decrease the reproduction, numbers, or distribution of the NLEB, despite the anticipated loss of individuals and population impacts. Therefore, we do not anticipate an appreciable reduction in the likelihood of both survival and recovery of the species as a whole.

After reviewing the current status of NLEB, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action will not jeopardize the continued existence of NLEB.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to 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. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the U.S. Forest Service so that they become binding conditions for the exemption in section 7(o)(2) to apply. The U.S. Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the U.S. Forest Service fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the U.S. Forest Service must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

The Service's April 2, 2015 interim 4(d) rule for NLEB (80 FR 17974) exempts take of the bat from section 9 prohibitions of the Act, when such take is a result of certain activities (see the interim rule for more information). 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. There are no activities that are covered by the interim 4(d)

rule (Appendix A). The remainder of this analysis addresses the incidental take resulting from those elements of the proposed action that are not covered by the 4(d) rule.

AMOUNT OR EXTENT OF TAKE

Karner blue butterfly

In this ITS, we are evaluating the incidental take of KBBs that may result from implementation of the proposed Bigelow-Newaygo project. Proposed specific actions may result in adverse effects to individual KBBs that rise to the level of take.

The process of creating openings and restoring savanna ecosystem habitats may adversely affect KBBs in the proposed action area. Habitat management techniques, such as prescribed burns, mowing, cutting, manual and chemical vegetation removal, soil scarification, and seeding and planting, have the potential to adversely affect KBB. Where these activities occur in occupied KBB habitat, eggs, larvae, and adults may be crushed or burned, causing death or injury. KBB larvae and eggs may also be incidentally harassed or displaced, causing harm.

Recreation management may also adversely impact KBBs in the proposed action area. Cross-country horseback riding, ORV and vehicle use on open Forest System and County Roads, and dispersed camping have the potential to adversely affect KBB. Where these activities occur in occupied KBB habitat, eggs, larvae, and adults may be harmed, harassed, displaced, crushed, or killed, causing harm, injury, or death.

Incidental take of actual eggs, larvae, or adult KBBs will be nearly impossible to detect. Finding a dead or impaired specimen is unlikely due to small body size, and losses may be masked by seasonal fluctuations in numbers or other causes. The level of take of this species can be anticipated by acreage of occupied habitat treated because habitat characteristics, particularly the presence of wild lupine, are adequately identifiable and actual presence of KBBs has been determined by surveys. For each acre of habitat treated, we assume that all individuals occupying that acre were taken. Thus, incidental take of eggs, larvae, and adults will be permitted on the basis of total known occupied acreage affected annually.

The HMNF will manage KBB habitat following strict guidelines that limit the amount and extent of take. Specifically, there are several conservation measures that limit the amount of occupied habitat that may be treated annually by burning or any other method. Also, most treatments will be planned for outside of the flight periods, to avoid take of adult butterflies. Provided that the HMNF follows the guidelines for KBB habitat restoration as identified in the proposed project, restoration activities will be spatially and temporally designed to improve the species' status.

For the 10-year duration of the proposed action considered in this biological opinion, the HMNF proposes to manage up to 932 acres of savannas and openings, with the goal of providing suitable KBB habitat on 614 of the 932 acres. A series of treatments would be implemented to achieve opening and savanna management goals, meaning that multiple treatment types would occur on the same acreage potentially on an annual basis. Currently, about 93 acres of occupied KBB habitat occurs within proposed treatment areas and approximately 368 acres of occupied KBB habitat occurs adjacent to or within dispersal distance of areas that would be managed. In the future, however, as restoration efforts progress, the occupied acreage should increase. Thus, this incidental take statement anticipates the taking of all KBBs associated with restoration of up to, but no more than, 932 acres of KBB habitat on the HMNF for the duration of the proposed action.

The 2006 Level 1 Programmatic Opinion anticipated the take of all KBBs associated with the restoration of 20,300 acres for KBB on the HMNF. The proposed project is expected to take 932 acres of occupied KBB habitat. This acreage is included within the Programmatic Opinion. No additional take has been authorized under the Level 1 Programmatic Opinion.

Effect of Take

In the accompanying biological opinion, we determined that the proposed action will not appreciably reduce the likelihood of recovery or survival of KBB. Therefore, we believe that the level of anticipated incidental take associated with the actions completed under the proposed Bigelow-Newaygo project is not likely to jeopardize the KBB.

Reasonable and Prudent Measures

The proposed project describes specific conservation measures designed to avoid and minimize impacts to KBB. Our effects analysis, jeopardy conclusion and incidental take assessment is predicated on full implementation of the conservation measures identified in the proposed project. The Service believes the following reasonable and prudent measure is necessary and appropriate:

1. Ensure compliance with all conservation measures, conducting management in a manner that minimizes take to the maximum extent practicable.
2. Report on the progress of project activities on the Forest and the impact on the species as required pursuant to 50 CFR 402.14 (i) (3).

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the HMNF must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1.1 Perform all restoration and treatment activities as proposed in the BA incorporating all conservation measures.
1.2 Ensure that all Forest Service employees and contractors understand the guidelines and protective measures designed to minimize take and avoid long-term adverse effects on KBB.
1.3. Ensure that all Forest Service employees and contractors are educated to recognize and avoid KBB, wild lupine, and potential KBB habitat.

2.1 Conduct annual monitoring KBBs in the action area and apply such information to management to minimize take.
2.2 Supply the Service's East Lansing Field Office with an annual report, due by April 1 each year, that outlines the-following:
   a. The amount of occupied habitat restored in the current year and the total amount of restored habitat since issuance of this biological opinion. The report should include what methods were used and pre- and post-treatment photos,
   b. Results of all monitoring activities, as outlined in the accompanying biological opinion and biological assessment,
   c. Results of annual KBB metapopulation surveys,
   d. Any incidents of take from illegal activities, and
   e. Progress and results of terms and conditions, as they were required, identified by project.

f. Salvage of specimens unlikely due to the nature of the proposed activities and the physical characteristics of KBBs, eggs, and larvae. Therefore, no protocol is provided for salvage of specimens.

We anticipate the taking of all KBBs associated with restoration, maintenance, and management of 932 acres of occupied KBB habitat on the Forest is reasonably certain to occur as a result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action.

Conservation Recommendations

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

We believe that the HMNF has already initiated or participated in important efforts to protect, manage, and increase our understanding of the KBB, including their commitment to implement the standards and guidelines in the proposed action. We offer the following conservation recommendations to further expand the knowledge of this species, and help better manage for the KBB in Michigan.

1. Take action to improve habitat conditions and avoid or minimize take of KBB on private land within or adjacent to the HMNF by a) adopting an education program which includes, but is not limited to, landowner contact, either independently or preferably in cooperation with the Landowner Contact Program of the MDNR and Michigan Natural Features Inventory already in progress; b) seeking opportunities to develop information on presence of KBBs on private land where owners are willing; and c) seeking opportunities, especially through partnerships, to help fund and carry out beneficial habitat management on private lands of willing owners.

2. To the extent possible, develop information on the presence of Federal candidate plants and animals during the monitoring activity of the project and regular KBB surveys.

3. Evaluate the contributions of drought, deer browsing, and growing-season frost on HMNF KBB populations, and propose potential solutions where necessary and prudent.

4. Evaluate whether measures to address potential adverse effects of roads and trails are necessary and prudent.

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

Northern long-eared bat

If NLEB are present or utilize an area proposed for timber harvest, habitat clearing, prescribed fire, or other disturbance, incidental take of NLEB could occur. The Service anticipates incidental take of the NLEB 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) NLEB 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 NLEB 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.

As detailed in Table 7, the Service anticipates that no more than 948 acres of potential NLEB summer habitat will be taken as a result of ongoing and planned project activities in the project area. Because no activities are exempted through the interim 4(d) rule, all 948 acres are addressed through the ITS. Project activities would primarily occur over the next one to five years; however, some activities may extend over the next ten years.

If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation. In this case, the HMNF must also immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures provided.

Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to NLEB. No critical habitat has been designated for NLEB, so none would be impacted.

Reasonable and Prudent Measures

The proposed project describes specific conservation measures designed to avoid and minimize impacts to NLEB. Our effects analysis, jeopardy conclusion and incidental take assessment is predicated on full implementation of the conservation measures identified in the proposed project. The Service believes the following reasonable and prudent measure is necessary and appropriate:

1. Ensure compliance with all conservation measures, conducting management in a manner that minimizes take to the maximum extent practicable.
2. Report on the progress of project activities on the Forest and the impact on the species as required pursuant to 50 CFR 402.14 (i) (3).

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the HMNF must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1.1 Perform all treatment activities as proposed in the BA incorporating all conservation measures.

1.2 Ensure that all Forest Service employees and contractors understand the guidelines and protective measures designed to minimize take and avoid long-term adverse effects on NLEB.

1.3 Ensure that all Forest Service employees and contractors are educated to recognize NLEB habitat.

a. If any NLEB maternity roost trees are identified within the project area, these roosts will be marked and not felled during any project-related activities unless required to address public or worker safety. The HMNF will evaluate planned activities around the roosts and establish appropriate buffers or protective measures in coordination with the USFWS so that project-related activities are not likely to damage or destroy the roost, or make it unstable.

2.1 Supply the Service's East Lansing Field Office with an annual report, due April 1 each year, that outlines the following:

a. The amount of NLEB habitat taken: the number of acres where project activities were implemented and if any timing restrictions were followed.
b. Results of any monitoring activities.
c. Any incidents of take from illegal activities, and
d. Progress and results of terms and conditions, as they were required, identified by project.
e. The number of live or dead NLEB encountered.

2.2 The Forest Service shall immediately notify the Service upon location of an injured or dead NLEB. Report the discovery of an injured or dead NLEB within 24 hours (48 hours if discovered on a Saturday) to the East Lansing Field Office 517-351-2555.

Conservation Recommendations

Section 7(a) (1) of the ESA directs federal agencies to utilize 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 adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. As described in the Conservation Measures section, the HMNF has already been pro-active in participating in a number of efforts to contribute to the conservation of the NLEB and other forest bat species. These efforts contribute to the conservation and recovery of the NLEB consistent with Section 7(a) (1) of the Act. The Service strongly supports these efforts and encourages the HMNF to continue these efforts in the future.

The Service has identified the following additional actions that, if undertaken by the Forest Service, would further the conservation and assist in the recovery of the NLEB. We recognize that limited resources and other agency priorities may affect the ability of the USFS to conduct these activities at any given time.

- Northern long-eared bats would benefit from minimizing activities with adverse effects during the period of summer occupancy (May 1 – September 1). Bats cannot be directly injured or killed if they are not present when the activities are in progress. If an activity with potential adverse effects cannot avoid the summer occupancy period, consideration should be made for implementation outside of the important non-volant period when NLEB pups are born to the time they are flying

(June 15 – August 1). Once bats are capable of flight, their ability to flush and evade injury and mortality from certain USFS actions is enhanced. Adverse effects to NLEB would be minimized by following these timing restrictions.

- ❖ Continue to gather information on the NLEB's distribution and use of the HMNF during the spring, summer, and fall. For example:
  - Conduct inventory surveys
  - Conduct radio telemetry to monitor status of NLEB colonies
  - Participate in North American Bat Monitoring Program (NABat) surveys
  - Investigate habitat characteristics of the forest in areas where post-WNS NLEB occurrences have been documented (e.g., forest type, cover, distance to water)
  - Investigate NLEB use (acoustics, radio telemetry) of recently managed areas of different prescriptions

- ❖ Provide support to expand on scientific studies and educational outreach efforts on NLEB and White Nose Syndrome. For example:
  - Monitor the status/health of the known colonies
  - Collect samples for ongoing or future studies
  - Provide funding for WNS research activities (on or off USFS lands)
  - Allow USFS staff to contribute to administrative studies (on or off of USFS lands)

- ❖ The HMNF should continue to work with the Service to reassess these Conservation Recommendations using best available science.

In order to be kept informed of actions minimizing or avoiding adverse effects, or benefitting listed species or their habitats, the Service requests notification if any of these additional conservation actions are carried out or if additional measures consistent with these conservation recommendations are implemented.

REINITIATION NOTICE

This concludes formal consultation for the HMNF actions outlined in your request dated March 2, 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, as measured by acres of potential habitat, 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. Project activities, respective acreages, effect determinations, and 4(d) take exemptions.

Project Objective #1: Restore and maintain savannas, prairies, dry grasslands, and mesic grasslands where they were known to previously occur for habitat diversity and to meet species viability needs

Activity	Acres	Cutting trees >3 inches DBH	Vegetative community	Take exempted via interim 4(d) rule	4(d) comments
Convert forested stands to openings by removing woody vegetation	102	Yes	Mixed	NLAA	Felling outside non-volant period
Restore and/or maintain existing openings	345	Yes	Openings	NLAA/No	Maintenance outside non-volant period; Fire may occur outside non-volant period
Convert oak and oak-dominated stands to savanna	314	Yes	Oak	NLAA	Felling outside non-volant period
Convert red pine stands to savanna	171	Yes	Red pine	NLAA	Felling outside non-volant period
Broadcast burning in pine-dominated, hardwood-dominated stands & existing openings	696	Yes	Mixed & openings	No	May occur during non-volant period
Woody vegetation herbicide treatment	100	n/a	Mixed	NLAA	
Prescribed burning	932	Yes	Mixed	No	May occur during non-volant period
Native plant seeding	242	n/a	openings	NLAA	
Site preparation	100	Yes	Mixed	NLAA	Forest management

Habitat protection measures	932	No	Opening	NLAA	
Road construction/redesignation	0.6 miles	Yes	Mixed	No	May occur during non-volant period
Road reconstruction	4.9 miles	Yes	Mixed	No	May occur during non-volant period
Road closure/redesignation	3.9 miles	Yes	Mixed	NLAA	Fell trees outside summer occupancy period
Non-native invasive species herbicide treatment	108	No	Other	NLAA	
Repair resource damage	180	Yes	Mixed	Variety of activities	

Project Objective #2: Wildlife and fisheries habitat and plant communities will be manage to maintain viable populations of existing native and desired non-native species; also includes activities listed in objective #1

Activity	**Acres**	**Cutting trees >3 inches DBH**	**Vegetative community**	**Take exempted via interim 4(d) rule**	**4(d) comments**
Reconstruct or replace up to 28 instream large woody debris structures in Bigelow Creek	n/a	n/a	n/a	NLAA	
Riparian tree planting	17	n/a	n/a	NLAA	
Improvements at 9 road/stream crossings	n/a	n/a	n/a	NLAA	

Project Objective #3: Reduce life-threatening and property damaging wildfire potential; includes the 696 acres of broadcast burning (pine, hardwood, openings) mentioned in objective #1

Activity	Acres	Cutting trees >3 inches DBH	Vegetative community	Take exempted via interim 4(d) rule	4(d) comments
Commercial thinning of predominantly red pine	1,412	Yes	Red pine	NLAA	Felling outside non-volant period
Overstory removal harvest	45	Yes	Red pine	NLAA	Felling outside non-volant period
Prescribed fire	932	Yes	Mixed	No	May occur during non-volant period
Road construction/redesignation	0.6 miles	Yes	Mixed	No	May occur during non-volant period
Road reconstruction	4.9 miles	Yes	Mixed	No	May occur during non-volant period
Road closure/redesignation	3.9 miles	Yes	Mixed	NLAA	Fell trees outside summer occupancy period
Broadcast burning in pine-dominated stands	447	Yes	Pine	No	May occur during non-volant period
Broadcast burning in hardwood-dominated or existing openings	249	Yes	Oak & existing openings	No	May occur during non-volant period

Project Objective #4: Provide recreational opportunities while protecting the unique ecosystem characteristics of the project area. This objective encompasses activities listed under the previous objectives, and includes opening creation, restoration and maintenance, savanna restoration, road construction and redesignation, road reconstruction, road closure and redesignation, maintenance of Bigelow Creek instream structures, riparian planting, non-native invasive species herbicide treatments, and repair of resource damage.