Michigan's Federally Listed Bats

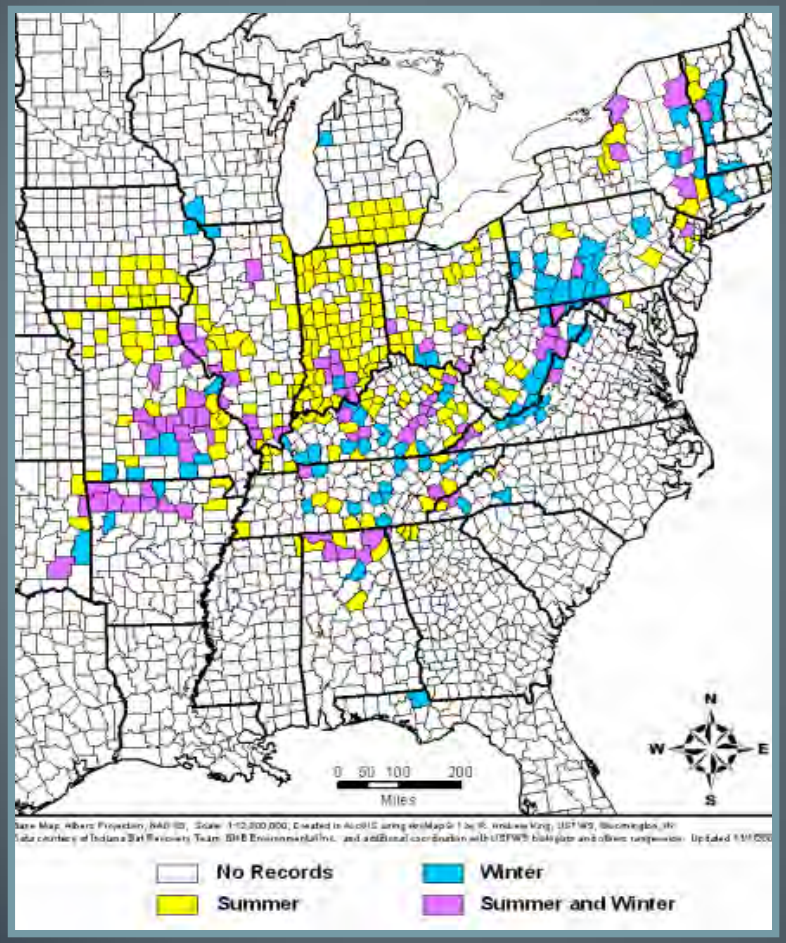
Jenny Wong, USFWS

Indiana Bat (*Myotis sodalis*)

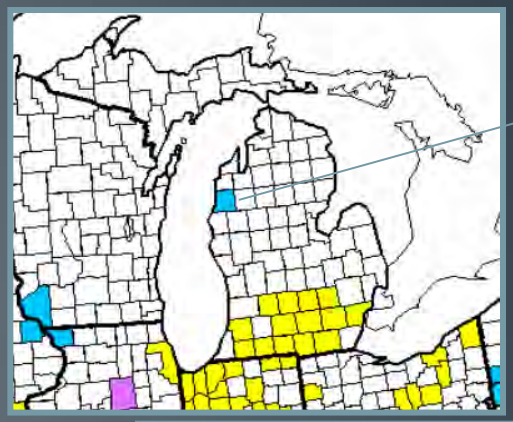
- Federal Status: Endangered (1967)
- Major Threats:
  - Loss of critical hibernacula
  - Human disturbance
  - Global climate change
  - Contaminants
  - White-Nose Syndrome (2006)

Photo: Risa Wright

Range & Distribution



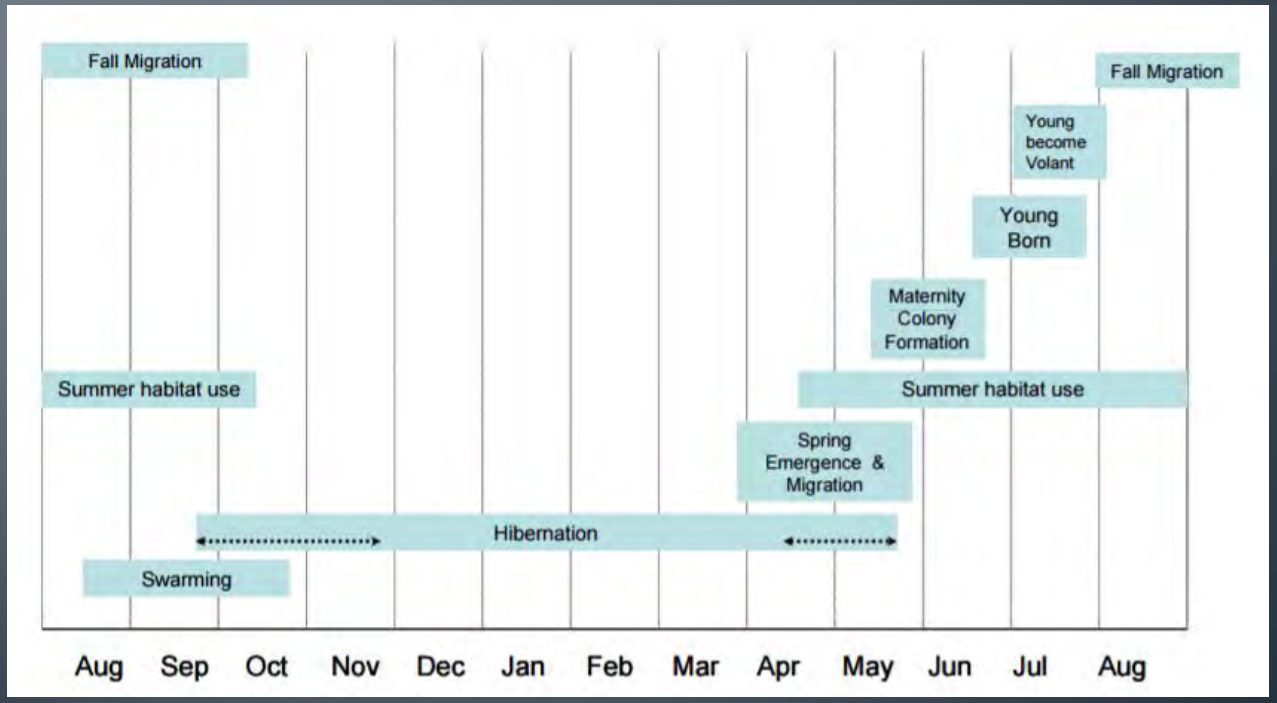
Source: USFWS. 2007. Indiana Bat Draft Recovery Plan: First Revision. Fort Snelling, Minnesota.



Tippy Dam: IBAT ~0.3% of >20,000 hibernating bats)

Seasonality & Migration

- Migrate up to 350 mi from hibernacula to summer foraging grounds
- Hibernacula mostly limited to karst regions of IN, MO, KY (use natural caves and cave-like structures)
  - One known MI hibernaculum (Tippy Dam)



Foraging & Diet

- Forage along wooded corridors, streams, floodplain forests, and occasionally upland forests, clearings, cropland edges, wooded fencerows, and ponds
- Apparent preference for wet sites in MI (Kurta and Whitaker 1998, Murray and Kurta 2002)
  - Diet: in MI, largely aquatic insects (i.e., caddisflies, flies, moths and beetles)
    - Unlike other bats, mosquitoes are consistent (albeit small) component of diet, especially during pregnancy

Roosting Ecology

- Maternity colonies = ~60-100 reproductive females + young
- 1 or 2 primary roosts + up to 20 alternate roosts
  - Usually closely spaced but may be dispersed over a few kilometers
- Typical maternity roost tree:
  - Large (e.g., 40-60 cm DBH, >20 ft tall)
  - Deciduous
  - Dead or dying (or live with naturally peeling bark- e.g., shagbark hickory)
  - High solar radiation
  - In late-successional, highly-disturbed forest with abundant standing snags
- Male IBATs/non-reproductive females = less specific requirements

Photo: Cal Butchkoski

Roosting Ecology

- Roost mainly beneath exfoliating bark and occasionally in cracks/crevices
- Smallest reported roost DBH = 2.5 in, but most >5 in DBH
- Common roost species :
  - Ash (*Fraxinus*)
  - Elms (*Ulmus*)
  - Hickories (*Carya*)
  - Maples (*Acer*)
  - Poplar (*Populus*)
  - Oaks (*Quercus*)
- Uncommon: beech, basswood, cherry, box elder, willows
- Infrequently roost in structures

Photo: US Forest Service

Roosting Ecology








Federal Regulations

- "Take" of Indiana bats prohibited throughout species' range
  - "Take": harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct
  - "Harm" includes "significant habitat modification or degradation"
- Activities that may result in incidental take:
  - Disturbance of hibernacula
  - Disturbance/removal of potential roost trees (especially when pups are unable to fly)
  - Removal of significant portion of available foraging/roosting habitat

Photo: Risa Wright

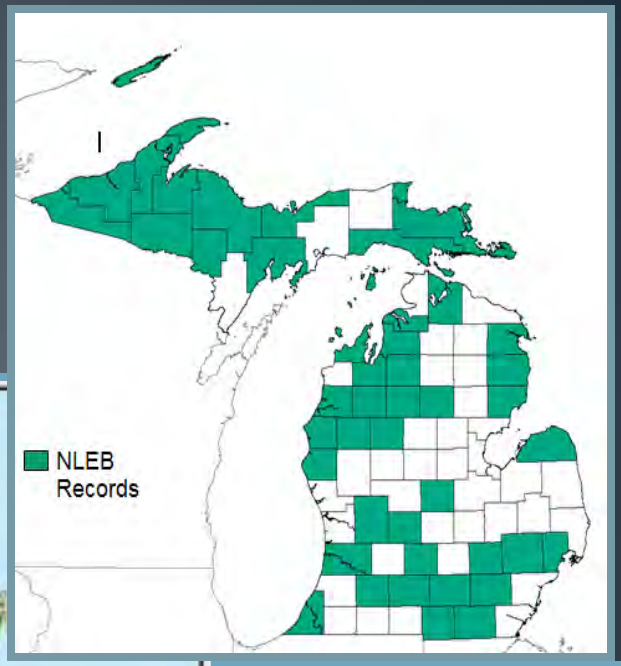
Northern Long-eared Bat (*Myotis septentrionalis*)

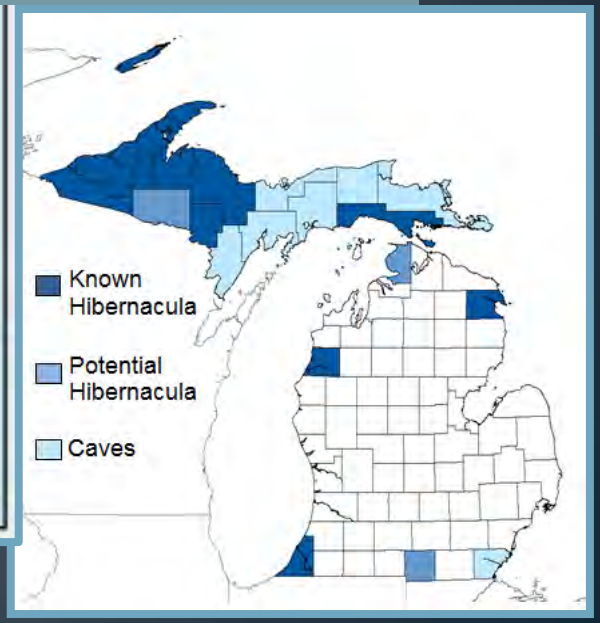
- Federal Status: Threatened (2015)
- Historically common throughout their range, but have experienced severe declines as a result of WNS since 2006

Photo: Risa Wright

Listing Timeline

Range & Distribution





Seasonality & Migration

- General dates for MI:
  - Hibernation: Oct- May
  - Spring staging: Apr- May
  - Summer roosting period: May- Sep
  - Non-volant (pup) season: Jun- Aug
  - Fall swarming period: Aug- Nov

© Burly Bird (burlybird.blogspot.com)

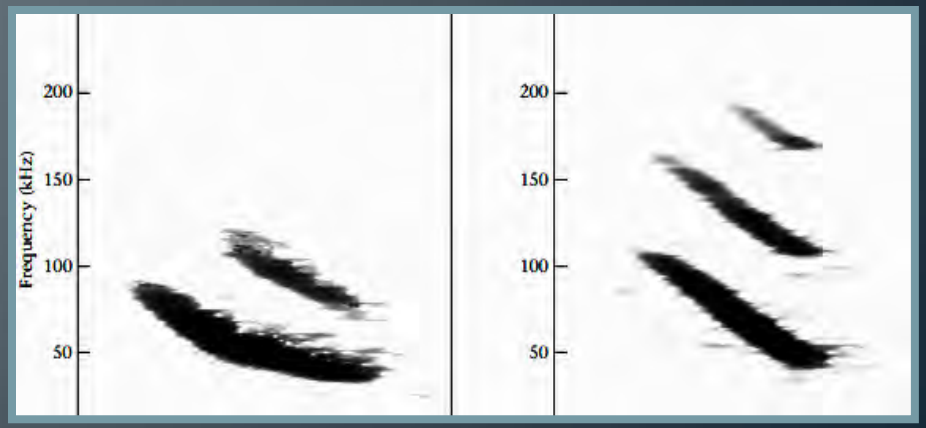
- Appear to migrate generally shorter distances than IBAT (8-270 km)
- Unlike IBAT, exhibit fidelity to multiple hibernacula
- May use alternate or undocumented hibernacula (buildings, storm cellars, bunkers, wells, rock outcrops, etc.)

Foraging & Diet

Interior-Forest Adapted:

- Morphology and sonar adapted for cluttered environments
- Diet: Lepidoptera and coleoptera (less abundant in open habitats)
- “Gleaner” as well as “hawker” (Dodd et al. 2012: spiders and lepidopteran larvae = 12.7% of diet)
- Literature suggests preference for interior forests

Photo: T. Brown



Little brown Northern long-eared

Spectrogram: Ratcliffe and Dawson 2003

Foraging & Diet

Variety of Forest Types:

- Hardwood, mixedwood & coniferous forests
- Floodplain & riparian forests
- Upland forests & forested ridges
- Unmanaged forests
- Recently & actively managed forests

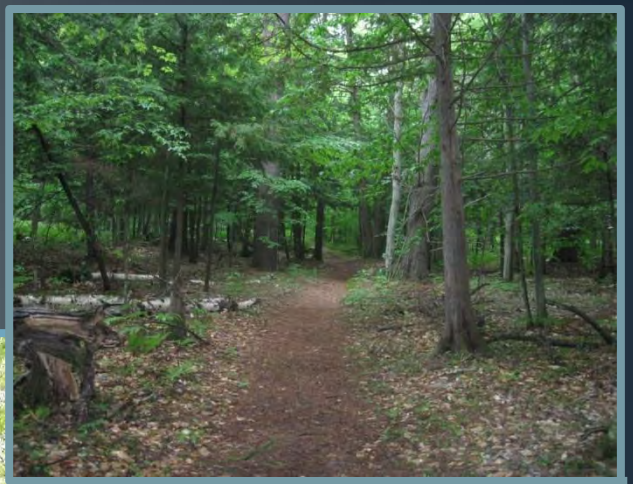


Photo: Devin Rose

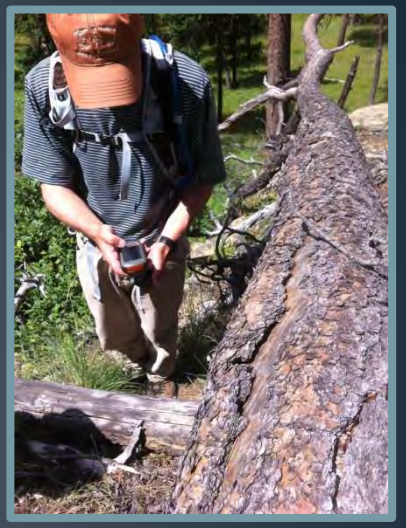
Roosting Ecology

- Maternity colonies = ~50-80 reproductive females + young
- 2 - 6 “central node” roosts + 3 - 16 alternate roosts
  - Usually spaced <1 km apart, but occasionally separated by a few kilometers
- Typical maternity roost = larger tree in mature, deciduous stands (but generally smaller than IBAT maternity roosts)
- Typical maternity roost = 24 - 56 cm DBH
- Male/non-reproductive bats = less specific requirements than females (greater variety in roost characteristics)

Roosting Ecology

- Greater variation in roosts compared with IBAT
  - >35 tree species documented (hardwoods & conifers)
  - Use live trees as well as snags
  - Use tree cavities in addition to exfoliating bark/crevices
  - Appear more tolerant of shade than IBAT
  - Often use smaller trees than sympatric IBAT
    - Maternity roosts <3 inches dbh reported
  - Reported roosting in stumps and fallen logs
  - Occasionally use manmade structures (buildings, bridges)

Photos: USFWS



Photos: NPS

Federal Regulations

- Section 4(d) of Endangered Species Act allows FWS to establish special regulations for species listed as Threatened
  - Can either decrease or increase ESA's normal protections
  - Allows FWS to focus on protections necessary or advisable to conserve the species
  - Incentivizes positive conservation actions
  - Cannot be applied to species listed as endangered (i.e., Indiana Bat)
  - Does not exempt federal agencies from consulting with the Service on actions that may affect listed species

NLEB 4(d) Rule

In Summary…

- Prohibited inside WNS Zone (MI):
  - All incidental take within known hibernacula
  - Incidental take caused by tree removal (without a permit) if:
    - Tree removal occurs within 1/4 mile of a known hibernaculum, at any time of year
    - Tree removal cuts or destroys a known occupied maternity roost tree or any other trees within a 150-foot radius of the maternity roost tree during the pup season (June 1 through July 31)

  *Projects with federal nexus must still consult with USFWS if they may affect NLEB

  - Locations of hibernacula and maternity roosts: https://www.fws.gov/Midwest/endangered/mammals/nleb/nhisites.html
    - Contact East Lansing Field Office: eastlansing@fws.gov

NLEB 4(d) Rule

Justification for 4(d) Rule:

- WNS is only major range-wide threat
- Populations healthy pre-WNS and outside WNS zone
- Extensive range and patchily distributed
- Small percentage of habitat impacted yearly
- Low relative exposure to non-WNS threats
- Post-WNS fewer bats exposed to human activities
- NLEB Plasticity:
  - Compared to IBAT, utilize broad variety of habitat types/roost trees
  - Tolerant of human activity
    - Evidence that NLEB will use (and may sometimes prefer) managed forests (e.g., Menzel et al. 2002, Owen et al. 2002: Perry and Thill 2007, Cryan et al. 2001, Badin 2014, Dickinson et al. 2009)

NLEB 4(d) Rule

Justification for 4(d) Rule:

- Broad habitat protections and regulatory prohibitions are impractical
- Minimizing prohibitions will help foster partnerships for recovery
- Prioritize WNS research and disease management
- Focused protections instead of broad protections
  - Vulnerable periods in the bat's life history within the WNS-affected area:
    - Females with young, where known
    - Spring staging and fall swarming
    - Hibernation

MDEQ Screening Process

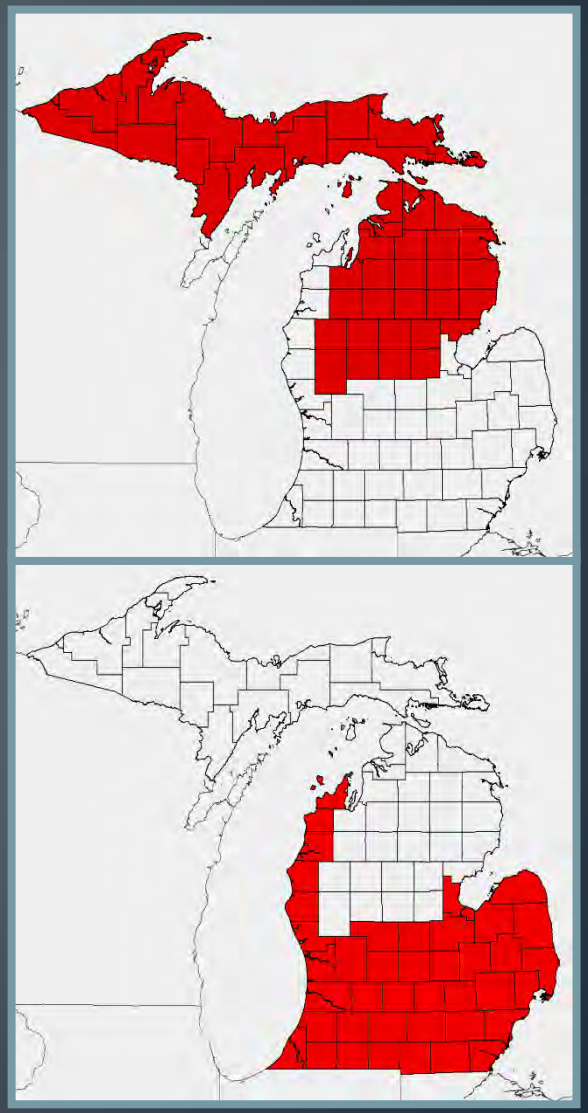
2 Screening Tools:

I. Red Filing for Northern Long-eared Bat

- Range of NLEB ONLY

II. Red Filing for Northern Long-eared Bat and Indiana Bat

- Range of NLEB AND Indiana Bat



MDEQ Screening Process

I. Red Filing for Northern Long-eared Bat:

1. If the applicant submits results of a bat survey, contact the WRD T&E coordinator. If no bat survey was conducted, continue to Step 2.
2. Check the U.S. Fish and Wildlife Service (USFWS) website at http://www.fws.gov/midwest/EastLansing/te/index.html to determine whether the project is in a township with known NLEB bat hibernacula or roost trees.

[1]The "project" includes all wetland/stream impacts that are part of the permit application as well as activities in uplands that would not or could not occur but for issuance of the MDEQ permit.

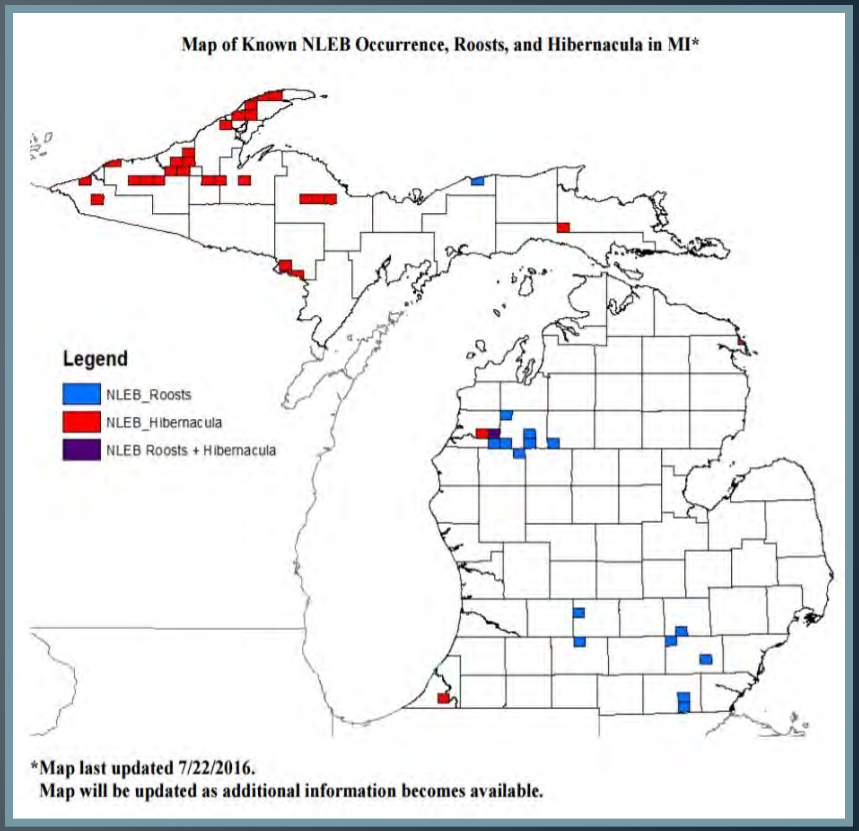
MDEQ Screening Process

I. Red Filing for NLEB:

(2) a. If the project is within one of the townships with a known NLEB hibernaculum (RED/PURPLE), contact ELFO to determine if the application should be red-filed.

b. If the project is within a township with a known roost tree (BLUE/PURPLE), continue to Step 3.

c. If the project is not within a township with a known hibernaculum or roost tree (WHITE), staff do not need to red-file the application.



MDEQ Screening Process

I. Red Filing for NLEB:

3. If the project involves tree removal[2], contact ELFO with a project location to determine if the project is within 150 feet of a known maternity roost tree.

   a. If the project is not within 150 feet of a known maternity roost tree, staff do not need to red-file the application due to NLEB.

[2]"Tree removal" is defined as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by Northern long-eared bats.

MDEQ Screening Process

I. Red Filing for NLEB:

(3) b. If the project is within 150 ft of a known maternity roost tree, condition[3] the permit to prohibit tree removal from June 1 – July 31.

[3]The permit condition language should be as follows: “To avoid take of Northern long-eared bat, which is federally listed as a threatened species, any trees, saplings, snags or any other form of woody vegetation likely to be used by Northern long-eared bats shall not be cut, harvested, destroyed, trimmed or manipulated in any other way within 150 feet of a known maternity roost tree (as identified by U.S. Fish and Wildlife Service on the attached) between June 1 and July 31in any permit year. The permittee shall notify U.S. Fish and Wildlife Service when the roost tree is removed.”

MDEQ Screening Process

I. Red Filing for NLEB:

(3) c. If the permit cannot be conditioned with the above seasonal tree removal restriction (removal prohibited June 1- July 31) based on conversations with the applicant, process the application as a red-file.

MDEQ Screening Process

II. Red Filing for NLEB and Indiana Bat

1. If the applicant submits results of a bat survey, contact the WRD T&E coordinator. If no bat survey was conducted, continue to Step 2.
2. Check the U.S. Fish and Wildlife Service (USFWS) website at http://www.fws.gov/midwest/EastLansing/te/index.html to determine whether the project[1] is in a township with known NLEB bat hibernacula or roost trees.

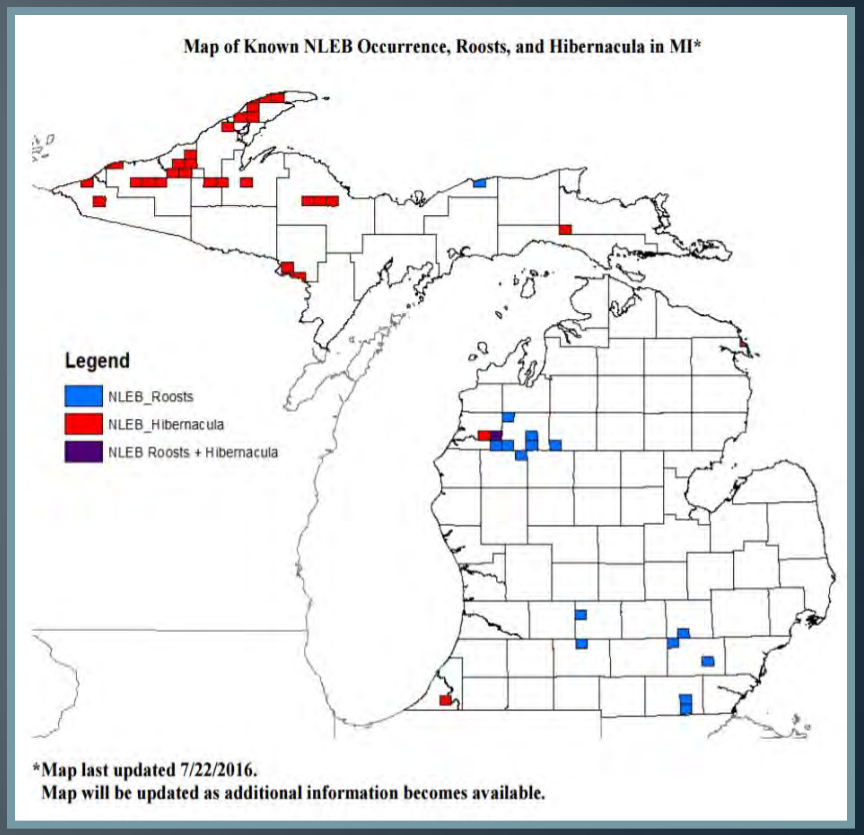
[1]The "project" includes all wetland/stream impacts that are part of the permit application as well as activities in uplands that would not or could not occur but for issuance of the MDEQ permit.

MDEQ Screening Process

II. Red Filing for NLEB and IBAT

(2) a. If the project is within one of the townships with a known NLEB hibernaculum (RED/PURPLE), contact ELFO to determine if the application should be red-filed.

b. If the project is not within a township with a known hibernaculum (RED/PURPLE), continue to Step 3.



MDEQ Screening Process

II. Red Filing for NLEB and IBAT:

- 3. Determine whether the project includes tree cutting in suitable IBAT habitat[2]

[2]Suitable summer habitat for IBAT 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 (i.e., live trees and/or snags ≥5 inches dbh that have exfoliating bark, cracks, crevices, and/or hollows), 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. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet of other forested/wooded habitat. Southern Michigan maternity roost trees are typically in open areas exposed to solar radiation.

MDEQ Screening Process

II. Red Filing for NLEB and IBAT:

(3) a. If the project includes tree cutting in suitable Indiana bat habitat but no more than 10% of the existing forested/wooded habitat will be cut within a half-mile buffer around the project area:

i. Condition[3] the permit to prohibit tree cutting or removal from April 1 – September 30 and continue to step 4;

[3]The permit condition language should be as follows: “To avoid take of Indiana bat, which is federally listed as an endangered species, any trees greater than 5 inches dbh on the project site shall not be cut between April 1 and September 30 in any permit year.”

MDEQ Screening Process

II. Red Filing for NLEB and IBAT:

(3) (a) ii. If the permit cannot be conditioned with the above seasonal tree cutting restriction based on conversations with the applicant, process the application as a red-file.

b. If the project includes tree cutting in suitable Indiana bat habitat and more than 10% of the existing forested/wooded habitat will be cut within a half-mile buffer around the project area, process the application as a red-file;

c. If the project site does not provide suitable habitat for Indiana bat, continue to Step 4.

MDEQ Screening Process

II. Red Filing for NLEB and IBAT:

4. If the project involves tree removal[4] and is within one of the townships with known northern long-eared bat maternity roost trees, contact the USFWS East Lansing Field Office with a project location to determine if the project is within 150 feet of a known maternity roost tree.

[4]"Tree removal" is defined as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats.

MDEQ Screening Process

II. Red Filing for NLEB and IBAT:

(4) a. If the project is not within 150 feet of a known maternity roost tree, staff do not need to red-file the application due to NLEB

b. If the project is within 150 feet of a known maternity roost tree, condition the permit to prohibit tree removal from June 1 – July 31;

The permit condition language should be as follows: “To avoid take of Northern long-eared bat, which is federally listed as a threatened species, any trees, saplings, snags or any other form of woody vegetation likely to be used by Northern long-eared bats shall not be cut, harvested, destroyed, trimmed or manipulated in any other way within 150 feet of a known maternity roost tree (as identified by U.S. Fish and Wildlife Service on the attached) between June 1 and July 31 in any permit year. The permittee shall notify U.S. Fish and Wildlife Service when the roost tree is removed.”

MDEQ Screening Process

II. Red Filing for NLEB and IBAT:

(4) c. If the permit cannot be conditioned with the above seasonal tree removal restriction based on conversations with the applicant, process the application as a red-file.

Questions?

Key Characteristics

Roosting/Foraging Habitat:

- Mature forest
- Large, contiguous forest tract (not fragmented)
- Hardwood or mixedwood composition
- Structural complexity
  - Mix of tree species and age classes
  - Presence of canopy gaps (e.g., from fallen snags), allowing greater radiation to certain trees
  - Increased insect diversity/abundance
- Greater overstory than understory clutter (e.g., high canopy cover with flight space below) and/or flight corridors
- Available open water (e.g., pond, stream)
- Abundant snags present
- Conditions leading to continual snag creation (e.g., succession, natural disturbance, management)

Key Characteristics

Roost Tree:

- Cavities/crevices and/or exfoliating bark present
- Dead or declining (e.g., broken top, dead limbs), with bark remaining
- Deciduous/hardwood
- Early successional, subcanopy species
- ≥3 in dbh (NLEB)
- ≥5 in dbh (IBAT)
- Absence of vines, low branches, or clutter that would obstruct flight access to roost or facilitate predation
- Within or adjacent to contiguous, intact forest
- Within 0.5 mi of open water (e.g., stream, pond)

Actual NLEB roost tree (New Jersey)
Photo: USFWS

Managing for Listed Bats

Photo: Michael Patrikeev

- Prioritize known roosting, foraging, and swarming/staging habitat
- Maintain and promote preferred habitat characteristics:
  - Contiguous, mature forest tracts
  - Riparian forests and forested wetlands
  - Vernal pools
  - Forested corridors
  - Vegetative diversity and structural complexity
  - Snags and hardwoods
  - Conditions necessary for snag creation

Managing for Listed Bats

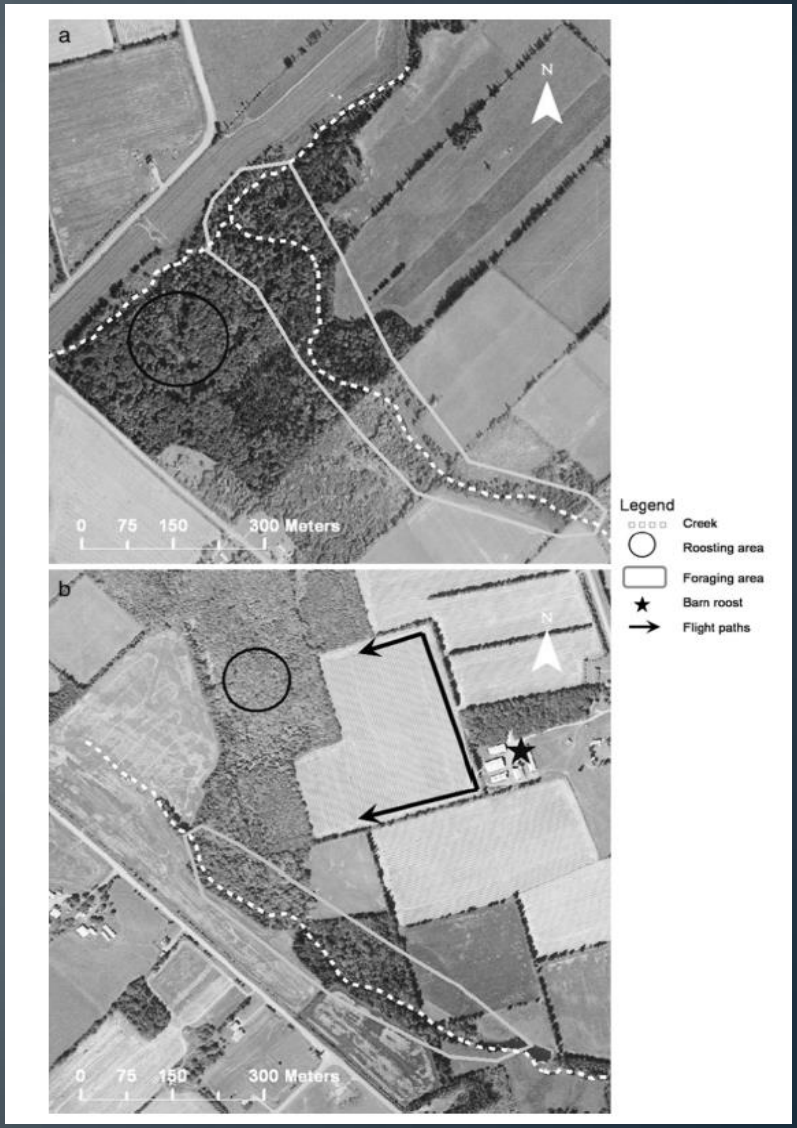
- Selective harvest/forest thinning rather than clearcutting
- Convert monoculture plantations into native hardwood/mixedwood forest
- Leave standing dead trees and fallen logs
- Remove invasive species

Vines obstructing access to potential roost tree

Photo: USFWS

Managing for Listed Bats

- Maintain/create:
  - Connective forest corridors
  - Flight corridors
  - Forested wetlands and waterbodies
  - Vernal pools



Henderson and Broders 2008

“Ideal” Bat Habitat

Floodplain Forests:

Photos: USFWS

“Ideal” Bat Habitat

Forested Wetlands/Swamps:

Photos: USFWS

“Ideal” Bat Habitat

Vernal Pools:

Photo: Steve Faccio

Photo: Nick Scobel

“Ideal” Bat Habitat

Riparian Corridors:

Photos: USFWS

“Ideal” Bat Habitat

Other Forested Corridors:

Photos: USFWS

“Ideal” NLEB Habitat

Structural complexity/succession (creates roosts, flight space and canopy gaps):

“Ideal” Bat Habitat

Structural complexity/succession (creates roosts, flight space and canopy gaps):

Photos: USFWS

Unsuitable Forest Habitat

Photo: Ben Kimball

Photo: Eli Sagor, UMN

Photo: USDA Forest Service

IBAT Critical Habitat

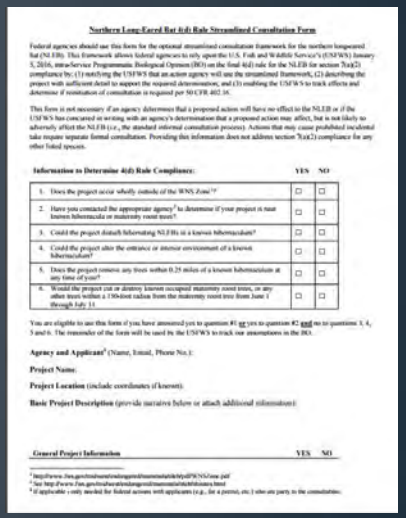
- 11 caves and 2 mines in 6 states:
  - **Illinois**
    - Blackball Mine (LaSalle Co.)
  - **Indiana**
    - Big Wyandotte Cave (Crawford Co.)
    - Ray's Cave (Greene Co.)
  - **Kentucky**
    - Bat Cave (Carter Co.)
    - Coach Cave (Edmonson Co.)
  - **Missouri**
    - Cave 021 (Crawford Co.)
    - Caves 009 and 017 (Franklin Co.)
    - Pilot Knob Mine (Iron Co.)
    - Bat Cave (Shannon Co.)
    - Cave 029 (Washington Co.)
  - **Tennessee** - White Oak Blowhole Cave (Blount Co.)
  - **West Virginia** - Hellhole Cave (Pendleton Co.).

NLEB Critical Habitat

- April 2015: Critical Habitat prudent but not determinable
- April 2016: CH not prudent
  - Summer habitat does not meet definition for CH:
    - No specific physical or biological features that are essential to the conservation of the species
    - Not limited
    - Summer habitat loss not a range-wide threat
  - Designating critical winter habitat would likely increase vandalism, disturbance, and potential spread of WNS

NLEB Streamlined Consultation

- Framework allows federal agencies to rely upon the Service's January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for NLEB for section 7(a)(2) compliance by:
  - Notifying the USFWS that an action agency will use the streamlined framework
  - Describing the project with sufficient detail to support the required determination
  - Enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16
- Streamlined consultation is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if FWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., standard informal consultation process)



Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies should use this form for the optional streamlined consultation framework for the northern longeared bat (NLEB). This framework allows federal agencies to rely upon the U.S. Fish and Wildlife Service's (USFWS) January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for the NLEB for section 7(a)(2) compliance by: (1) notifying the USFWS that an action agency will use the streamlined framework, (2) describing the project with sufficient detail to support the required determination, and (3) enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16.

This form is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if the USFWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., the standard informal consultation process). Actions that may cause prohibited incidental take require separate formal consultation. Providing this information does not address section 7(a)(2) compliance for any other listed species.

Information to Determine 4(d) Rule Compliance:

	YES	NO
1. Does the project occur wholly outside of the WNS Zone?[1]	☐	☐
2. Have you contacted the appropriate agency[2] to determine if your project is near known hibernacula or maternity roost trees?	☐	☐
3. Could the project disturb hibernating NLEBs in a known hibernaculum?	☐	☐
4. Could the project alter the entrance or interior environment of a known hibernaculum?	☐	☐
5. Does the project remove any trees within 0.25 miles of a known hibernaculum at any time of year?	☐	☐
6. Would the project cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree from June 1 through July 31	☐	☐

You are eligible to use this form if you have answered yes to questions #1 or yes to question #2 and no to questions 3, 4, 5 and 6. The remainder of the form will be used by the USFWS to track our assumptions in the BO.

Agency and Applicant[3] (Name, Email, Phone No.):

Project Name:

Project Location (include coordinates if known):

Basic Project Description (provide narrative below or attach additional information):

General Project Information	YES	NO

[1] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf
[2] See http://www.fws.gov/midwest/endangered/mammals/nleb/4dRule.html
[3] If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.