United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Standing Analysis for the All-Species Michigan Determination Key

Version 7 – March 2026

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1 INTRODUCTION

1.1 PURPOSE OF THE STANDING ANALYSIS

This Standing Analysis provides an optional, streamlined alternative consultation process for Federal Action Agencies to address potential effects of future actions, pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act), to the following species and critical habitat(s)[1] that occur in Michigan:

Animals

Birds

- Whooping Crane (*Grus americana*)- NEP (Nonessential Experimental Population)
- Piping Plover (*Charadrius melodus*)- E
- Rufa Red Knot (*Calidris canutus rufa*)- T

Freshwater Mussels

- Clubshell (*Pleurobema clava*)- E
- Northern Riffleshell (*Epioblasma torulosa rangiana*)- E
- Rayed Bean (*Villosa fabalis*)- E
- Snuffbox (*Epioblasma triquetra*)- E
- Round hickorynut *(Obovaria subrotunda)* - T
- Salamander mussel (*Simpsonaias ambigua*) – proposed E

Insects

- Hine's Emerald Dragonfly (*Somatochlora hineana*)- E
- Hungerford's Crawling Water Beetle (*Brychius hungerfordi*)- E
- Karner Blue Butterfly (*Lycaeides melissa samuelis*)- E
- Mitchell's Satyr (*Neonympha mitchelli mitchelli*)- E
- Poweshiek Skipperling (*Oarisma poweshiek*)- E
- Monarch butterfly (*Danaus plexippus*) - proposed T

Mammals

- Canada Lynx (*Lynx canadensis*)- T
- Gray Wolf (*Canis lupus*)- E
- Indiana Bat (*Myotis sodalis*)- E
- Northern Long-eared Bat (*Myotis septentrionalis*)- E
- Tricolored Bat (*Permyotis subflavus*)- proposed E

Reptiles

- Copperbelly Water Snake (*Nerodia erythogaster neglecta*)- T
- Eastern Massasauga Rattlesnake (*Sistrurus catenatus*)- T

Plants

- American Hart's-Tongue Fern (*Asplenium scolopendrium* var. *americana*)- T
- Dwarf Lake Iris (*Iris lacustris*)- T

[1] C = candidate, CH = critical habitat, E = endangered, NEP = nonessential experimental population, P = proposed, T = threatened

- Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)- T
- Houghton's Goldenrod (*Solidago houghtonii*)- T
- Lakeside Daisy (*Hymenoxys herbacea*)- T
- Michigan Monkey-Flower (*Mimulus michiganensis*)- E
- Pitcher's Thistle (*Cirsium pitcheri*)- T

Critical Habitats (CH)

- Hine's Emerald Dragonfly CH
- Piping Plover CH
- Poweshiek Skipperling CH
- Salamander Mussel – Proposed CH

The U.S. Fish and Wildlife Service (Service) developed this standing analysis to streamline the process of reviewing actions that would result in a "may affect, not likely to adversely affect" (NLAA) determination for the subject species and critical habitat(s). This standing analysis also provides proactive technical assistance to Federal Action Agencies in making a "No Effect" determination.

This standing analysis provides an optional consultation process that is available to Federal Agencies for Federal Actions that meet the criteria described below as delivered through a Determination Key (Dkey) in the Service's Information for Planning and Consultation (IPaC) application. To obtain consultation documents, including technical assistance for NE and concurrence with NLAA determinations, Federal Agencies may use the associated Dkey in IPaC to answer questions about the proposed action. By screening the project through the Dkey, all or part of the standing analysis is adopted by the Federal Action Agency and used to submit a concurrence request to support their NLAA determination. It also provides technical information to help agencies determine whether an action will have no effect on the species or critical habitat. Actions which an Action Agency determines will have no effect on species or critical habitat do not require submittal to the Service. This key may also include provisions from programmatic consultations that address actions with adverse effects to listed species in specific scenarios.

Although consultation (section 7 of the Act) is not required in the absence of a Federal nexus, this standing analysis also provides technical assistance for non-Federal actions to assist applicants in screening for potential impacts to listed species. See Section 3 for additional information on the Michigan Dkey's applicability for both Federal and non-Federal projects.

Throughout the remainder of this document, statements regarding this standing analysis refer to both the standing analysis and the associated Dkey.

2 BENEFITS OF THE STANDING ANALYSIS

For those actions that the Service has accumulated significant knowledge in analyzing previously, the Service is able to develop a standing analysis to streamline the consultation process for eligible actions. The streamlined process facilitated by this standing analysis will

reduce the amount of Service staff time necessary to review actions requesting consultation and provide Federal Agencies, consultants, and other project proponents a predictable, consistent, and timely response for qualified actions. In addition, development of a standing analysis to assess the impacts of individual projects allows the Service to more efficiently track multiple independent actions on listed species and critical habitat.

2.1 ELIGIBILITY FOR USE OF THE STANDING ANALYSIS

A standing analysis does not convey concurrence with NLAA determinations for individual projects. Rather, it serves as a streamlining tool. Action Agencies may use it to develop their request for concurrence from the Service and support their finding that the action is not likely to adversely affect species and critical habitat. The standing analysis also allows the Service to quickly evaluate an Action Agency's analysis of effects to listed species and critical habitat. If the Action Agency's proposed action is consistent with the covered[2] area and covered activities, including any required conservation measures in the standing analysis, the Service will concur that the action will have insignificant, discountable, or completely beneficial effects on the relevant listed species and critical habitat (i.e., NLAA).

The standing analysis may also provide technical information to help Agencies identify actions that will have no effects to the listed species and critical habitat. For projects that do not qualify to use the standing analysis, Action Agencies/project proponents should coordinate directly with the Michigan Ecological Services Field Office (MIFO) and address any consultation requirements, as appropriate.

2.2 ENSURING ACCURATE DETERMINATIONS

The Service relies on complete and accurate information provided by Federal Action Agency or non-Federal project proponent during consultation or coordination. To apply this standing analysis to a project, it is the responsibility of the Action Agency/project proponent to provide information that is truthful and accurate and that fully represents the entire scope of the project in order to comply with the Act.

Where appropriate in our analysis, we make note of which activities are expected to have no effect[3] on a species or critical habitat. This information is provided as technical assistance to Action Agencies making no effect/may affect determinations.

[2] The term "covered" is used throughout this document to define the limits of use of a standing analysis. Although a defined area (i.e., Michigan), activities, and species are "covered" by the standing analysis, impacts of proposed actions are not automatically "covered" by the standing analysis. Instead, Action Agencies or non-Federal project proponents must utilize the information in the standing analysis to assess potential impacts of the proposed action on listed species and habitats and request Service concurrence that the action is NLAA for listed species and critical habitat (either through the Dkey or by coordinating with Service outside the Dkey), as necessary.

[3] A "no effect" determination is appropriate when a listed species is either not present in the Action Area or not exposed to any possible stressors or impacts from the proposed action.

2.3 Updates to the Standing Analysis

This standing analysis will be reviewed annually and updated as needed to ensure the analysis contains the best scientific and commercial data available. This update process will include regular reviews to ensure that the analysis is accurate and valid, and that the standing analysis still meets the Act's requirements. All updates will also ensure that the logic is sound and determinations are appropriate for covered activities.

Projects reviewed under this standing analysis must rely on the version that is current on the date consultation is completed. For reference, both current and previous versions of the standing analysis will be maintained by the lead field office.

Our Michigan Determination key library, including our standing analysis, is located here: https://www.fws.gov/library/collections/michigan-determination-key-d-key. Additional details on updating our Dkey, based on our auditing process, can be found below in section 3.1.

3 Background on All-Species Michigan Determination Key

3.1 Development and Usage of Michigan Dkey

In Fiscal Year 2019 (prior to the MIFO's implementation of the Dkey), the MIFO received over 1,270 projects that it reviewed and determined would not significantly affect or result in the prohibited take of species or habitats listed under the Act. The routine nature of the review of various Federal and non- Federal projects provides an opportunity for the MIFO to programmatically evaluate the effects of common activities on threatened and endangered species. Most incoming projects overlap with the Area of Influence (AOI) of multiple listed species in Michigan. The availability of a Dkey covering all threatened and endangered species and critical habitats in Michigan eliminates the need for the MIFO to individually review large numbers of projects and provides Federal Action Agencies, consultants, and project proponents with immediate and consistent responses to their requests for consultation, technical assistance, or conservation planning assistance.

Since the release of the initial version of the Michigan Dkey in December 2020, IPaC has generated well over 9,500 letters (Figure 1). Availability of our all-species, state-wide Dkey has resulted in increased coordination with Federal Agencies and non- Federal partners and resulted in significant streamlining for MIFO staff as well as applicants.

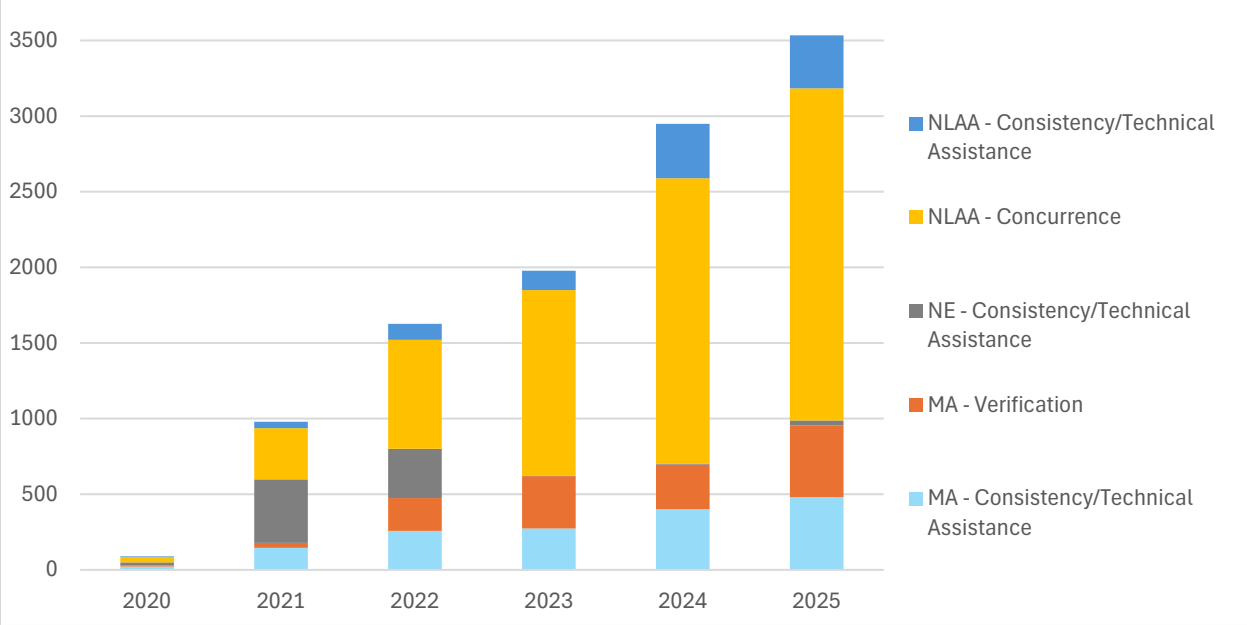

Figure 1. Michigan Dkey usage (as of December 31, 2025).

To use the Michigan Dkey, applicants enter their project area in IPaC, and the program determines whether the project's geographic extent intersects AOI of any federally listed species. The applicant has the option to complete an available determination key, including the Michigan Dkey, for those species for which their project area intersects an AOI. The Dkey starts by asking a series of questions to determine if the project qualifies for the Dkey (see General Limits/Sideboards below). If the project does not qualify for the Dkey, they will be notified that they must consider effects to threatened and endangered species outside of the Dkey. If the user's project qualifies for the Dkey, they will receive questions based on the specific species that may be present in the Action Area. Depending on how they answer the questions and the corresponding determinations that are reached, they will receive one of 5 types of output letter from IPaC (Table 1). The majority of letters that are generated by users are "NLAA Concurrence" (Figure 1).

The MIFO has an internal "auditing" process by which a biologist "audits" or reviews the letters generated by IPaC to determine whether the Dkey is functioning properly and that the appropriate determinations are delivered. We also update the Dkey regularly to improve function based on feedback from applicants and auditors. We follow up with applicants when we need clarification regarding a letter or project or if we believe there is an error in a particular determination.

Table 1. Types of letters generated by the Michigan Dkey and instructions to applicants on whether there is a verification period or if additional action is needed.

File name	Subject line	Comments
DATE NE TA MI_Statewide	Subject: Technical Assistance [or Consistency] letter for 'PROJECT NAME'	NE determination for all species/critical habitats. No additional action is needed.
DATE NLAA TA MI_Statewide	Subject: Technical Assistance [or Consistency] letter for 'PROJECT NAME'	Non-Federal projects; NLAA or NE determination for all species/critical habitats. No additional action is needed.
DATE NLAA Concurrence MI_Statewide	Subject: Verification letter for the project named 'PROJECT NAME'	Federal project; NLAA or NE for all species/critical habitats. 30-day verification period.
DATE MA Verification MI_Statewide	Subject: Verification letter for 'PROJECT NAME'	NE or NLAA for all listed species/critical habitats; candidate, experimental, or proposed populations get MA. No additional action is needed. 30-day verification period.
DATE MA TA MI_Statewide	Subject: Technical Assistance [or Consistency] letter for 'PROJECT NAME'	Dkey could not provide automated clearance for at least one species; **section 7 consultation NOT complete for projects with Federal nexus. Not reviewed by MIFO automatically depending on workload.**

For Federal projects that reach a NLAA determination, there is a 30-day "verification period" to provide an opportunity for the Service to review the project details when selected and helping ensure the action meets the criteria for a NLAA determination. Output letters will indicate that if the project proponent does not hear otherwise within that timeframe, the NLAA determination is verified, and they can proceed with their action as described in the IPaC report and concurrence verification letter. This verification period allows the MIFO to apply local knowledge to evaluation of the action and ensure actions do not have unanticipated impacts. Thus, there may be a small subset of actions for which the MIFO may request additional information during this timeframe to verify the effects determination reached through the Dkey. There is no verification period for non-Federal projects or for NE determinations, although MIFO staff still review these for accuracy. If the user gets a MA determination for any species, they are advised to contact the MIFO to complete consultation outside of the Dkey. MA determinations, in the context of the Dkey, mean the Dkey was not able to assist the user in making a determination. It does not necessarily mean that adverse effects to listed species or critical habitats are expected.

All applicable output letters include reinitiation language as follows: "The Service recommends that your agency contact the Service or re-evaluate the project in IPaC if: 1) the scope or location of the proposed action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occur, additional consultation with the Service should take place before project changes are final or resources committed."

3.2 Benefits of an All-species Determination Key approach in Michigan

The all-species, statewide Dkey approach taken in Michigan has improved ESA compliance, consistency, and efficiency for project proponents and the MIFO:

Compliance: Previously, many users in Michigan filed their official species lists or single-species Dkey (e.g., Range-wide NLEB Dkey) output letter and considered their section 7 obligations met, even if their species lists or species-focused Dkey letters clearly indicated additional consultation was needed. Availability of the Michigan Dkey has allowed users to more easily consider all listed species and critical habitats.

Consistency: Our Dkey utilizes local, Michigan-specific data regarding species ecology, landscape and habitat availability, climate, and potential stressors. The logic is consistent with the approach the Field Office takes for consultation outside of determination keys and the IPaC system, and it is based on the best available information for listed species populations in Michigan. We work closely with our state partners at the Michigan Department of Natural Resources and Michigan Department of Environment, Great Lakes, and Energy (EGLE) to ensure our approach is consistent with the state agency's approach to implementing state authorities.

Efficiency: Our Dkey provides a comprehensive approach that is convenient for the user. Project proponents can complete one set of questions about their project and can often obtain a concurrence letter that covers all listed species and critical habitat. The auditing process described above allows the MIFO to quickly review the large volume of projects being screened using the Dkey.

Our statewide Dkey also allows us to integrate other authorities that are helpful to project proponents. For example, in our Michigan Dkey output letters we are able to provide: comments on communications towers and impacts to migratory birds under the Migratory Bird Treaty Act (Appendix A); information related to the Bald and Golden Eagle Protection Act; recommendations for projects intersecting a Coastal Barrier Resources Act unit; recommendations for state-listed species; and recommended permit conditions for projects applying for a state wetland permit. We can use a Michigan-specific post-Dkey questionnaire to help us better understand project impacts individually and

cumulatively. This allows for greater conservation outcomes and better communication with project proponents. We have found that our approach has also allowed us to interact and build relationships with agency staff and consultants through our various outreach efforts around our Dkey.

In summary, project proponents greatly appreciate having a "one-stop shop" for their projects by using the Michigan Dkey, which allows them to use IPaC to generate a concurrence letter for their project that considers all federally listed species and habitats. Based on our observations during the implementation of both state-specific and Range-wide Dkeys over the last several years, we believe the statewide approach also improves compliance, because applicants consider all species without additional steps or coordination.

4 COVERED AREA

This standing analysis applies throughout the state of Michigan. To qualify to use this standing analysis, a project's Action Area must fall completely within Michigan. Projects that extend into Canada or other states within the U.S. are not able to use the Michigan Dkey.

5 COVERED SPECIES AND CRITICAL HABITAT

The following section includes a summary of relevant background information on the species and critical habitat(s) used to develop this standing analysis. A complete description of the species can be found on ECOS (https://ecos.fws.gov). This overview is included to inform the reader of the species prior to the analysis of the effects of the action presented below. Species and critical habitats within a project's Action Area that may be affected by the proposed action, but are not covered by this standing analysis, will require individual consultation with the MIFO.

5.1 NONESSENTIAL EXPERIMENTAL POPULATION OF WHOOPING CRANE (*GRUS AMERICANA*)

The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Bulrush is the dominant vegetation type in the potholes used for nesting, although cattail, sedge, musk-grass, and other aquatic plants are common. Nest sites are primarily located in shallow diatom ponds that contain bulrush. During migration, whooping cranes use a variety of habitats; however, wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally and semi permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands.

The whooping crane has been federally listed as endangered since 1967 due to habitat loss and over-hunting. Wild whooping cranes currently exist in two flocks, a non-migratory flock in Florida, and a migratory flock that summers in Wood Buffalo National Park in Canada and winters near and at Aransas National Wildlife Refuge in Texas along the Gulf coast. It is possible that all or most of these birds could be wiped out from a single event such as a

hurricane, disease outbreak, toxic spill, or prolonged drought, making the species vulnerable to extinction. To ensure that the whooping crane survives, the International Whooping Crane Recovery Team recommended that an additional flock of whooping cranes be established that is separate from the single remaining natural wild migratory population. On June 26, 2001, the Service published a final rule in the Federal Register to establish a Nonessential Experimental Population (NEP) within a 20-state area in the eastern U.S., which includes Michigan (USFWS 2012a).

For the purposes of section 7 of the ESA, we treat NEPs as threatened species when the NEP is located within a National Wildlife Refuge (NWR) or National Park (NP), and therefore section 7(a)(1) and the consultation requirements of section 7(a)(2) of the ESA apply in NWRs and NPs. Section 7(a)(1) requires all Federal Agencies to use their authorities to conserve listed species. Section 7(a)(2) requires that Federal Agencies consult with the Service before authorizing, funding, or carrying out any activity that would likely jeopardize the continued existence of a listed species or adversely modify its critical habitat.

For Federal projects outside a NWR or NP, we treat the population as proposed for listing and only two provisions of section 7 would apply: section 7(a)(1) and section 7(a)(4). In these instances, NEPs provide additional flexibility because Federal Agencies are not required to consult with us under section 7(a)(2). Section 7(a)(4) requires Federal Agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species. The results of a conference are advisory in nature and do not restrict Agencies from carrying out, funding, or authorizing activities.

For purposes of section 9 of the ESA, individual species within a NEP area are treated as threatened regardless of the species' designation elsewhere in its range. Under section 4(d) of the ESA, we have greater discretion in developing management programs and special regulations for threatened species than we have for endangered species. Section 4(d) of the ESA allows us to adopt whatever regulations are necessary to provide for the conservation of a threatened species. The special 4(d) rule contains the prohibitions and exemptions necessary and appropriate to conserve that species. Because of the flexibility, regulations issued under a 4(d) rule are generally compatible with routine human activities in the reintroduction area. For whooping crane in the NEP in Michigan, purposeful take is prohibited under the special rule; actions that cause take that is accidental and occurred incidentally to an otherwise lawful activity that was being carried out in full compliance with all applicable laws and regulations, is not prohibited under the ESA. In the case of an intentional actions (e.g., intentional shooting), the full protection of the ESA could apply.

For additional information on the whooping crane, including a five-year status review and recovery plan, please see the species profile.

5.2 PIPING PLOVER (*CHARADRIUS MELODUS*)

The piping plover is a small shorebird that nests in three separate geographic populations in the U.S.: the Great Plains states, the shores of the Great Lakes, and the shores of the Atlantic coast. Birds from all populations winter on the southern Atlantic and Gulf coasts in the U.S (Saunders et al 2014).

In the Great Lakes, piping plovers nest, feed, and rear their young in open, sparsely vegetated sandy areas, including sand spits and sand beaches with wide, unforested dunes and swales or in the flat pans behind the primary dune. Piping plovers begin arriving in Michigan in late April, and most mated pairs are nesting by mid to late May. Eggs typically hatch from late May to late July, with chicks fledging 21 to 30 days after hatching. Although piping plovers typically produce one brood per year, they sometimes bring off two broods during a summer. Piping plovers feed on exposed beach surfaces by pecking for invertebrates that are 1/2 inch or less below the surface. They feed mostly during the day and eat insects, marine worms, crustaceans, and mollusks as well as eggs and larvae of flies and beetles. Most adults depart for their wintering grounds by mid-August. Young birds hatched during the summer start their migration a few weeks later than adults, and most are gone from the Great Lakes by late August.

The Great Lakes population of the piping plover was listed as endangered in 1986 (USFWS 2020b). An active recovery program in Michigan, aided by many volunteers, has helped the plover population to steadily increase. In 2019, there were 71 breeding pairs (142 individuals) (USFWS unpubl. data 2020). Of these, 49 pairs nested in Michigan, while 22 pairs were found outside the state, including one pair in Chicago, Illinois, one pair in Pennsylvania, ten pairs in Wisconsin, and nine pairs in Ontario, Canada. A single breeding pair discovered in 2007 in the Great Lakes region of Canada represented the first confirmed piping plover nest there in over 30 years. In 2019, a pair of piping plovers had their first successful nesting site at Montrose Beach in Chicago, Illinois in more than 60 years.

The species remains extremely vulnerable to extinction from factors that include disease, habitat destruction, and unpredictable changes in the environment. Recent studies of Great Lakes Piping Plovers indicate that predation and human-caused disturbance also continue to negatively affect the population. During 2019, as many as 11 adults were lost due to predation by merlins, snowy owls, and off-leash dogs (USFWS unpubl. data 2020).

For additional information on the piping plover, including a recent five-year status review and recovery plan, check out the species profile.

Under the terms of a court order, the Service designated CH for the Great Lakes breeding population of the piping plover on May 7, 2001. This includes 35 units in 8 states, including 23 units in Michigan:

- St. Louis County, Minnesota
- Douglas, Ashland, Marinette, and Manitowoc Counties, Wisconsin
- Lake County, Illinois
- Porter County, Indiana
- Erie and Lake Counties, Ohio
- Erie County, Pennsylvania
- Oswego and Jefferson Counties, New York
- Alger, Schoolcraft, Luce, Mackinac, Chippewa, Iosco, Presque Isle, Cheboygan, Emmet, Charlevoix, Leelanau, Benzie, Mason and Muskegon Counties, Michigan.

The final CH designation includes approximately 201 miles (325 km) of mainland and island shoreline for the Great Lakes breeding population in these 26 counties. Within the 35 critical habitat units, only the areas that contain the primary constituent elements of piping plover

habitat, as described above, are designated as CH. See https://www.fws.gov/species-publication-action/etwp-final-determination-critical-habitat-great-lakes-breeding for more information about piping plover CH in Michigan.

5.3 RUFA RED KNOT (*CALIDRIS CANUTUS RUFA*)

The rufa red knot is a migratory shorebird that breeds in the Canadian Arctic and winters in parts of the United States, the Caribbean, and South America. Some red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom (USFWS 2020a). Major migration stopover areas occur along the Gulf coast and Atlantic coasts of North and South America. However, red knots have been regularly sighted in inland areas of the United States within the Atlantic and central flyways, including the coasts of the Great Lakes in Michigan. Red knots generally nest in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation. Best available information indicates nest sites are within 600 feet of a freshwater wetland, and, although nests are typically within 31 miles (50 kilometers [km]) of the ocean, knots do not typically use saltwater habitats on the breeding grounds (Smith pers. comm. 2019).

The Service listed the rufa subspecies of red knot as threatened under the ESA on December 11, 2014. The reason for listing was due to loss of both breeding and nonbreeding habitat; likely effects related to disruption of natural predator cycles on the breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies (mismatches) in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions.

For additional information on the rufa red knot, including a recovery outline, please see the species profile.

5.4 FEDERALLY LISTED FRESHWATER MUSSEL IN MICHIGAN

Freshwater mussels are one of the most critically imperiled groups of organisms in the world. In North America, 65% of the remaining 300 species are vulnerable to extinction (Haag and Williams 2014). Implementing measures to conserve and restore freshwater mussel populations directly improves water quality in lakes, rivers, and streams throughout Michigan. An adult freshwater mussel filters anywhere from 1 to 38 gallons of water per day (Baker and Levinton 2003, Barnhart pers. comm. 2019). A 2015 survey found that in some areas mussels can reduce the bacterial populations by more than 85% (Othman et al. 2015 in Vaughn 2017). Mussels are also considered to be ecosystem engineers, stabilizing substrate and providing habitat for other aquatic organisms (Vaughn 2017). In addition to ecosystem services, mussels play an important role in the food web, contributing critical nutrients to both terrestrial and aquatic habitats, including those that support sport fish (Vaughn 2017). Taking proactive measures to conserve and restore freshwater mussels will improve water quality, which has the potential to positively impact human health and recreation in the State of Michigan.

The Michigan Freshwater Mussel Survey Protocols and Relocation Procedures (https://www.fws.gov/media/michigan-freshwater-mussel-survey-protocols-and-relocation-

procedures-rivers-and-streams) provide project proponents with guidance to minimize impacts to mussel species that are currently identified as threatened or endangered by the USFWS. These protocols are designed to document the potential presence or absence of state or federally listed mussel species as well as provide guidance for survey and relocation activities to minimize impacts to native mussels in Michigan.

As part of the Michigan Freshwater Mussel Survey Protocols and Relocation Procedures Michigan rivers and streams have been grouped according to existing knowledge of mussel distribution and individual species conservation status. The Mussel Protocol Stream Groups are designed to document the potential presence or absence of state or federally listed mussel species. The layer was created by modeling the habitat suitability for each mussel species and may not correspond directly with a documented location for a listed mussel. A segment may be predicted as suitable for a number of mussel species, so the stream group number was assigned to the most restrictive of the potential mussel species present. The watersheds have associated mussel species data and can be queried to generate a species list. These stream groups determine the necessary level of coordination by project proponents with the USFWS as well as the appropriate survey protocol applicable to the project site. Below are the stream groupings, which are available via Michigan Natural Features Inventory Mussel Map Viewer (https://mnfi.anr.msu.edu/resources/michigan-mussels). The Mussel Map Viewer is an interactive tool to allow users to explore listed native mussels across the Michigan landscape. Watershed level species lists are available alongside the Mussel Protocol Stream Groups.

- Group 1: Stream and rivers known to support mussels considered to be special concern by the State, but lacking mussel occurrence data at the project site.
- Group 2: Streams and rivers known to support populations of State threatened and endangered mussels.
- Group 3a: Small and medium streams and rivers with a drainage area less than 300 mi^2 that support populations of federally listed mussels.
- Group 3b: Large rivers (drainage area greater than 300 mi^2) that support populations of federally listed mussels.

5.4.1 Clubshell (*Pleurobema clava*)

The clubshell is a freshwater mussel that prefers clean, loose sand and gravel in medium to small rivers and streams. Clubshells will bury themselves in the bottom substrate to depths of up to four inches (Watters 1990). Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. The striped shiner (*Notropis chrysocephalus*), central stoneroller (*Campostoma anomalum*), blackside darter (*Percina maculata*), and logperch (*Percina caprodes*) have been capable of serving as hosts of the clubshell under laboratory conditions.

Clubshell was listed as endangered in 1993. The clubshell was once found from Michigan to Alabama, and from Illinois to West Virginia. Clubshell originally inhabited 100 streams across this range. Currently there are 13 extant populations of clubshell in the Ohio River and Lake Erie Basins. Portions of 21 streams potentially support populations of clubshell. Evidence of recent successful recruitment has been reported in 10 streams: the Allegheny River, French Creek, LeBoeuf Creek, Muddy Creek, Tippecanoe River, Middle Branch of the North Fork Vermilion

River, Green River, Elk River, Little Darby Creek, and Shenango River. In several streams, clubshell populations appear to comprise only older adults, and the populations are in decline and possibly extirpated: East Fork of the West Branch St. Joseph River, Fish Creek, Hackers Creek, Walhonding River, Cassadaga Creek, Pymatuning Creek, Conneaut Outlet, and Conneauttee Creek (USFWS 2019c).

The distribution of clubshell is very limited in Michigan and only occurs in the East Branch of the West Fork of the St. Joseph River, Maumee drainage. Reasons for its decline in the upper Ohio and Wabasha watersheds have been principally due to pollution from agricultural runoff and industrial wastes, and extensive impoundments for navigation. These are thought to be also responsible for its decline elsewhere as well. An added threat now is the zebra mussel, a fast-spreading exotic species accidentally introduced in ballast water from the Caspian Sea area. These tiny mussels reproduce in enormous numbers which tend to cover and suffocate native mussels (USFWS 2019c). In the St. Joseph watershed, water quality degradation as a result of land-based activities such as agriculture and development is a major threat. These types of activities result in excess sedimentation and pollutants that may affect clubshell survival, growth, and reproduction. It is likely that there are barriers within the watershed that also have altered habitat, hydrology, temperature, and sediment transport, limiting the range of clusbshell as well as potentially directly affecting certain localized populations. Lastly, instream activities such as bridge and road construction also have the potential to impact localized populations of clubshell.

For additional information on the clubshell mussel, including a recent five-year status review, please see the species profile.

5.4.2 Northern Riffleshell (*Epioblasma torulosa rangiana*)

This mussel is found in a wide variety of streams, including large streams and small rivers, where it buries itself in firmly packed sand or gravel in riffle areas. It is also found in Lake Erie. Like all freshwater mussels, northern riffleshell require a stable, undisturbed habitat and a sufficient population of host fish for reproduction. The mottled sculpin (*Cottus bairdi*), banded darter (*Etheostoma zonale*), bluebreast darter (*Etheostoma camurum*), and brown trout (*Salmo trutta*) are potential host species (Watters 1996).

Northern riffleshell was listed as endangered in 1993. Historically, the northern riffleshell was found in the Ohio river drainage in Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and west Virginia, and into southeastern Michigan and southwestern Ontario. Of the 54 streams once known to be occupied by northern riffleshell, it is known to currently occur in 13 populations, 4 of which are stable and recruiting. Of the four recruiting populations, three are apparently large and occur in the Allegheny River, French Creek, and East Branch Sydenham River. A fourth, smaller population occurs, as of 2006, in the AuSable River. In Michigan the current status of northern riffleshell is unknown with only shells found during a 2007/2008 survey of the Detroit River and Lake St. Clair. It is possible that these populations are extirpated as a result of the introduction of nonnative zebra and quagga mussels (USFWS 2019a). Numerous threats persist for the remaining northern riffleshell populations, including invasive species, the effects of small population sizes, habitat alteration, land-use changes, changing precipitation and temperature patterns, and point and non-point source pollution.

For additional information on the northern riffleshell mussel, including the five-year status review, please see the species profile.

5.4.3 Rayed Bean (*Villosa fabalis*)

The rayed bean is a small mussel usually estimated around 1.5 inches (3.8cm) in length (Cummings and Mayer 1992; Parmalee and Bogan 1998; West et al. 2000). Generally, they live in smaller, headwater creeks, but it is sometimes found in large rivers and wave-washed areas of glacial lakes (Cummings and Mayer 1992; Parmalee and Bogan 1998, West et al. 2000). It prefers gravel or sand substrates and is often found in and around roots of aquatic vegetation. Adults spend their entire lives partially or completely buried in substrate, filtering water through their gills to remove algae, bacteria, detritus, microscopic animals, and dissolved organic material for food (Murray and Leonard 1962; Silverman et al. 1997; Nichols and Garling 2000; Christian et al. 2004; Strayer et al. 2004). Juvenile mussels, called glochidia, use fish as hosts, allowing the species to move upstream and populate habitats it could not otherwise reach. At the time of listing, the Tippecanoe darter (*Etheostoma tippecanoe*) was the only reported known host fish for the rayed bean. Gibson et al. (2011) also verified the spotted darter (*Etheostoma maculatum*) as a suitable host fish (USFWS 2018a).

Rayed bean was listed as endangered in 2012. Rayed bean was listed as endangered in 2012. The Species Status Assessment (SSA) for rayed bean was completed by the Service in 2022. The SSA summarizes the best available scientific information on the biological condition and viability of the species. The analysis of the current condition of rayed bean in the SSA was conducted at the U.S. Geological Survey hydrologic unit scale (HUC) of HUC8, which is at the subbasin scale. Demographic population condition was assessed as high, moderate, low, or very low/functionally extirpated based on specific criteria and estimated a probability of persistence over 2 lifespans of rayed bean (30 years) (USFWS 2022b). Five primary risk factors were also evaluated including water quality/contaminants, hydrological regime, landscape, connectivity, and invasive species (USFWS 2022b). Risk factors were assigned a category of high, moderate, or low, and assigned a probability of persistence over 50 years (USFWS 2022b).

The rayed bean historically occurred in at least 115 streams, lakes, and some human-made canals in 10 states: Illinois, Indiana, Kentucky, Michigan, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia; and Ontario, Canada. Rayed bean is currently considered to be extant in 28 streams and 1 lake in seven states and 2 streams in one Canadian province: Indiana, Michigan, New York, Ohio, Pennsylvania, Tennessee, and West Virginia; and Ontario, Canada (total of 31 streams and lakes). The rayed bean's range within the Great Lakes basin includes a portion of Canada, Indiana, Michigan, and Ohio. Nine populations are considered extant in the Great Lakes basin. The demographic condition of four populations is categorized as high and the other five populations are categorized as low (USFWS 2022b).

Major threats to rayed bean are modification and destruction of river and stream habitat, primarily by the construction of impoundments. Other factors contributing to the reduction in range include dredging and channelization, chemical contamination, oil and gas production, sand and gravel mining, and siltation.

In addition, there are other emerging threats such as disease and climate change. Little is known about diseases in freshwater mussels (Grizzle and Brunner 2007, USFWS 2018a). However, mussel die-offs have been documented in streams within the range of rayed bean, some researchers believe that disease may be a factor contributing to the die-offs (USFWS 2018a).

For additional information on the rayed bean mussel, including a recent five-year status review, please see the species profile.

5.4.4 Round Hickorynut

The round hickorynut mussel is a small- to medium-sized mussel up to three inches long, living up to 15 years. It is found in small streams to large rivers, and prefers a mixture of sand, gravel, and cobble stream bottoms.

The round hickorynut and other aquatic species have endured negative influences commonly found in the central and eastern U.S., including habitat fragmentation from dams and other barriers; habitat loss; degraded water quality from chemical contamination and erosion from poorly managed development, agriculture, mining, and timber operations; direct mortality from dredging and harvest; and the proliferation of invasive species, such as the zebra mussel.

The round hickorynut exhibits a preference for sand and gravel in riffle, run, and pool habitats in streams and rivers, but also may be found in sandy mud. They can be found in shallow habitats with gentle flows at less than one foot with abundant American water-willow, but in larger rivers are commonly found up to depths of 6.5 feet.

In Michigan, the round hickorynut is found in the Lake St. Clair and Lake Erie drainages, including the Pine and Belle Rivers (St. Clair County), and Lake St. Clair (Macomb County). Although critical habitat has been designated for this species, none occurs in Michigan.

For additional information on the rayed bean mussel, including a recent five-year status review, please see the species profile.

5.4.5 Snuffbox (*Epioblasma triquetra*)

The snuffbox is usually found in riffles and shoals of small- to medium-sized streams and rivers due to higher flow activity (Cummings and Mayer 1992, Parmalee and Bogan 1998). Adults often burrow deep in substrates, except when they are spawning (Parmalee and Bogan 1998). They are suspension feeders, typically feeding on algae, bacteria, detritus, microscopic animals, and dissolved organic material (Christiansen et al. 2004). Snuffbox females can reach a maximum length of about 1.8in (4.5cm), while males reach up 2.8in (7.0cm) in length (USFWS 2012, Cummings and Mayer 1992, Parmalee and Bogan 1998). Their life span is estimated to be approximately 20 years.

Snuffbox was listed as endangered in 2012. The Species Status Assessment (SSA) for snuffbox was completed by the Service in 2022. The SSA summarizes the best available scientific information on the biological condition and viability of the species. The analysis of the current

condition of snuffbox in the SSA was conducted at the U.S. Geological Survey hydrologic unit scale (HUC) of HUC8, which is at the subbasin scale. Demographic population condition was assessed as high, moderate, low, or very low/functionally extirpated based on specific criteria and estimated a probability of persistence over 2 lifespans of snuffbox (40 years) (USFWS 2022a). Five primary risk factors were also evaluated including water quality/contaminants, hydrological regime, landscape, connectivity, and invasive species (USFWS 2022a). Risk factors were assigned a category of high, moderate, or low, and assigned a probability of persistence over 50 years (USFWS 2022a).

Snuffbox was historically known from 211 streams and lakes in 18 states and Canada (USFWS 2018). Snuffbox is currently considered to be extant in 83 streams in 14 states (Alabama, Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin) and Ontario, Canada (USFWS 2018, USFWS 2022a). The current condition is summarized at the HUC8 scale as following: Great Lakes basin has 11 extant populations; of these, 4 are at high risk, 5 are at moderate risk, and 1 is at low risk (one population in Canada was not able to be fully analyzed); Ohio basin has 30 extant populations; 13 of which are at high risk, 15 are at moderate risk, and 2 are at low risk; Tennessee basin has five populations, three at high risk and two at moderate risk; Upper Mississippi basin has four populations, and the Lower Mississippi basin has one population, and all populations in these basins are at high risk (USFWS 2022a). The Arkansas-White-Red basin has four populations, two are at high risk, one is at moderate risk, and one is at low risk (USFWS 2022a).

Habitat loss and degradation continues to be one of the major threats to snuffbox (USFWS 2018b). Water quality degradation from point and non-point sources including agricultural runoff, municipal effluents, industrial sources, and spills continue to contribute sediment, organic compounds, heavy metals, pesticides, and a wide variety of newly emerging contaminants to the aquatic environment. (USFWS 2018). Other factors contributing to the reduction in range include dredging and channelization, oil and gas production (including water withdrawal), and sand and gravel mining, and development. Exotic species, including the zebra mussel, Asian clam, round goby, and black carp, threaten the snuffbox, or its host fish, or both, through mechanisms such as habitat modification, competition, and predation (USFWS 2018b).

For additional information on the snuffbox mussel, including a recent five-year status review, please see the species profile.

5.4.6 Salamander Mussel (*Simpsonaias ambigua*)

The salamander mussel is frequently found bedding under flat rocks in rivers, streams, creeks, or lakes of moderate flow. They are a small, thin-shelled mussel ranging around 2-inches long and 1-inch high (Watson et al. 2001). It is the only North American freshwater mussel species within the Unionidae family know to have a non-fish host, the mudpuppy, for reproduction. Age of sexual maturity is not known. The females hold the glochidia in their marsupial gills over the winter over the winter until they are released that following spring or summer (Watson 2001).

Salamander mussels were proposed for listing as endangered on August 22, 2023. A species status assessment was completed on May 1, 2023. They are historically found in small streams or

large rivers throughout 14 states (Arkansas, Missouri, Tennessee, Kentucky, Iowa, Illinois, Indiana, Minnesota, Wisconsin, Michigan, Ohio, Pennsylvania, New York, and Virginia). The current distribution of Salamander mussels in Michigan is Black River (Sanilac Co.), Pine River (St. Clair Co.), near Belle Isle (Wayne Co.), Macon Creek (Monroe Co.), and Clinton River (Oakland Co.).

The primary threat to survival of this species is contaminants, hydrological regime, landscape alterations, lack of connectivity, invasive species, and host vulnerability. Movement and presence of host species is critical to development and distribution of mussel (Watters 1992; Haag and Warren 1998).

For additional information on the salamander mussel please see the species profile.

5.5 HINE'S EMERALD DRAGONFLY (*SOMATOCHLORA HINEANA*)

The Hine's emerald dragonfly lives in calcareous (high in calcium carbonate) spring-fed marshes and sedge meadows overlaying dolomite bedrock. Adult males defend small breeding territories, pursuing and mating with females who enter. The female lays eggs by repeatedly plunging the tip of her body into shallow water (Cashatt and Vogt 1996, Service 2001). Later in the season or the following spring, immature dragonflies, called nymphs, hatch from the eggs. The nymph lives in the water for two to four years, eating smaller aquatic insects and shedding its skin many times. The nymph then crawls out of the water and sheds its skin a final time, emerging as a flying adult. The adults may live only four to five weeks.

The principal threat to the species is habitat destruction and alteration. Commercial and residential development, quarrying, landfills, roadways, construction of pipelines, and filling of wetlands could decrease the area of suitable habitat available to the species and fragment populations (USFWS 2001). Changes in surface and sub-surface hydrology could also be detrimental to this species. Alteration of hydrologic regimes could adversely affect the larval and breeding habitat of the species by changing water temperature, flow, chemistry, and volume. Municipal and private wells, addition of impervious surfaces, and alteration of surface drainage patterns could all cause reductions in the suitability of habitat or the outright loss of suitable larval and breeding habitat.

The Hine's emerald dragonfly was listed as endangered on January 26, 1995 (60 FR 5267). Historically, the Hine's emerald dragonfly was found in Alabama, Indiana, and Ohio, and probably has been extirpated in those states. Today, the dragonfly can only be found in Illinois, Michigan, Missouri, and Wisconsin. Hine's emerald dragonfly was first discovered in Michigan at seven sites in 1997 (Steffens 1997). Known sites in the state are in both the Upper and Lower Peninsulas. Most are near the Straits of Mackinac, with the exception of the Menominee County site. The species is known from 20 sites in six counties in Michigan. Ten of these sites occur on the Hiawatha National Forest, and five sites are owned and managed by the Michigan Department of Natural Resources.

For additional information on the Hine's emerald dragonfly, including a recent five-year status review, please see the species profile.

Critical habitat for the species was first designated on September 5, 2007 (72 FR 51101) and later revised on April 23, 2010 (75 FR 21393). A total of 37 units, encompassing approximately 26,531.8 acres (10,737 hectares) in Cook, DuPage, and Will Counties in Illinois; Alpena, Mackinac, and Presque Isle Counties in Michigan; Crawford, Dent, Iron, Phelps, Reynolds, Ripley, Washington, and Wayne Counties in Missouri; and Door and Ozaukee Counties in Wisconsin, were included in the designation. These are lands of wet meadows, groundwater seeps, and associated wetlands that lie over dolomite bedrock and provide breeding and foraging habitat for the dragonfly. For more information on CH for Hine's emerald dragonfly in Michigan, see https://www.fws.gov/species-publication-action/final-revised-critical-habitat-hines-emerald-dragonfly-somatochlora.

5.6 HUNGERFORD'S CRAWLING WATER BEETLE (*BRYCHIUS HUNGERFORDI*)

Hungerford's crawling water beetles (HCWB) are found in the cool riffles of clean, slightly alkaline streams. All streams where this beetle has been found have moderate to fast water flow, good stream aeration, inorganic substrate, and alkaline water conditions. The highest densities of HCWB have been found below beaver dams or immediately below structures (e.g., culverts) that provide similar conditions.

Adults appear to be generalists in their food choice, feeding on algae including *Chara*, *Cladophora*, and *Dichotomosiphon*, as well as the epiphytic diatom *Cocconeis* (Grant and Vande Kopple 2009). The diet of adults may also change seasonally (Grant and Vande Kopple 2003). Larvae appear to prefer the alga *Dichotomosiphon tuberosus* (Grant and Vande Kopple 2009). *Dichotomosiphon*, although widespread, is not common. Its presence may be an important factor in determining the distribution of HCWB (Grant and Vande Kopple 2009).

At the time of listing in 1994, HCWB was known to occur in only three streams range wide. Currently, it is known to occur in 17 streams, with 15 of these streams in northern Michigan and two in Ontario, Canada. It is unknown whether HCWB has a wider distribution or if the species' status is stable, increasing or decreasing. Species of *Brychius* tend to be highly localized and difficult to collect. Even when present, it is possible to sample an area and collect no specimens (Mousseau 2004; Grant et al. 2011). Additional surveys are necessary to determine the extent of HCWB's distribution. There is reason to believe HCWB may be more widely distributed than the streams where it has been previously documented. The types of streams inhabited by this species do not appear to be rare. In fact, streams similar to those in which the species is found appear to be common in northern Michigan and other surrounding states.

Hungerford's crawling water beetle was added to the List of Endangered and Threatened Wildlife and Plants on April 6, 1994 (59 FR 10580). The primary threat to the species is modification of its habitat. Actions that are potentially harmful include dredging, channelization, bank stabilization, and impoundment. Fish introductions or removals may also pose a threat to the species. The introduction of brown trout, for example, can result in increased predation of HCWB. Other management practices, such as the use of chemical treatments, may also be harmful to this rare beetle.

For additional information on the Hungerford's crawling water beetle, including a recovery plan and recent biological opinions, please see the species profile.

5.7 KARNER BLUE BUTTERFLY (*LYCAEIDES MELISSA SAMUELIS*)

The Karner blue butterflies are small with a wingspan of about 2.5 cm. (one inch). The forewing length of adult Karner blues is 1.2 to 1.4 cm for males and 1.4 to 1.6 cm for females (Opler and Krizek 1984). Karner's were historically associated with native barrens and savanna ecosystems, but is now found in remnant barrens, savannas, highway and utility rights-of-way, gaps within forest stands, young forest stands, trails, and military camps that occur on the landscapes previously occupied by native prairie and savannas. The larvae are dependent upon wild lupine (*Lupinus perennis*), the only known larval food source, while wild adults use a variety of wild flowers for nectar (Scott 1986).

The Karner blue butterfly was federally listed as an endangered species in 1992. The butterfly is most widespread in Wisconsin, but is also found in portions of Indiana, Michigan, Minnesota, New Hampshire, New York, and Ohio (USFWS 2019d). It may also be present in Illinois Habitat throughout the range of the Karner blue butterfly has been lost as a result of land development and lack of natural disturbance, primarily wildfire. Such disturbance helps maintain the butterfly's habitat by setting back encroaching forests and encouraging lupine and flowering plant growth. Additionally, the Karner blue butterfly's rarity and beauty make it a desirable addition to butterfly collections. Because butterfly numbers are so low, the collection of even a few individuals could harm the species' populations.

For additional information on the Karner blue butterfly, including a recent five-year status assessment, please see the species profile.

5.8 MITCHELL'S SATYR (*NEONYMPHA MITCHELLI MITCHELLI*)

In Michigan and Indiana, Mitchell's satyrs are found exclusively in prairie fens and open parts of rich tamarack swamps. These systems are a mosaic of open, shrubby, and forested communities, with peat soils and alkaline groundwater seeps. Thin-leaved sedges usually dominate the ground layer in the fens. Mitchell's satyr butterflies are rarely found in open fens without trees or tamarack swamps without openings.

The greatest threat to Mitchell's satyr is direct destruction and modification of its habitat. Prairie fens supporting Mitchell's satyr have disappeared or been altered for agricultural or urban development, which has led to species extirpation and further isolation of populations (Kost and Hyde 2009). Hydrological disruptions also constitute a serious threat, as groundwater diversion, pollution, warming of water sources, and other groundwater alterations lead to less-than-optimal habitat conditions. Offsite activities that affect groundwater flowing into prairie fens could inadvertently impact Mitchell's satyr. For example, a prairie fen's recharge source may be located near or far away from the fen, in a different watershed, county or state. As such, no matter the distance, altering the fen's groundwater source will affect the quality, quantity, or flow of groundwater into the fen (Abbas 2011). Groundwater alteration leads to, among other things, drying of the fen and/or facilitating encroachment of invasive species.

Invasive species, such as buckthorn, hybrid cattail, narrowleaf cattail, multiflora rose, purple loosestrife, reed canary grass, and others, represent additional threats and can be a significant

management problem (Tesauro and Ehrenfeld 2007). Removal of these plants is required at many occupied sites to maintain suitable habitat conditions.

Satyr populations in the northern part of the range have decreased drastically; however, multiple new populations of what appears to be Mitchell's satyr continue to be discovered in the southeastern U.S. (Alabama, Mississippi, and Virginia). Ongoing genetics research will confirm and compare the taxonomy of the southern butterflies.

For additional information on the Mitchell's satyr, including the recovery plan, please see the species profile.

5.9 POWESHIEK SKIPPERLING (*OARISMA POWESHIEK*)

The Poweshiek skipperling is an endemic tallgrass prairie butterfly species. Historically, this species occurred in Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, South Dakota, Wisconsin, and Manitoba, Canada. However, the butterfly's range has contracted significantly in the last decade and can now only be found only at a few sites in a single Michigan county, in very limited numbers at one site in Wisconsin, and in Canada at the single Manitoba site. In Michigan, the skipperling occurs exclusively in prairie fens, specifically in peat domes within larger prairie fen complexes in a community typically composed of multiple, distinct zones of vegetation, some of which contain prairie grasses and forbs (Cuthrell and Slaughter 2012). In other locales (outside of Michigan), the species has or currently occurs in mesic prairies (Pogue et al. 2015; Selby 2016). Also within Michigan, Poweshiek skipperlings are rarely found a great distance from either prairie dropseed or mat muhly (Cuthrell and Slaughter 2012).

Poweshiek skipperling was listed as endangered in 2014. Habitat for this species been affected by altered hydrology, water pollution, sedimentation, invasive species, fire suppression, cattle grazing, and filling for development or dredging to create ponds or lakes (Kost and Hyde 2009). As a result, prairie fens are now very rare and those that remain require management to maintain appropriate habitat that supports native fen biota. Management of Poweshiek skipperling habitat is needed to maintain the basic high-quality native prairie conditions on which the species depends. Management is needed to prevent secondary succession to woody habitat types; to control invasive species; and, to ensure sufficient abundance and diversity of nectar plants. Control of invasive plants species is required to maintain important qualities of habitat, but care must be taken to ensure that treatments do not have adverse effects.

For additional information on the Poweshiek skipperling, including a recent five-year status assessment, check out the species profile.

CH for the Poweshiek skipperling was designated on October 1, 2015. CH comprises approximately 25,900 acres in 56 units in Iowa, Michigan, Minnesota, North Dakota, South Dakota and Wisconsin. See https://fws.gov/species/poweshiek-skipperling-oarisma-poweshiek for more information about CH for the Poweshiek skipperling in MI.

5.10 MONARCH BUTTERFLY (*DANAUS PLEXIPPUS*)

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings (Bouseman and Sternburg 2001). Adult monarchs are sexually dimorphic, with males having narrower wing venation and scent patches (CEC 2008). The bright coloring of a monarch serves as a warning to predators that eating them can be toxic.

During the breeding season, monarchs lay their eggs on their obligate milkweed host plant (primarily Asclepias spp.), and larvae emerge after two to five days (Zalucki 1982; CEC 2008). Larvae develop through five larval instars (intervals between molts) over a period of 9 to 18 days, feeding on milkweed and sequestering toxic chemicals (cardenolides) as a defense against predators (Parsons 1965). The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks; overwintering adults enter reproductive diapause (suspended reproduction) and live six to nine months (Cockrell et al. 1993; Herman and Tatar 2001).

In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months (Urquhart and Urquhart 1978). In early spring (February-March), surviving monarchs break diapause and mate at the overwintering sites before dispersing (Leong et al. 1995; van Hook 1996). The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again (Malcolm et al. 1993).

Monarch butterfly was proposed for listing as threatened on December 12, 2024. If listed, protections would only go into place after the final rule is published. The U.S. Fish and Wildlife Service continues to evaluate the monarch butterfly using the best available science and in accordance with all requirements of the Endangered Species Act. As reflected in the Trump Administration's Unified Agenda of Regulatory and Deregulatory Actions, the final listing determination for the monarch is included as a long-term action. The administration continues to emphasize voluntary, locally driven conservation as a proven tool for supporting species and reducing the need for additional federal regulation. To learn more about how to conserve monarch, visit our Save the Monarch website, and our recommended BMPs in Appendix I.

For additional information on the monarch, check out the species profile.

5.11 CANADA LYNX (*LYNX CANADENSIS*)

Canada lynx and snowshoe hares are strongly associated with moist, cool, boreal spruce-fir forests. Landscapes with high snowshoe hare densities are optimal for lynx survival and reproduction, and research suggests that hare densities consistently at or above 0.5 hares per hectare (0.2 hares/acre) are needed to support persistent lynx populations (Ruggiero et al. 2000b; ILBT 2013). Hares are most abundant in young regenerating or mature multistoried forests with dense understory vegetation that provides food and cover. In the northern contiguous U.S., boreal forests become naturally patchy and marginal for lynx as they transition to temperate

forest types that support lower hare densities. Such forests cannot support lynx populations, even though snowshoe hares may still be present. Snow also influences lynx distribution, and populations typically occur where continuous snow cover lasts four months or longer (Peers et al. 2012). Such areas are believed to provide lynx with a seasonal competitive advantage over other terrestrial hare predators like bobcats and coyotes.

Lynx are broadly distributed across most of Canada and Alaska, which combined encompass about 98% of the species breeding range (McKelvey et al. 2000b). The contiguous U.S. distinct population segment (DPS) accounts for the other two percent, and includes resident breeding populations in northern Maine, northeastern Minnesota, northwestern Montana/northern Idaho, and north-central Washington. An introduced population also occurs in western Colorado, and several other areas may have historically supported small resident populations (e.g., northern New Hampshire, Isle Royale, Michigan, northeastern Washington, and the Greater Yellowstone area of southwestern Montana and northwestern Wyoming). Lynx also have occurred temporarily in many other states, typically during irruptions (mass dispersal events) from Canada, when northern hare populations underwent dramatic cyclic declines roughly every 10 years. The Contiguous U.S. DPS of lynx was listed as threatened in 2000 because regulations on some Federal lands at that time were inadequate to ensure the conservation of lynx populations and habitats.

Currently, the best available information, including historic records and recent surveys, indicates that Canada lynx, if present in Michigan, are likely limited to a small number of dispersing individuals in the Upper Peninsula. There is no indication of recent or current lynx breeding within the state. Verified sightings of lynx in Michigan are infrequent and dispersed. In 2003, a lynx was incidentally captured in a bobcat trap on the Hiawatha National Forest, and in 2010 a lynx was observed on Sugar Island near Sault Ste. Marie. Most recently, a probable Canada lynx was photographed in Marquette County in 2022. Other recent records, include a Lynx trapped in the Lower Peninsula in early 2019 and was subsequently released in Schoolcraft County. Detection of a very low number of dispersing individuals may be difficult, however project assessment for potential effects to lynx in the Upper Peninsula may be prudent.

For additional information on the Canada lynx, please see the species profile.

5.12 Gray Wolf (*Canis lupus*)

Gray wolves in North America, are primarily predators of medium and large mammals. They are highly territorial, social animals and group hunters, normally living in packs of seven or fewer, but sometimes attaining pack sizes of 20 or more wolves (Mech 1970; Mech and Boitani 2003; Stahler et al. 2020). Wolves are capable of mating by age one or two and sometimes form a lifelong bond. On average, four to five pups are born in early spring and are cared for by the entire pack. For the first six weeks, pups are reared in dens. Dens are often used year after year, but wolves may also dig new ones or use some other type of shelter, such as a cave. After a year or two, young wolves often leave their packs to try to find a mate and form a pack or join other existing packs. Wolf packs occupy and defend territories, which range in size from less than 50 square miles to more than 1,000 square miles, depending on habitat and seasonal movements of available prey (Fuller et al. 2003; Mech and Boitani 2003; Sells et al. 2021). Wolves travel over

large areas to hunt, as far as 30 miles in a day. Although they usually trot along at five miles per hour, wolves can run as fast as 40 miles per hour for short distances.

Wolves occur throughout Michigan's Upper Peninsula, and efforts to reintroduce a population of 20-30 wolves to Isle Royale were initiated in 2018. On November 3, 2020, the Service issued a final rule (effective January 4, 2021) removing from the List of Endangered and Threatened Wildlife the gray wolf entities in the lower 48 United States and Mexico, except for the Mexican wolf (*C. l. baileyi*), that will remain listed (85 FR 69778). On February 10, 2022, a district court vacated and remanded the delisting rule, resulting in return to the List of Endangered and Threatened Wildlife.

For additional information on the gray wolf, please see the species profile.

5.13 INDIANA BAT (*MYOTIS SODALIS*)

Indiana bats may summer in a wide range of habitats, from highly altered landscapes to intact forests. Roost trees vary considerably in size. Although trees used by Indiana bat maternity colonies are typically greater than 9 inches diameter at breast height (dbh), those used by males and non-reproductive females or as alternate roosts for maternity colonies may be as small as 5 inches dbh. Indiana bats typically roost beneath peeling bark but may also use cracks or crevices (Kurta et al 2002). As such, roost trees tend to be dead or dying trees with some bark remaining, or live trees with naturally exfoliating bark, such as shagbark hickory (*Carya ovata*); see Appendix B for more information. Rarely do Indiana bats roost in structures, such as barns, sheds, or bridges. During winter, the species hibernates in caves, abandoned mine portals or similar structures.

The Indiana bat was listed as endangered in 1967 due to episodes of people disturbing hibernating bats in caves during winter, which resulted in the death of substantial numbers of bats (USFWS 2019e). Indiana bats are vulnerable to disturbance because they hibernate in large numbers in only a few sites, with major hibernacula supporting 20,000 to 50,000 bats. Since its listing, the range-wide Indiana bat population has declined by nearly 60%. Several threats are believed to have contributed to the Indiana bat's decline, including the commercialization of caves, loss and degradation of forested habitat, pesticides and other contaminants, and most recently, the disease white-nose syndrome (WNS).

Indiana bats have been documented at many sites in Lower Michigan and are believed to range throughout the southern five county tiers, as well as parts of the thumb and the western coastal counties up to (and including) the Leelanau peninsula. Indiana bats that summer in Michigan roost in trees in riparian, bottomland, and upland forests from approximately April through September. Michigan is home to a single known Indiana bat hibernaculum: a hydroelectric dam in Manistee County. Although the dam supports about 20,000 hibernating bats, Indiana bats comprise less than 1% of the winter population. Research suggests that the majority of the Indiana bats that summer in Michigan migrate to hibernacula in nearby states, including Indiana and Kentucky. See the Appendices for more information on suitable Indiana bat habitat in Michigan.

For additional information on the Indiana bat, please see the species profile. For information on the ecosystem services Indiana bats and other native bats provide, see Appendix G.

5.14 NORTHERN LONG-EARED BAT (*MYOTIS SEPTENTRIONALIS*)

Northern long-eared bats spend winter hibernating in caves, mines, or similar structures, preferring areas with constant temperatures, high humidity, and no air currents (Raesly and Gates 1987; Caceres and Pybus 1997; Brack 2007). During the summer, the species typically roosts underneath bark or in cavities, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh; see Appendix C) (Sasse and Pekins 1996; Foster and Kurta 1999; Owen et al. 2002; Carter and Feldhamer 2005; Perry and Thill 2007; Timpone et al. 2010). On occasion, northern long-eared bats roost in manmade structures, such as barns and sheds. These bats forage for insects in upland and lowland woodlots and tree-lined corridors.

The northern long-eared bat is one of the species most impacted by WNS and faces extinction due to the disease's range-wide impacts. The species was proposed for Federal listing as endangered on October 2, 2013. On April 2, 2015, the species was given a proposed listing of threatened with an interim 4(d) rule, which was finalized on January 14, 2016 (USFWS 2016a). On March 22, 2022, the Service published a Species Status Assessment Report for the Northern Long-eared Bat (USFWS 2022a), and on the following day (March 23, 2022), published a proposal to reclassify the northern long-eared bat as endangered under the ESA.

On November 29, 2022 the U.S. Fish and Wildlife Service (Service) published a final rule to reclassify the northern long-eared bat as endangered under the Endangered Species Act. On March 31, 2023, when the uplisting rule became effective, the Service released interim guidance and tools to help stakeholders transition to the species' reclassification. The interim wind guidance, interim habitat modification guidance and interim Section 7 framework guidance and tools were scheduled to be in place until April 1, 2024, but were extended until final tools were released.

On April 1, the Service released a draft version of these final guidance and tool documents, with a 30-day feedback period, fulfilling a commitment to seek feedback from interested parties before finalizing tools and guidance. Comments were received from 47 entities representing industry groups, federal agencies, state agencies and conservation organizations. All substantive feedback on the draft materials received by May 1, 2024, was considered in the development of these final documents. These tools also support the conservation of the tricolored bat should the species be listed. Final tools and guidance documents were released on the species profile page on October 23, 2024. At that time the final tools and guidance documents replaced the Interim Consultation products; however, the Interim Consultation Framework was still valid for use by federal agencies through November 30, 2024. For federal agency projects not completed by November 30, 2024, that previously were issued streamlined biological opinions for the northern long-eared bat under the Interim Consultation Framework, a memorandum was released with recommended next steps for these projects.

The northern long-eared bat's historic range encompassed the entire state of Michigan, and the species has been physically detected (i.e., mist net captures, hibernacula counts, museum collections, roosts) in 46 of Michigan's 83 counties. The species is present in the state year-

round, migrating between summer and winter habitat during the spring and fall. The majority of known northern long-eared bat hibernacula are located in the western Upper Peninsula (UP), with only three of 77 known hibernacula located in the Lower Peninsula. Correspondingly, available Michigan data suggest that the species was historically most abundant in the UP (Kurta 1982, USFWS unpublished data). Although formerly widespread and common, the species' population has declined dramatically as result of WNS. Regular winter census data from 50 Michigan hibernacula demonstrated that the species' winter population has declined by at least 98.5% post-WNS (Kurta and Smith 2020), and recent summer surveys have failed to detect the species in several parts of the state where they were historically present (Kurta 2023, Kurta 2024, USFWS unpublished data). Although not nearly as common today, winter surveys document that the species continues to occur in Michigan in low numbers. See the Appendices B–F for more information on suitable northern long-eared bat habitat in Michigan. For additional information on the northern long-eared bat, including the previous 4(d) rule, Species Status Assessment, reclassification rule, and details on the Interim Consultation Framework, please see the Service's species profile. For information on the ecosystem services northern long-eared bats and other native bats provide, see Appendix G.

5.15 TRICOLORED BAT (*PERIMYOTIS SUBFLAVUS*)

The tricolored bat is one of the smallest bats in eastern North America and is distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle, and dark at the tip (Barbour and Davis 1969). The once common species is wide-ranging across the eastern and central United States and portions of southern Canada, Mexico, and Central America. During winter, tricolored bats hibernate in caves, abandoned mines, and abandoned tunnels (Sandel et al. 2001, Katzenmeyer 2016, Limon et al. 2018, Lutsch 2019, Meierhofer et al. 2018). During the spring, summer and fall months, they roost primarily among leaf clusters of live or recently dead deciduous/hardwood trees (Perry and Thill 2007, Thames 2020).

The species faces extinction due to the impacts of WNS, which has led to 90 to 100% declines in tricolored bat winter colony abundance at sites impacted by the disease. Since WNS was first observed in New York in 2006, it has spread rapidly across the majority of the tricolored bat's historic range. A petition to list the tricolored bat as threatened was received by the Service on June 16, 2016. On December 20, 2017, the Service found that the petition presented substantial scientific or commercial information indicating that the petitioned actions may be warranted and commenced a review (as a 12-month finding) to determine if listing of the tricolored bat is warranted (82 C.F.R. 60362; December 20F, 2017). On September 14, 2022, the Service posted a completed Species Status Assessment (SSA) Report for the Tricolored Bat (USFWS 2021) and published a proposed rule to list the tricolored bat as endangered. A final listing decision remains pending as of February 2025.

Tricolored bats are speculated to be a relatively recent resident of the central Great Lakes Basin, most likely colonizing Michigan from the southwestern Lower Peninsula and/or northwestern Upper Peninsula (UP) during the mid-twentieth century (Burt 1957, Kurta et al. 2007, Brown and Kurta 2013). The species was first observed in Michigan in 1965 and has been physically observed in 12 of the 83 Michigan counties, almost exclusively during the fall or winter (September through mid-March) in or near hibernation sites. Most known hibernacula are abandoned mines in the western UP, and all historically supported the northern long-eared bat

and/or Indiana bat (e.g., Tippy Dam). Although the historic presence of both males and females and the species' typically short migration range suggests a breeding population may have occurred and may still occur year-round in parts of the state, the species was always relatively rare in Michigan (Brown and Kurta 2013, Kurta 2020). Hibernating populations have been small (i.e., <10 individuals per site) since before WNS, and Michigan's hibernating population has declined by nearly 94% as of 2020 (Kurta and Smith 2020). With very few exceptions, the species has not been observed in Michigan in the summer, and no maternity colonies have been documented, despite repeated and extensive mist netting and mortality monitoring at wind turbines across much of the southern Lower Peninsula.

If tricolored bats summer in Michigan, they most likely do so within close proximity of known hibernacula (which are largely clustered in the western UP). Notably, most of the current range of the species falls outside the range predicted by local bat expert Dr. Allen Kurta of Eastern Michigan University. In his book Mammals of the Great Lakes (2020, Third Edition), Kurta excludes the eastern UP from the predicted range of the species, whereas the Service's draft species range is largely restricted to the eastern UP. Despite the current draft range (which was developed using a range-wide modeling approach), the MIFO believes it is unlikely that tricolored bats occur in summer habitat outside of a 5-mi radius of known hibernacula and/or modeled summer habitat for the northern long-eared bat. For additional information on the tricolored bat, please see the Service's species profile. For information on the ecosystem services tricolored bats and other native bats provide, see Appendix G.

5.16 COPPERBELLY WATER SNAKE (*NERODIA ERYTHOGASTER NEGLECTA*)

Copperbelly water snakes require a mosaic of shallow wetlands or floodplain wetlands surrounded by forested uplands. Seasonally flooded wetlands without fish are favored foraging areas, and copperbellies frequently move from one wetland to another. The species feeds primarily on amphibians, mostly frogs and tadpoles, and requires shallow wetlands along the edges of larger wetlands complexes where they can hunt for frogs, as well as multiple wetland types and adjacent uplands (Mushinsky and Hebrard 1977, Diener 1957, Kofron 1978). Copperbellies hibernate, often in crayfish burrows, in forested wetlands and immediately adjacent forested uplands. They remain underground from late October until late April (Kingsbury 1996, Kingsbury et al. 2003).

The copperbelly water snake is found in two geographically separated areas. The northern distinct population segment (DPS) includes southern Michigan, northeastern Indiana and northwestern Ohio. This DPS was listed as threatened under the ESA in 1997. The southern DPS is not federally listed. Over the last 20 years, surveys have shown a continuing decline in the overall number of snakes in the northern DPS. At present, only five small sub-populations persist within the tri-state area, including Hillsdale County in Michigan. Threats to copperbelly watersnake include habitat fragmentation and loss, predation, persecution, and emerging stressors such as climate change and disease.

For additional information on the copperbelly watersnake, including a recent five-year status assessment, please see the species profile.

5.17 EASTERN MASSASAUGA RATTLESNAKE (*SISTRURUS CATENATUS*)

The Eastern massasauga rattlesnake (EMR)'s habitat is typically associated with open to forested wetlands and adjacent uplands. During colder months (generally October through April), EMR hibernate below the frostline in crayfish or small mammal burrows, tree root networks or rock cervices in areas where the water table is near the surface (areas where the soil is saturated but not inundated) and with consistent hydrology to support overwinter survival (Reinert and Kodrich 1982). Hibernacula are typically near wetland edges, or slightly upland (typically within 500 meters of regulated wetland) (Reinert and Kodrich 1982; Seigel 1986; Weatherhead and Prior 1992; Johnson 1995; Bissell 2006). EMR stay in the area around their hibernacula until overnight temperatures warm up enough for them to move to their active season range.

The Service listed the EMR as a threatened species under the ESA on September 30, 2016. Once common across its range, the EMR has declined dramatically since the mid-1970s as a result of habitat loss and fragmentation, a lack of proper habitat management, and eradication by humans. The most prominent threats include habitat loss and fragmentation through development and vegetative succession, mortality of individuals as a result of roads, hydrologic alteration resulting in drought or flooding, persecution, collection, and post-emergent prescribed fire, mowing, and disking. Disease is a relatively recent threat with still unknown consequences. The effects of threats on extinction risk to EMR populations were included in model evaluations (Faust *et al.* 2011), while the Species Status Assessment (Szymanski *et al.* 2016) considered the total number of sites range wide where specific threats were reported.

Michigan currently supports more EMR populations than any other state or province, although the species has declined within the state. The range within Michigan includes most of the Lower Peninsula and Bois Blanc Island in Mackinac County (Lake Huron). The EMR is highly secretive and cryptic in nature, and can persist in low densities, which makes them difficult to detect. Further, there are extensive areas of the state that have never been surveyed for EMR. To assist project proponents in determining the likelihood of EMR presence in their project areas, the Service has identified occupied and likely occupied habitat using a tiered system in Michigan. Tiered habitat is based on the proximity to a known element occurrence and the suitability of the habitat according to available spatial data and population modeling. Tier 1 habitat are those areas known to be occupied or highly likely to be occupied by EMR. Tier 2 habitat includes areas with high potential habitat (and may be occupied by EMR). Projects can also be "within the known range" of EMR. Areas within the known range but outside of Tier 1 and Tier 2 are considered less likely to be occupied. However, it is likely that there are additional and yet-unknown occurrences throughout the Lower Peninsula of Michigan.

For additional information on the eastern massasauga, including a recent Species Status Assessment and draft recovery plan, please see the species profile.

5.18 AMERICAN HART'S-TONGUE FERN (*ASPLENIUM SCOLOPENDRIUM VAR. AMERICANA*)

American hart's-tongue fern is found in close association with outcrops of dolomitic limestone, in coulees, gorges and in cool limestone sinkholes in mature hardwood forests. It requires high

humidity and deep shade provided by mature forest canopies or overhanging rock cliffs (Soper 1954). It prefers soils high in magnesium.

Although American hart's-tongue is found over a very wide area, from Alabama to Canada, its populations tend to be very small and isolated due to its unique habitat. Because of its natural rarity, it is particularly vulnerable to disturbance. Many activities threaten the American hart's-tongue. Quarrying, recreation, and residential development have all destroyed these plants and their habitat (Stebbins 1935). Canadian populations are threatened by lumbering and the development of land for ski resorts and country estates, among other activities (COSEWIC 2016). By removing shade trees, logging raises light levels and lowers humidity, decimating any American hart's-tongue ferns in that area. The Service officially listed American hart's-tongue on July 14, 1989.

In Michigan, all known American hart's-tongue populations occur on prominent highlands of the Niagara escarpment in the eastern Upper Peninsula, typically in relatively young forest dominated by sugar maple. It is commonly found in association with northern holly fern (*Polystichum lonchitis*), common polypody (*P. virginianum*), maidenhair spleetwort (*Asplenium trichomanes*), fragile fern (*Cystopteris fragilis*), and herb-robert (*Geranium robertianum*).

For additional information on the Hart's-tongue fern, including a recent Species Status Assessment, please see the species profile.

5.19 Dwarf Lake Iris (*Iris lacustris*)

Occurring close to Great Lakes shorelines in cool, moist lakeshore air, dwarf lake iris is found on sand or in thin soil over limestone-rich gravel or bedrock. Habitat is along old beach ridges or behind open dunes. Changing water levels can open new habitat for the plants.

Dwarf lake iris was added to the U.S. List of Endangered and Threatened Wildlife and Plants in 1988. Dwarf lake iris only grows around the Great Lakes and occurs near the northern shores of Lakes Huron and Michigan in Michigan, Wisconsin, and Ontario, Canada (COSEWIC 2004). The lakeshore habitat of dwarf lake iris has been greatly reduced by shoreline development. Residential and vacation homes as well as associated road-widening, chemical spraying and salting, and off-road vehicle use have caused disturbance and destruction of habitat. The flowers bloom from mid-May until mid-August, then will burst open (Planisek 1983).

For additional information on the dwarf lake iris, including a recovery plan, please see the species profile.

5.20 Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)

The eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, even bogs (Sheviak and Bowles 1981). It requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. A symbiotic relationship between the seed and soil fungi, called mycorrhizae, is necessary for seedlings to become established. The fungus helps the seeds assimilate nutrients in the soil. This orchid is a perennial herb that grows from an underground tuber. Flowering begins

from late June to early July and lasts for 7 to 10 days (Bowles 1983). Blossoms often rise just above the height of the surrounding grasses and sedges. The more exposed flower clusters are more likely to be visited by the hawkmoth pollinators, though they are also at greater risk of being eaten by deer. Seed capsules mature over the growing season and are dispersed by the wind from late August through September.

Historically, eastern prairie fringed orchid was found in more than 20 Michigan counties, including the southern Lower Peninsula and Cheboygan County. Following extensive habitat loss, it now persists in fewer than 10 counties and is largely limited to the remnant lakeplain prairies of Saginaw Bay and western Lake Erie. Since the 1980s, inventories have demonstrated a continued decline of the orchid within known habitats, likely as a result of high lake levels and drought.

The eastern prairie fringed orchid was listed as threatened on September 28, 1989. Early decline was attributed to loss of habitat, mainly conversion of natural habitats to cropland and pasture. Habitat loss, including from the drainage and development of wetlands, is a continued threat to the species. Other current threats include succession to woody vegetation, competition from non-native species, and over-collection.

For additional information on the eastern prairie fringed orchid, please see the species profile.

5.21 HOUGHTON'S GOLDENROD (*SOLIDAGO HOUGHTONII*)

Houghton's goldenrod typically grows on moist sandy beaches and shallow depressions between low sand ridges along the shoreline, called interdunal wetlands. Fluctuating water levels of the Great Lakes play a role in maintaining this unique goldenrod. During high water years, colonies of Houghton's goldenrod may be submerged. When water levels recede, some plants survive the inundation and new seedlings establish on the moist sand. Other plants that often grow with Houghton's goldenrod include Grass-of-Parnassus, Kalm's lobelia, shrubby cinquefoil, twigrush, and other goldenrods.

Houghton's goldenrod occurs almost exclusively on Great Lakes shoreline, growing primarily along the northern shores of Lakes Michigan and Huron in the Straits region. Most populations occur in Chippewa, western Mackinac, northern Emmet, Cheboygan, and northern Presque Isle counties. There are also interior populations in Mackinac County (a few miles from the Great Lakes shoreline). Interior populations in Kalkaska and Crawford Counties have been determined to be another species, *S. vossii* (Laureto and Pringle 2010) but are considered as part of the originally listed entity (also threatened status).

Houghton's goldenrod was listed as threatened on July 18, 1988 (53 FR 27134). High lake levels are a potential threat to some population that occur along Great Lakes shorelines, particularly in recent years. Residential development continues to be a threat, especially along the shores of Lake Huron in Cheboygan and Presque Isle Counties, Michigan. Invasive species, including *Phragmites australis* (common reed) and *Typha spp.* (cattails) threaten some populations (Leopold and Weber 2019).

For additional information on Houghton's goldenrod, including a recent five-year status review, please see the species profile.

5.22 Lakeside Daisy (*Hymenoxys herbacea*)

Lakeside daisy is a long-lived perennial daisy that grows on alvars, a type of limestone with little plant cover, in full sunlight. All individuals within a given population tend to bloom about the same time, typically in late spring. After about a week, the double notched petals fade before falling. Seed dispersal takes place about a month later. Lakeside daisy also reproduces vegetatively by rhizomatous growth (USFWS 2021a).

Lakeside daisy is an endemic restricted to the Great Lakes area, within which it is one of the region's rarest plants, naturally occurring at only a handful of sites. In the U.S., it is known only from the Marblehead Peninsula area in northern Ohio, three restored populations in northern Illinois (where it was known historically from two sites), and a single, extremely small colony in Michigan's Upper Peninsula. In Ontario, Canada, where lakeside daisy is most abundant, it occurs along much of the southern coast of Manitoulin Island and in several restricted areas near the tip of the Bruce Peninsula.

The lakeside daisy was listed as threatened on June 23, 1988. The wide area encompassing known lakeside daisy sites suggests that the species was once widespread in prairie habitats throughout the Midwest and along Huron's northern shore. Fire suppression practices have eliminated the wildfires which once regularly cleared prairie grasslands of the encroaching woods. Now the expansion of shrubs and trees threatens the daisy, which needs full sun to survive. Limestone quarrying, which has increased in recent years, destroys the daisy's habitat. Finally, collectors may also pose a threat, since the daisy is now found in just a handful of sites.

For additional information on lakeside daisy, please see the species profile.

5.23 Michigan Monkey-Flower (*Mimulus michiganensis*)

The Michigan monkey-flower (MMF) is a rare Michigan endemic plant with a range restricted to Great Lakes shorelines in the Mackinac Straits and Grand Traverse regions. It is semi-aquatic and forms mats over mucky soil and sand saturated or covered by cold, flowing spring water.

The MMF was listed as endangered on June 21, 1990 (55 FR 25596 25599). The greatest threat to MMF is direct destruction and modification of its habitat. The MMF's habitat has been developed for recreational and residential purposes, which has led to severe impacts to and, in some cases, extirpation of historical populations. Hydrological disruptions also constitute a serious threat, as water diversion, warming of water sources, and other groundwater alterations lead to less-than-optimal habitat conditions.

Consequently, this species may be inadvertently impacted by offsite activities. Populations of MMF are particularly vulnerable to extirpation due to low numbers and limited capability for sexual reproduction. Additionally, periodic high-water levels of the Great Lakes and strong winter storms impact MMF habitat that occurs near the Great Lakes shoreline by redirecting

seepage streams and opening the overstory by felling cedars. However, opening of the overstory may also benefit MMF by allowing for colonization.

Invasive species, including forget-me-not (*Myosotis scirpoides*), coltsfoot (*Tussilago farfara*), reed canary grass (*Phalaris arundinacea*), and Canada thistle (*Cirsium arvense*) represent an additional threat (Wiler and Skoglund 2022). Some of the MMF colonies at the Maple River site are in pockets of habitat with up to 99% invasive species (Canada thistle and forget-me-not), with only scattered MMF stems remaining. Coltsfoot and reed canary grass are known to occur at or in the vicinity of other MMF sites.

For additional information on the MMF, including a recent five-year status review, please see out the species profile.

5.24 Pitcher's Thistle (*Cirsium pitcheri*)

Pitcher's thistle is a native thistle occurring on the open sand dunes and low open beach ridges of Great Lakes shoreline. It is most often found in near-shore plant communities, but it can grow in all non-forested areas of a dune system. It is now found in Indiana, Michigan, Wisconsin, and Ontario, Canada. Pitcher's thistle was extirpated from Illinois but has been reintroduced in Lake County.

Pitcher's thistle was added to the List of Endangered and Threatened Wildlife and Plants on July 18, 1988 (53 FR 27137). The primary threats are invasive plants and recreational use of the dunes, but there is continued concern regarding the potential impact of seed-eating weevils. Surveys have been done in portions of the range, indicating increased abundance and potential stability in parts of the range (i.e., Upper Peninsula of Michigan) and decreased abundance or even extirpation of previously known populations in other parts of the range (i.e., southern Michigan).

Survey work by Michigan Natural Features Inventory in 2012-2016 has shown that the Pitcher's thistle population in Michigan may be larger than previously believed and could exceed 1,000,000 individuals (Slaughter and Cuthrell 2017). Conversely, research on the invasive weevil species (*Larinus planus* and *Rhinocyllus conicus*) in recent years has shown cause for concern, with demonstrated declines in population growth rates that could lead to localized extinctions of some populations (Havens et al. 2012a). More information is needed in order to assess the magnitude and extent of this threat.

For additional information on Pitcher's thistle, including a recent five-year status review, please see the species profile.

6 Covered Activity Description

The activities described herein include all activities addressed in this standing analysis. The activity description, conservation measures, and covered area inform the standing analysis and describe which specific activities are appropriate for NE or NLAA outcomes under this analysis. The description of activities and their inclusion in the standing analysis should not be construed

to indicate that these activities will always result in effects to the species (or its critical habitat, if designated), nor is it meant to cover activities that fall outside of the analysis as described below. Action Agencies are not required to use this standing analysis; they continue to have the option to request individual consultation on a project; however, in most cases, we anticipate use of the standing analysis will substantially decrease consultation timeframes.

The proposed action is the compilation of many different types of projects that, depending on their size and specific location, often do not significantly affect any federally listed threatened or endangered species or critical habitats in Michigan. Common project types include, but are not limited to, the following:

- Vegetation management, including mowing, forestry activities, prescribed burning and harvest
- Construction, maintenance, operation, and/or removal of:
    - Roads and trails
    - Communication towers
    - Transmission and utility lines
    - Bridges and culverts
    - Oil and gas pipelines
    - Hydroelectric facilities/dams
    - Mines/quarries
    - Canals/levees/dikes
- Commercial, residential and recreational developments
- Agricultural activities
- Site/habitat restoration/enhancement
- Shoreline protection/beach nourishment
- Dredging and filling of wetlands/waterbodies
- Military operations

For additional details on these actions and their component subactivities, a deconstruction table can be found in Appendix D.

6.1 General Limits/Sideboards

To assist Action Agencies/project proponents in determining whether their project meets the requirements of this standing analysis, the Service will provide a series of questions to assess whether the action is not likely to adversely affect listed species or critical habitat because the impacts are either unable to be 1) meaningfully measured, detected, or evaluated and, therefore, insignificant; 2) extremely unlikely to occur and, therefore, discountable; or 3) wholly beneficial. Any actions that are likely to adversely affect a listed species or critical habitat do not qualify under this standing analysis and require separate individual project review and consultation by the local ESFO.

Actions that include certain activities, occur in certain geographic areas, or meet one or more context-dependent conditions will not be eligible to use the standing analysis. For projects requiring consultation (i.e., that “may affect” listed species or critical habitats) that do not qualify

due to one or more of these exclusions, Action Agencies/project proponents must contact the appropriate ESFO directly to complete their consultation requirements.

Species-specific sideboards and conservation measures are discussed in section 7.

6.1.1 General Activity Based Limits/Sideboards

To receive the Service's technical assistance acknowledgement of an Action Agency's NE determination or the Service's concurrence for a NLAA determination, based on this standing analysis, actions and activities may NOT include the following:

1. Long-term (i.e., greater than 10 years) permits, plans, or other actions (e.g., FERC licenses)
2. Construction or operation of wind turbines or solar energy development
3. Projects for which there are less than 30 days prior to the action occurring; or
4. Aerial or other broad application of chemicals (i.e., non-targeted applications)

To ensure compliance with the ESA, project-specific consultation (or other programmatic consultation, if applicable) with the Service may be necessary for projects including one or more of the general exclusions listed above. Those projects may not necessarily result in significant adverse effects to listed species or habitats but rather warrant individual review and consideration of project-specific conservation measures.

Additionally, to use this standing analysis and receive a conclusion from IPaC, projects must include the species/taxon-specific conservation measures detailed below, as appropriate (section 7). These include activity-based exclusions and conservation measures as well as location-based sideboards.

6.1.2 May 2024 Updates to General Exclusions:

In May 2024, we updated our Michigan Dkey to allow more communications tower projects to receive automated effects determinations. Listed migratory bird species at risk of tower collision will receive a "may affect" (MA) determination if the proposed tower is guyed and within certain known bird concentration areas. In addition, we provide language in IPaC-generated output letters regarding Migratory Bird Treaty Act considerations (Appendix A).

We also removed a qualifying question related to groundwater impacts (withdrawal of more than 10,000 gallons of water per day). This question was intended to address large-scale impacts to hydrology and groundwater tables. Answering "yes" to this question will now generate a MA determination for listed species dependent on wetlands and stable hydrology rather than disqualifying the project (thus assisting the user in making effects determinations for other species on their species list and streamlining coordination with our office).

6.1.3 July 2025 Updates to General Exclusions

Effective July 17, 2025, solar energy development is excluded pending review process updates.

7 SPECIES-SPECIFIC AND TAXA-SPECIFIC SIDEBOARDS AND CONSERVATION MEASURES

This standing analysis applies conservation measures as design features to avoid adverse effects on an individual, population, or species. The Service has previously found that incorporation of certain conservation measures, while voluntarily adopted by Action Agencies, has reduced effects to the extent that the actions do not require formal consultation, and the Service and the Action Agency have found that actions are not likely to adversely affect species and critical habitat. Projects using this standing analysis to support a determination of NE or NLAA must meet all the requirements of the standing analysis. The inability to voluntarily adopt certain conservation measures may result in a project not qualifying to use this standing analysis.

7.1 WHOOPING CRANE

Projects that intersect the whooping crane NEP AOI and may affect whooping crane must not occur within a National Wildlife Refuge or National Park. For Federal projects for which the Action Agency cannot conclude "no effect" to whooping crane within NWRs or NPs, Agencies must consult with the Service outside of the determination key. Outside of NWRs or NPs, Agencies must confirm that their project is not likely to jeopardize the continued existence of whooping crane. If they cannot confirm no jeopardy, they must conference to complete their section 7 requirement outside of the determination key.

7.2 PIPING PLOVER AND PIPING PLOVER CRITICAL HABITAT

Projects that intersect the piping plover AOI, occur within ¼ mile onshore and ¼ mile offshore of Great Lakes shoreline, and contain suitable piping plover habitat; or intersect piping plover critical habitat containing the primary constituent elements, must not result in:

1. Any changes to the quality, quantity, or availability[4] of suitable piping plover habitat[5] during the breeding season (April 15 through August 15) or to CH at any time of year
2. Any permanent changes to suitable piping plover habitat[6] or CH
3. Increased activity[7] within suitable piping plover habitat or CH
4. A new communications tower or changes to an existing tower resulting in a guyed tower in a bird concentration area (riparian and coastline areas, Audubon Society "important Bird Areas", National Wildlife Refuges, State Game Areas, etc.)

If the project does not occur in suitable habitat along the Great Lakes shoreline, or if the critical habitat doesn't contain the physical and biological features essential to the conservation of piping plover (for details, refer to 66 FR 22938), piping plovers are not likely to be present in the Action Area. As such, adverse effects are discountable. Projects that increase human disturbance or

[4]For example, beach grooming, boardwalk actions, breakwaters, development, dredge deposition, etc.
[5]Piping plover habitat consists of Great Lakes islands and mainland shorelines that support, or have the potential to support, open, sparsely vegetated sandy habitats, such as sand spits or sand beaches that are associated with wide, non-forested systems of dunes and interdunal wetlands.
[6]In this context, we define permanent to be effects lasting in duration more than 3 weeks
[7]For example, human disturbance, dog activity, or an increase in potential predators such as merlins, or mammalian predators.

potential for predation need further evaluation and will receive a "may affect" determination. Similarly, communications towers that have a higher risk of collision will receive a "may affect" determination for piping plover.

7.3 RUFA RED KNOT

Projects that intersect the rufa red knot AOI and occur within 0.25 mi of a red knot occurrence must not:

1. Permanently modify beaches, dunes, mudflats, peat banks, sandbars, shoals, or other red knot habitats[8] during the red knot migration windows (May 15 through June 15 in the spring OR July 1 through September 30 in the fall)
2. Result in increased human disturbance or predation[9] during the red knot migration windows (May 15 through June 15 in the spring OR July 1 through September 30 in the fall)
3. A new communications tower or changes to an existing tower resulting in a guyed tower in a bird concentration area (riparian and coastline areas, Audubon Society "important Bird Areas", National Wildlife Refuges, State Game Areas, etc.)

During migration, habitat loss, disturbance and increased predation could result in adverse effects and warrant additional evaluation separate from the DKey. If these actions occur outside of the migration window, adverse effects are discountable. Communications towers that have a higher risk of collision will receive a "may affect" determination for red knot.

7.4 FRESHWATER MUSSELS

Projects that intersect the AOI for rayed bean, northern riffleshell, snuffbox, round hickory nut, salamander mussel, or clubshell mussels must have no direct or indirect effects to mussel habitat. If any portion of the project area intersects a Group 3 stream or the 0.5-mi area upstream of a Group 3 stream, or an adjacent/connecting lake/reservoir for snuffbox, the project must not:

1. Have any direct impacts to a stream or river (e.g., stream/road crossings, new stormwater outfall discharge, dams, other in-stream work, etc.)
2. Have potential to indirectly impact the stream/river or the riparian zone (e.g., cut and fill, horizontal directional drilling, construction, vegetation removal, discharge, etc.)

The AOI for mussels is currently a county-based list (clubshell, northern riffleshell) or watershed based (snuffbox, rayed bean, round hickory nut, salamander mussel). The Group 3 is a more specific list of stream segments within known counties that contain habitat likely to be occupied by listed mussels (see https://www.fws.gov/media/michigan-freshwater-mussel-survey-protocols-and-relocation-procedures-rivers-and-streams for

[8]For example, the following Actions may modify red knot habitat: groins, jetties, sea walls, revetments, bulkheads, rip-rap, beach nourishment, nearshore dredging, dredge spoil disposal, sand mining/borrowing, beach bulldozing, sandbagging, sand fencing, vegetation planting/alteration/removal, deliberate or possible introduction of non-native vegetation, beach raking/mechanized grooming, boardwalks, aquaculture development.

[9]For example, the Action is likely to indirectly increase access or use of red knot habitats by humans and/or predators at times of year that the birds are typically present (e.g., commercial/residential development, beach access structures, boardwalks, pavilions, bridges/roads/ferries/trails, marinas, posts or other avian predator perches, structures or habitat features likely to encourage predator nesting/denning, trash cans or other predator attractants, feral cat colonies, policy changes likely to increase human use).

additional information). Avoiding direct or indirect impacts to the stream, including changes to hydrology, will ensure adverse effects are insignificant and/or discountable.

In addition, some Michigan EGLE/Army Corps of Engineer joint permit application Minor Permit (MP) and General Permit (GP) categories (https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/Wetlands/Minor-Project-Categories.pdf and https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/Wetlands/General-Permit-Categories.pdf, respectively) have been evaluated and determined to have discountable effects to listed mussels (USFWS 2019b), including:

- MP 3 - Boat Hoist;
- MP 5 - Boat Wells;
- MP 7 - Completed Enforcement Actions;
- MP 13 - Dock;
- MP 22 - Fish and Wildlife Habitat Structures;
- MP 25 - Ford Stream Crossings for Commercial Forestry Operations;
- MP 31 - Maintenance and Repair of Serviceable Structures;
- MP 52 - Temporary Recreational Structures;
- MP 54 - Wetland Habitat Restoration and Enhancement;
- GP A - Aids to Navigation;
- GP C - Clear Span Bridge;
- GP J - Dry Fire Hydrant;
- GP O - Minor Permit Revisions and Transfers;
- GP Q - Mooring Buoy;
- GP W - Scientific Measuring Devices;
- GP X - Snow Road Stream Crossings for Forestry Operations;
- GP Z - Spring Piles and Piling Clusters

Group 2 Streams are those that are likely to have state listed mussels. Note that if the project intersects a Group 2 stream and receives no effect determination for federally listed mussels, the output letter will include language notifying the applicant that state-listed mussels may occur in the area, and to contact the Michigan Department of Natural Resources to determine effects to state-listed mussels.

7.5 Hine's Emerald Dragonfly and Hine's Emerald Dragonfly CH

Projects that intersect the Hine's emerald dragonfly AOI or CH must not:

1. Disturb the ground or existing vegetation within 500 meters of a calcareous wetland, fen, sedge meadow, or marsh[10]
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal

[10]This includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

4. Include construction or modification of a road or trail within occupied or CH buffered habitat

The main threats to Hine's emerald dragonfly are habitat destruction, urban sprawl, off-road vehicles, road and pipeline construction – all of which result in ground disturbance. Avoiding ground disturbance will preclude direct effects to Hine's emerald dragonfly. Avoiding alterations to hydrology will preclude indirect effects.

7.6 HUNGERFORD'S CRAWLING WATER BEETLE

Projects that intersect the HCWB AOI must not intersect potentially suitable streams and:

1. Involve any road or stream actions (e.g., bridge or culvert actions) or in-stream disturbance within or adjacent to (i.e., within 100m of) a stream or river including loss of riparian vegetation
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal

Avoiding direct and indirect impacts to streams will avoid impacts to suitable HCWB habitat. Projects that involve work within or adjacent to streams within the HCWB's AOI do not qualify for this key.

7.7 KARNER BLUE BUTTERFLY

Projects that intersect the KBB AOI must avoid the following within suitable habitat[11]:

1. Disturbance to any areas containing wild lupine
2. Chemical use
3. Any activities that may result in habitat loss

Avoiding areas containing wild lupine (the host plant for KBB) will ensure disturbance will have no adverse effects to KBB. Additional consultation (outside of the Dkey) is needed if loss of habitat will occur to ensure effects are insignificant or discountable.

7.8 MITCHELL'S SATYR

Projects that intersect the Mitchell's satyr AOI must not:

1. Include alteration or fill of more than 3 acres of wetland
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal
4. Disturb the ground or existing vegetation within 0.5 miles of a Mitchell's satyr occurrence in suitable habitat (prairie fen, shrub carr, tamarack swamp, tamarack savanna, wet meadow, or wet prairie habitat)

Projects must avoid disturbing the ground or existing vegetation, which includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including

[11]This includes a variety of habitats containing wild lupine, including oak savanna, oak or pine barrens, openings within oak forest (including rights-of-way), or old fields in association with oak forest.

removal or maintenance using equipment or chemicals), cultivation, development, etc. Avoiding ground disturbance (defined to include use of chemicals) in suitable habitat will ensure direct effects are discountable. Avoiding changes to hydrology, including large volume water withdrawal, will avoid indirect effects to Mitchell's satyr within an occupied watershed.

7.9 MONARCH

On December 12, 2024, the U.S. Fish and Wildlife Service announced a proposal to list the monarch butterfly as a threatened species with species specific protections and flexibilities to encourage conservation under section 4(d) of the Act. The prohibitions and exceptions in the proposed rule affect monarch butterflies only in the contiguous United States, Puerto Rico and U.S. Virgin Islands, the monarch's historic range.

In the Michigan Dkey, users can make a NE determination for monarch (i.e., if the project will not affect individuals or their habitat). Users are reminded that the Service does not concur on NE determinations.

If users do not make a NE determination, the Dkey will prompt federal agencies to consider whether their project is likely to jeopardize the continued existence of monarch. Federal projects that indicate that their action is not likely to result in jeopardy of the monarch can obtain an automated "MA submittable" determination while the monarch is a proposed species. For federal projects who respond that the project is likely to jeopardize monarch, they will get a "true" MA determination and language instructing them to initiate conference as required per 50 CFR 402.10. Non-federal users will receive an automated "MA submittable" determination. Both Federal and non-Federal projects that receive a "MA submittable" determination for monarch may be in compliance with the Act unless the species is listed while project activities are ongoing.

For additional information about best management practices for monarch, see Appendix I.

7.10 POWESHIEK SKIPPERLING AND POWESHIEK SKIPPERLING CRITICAL HABITAT

Projects that intersect the Poweshiek skipperling AOI or CH must not:

1. Include alteration or fill of more than 3 acres of wetland
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal
4. Disturb the ground or existing vegetation within 0.5 miles of a population that has been extant within the last 5 years in suitable habitat (prairie fen, sedge meadow, or tall grass prairie habitat)

Projects must avoid disturbing the ground or existing vegetation, which includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc. Avoiding ground disturbance (defined to include use of chemicals) in suitable habitat will ensure direct

effects are discountable. Avoiding changes to hydrology, including large volume water withdrawal, will avoid indirect effects to Poweshiek skipperling within an occupied watershed.

7.11 Canada Lynx

Projects that intersect the Canada lynx AOI must not include any actions that would harm the species directly (e.g., mammal trapping, poison bait, etc.).

7.12 Gray Wolf

Projects that intersect the gray wolf AOI must not:

1. Overlap with a known gray wolf denning or rendezvous area (users are directed to contact the lead gray wolf biologist with the Michigan Department of Natural Resources for assistance in determining whether their project area may overlap known denning or rendezvous areas)
2. Have any potential for the action to harm wolves directly (e.g., mammal trapping, poison bait), or indirectly (e.g., increasing vehicle use that may result in vehicle strikes, exposure to potential human persecution)

7.13 Indiana Bat

Projects that intersect the Indiana bat AOI must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting Indiana bats
3. Include the application or potential drift of insecticides, rodenticides, or fungicides into forested habitats

Additionally, projects that contain known or potential Indiana bat habitat[12] and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects that contain known or potential Indiana bat habitat and include tree cutting/trimming and/or prescribed fire that is not either (1) part of forest management or (2) limited to narrow,

[12]Suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥5 inches dbh that have exfoliating bark or cracks/crevices), 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 characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Southern Michigan maternity roost trees are typically dead or dying trees in open areas exposed to solar radiation. Infrequently, Indiana bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes.

linear corridors (e.g., rights-of-way) <1000 feet wide[13] (e.g., projects clearing land for development or conversion) must not:

1. Clear >10 contiguous acres of forest habitat within 5 miles of a known Indiana bat hibernaculum (Tippy Dam)
2. Clear >10 contiguous acres of modeled[14] summer habitat (see Appendix E, F)
3. Fragment a connective corridor (e.g., tree line) between 2 or more forest patches of at least 5 acres (see Appendix F)
4. Cut or trim any potential Indiana bat roost trees (trees ≥5 inches in diameter [at breast height] with cracks, crevices and/or exfoliating bark; see Appendix B), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific time periods:
    a. Within 5 miles of a known hibernaculum (Tippy Dam): April 1 through November 15 (i.e., activities limited to November 16 through March 31)
    b. In modeled summer habitat and >5 mi from Tippy Dam: April 15 through September 30 (i.e., activities limited to October 1 through April 14)
    c. Outside modeled summer habitat and >5 miles from Tippy Dam: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

Projects that contain known or potential Indiana bat habitat and include tree cutting/trimming limited to that associated with forest management (e.g., tree cutting/trimming as a part of continuing forest land-use) must:

1. Retain all snags and cavity trees and restrict tree cutting to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July), if not entirely covered by the Lake States Forest Management Bat Habitat Conservation Plan (Lake States HCP) through an Incidental Take Permit (ITP) or Certificate of Inclusion (COI), OR
2. Follow the conservation measures for tree cutting trimming NOT associated with forest management (e.g., seasonal cutting restrictions and clearing thresholds), summarized above, OR
3. Apply all applicable Lake States HCP conservation measures if enrolled and covered by an ITP (Michigan Department of Natural Resources [Michigan DNR]) or COI (participating enrollee or applicant).[15]

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[13] Cutting for forest management and linear clearing limits <1000 feet wide are not expected to significantly reduce or fragment available habitat and may in many cases indirectly enhance roosting/foraging habitat.

[14] The Michigan Field Office has modeled suitable Indiana bat habitat across the species' expected range in Michigan based on available data. See Appendix II for details on how the habitat suitability model was developed and incorporated into the DKey.

[15] Projects that are fully covered by the Lake States HCP ITP or a COI (including applicants who have submitted an application to the Michigan DNR to enroll their lands) and agree to apply all applicable conservation measures are eligible for a "May Affect submittable" determination for Indiana bat in the Dkey. The Service has evaluated potential effects to the endangered Indiana bat, endangered northern long-eared bat, and proposed endangered tricolored bat as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated

Projects in the Indiana bat AOI that include prescribed burning within 200 feet of forested habitat which is limited to that associated with forest management (e.g., prescribed burning as a part of continuing forest land-use) must:

1. Restrict burning to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July) when temperatures are ≥40 degrees Fahrenheit, AND
2. To the extent practicable, keep flame heights below 8 feet, if not entirely covered by the Lake States Forest Management Bat Habitat Conservation Plan (HCP) through an Incidental Take Permit (ITP) or Certificate of Inclusion (COI), OR
3. Apply all relevant Lake States HCP conservation measures if enrolled and covered by an ITP [Michigan DNR] or COI (participating enrollee or applicant).[16]

Projects that include removal/modification of an existing bridge suitable for day-roosting Indiana bats[17] must not:

1. Result in the permanent loss of known or potential roosting spaces
    a. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation Agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.
2. Direct temporary lighting away from suitable habitat when bats may be present

7.14 NORTHERN LONG-EARED BAT

Projects that intersect the northern long-eared bat AOI must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting northern long-eared bats

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Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats for covered activities.

[16] Projects that are fully covered by the Lake States HCP and agree to apply all relevant conservation measures are eligible for a "May Affect submittable" determination for Indiana bat in the Dkey. The Service has evaluated potential effects to the endangered Indiana bat, endangered northern long-eared bat, and proposed endangered tricolored bat as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats.

[17] Suitable bridges include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices).

3. Include the application or potential drift of insecticides, rodenticides, or fungicides into forested habitats

Additionally, projects that contain known or potential northern long-eared bat habitat[18] and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects that contain known or potential northern long-eared bat habitat and include tree cutting/trimming and/or prescribed fire that is not either (1) part of forest management or (2) limited to narrow, linear corridors (e.g., rights-of-way) <1000 feet wide[19] (e.g., projects clearing land for development or conversion) must not:

1. Clear >10 acres of forest habitat within 5 miles of a known northern long-eared bat hibernaculum
2. Clear >10 contiguous acres of modeled summer habitat in the Indiana bat's range (see Appendix E, F)
3. Clear >20 contiguous acres of modeled summer habitat outside the Indiana bat's range (see Appendix E, F)
4. Fragment a connective corridor between 2 or more forest patches of at least 5 acres (see Appendix F)
5. Cut or trim any potential northern long-eared bat roost trees (trees ≥3 inches in diameter [at breast height] with cracks, crevices, cavities/hollows and/or exfoliating bark; see Appendix C), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific time periods:
    a. Within 5 miles of a known northern long-eared bat hibernaculum in the Indiana bat's range/AOI: April 1 through November 15 (i.e., activities limited to November 16 through March 31)
    b. Within 5 miles of a known hibernaculum outside the Indiana bat's range/AOI: April 15 through October 31 (i.e., activities limited to November 1 through April 14)
    c. In modeled summer habitat and >5 mi from known northern long-eared bat hibernacula in the Indiana bat's range/AOI: April 15 through September 30 (i.e., activities limited to October 1 through April 14)

[18] Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks/crevices, and/or cavities/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 characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Infrequently, northern long-eared bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes.

[19] Cutting for forest management and linear clearing limits <1000 feet wide are not expected to significantly reduce or fragment available habitat and may in many cases indirectly enhance roosting/foraging habitat.

d. In modeled summer habitat and >5 mi from known northern long-eared bat hibernacula outside the Indiana bat's range/AOI: April 15 through September 30 (i.e., activities limited to October 1 through April 14)
e. Outside modeled summer habitat and >5 mi from known northern long-eared bat hibernacula: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

Projects that contain known or potential northern long-eared bat habitat and include tree cutting/trimming limited to that associated with forest management (e.g., tree cutting/trimming as a part of continuing forest land-use) must:

1. Retain all snags and cavity trees and restrict tree cutting to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July), if not entirely covered by the Lake States Forest Management Bat Habitat Conservation Plan (Lake States HCP) through an Incidental Take Permit (ITP) or Certificate of Inclusion (COI), OR
2. Follow the conservation measures for tree cutting trimming NOT associated with forest management (e.g., seasonal cutting restrictions and clearing thresholds), summarized above, OR
3. Apply all applicable Lake States HCP conservation measures if enrolled and covered by an ITP (Michigan Department of Natural Resources [Michigan DNR]) or COI (participating enrollee or applicant).[20]

Projects in the northern long-eared bat AOI that include prescribed burning within 200 feet of forested habitat which is limited to that associated with forest management (e.g., prescribed burning as a part of continuing forest land-use) must:

1. Restrict burning to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July) when temperatures are ≥40 degrees Fahrenheit, AND
2. To the extent practicable, keep flame heights below 8 feet, if not entirely covered by the Lake States Forest Management Bat Habitat Conservation Plan (HCP) through an Incidental Take Permit (ITP) or Certificate of Inclusion (COI), OR
3. Apply all relevant Lake States HCP conservation measures if enrolled and covered by an ITP [Michigan DNR] or COI (participating enrollee or applicant).[21]

[20] Projects that are fully covered by the Lake States HCP ITP or a COI (including applicants who have submitted an application to the Michigan DNR to enroll their lands) and agree to apply all applicable conservation measures are eligible for a "May Affect submittable" determination for Indiana bat in the Dkey. The Service has evaluated potential effects to the endangered Indiana bat, endangered northern long-eared bat, and proposed endangered tricolored bat as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats for covered activities.

[21] Projects that are fully covered by the Lake States HCP and agree to apply all relevant conservation measures are eligible for a "May Affect submittable" determination for Indiana bat in the Dkey. The Service has evaluated potential effects to the endangered Indiana bat, endangered northern long-eared bat,

Projects that include removal/modification of an existing bridge suitable for day-roosting northern long-eared bats[22] must not:

1. Result in the permanent loss of known or potential roosting spaces
    a. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation Agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable
2. Direct temporary lighting away from suitable habitat when bats may be present

For a discussion of differences between the Michigan All-Species Dkey and the Range-wide Northern Long-Eared Bat and Tricolored Bat Dkey currently available in IPaC Beta, see Appendix H.

7.15 TRICOLORED BAT

As of February 2025, the tricolored bat is a proposed species. Section 7(a)(4) requires Federal agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species.

While the tricolored bat is a proposed species, Federal agencies must review projects that receive an automated MA determination for tricolored bat in order to ensure their actions will not jeopardize the continued existence of the species. Both Federal and non-Federal projects that receive a MA determination for tricolored bat may be in compliance with the Act unless the species is listed while project activities are ongoing. Non-Federal projects and Federal projects that indicate that their action is not likely to result in jeopardy of the monarch can obtain an automated "MA submittable" determination while the tricolored bat is a proposed species.

Although not required while the species is proposed for listing as endangered, projects that intersect the tricolored bat AOI can qualify for an automated NE or NLAA determination if the following conditions are met. Proactively applying conservation measures and obtaining an

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and proposed endangered tricolored bat as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats.

[22] Suitable bridges include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). If the bridge has been inspected for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15) and no bats or signs of bats were observed, work on the bridge can proceed at any time of year.

automated NLAA determination for tricolored bat ensures that project activities are unlikely to adversely impact tricolored bat even if the species is listed as endangered.

To obtain an automated NLAA determination for tricolored bats, projects that intersect the tricolored bat AOI must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting tricolored bats
3. Include application or potential drift of insecticides, rodenticides, or fungicides into forested habitats

Additionally, projects that contain known or potential tricolored bat habitat[23] and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects that contain potential tricolored bat habitat and include tree cutting/trimming and/or prescribed fire that is not either (1) part of forest management or (2) limited to narrow, linear corridors (e.g., rights-of-way) <1000 feet wide[24] (e.g., projects clearing land for development or conversion) must not:

1. Clear >10 acres of forest habitat within 5 miles of a known tricolored bat hibernaculum
2. Clear >10 contiguous acres of modeled summer habitat in the Indiana bat's range (see Appendix E, F)
3. Clear >20 contiguous acres of modeled summer habitat outside the Indiana bat's range (see Appendix E, F)
4. Fragment a connective corridor between 2 or more forest patches of at least 5 acres (see Appendix F)
5. Cut or trim any potential tricolored bat roost trees[25], conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific periods:
    a. Within 5 miles of a known tricolored bat hibernaculum in the Indiana bat's range/AOI: April 1 through November 15 (i.e., activities limited to November 16 through March 31)

[23] Suitable summer habitat for tricolored bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and include some adjacent and interspersed non-forested habitats such as emergent wetlands, shrublands, grasslands, and forested edges of agricultural fields, old fields, and pastures. Roosting habitat includes forests, woodlots, and linear features (e.g., fencerows and riparian corridors) containing trees with potential roost substrate (e.g., live and dead leaf clusters of live and recently dead deciduous trees, Spanish moss [*Tillandsia usneoides*], and beard lichen [*Usnea trichodea*]).

[24] Cutting for forest management and linear clearing limits <1000 feet wide are not expected to significantly reduce or fragment available habitat and may in many cases indirectly enhance roosting/foraging habitat.

[25] Tricolored bats roost in a variety of tree species, especially oaks (*Quercus spp.*), and often select roosts in tall, large diameter trees, but will roost in trees as small as 4 inches in diameter when potential roost substrate is present. Tricolored bats commonly roost in the mid to upper canopy of trees, although males will occasionally roost in dead leaves at lower heights (e.g., < 16 feet from the ground).

b. Within 5 miles of a known tricolored bat hibernaculum outside the Indiana bat's range/AOI: April 15 through October 31 (i.e., activities limited to November 1 through April 14)
c. In summer habitat and >5 mi from known tricolored bat hibernacula in the Indiana bat's range/AOI: April 15 through September 30 (i.e., activities limited to October 1 through April 14)

Projects that contain known or potential tricolored bat habitat and include tree cutting/trimming limited to that associated with forest management (e.g., tree cutting/trimming as a part of continuing forest land-use) must:

1. Retain all snags and cavity trees and restrict tree cutting to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July), if not entirely covered by the Lake States Forest Management Bat Habitat Conservation Plan (Lake States HCP) through an Incidental Take Permit (ITP) or Certificate of Inclusion (COI), OR
2. Follow the conservation measures for tree cutting trimming NOT associated with forest management (e.g., seasonal cutting restrictions and clearing thresholds), summarized above, OR
3. Apply all applicable Lake States HCP conservation measures if enrolled and covered by an ITP (Michigan Department of Natural Resources [Michigan DNR]) or COI (participating enrollee or applicant).[26]

Projects in the tricolored bat AOI that include prescribed burning within 200 feet of forested habitat which is limited to that associated with forest management (e.g., prescribed burning as a part of continuing forest land-use) must:

1. Restrict burning to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July) when temperatures are ≥40 degrees Fahrenheit, AND
2. To the extent practicable, keep flame heights below 8 feet, if not entirely covered by the Lake States Forest Management Bat Habitat Conservation Plan (HCP) through an Incidental Take Permit (ITP) or Certificate of Inclusion (COI), OR
3. Apply all relevant Lake States HCP conservation measures if enrolled and covered by an ITP [Michigan DNR] or COI (participating enrollee or applicant).[27]

[26] Projects that are fully covered by the Lake States HCP ITP or a COI (including applicants who have submitted an application to the Michigan DNR to enroll their lands) and agree to apply all applicable conservation measures are eligible for a "May Affect submittable" determination for Indiana bat in the Dkey. The Service has evaluated potential effects to the endangered Indiana bat, endangered northern long-eared bat, and proposed endangered tricolored bat as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats for covered activities.

[27] Projects that are fully covered by the Lake States HCP and agree to apply all relevant conservation measures are eligible for a "May Affect submittable" determination for Indiana bat in the Dkey. The Service has evaluated potential effects to the endangered Indiana bat, endangered northern long-eared bat,

Projects that include removal/modification of an existing bridge suitable for day-roosting tricolored bats[28] must not:

1. Result in the permanent loss of known or potential roosting spaces
    a. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation Agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable
2. Direct temporary lighting away from suitable habitat when bats may be present

7.16 Listed Bats - Summary of Dates for Tree Cutting Projects

To receive automated concurrence through the Dkey, projects that intersect one or more listed bat AOIs, contain known or potential roosting habitat, and include tree cutting/trimming must apply the project and location-specific seasonal restrictions as described above and summarized in Table 2.

and proposed endangered tricolored bat as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan). As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats.

[28] Suitable bridges include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices).

Table 2. Tree cutting dates within bat AOIs (ranges). Where these dates differ from the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key, they provide more flexibility to Michigan project proponents, based on state-specific data and alignment with state threatened and endangered species protections (see Appendix H for more information).

Tree Cutting Category	Location	Cutting Dates	Dates to Avoid
Indiana Bat Range (AOI)			
Clearing trees for development or conversion	<5 mi of known hibernacula	Nov 16 – Mar 31	Apr 1 – Nov 15
	>5 mi from known hibernacula In modeled roosting habitat	Oct 1 – Apr 14	Apr 15 – Sept 30
	>5 mi from known hibernacula Outside modeled roosting habitat	Aug 1 – May 31	June 1 – July 31
Clearing trees for forest management (e.g., retaining all snags and cavity trees and maintaining forest habitat)[29]	Anywhere within AOIs	Aug 1 – May 31	June 1 – July 31
Northern Long-eared/Tricolored Bat AOIs[30] ***outside*** **Indiana Bat Range**			
Clearing trees for development or conversion	<5 mi of known hibernacula	Nov 1 – Apr 14	Apr 15 – Oct 31
	>5 mi from known hibernacula In modeled roosting habitat	Oct 1 – Apr 14	Apr 15 – Sept 30
	>5 mi from known hibernacula Outside modeled roosting habitat	Aug 1 – May 31	June 1 – July 31
Clearing trees for forest management (e.g., retaining all snags and cavity trees and maintaining forest habitat)	Anywhere within AOIs	Aug 1 – May 31	June 1 – July 31

[29] Forest management activities covered by the Lake States HCP need not apply any bat conservation measures beyond those prescribed in the HCP.

[30] Projects within the tricolored bat AOI need not apply species-specific conservation measures unless the species is listed as endangered.

7.17 COPPERBELLY WATER SNAKE

Projects that intersect the copperbelly water snake AOI and buffered habitat must not:

1. Involve construction or maintenance of a road or other barrier (e.g., paved trail)
2. Affect local hydrology (permanently or temporarily)
3. Include more than 10,000 gallons/day of water withdrawal
4. Disturb the ground or existing vegetation[31] within 0.5 miles of a copperbelly occurrence

Projects that fragment habitat, affect hydrology, or result in ground disturbance need project-specific review in areas where copperbelly occur.

7.18 EASTERN MASSASAUGA RATTLESNAKE

The following projects are not covered by the Dkey in Tier 1 or Tier 2 habitat[32]:

1. Prescribed fire
2. New roads, widening existing roads, and other types of projects that create a permanent barrier to snake movement
3. Projects that permanently alter hydrology
4. Include more than 10,000 gallons/day of water withdrawal
5. Projects that temporarily alter hydrology during the inactive season
6. In Tier 1, projects that impact more than 0.5 acres of EMR habitat, or in Tier 2, greater than 1 acre of EMR habitat (size limit here is to ensure extent of project is small enough that BMPs can be effective without project-level review)
7. Projects that include mowing vegetation (non-turf grass) during the active season

In addition, in order to reach a not likely to adversely affect determination:

8. In Tier 1, projects cannot result in ground disturbance in areas where potential hibernacula occur. (If present in Tier 1, projects must avoid ground disturbance any time of year). In Tier 2, projects cannot result in ground disturbance to potential hibernacula during the inactive season (if present in Tier 2, ground disturbance must be well within the active season to avoid when snakes are present underground).
9. If conducting ground disturbing work in Tier 1 or Tier 2 habitat, the following best management practices (BMPs) must be implemented (if applicable):
    a. Use existing roads and minimize speeds at facilities and access roads (e.g., <15 mph on two track roads), during the active season.
    b. Use low impact equipment such as lightweight track mounted vehicles with low ground pressure OR limit vehicle use to the inactive season, when the ground is completely frozen.
    c. Revegetate all disturbed areas with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance). Monitor all restoration plantings for proper establishment and implement

[31]This includes any off-road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.
[32]In Tier 1 habitat, contact the Service regarding the potential applicability of surveys to determine EMR absence in suitable habitat.

supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions.

d. Avoid the spread of invasive species into suitable EMR habitat by following best practices such as inspecting and cleaning equipment and vehicles for invasive plant materials and seeds before entering EMR habitat areas.
e. Ensure fill is clean and free of contaminants/invasive species.

10. For projects during the active season, in Tier 1 and Tier 2, projects must include the following BMPs (if applicable):
    a. In Tier 1, for projects involving earth work, properly install exclusionary fencing, clear the area before work begins using a qualified person, and remove all fencing following project completion.
    b. Keep turf grass short (<6 inches) throughout the active season. In non-turf grass, mow tall (>6 inches) vegetation during the inactive season (for Tier 1), or raise the deck height to greater than 8 inches (for Tier 2).
11. For projects using chemical treatments (e.g., herbicides), they must agree to follow all appropriate label instructions regarding which herbicide formulation and proper use in potential EMR habitat AND avoid spray drift beyond the target species/area (observing label instructions regarding optimal wind speed and direction, boom height, droplet size calibration, precipitation forecast, etc.).

For all Projects within Tier 1 and Tier 2, projects must include all General BMPs:

a. Use wildlife-safe materials for erosion control and site restoration throughout the project area. Do not use erosion control products containing plastic mesh netting or other similar material that could entangle eastern massasauga rattlesnake (EMR). Several products for soil erosion and control exist that do not contain plastic netting including net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales. Others are made from natural fibers (such as jute) and loosely woven together (often referred to as "leno weave") in a manner that allows wildlife to wiggle free.
b. To increase human safety and awareness of EMR, those implementing the project should first watch Michigan DNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/~PFnXe_e02w), review the EMR factsheet (available at https://www.fws.gov/media/eastern-massasauga-rattlesnake-fact-sheet), or call (517) 351-2555.
c. During project implementation, require reporting of any federally listed species, including EMR, to the Service within 24 hours.

Within the range but outside of Tier 1 and Tier 2 habitat, we recommend the General BMPs above, but they are not required to get to a NLAA determination.

Based on implementation of the recommended BMPs, and avoidance of the excluded actions, adverse effects to eastern massasauga are expected to be discountable.

7.19 PLANTS

In Michigan, threatened plants include American hart's tongue fern, dwarf lake iris, eastern prairie fringed orchid, Houghton's goldenrod, lakeside daisy, and Pitcher's thistle. Michigan monkey flower is Michigan's only endangered plant species. Plants in Michigan are protected by state law in additional to the Federal ESA.

Projects that are funded, authorized, or carried out by a Federal agency, intersect the AOI and/or buffered habitat of a federally listed plant, and have either determined presence through a survey or have not conducted a survey and are assuming presence must not:

1. Indirectly alter the habitat or resources of the listed plant(s)[33]
2. Directly harm the listed plant(s)[34]
3. Include more than 10,000 gallons/day of water withdrawal (for wetland dependent species to include Michigan monkey flower, Houghton's goldenrod, eastern prairie fringed orchid)

If the project does not have a Federal nexus but has the potential to affect a listed plant, the user will receive output language advising them to contact the Michigan Department of Natural Resources regarding compliance with state law and to determine whether a state permit is needed. We also encourage landowners to maintain habitat for listed plant species and avoid disturbing listed plants to the extent possible.

For projects with a Federal nexus, avoiding direct and indirect effects to plants will ensure effects are insignificant or discountable.

7.20 BALD EAGLE

Although no longer listed under the ESA, bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d). The Dkey provides the user with information on the BGEPA and directs users to contact the MIFO for more information on the BGEPA if their action may impact bald or golden eagles.

8 EFFECTS ANALYSIS

This section covers the effects of the anticipated activities covered in this standing analysis to the covered species and critical habitat (above). Where appropriate in our analysis, we make note of which activities are expected to have no effect on a species and critical habitat. This information is provided as helpful technical assistance to those Agencies and project proponents who may be

[33]For example, actions that cause a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.
[34]For example, through prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduction to possession, etc.

unfamiliar with the species and activities and can be incorporated by reference by action Agencies when they make a NE determination.

The effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

A project's Action Area must include all areas affected (i.e., modifications to land, air, or water) by the proposed action, and not merely the immediate area involved in the action. If the activities satisfy the two-part test for causation ("but for" and "reasonably certain to occur"), they should be considered as part of the action. To qualify for use of this standing analysis, a project's Action Area must be wholly encompassed by the coverage area for this standing analysis as described above and all activities within the proposed action must fit within the scope of the standing analysis.

Qualifying actions typically involve one or more of the stressors addressed below.

Insignificant Habitat Loss/Degradation

Some projects that qualify for use of this Dkey may result in minor loss/fragmentation or temporary degradation of available habitat for one or more federally listed species. However, we believe that adherence to the specific conservation measures will ensure that any reduction or modification of available habitat will result in only insignificant effects to listed species and critical habitats. Conservation measures that control for significant loss/degradation of habitat include restrictions on the extent and timing of certain activities (e.g., acreage thresholds for tree clearing projects within the Indiana bat AOI, seasonal restrictions on temporary surface- and groundwater elevation changes in potential eastern massasauga hibernation habitat), restrictions on stream/hydrology-impacting or vegetation/ground-disturbing activities within the AOIs/buffered habitat of several species (e.g., copperbelly water snake, listed insects), and restrictions on Actions that may fragment habitat or create barriers to movement/dispersal within the AOIs of several species (e.g., dams within Group 3 streams, roads/trails/fences within listed snake habitats).

Noise and Vibration

Noise and/or vibration resulting from some projects are typically produced temporarily during the construction phase (e.g., construction vehicles and equipment, blasting) and may be permanently produced during the operation phase (e.g., roads/trails/bridges, commercial/recreational facilities, military operations, etc.). However, we believe that adherence to the specific conservation measures will ensure that any disturbance related to an increase in noise and/or vibration will result in only insignificant effects to listed species and critical

habitats. Conservation measures that limit exposure to these stressors and control for significant disturbance include restrictions on the timing of certain activities (e.g., tree cutting during the Indiana bat active season, modifications to beaches, dunes, mudflats or other potential habitats during the red knot migration windows), restrictions on ground-disturbing activities within the AOIs of several species (e.g., listed snakes, insects), and restrictions on in-stream disturbance within the AOIs of Hungerford's crawling water beetle and listed mussels).

Smoke, Dust, Chemicals, and Odor

Smoke, dust, chemicals, and/or odor resulting from some project activities are typically produced temporarily during the construction phase (e.g., construction vehicles and equipment, blasting, invasives treatment/pesticide application, prescribed burning) and may be permanently produced during the operation phase (e.g., mines/quarries, commercial/residential developments, military operations, etc.). However, we believe that adherence to the specific conservation measures will ensure that any disturbance related to an increase in smoke, dust, chemicals, and/or odor will result in only insignificant effects to listed species and critical habitats. Conservation measures that limit exposure to these stressors and control for significant disturbance include restrictions on the timing of certain activities (e.g., prescribed burning and pesticide use in potential habitat during the Indiana bat and eastern massasauga active seasons), restrictions on chemical use and vegetation-disturbing activities within the AOI of listed insects, restrictions on direct and indirect river/stream impacts in Group 3 streams, and disturbance buffers around sensitive areas (e.g., known gray wolf denning or rendezvous sites).

Night Lighting

Night lighting produced by some projects may occur temporarily during the construction phase (e.g., equipment lighting) and/or permanently during the operation phase (e.g., road/trail and facility lighting). However, we believe that application of the specific conservation measures will ensure that any disturbance related to night lighting will result in only insignificant effects to listed species and critical habitats. Most federally listed species are not expected to be affected by night lighting; however, certain species that are active at night (e.g., listed mammals, snakes, migrating birds) may be sensitive to an increase in lighting at night. Conservation measures that limit exposure to this stressor and control for significant disturbance include the general exclusion for communications towers more than 200 feet in height (which require night lighting), the timing of certain activities (e.g., Actions that may increase human activity in potential habitat during the red knot migration windows), and disturbance buffers around sensitive areas (e.g., known gray wolf denning or rendezvous sites).

Changes to Hydrology

Several Michigan species are dependent on wetland habitats and stable water levels. Major alteration of habitat through changes to hydrology could change habitat conditions such that they are no longer suitable, either through drying or inundation. For species that overwinter or shelter in crayfish burrows (listed snakes, Hine's emerald dragonfly larvae), stable hydrology is

necessary for successful overwintering. Examples of projects that may significantly alter hydrology include those with large amounts of fill, large water withdrawals, and changes to structures (culverts or dams) within rivers and streams. Conservation measures that address potential changes to hydrology include limits on water withdrawal, amount of fill (butterflies), extent of water table elevation changes (including drawdown and inundation), and extent of project scale (e.g., less than 0.5 acres for Tier 1 habitat for EMR).

Conclusion

If a project is not consistent with the general and species/taxon-specific conservation measures and/or exclusions detailed above, the DKey will provide a response indicating that it cannot generate a conclusion (i.e., NE or NLAA determinations) for all species and will recommend project-specific coordination with the MIFO. In other words, for any species for which the user gets a MA determination, further consideration is required and their endangered species review cannot be completed using the Dkey. On the other hand, if the user provides project-specific information consistent with the conservation measures, IPaC will generate a consistency letter (for non- Federal project proponents) or a concurrence letter (for Action Agencies) concluding that the project is consistent with NE and/or NLAA determinations for all listed species. We base these conclusions on the effects analysis above, which are summarized in Table 3.

Table 3. **A summary of the effects of the stressors from qualifying projects on federally listed species in Michigan.**

Stressor	Effect
Habitat Loss/Degradation	None or insignificant/discountable
Noise and Vibration	None or insignificant/discountable
Smoke, Dust, Chemicals, and Odor	None or insignificant/discountable
Night Lighting	None or insignificant/discountable
Changes to Hydrology	Insignificant or discountable
Conclusion	**"May affect – not likely to adversely affect"**

For additional analysis, see Appendix D.

9 SUMMARY AND CONCLUSION

After considering the relevant information pertaining to the species and critical habitat, reviewing the covered activities and associated required conservation measures, and evaluating their anticipated effects), we conclude that Federal and non-Federal actions subject to this standing analysis will support a determination of "No Effect" or "may affect, not likely to adversely affect" (NLAA), as appropriate, for the subject species and critical habitat as described above. This standing analysis is based on the consultation provisions of section 7(a)(2) of the Act, our approach to technical assistance, and the information cited and will undergo review and revision, as needed, if any of the following conditions have been met: 1) If new information reveals the effects of the covered action(s) to the covered species or critical habitat are occurring in a manner or to an extent not considered in this standing analysis based on applied use; or 2) If the species or critical habitat covered by the standing analysis has a change in status.

This standing analysis will be provided on our website and through IPaC via a link within the Dkey. For a list of all possible questions, visit the All Species Michigan Determination Key Overview (you may need to login to your IPaC account). Please note that no project will receive all of these questions; which questions a user gets depends on 1) where they draw the project and 2) how they answer previous questions.

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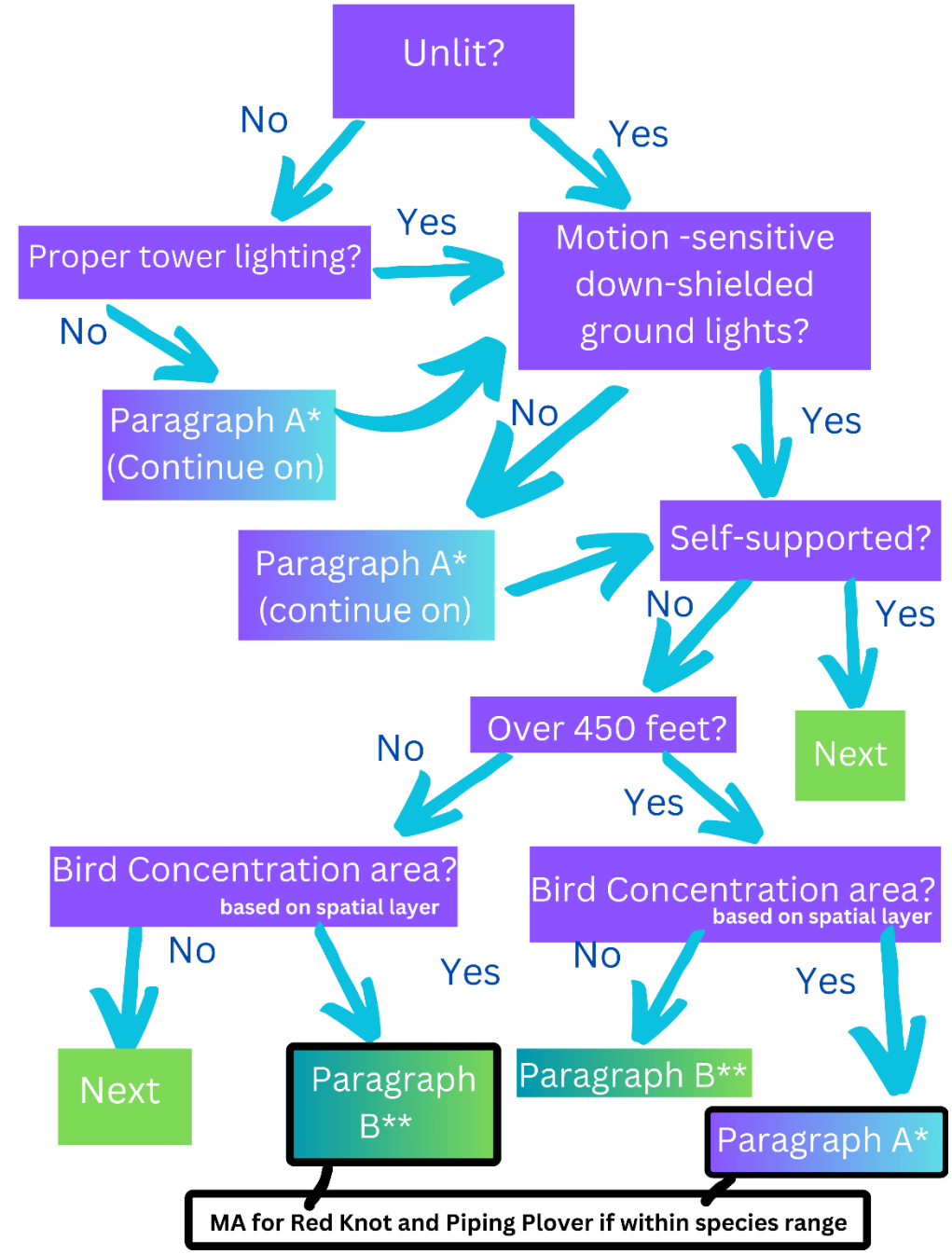
Appendix A: Michigan Communication Towers Flow Chart and MBTA language

Michigan Dkey Communication Towers Flow Chart



Migratory Bird Treaty Act language:

*Paragraph A: Your communications tower, as proposed, may have significant impacts to migratory birds. We strongly recommend that all communications towers are either unlit or use flashing-only LED lights at the minimum configuration allowed by the FAA to reduce the tower's nighttime attraction to birds. Additionally, to further reduce your project's attraction to birds, we strongly recommend that all on-ground facilities, equipment, and infrastructure use motion- or heat-sensitive, down-shielded, and minimum intensity security lighting (as applicable). Guyed towers may have increased risk to migratory birds, especially when over 450 feet tall and/or when constructed near areas that may have large concentrations of birds (e.g., riparian and coastline areas, Audubon Society "Important Bird Areas", National Wildlife Refuges, State Game Areas, etc.). Towers built with these configurations may necessitate the development of an Environmental Assessment and be subject to additional environmental review. You can avoid this by adopting recommended lighting specifications to reduce nighttime attraction to birds and eliminating guy wires.

**Paragraph B: The Michigan Field Office is concerned with the impact that communication towers have on migratory birds. Your project is designed to reduce nighttime bird attraction as the tower is either not lit or will use flashing-only LED lights at the minimum configuration allowed by the FAA. Additionally, your project will use motion- or heat-sensitive, down-shielded, and minimum intensity security lighting on all on-ground facilities, equipment, and infrastructure (as applicable). However, your project may still have negative impacts to migratory birds due to the use of guy wires and the project's proposed location near areas that may have large concentrations of birds (e.g., riparian and coastline areas, Audubon Society "Important Bird Areas", National Wildlife Refuges, State Game Areas, etc.). We therefore recommend you review the USFWS's Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning (updated March 2021 available at https://www.fws.gov/media/recommended-best-practices-communication-tower-design-siting-construction-operation), and incorporate additional avoidance and minimization measures, as practicable.

Appendix B: Potential Indiana Bat Roost Trees

The Service defines suitable Indiana bat roost tree as any tree ≥5 inches in diameter (at breast height) with cracks, crevices and/or exfoliating bark that is within 1,000 feet of forested/wooded habitat.

Although live trees may be used, Indiana bat roosts are most typically snags in early to mid-decay stages. When healthy live trees are used, they tend to be species with naturally sloughing bark, such as shagbark hickory (*Carya ovata*). While over 40 Indiana bat roost tree species have been documented, including coniferous species, deciduous trees are most frequently used, and all the Indiana bat roosts reported in Michigan have been deciduous species. Generally, roost quality improves with tree height, diameter, amount of peeling bark, and solar exposure. Maternity roosts (roost trees used by reproductive female bats and their young) are typically high-quality roosts (i.e., large, tall trees with peeling bark and/or large cracks/crevices that receive a high degree of solar radiation).

Examples of Indiana bat roost trees:

Appendix C: Potential Northern Long-eared Bat Roost Trees

The Service defines suitable northern long-eared bat roost tree as any tree ≥3 inches in diameter (at breast height) with cracks, crevices, exfoliating bark, and/or cavities/hollows that is within 1,000 feet of forested/wooded habitat.

Although northern long-eared bat roosts are often dead or dying trees, live trees with defects are also commonly used. Northern long-eared bats have been reported to use over 35 roost tree species, but deciduous species are most frequently selected. Maternity roosts (roost trees used by reproductive female bats and their young) are typically higher-quality roosts (i.e., large-diameter, tall trees with peeling bark and/or notable defects and adequate solar exposure); however, compared to sympatric Indiana bat roosts, northern long-eared bat roosts (even maternity roosts) are often smaller, shorter trees with a higher degree of canopy cover and are more likely to be living.

Examples of northern long-eared bat roost trees:

Appendix D. Exposure-Response Table

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Mowing	Snakes	Tires and moving blades	adults, neonates, gravid females	crushing, injuring, mortality	Mow during inactive season when snakes are hibernating and under ground. Keep grass short (less than 6 inches) to make less suitable. Raise mower deck (>8 inches) to reduce risks during active season. In terms of scope, Dkey limits size of project to less than 0.5 acre in Tier 1 habitat.	discountable or insignificant
Mowing	Butterflies	Tires and moving blades	early life stages (eggs, larvae, pupae)	crushing, injuring, mortality; loss of nectaring resources or host plants	Avoid working in suitable habitat	discountable if working outside of areas with host plants and nectar resources for adults
Mowing	Plants	Tires and moving blades	vegetative and flowering tissue	crushing, injuring, mortality	Avoid working in suitable habitat	discountable if working outside of suitable habitat; if working within suitable habitat and they are mowing, dkey gives MA

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Tree cutting that is not part of forest management (e.g., conversion)	Bats	Felling of trees/limbs, permanent removal or fragmentation of roosting/foraging habitat	Adults, pups	Crushing, injury, mortality (if roosting bats are present); increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are flushed or forced to seek alternate roosts), severing flight corridors	Avoid cutting when bats may be roosting in trees; avoid cutting within 0.25 mi of known hibernacula; limit extent of tree clearing and ensure adequate habitat will remain in surrounding areas, avoid fragmenting connective forested corridors (e.g., tree lines); alternatively, perform summer presence/absence survey to determine occupancy	Insignificant or discountable
Tree cutting for forest management (e.g., timber harvest, forest stand improvements)	Bats	Felling of trees/limbs, minor or temporary removal of suitable roosting/foraging habitat; enhancement of suitable roosting/foraging habitat	Adults, pups	Crushing, injury, mortality (when bats present); colony fragmentation, increased metabolic costs/physiological stress/reproductive effects (when bats not present); increased flight space, thermal benefits to roost trees, increased insect activity/abundance (enhancement of roosting and foraging habitat)	Retain high-quality potential roosts (e.g., standing snags, hollow trees); avoid cutting potential roosts during non-volant pup season; avoid cutting within 0.25 mi of known hibernacula; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant, discountable, or wholly beneficial

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Prescribed fire	Snakes	Heat and smoke; fire breaks (see mowing and ground disturbance)	adults, neonates, gravid females	harm or mortality	Avoid in Tier 1 or Tier 2 habitat. If can't avoid Tier 1 or 2, BMPs can include timing restrictions, slow rate of spread, lower intensity, etc. but would want a project-level review (outside of dkey) so dkey gives MA determination.	Discountable if outside of EMR tiered habitat.
Prescribed fire	Butterflies	Heat and smoke; fire breaks (see mowing and ground disturbance)	all life stages	harm or mortality	Avoid in suitable habitat where species may be present.	Discountable if outside of suitable habitat.
Prescribed fire	Plants	Heat and smoke; fire breaks (see mowing and ground disturbance)	all	harm or mortality	Avoid in suitable habitat where species may be present.	Discountable if outside of suitable habitat.

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Prescribed fire	Bats	Smoke, heat/flames, CO and other gases, alteration or temporary loss of roosting/foraging habitat (e.g., scorching or felling of roost trees)	Adults, pups	Scorching/thermal injury/mortality, increases in blood carboxyhemoglobin (if roosting bats present); increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are flushed); temporary loss of roost trees and/or foraging habitat; increased flight space, thermal benefits to roost trees, increased insect activity/abundance (enhancement of roosting and foraging habitat)	Avoid burning in/near suitable forested habitat during the non-volant pup season or when temperatures are <40 degrees F; avoid burning within 0.25 mi of known hibernacula; if bats may be present, keep average flame length ≤8 feet and smoke to a minimum, avoid felling potential roost trees during site prep; during the burn, leave visibly burning trees standing unless they present a safety threat; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant, discountable, or wholly beneficial
Ground disturbance, earth movement, excavation	Snakes	heavy equipment (crushing/injury risk), loss of hibernacula	adults, neonates, gravid females	injury or mortality of individuals if present, loss of hibernacula could result in indirect mortality if other suitable hibernacula are not present and able to be located by EMR or CWS	Conduct work outside of the active season when snakes are not above ground. Avoid work in areas where hibernacula could occur. Alternatively, during the active season, exclude snakes from work area using exclusionary fencing. Dkey limits size of project to less than 0.5 acre in Tier 1 habitat.	Insignificant or discountable

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Ground disturbance, earth movement, excavation	Butterflies	heavy equipment (crushing/injury risk), loss of host plant, nectar resources, loss of suitable hydrology, spread of invasive species (see separate action)	all life stages	Injury or mortality of individuals if present, loss of host or nectar plants could result in indirect mortality.	Avoid working in suitable habitat	Insignificant or discountable
Ground disturbance, earth movement, excavation	Plants	heavy equipment (crushing/injury risk), loss of suitable hydrology (see separate action), spread of invasive species (see separate action)	all	Injury or mortality of individuals if present	Avoid working in suitable habitat	Insignificant or discountable
Hydrological Changes	Insects (HED, MISA, POSK, HCWB)	loss of suitable habitat for feeding, breeding, and sheltering	all	lowered fitness	Project must not have permanent or temporary impacts to hydrology within occupied watershed or result in water withdrawal of more than 10,000 gallons/day.	Insignificant or discountable

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Hydrological Changes	Snakes	loss of suitable habitat for feeding, breeding, and sheltering (including hibernation)	all	lowered fitness; freezing or desiccation (mortality) during winter if water levels are not stable	Project must not result in changes to water table of more than 6 inches or result in inundation lasting more than 2 weeks. Within the watershed, water withdrawals cannot be more than 10,000 gallons/day.	Insignificant or discountable
Hydrological Changes	Plants	loss of suitable habitat and resources	all	lowered fitness	If within suitable habitat, project cannot directly or indirectly effect resources including hydrology. Within the watershed, water withdrawals cannot be more than 10,000 gallons/day.	Insignificant or discountable
Spread of invasive species	Insects (HED, MISA, POSK, HCWB, KBB)	loss of suitable habitat and resources for feeding, breeding, and sheltering	all	lowered fitness	Avoid working in suitable habitat	Insignificant or discountable

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Spread of invasive species	Snakes (EMR and CWS)	loss of suitable habitat and resources for feeding, breeding, and sheltering	all	lowered fitness	At the conclusion of the action, revegetate all disturbed areas with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance); monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions	Insignificant or discountable
Spread of invasive species	Plants	loss of suitable habitat and resources for feeding, breeding, and sheltering	all	lowered fitness	Avoid working in suitable habitat	Insignificant or discountable
Planting, cultivation	Bats	Increased forest and/or insect habitat	Adults, pups	Enhanced roosting, foraging, and/or commuting habitat	N/A	Wholly beneficial

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Herbicide/fungicide use	Bats	Chemical exposure, vegetation changes	Adults, pups	Chemical toxicity, modification of suitable habitat (including potential enhancement of roosting/foraging habitat)	Follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants; avoid application within 0.25 mi of known hibernacula; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant, discountable, or wholly beneficial
Pesticide (insecticide/ rodenticide) application	Bats	Exposure to chemicals targeting mammals and/or prey sources (bioaccumulation)	Adults, pups	Chemical toxicity	Avoid application within 0.25 mi of known hibernacula and within suitable habitat when bats may be present; alternatively, perform summer presence/absence survey to determine occupancy	Insignificant or discountable
Pesticide (insecticide, rodenticide, herbicide application)	All	Exposure to chemicals directly affecting species (lethal or sublethal) and/or prey sources (bioaccumulation) or host plants/nectar sources	All	chemical toxicity; loss of prey; loss of host plant or nectar source	No broad application of chemicals; only targeted can get through our dkey. No application in suitable habitat for sensitive species.	Insignificant or discountable
Placement of fill or rip rap, dredging	Freshwater mussels	crushing, suffocation, loss of suitable substrate	adults, juveniles	lowered fitness, mortality	Avoid direct and indirect impacts to streams within group 3 streams	Discountable

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Construction of structures	Birds (PIPL and REKN)	collision risk for certain buildings and towers	adults	mortality or injury	For communication towers, structure must be unlit or will use flashing-only LED lights at the minimum configuration allowed by the FAA; use motion- or heat-sensitive, down-shielded, and minimum intensity security lighting on all on-ground facilities, equipment, and infrastructure; avoid bird concentration areas if using guy wires	Discountable
Construction of structures	Bats	Alteration of suitable day roosting habitat	Adults, pups	Crushing, injury, mortality (if roosting bats are present); increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are flushed or forced to seek alternate roosts)	Avoid removal/modification of suitable bridges when bats may be present, avoid permanent loss of known or potential day-roosting spaces; alternatively, perform a bridge assessment or summer presence/absence survey to determine occupancy	Insignificant or discountable
Human activity	Birds (PIPL and REKN)	Increase in dogs off leashes, increase in predators (avian and mammalian)	Adults, chicks, eggs	mortality or injury, decreased fitness	Avoid actions that increase risk of dogs off leash, avian and mammalian predators in suitable habitat -- any time of year for permanent changes; during breeding season for temporary changes.	discountable or insignifiant

Action Component	Species or Taxa Group	Stressor	Life History Form or Physical/ Biological Feature	Anticipated Response to Stressor	Conservation (Avoidance and Minimization) Measure	Anticipated Effects of the Component (After Applying Conservation Measure, If Any)
Roads and trails	Snakes	Barrier to movement, fragmentation	All	decreased fitness, road mortality	No new roads or trails; no significant widening (>10 ft) of an existing road footprint, converting the surface of an existing road or trail from a non-paved to a paved surface, widening of a paved or gravel trail, or adding new linear features such as fences, canals, or other permanent barriers have the potential to fragment habitat and alter movement and dispersal.	discountable or insignifiant
Temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s)	Bats	Light pollution, changes in insect activity	Adults	Avoidance of lit areas; increased metabolic costs, physiological stress, colony fragmentation/reproductive effects (if bats are forced to seek alternate habitats); enhanced foraging opportunities	When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable; direct temporary lighting away from suitable habitat when bats may be present	Insignificant, discountable, or wholly beneficial

Appendix E: Development of a Habitat Suitability Model for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*M. septentrionalis*) in Michigan

In 2018, the Michigan Ecological Services Field Office (MIFO) contracted with Dr. Eric McCluskey of Grand Valley State University to develop a habitat model for the Indiana bat in Michigan. In 2021, MIFO again contracted with Dr. McCluskey to develop a habitat model for the northern long-eared bat in Michigan, which we combined with the Indiana bat model. A shapefile of the combined habitat model is available here: Michigan Listed Bat Habitat Model

Indiana Bat Model

To develop the model, we compiled all available Indiana bat summer capture (foraging) and roost occurrence data for Michigan and applied a 500-m spatial filter as a minimum distance between occurrence records to minimize overemphasis of habitat importance based on clusters of individuals. After filtering the occurrence data, 44 locations remained (20 capture and 24 roost locations). We developed models using capture and roost occurrences separately as well as with all occurrences combined to determine which model was best suited for identifying foraging and roost habitat.

Due to the small number of occurrences, we used an ensemble of small models (ESM) approach that permits more predictor variables to be used by running each pairwise combination of variables and then weighting these final models in an ensemble. The ESMs were run in the R package ecospat. Presence only modeling requires the selection of background area from which background points will be randomly sampled to compare to the occurrence data. The background area should represent parts of the landscape that are accessible to the focal organism. We created a convex hull around our occurrence data using ArcMap, a polygon formed by connecting straight lines between points. We then buffered this convex hull by 25 km to include areas beyond the known core distribution of Indiana Bat in southern Michigan that should be physically accessible and may have undetected presences. We set background point selection for this entire buffered area except for within 5 km of Indiana Bat occurrences where background points are most likely to unintentionally represent true presences.

We selected predictor variables by removing the worse performing variable from highly correlated pairs (>0.75) using the 'corSelect' function from the fuzzySim R package. Then we then used Maxent's internal variable importance (permutation importance) and jackknife measures to determine which of the remaining variables were important to retain for separate capture and roost models. We selected two model types, Artificial neural network (ANN) and Maxent, for the ESMs. We compared five runs for each model type with the capture, roost, and combined datasets using area under the ROC curve (AUC) and true skill statistic (TSS). We then calculated the Boyce Index value using ecospat to compare the ANN and Maxent models from each dataset in their ability to identify capture and roost locations. We used Boyce Index

as the primary assessment metric as it allowed for comparisons across all three model types for capture and roost data.

Based on the Boyce Index assessment, we selected the Maxent presence-only roost model as the strongest fit model. Using the 10th percentile threshold, we converted the model output to a binary raster. The binary raster was then converted to a shapefile using non-simplified shapes. Because considerable portions of the modeled habitat contained clearly non-suitable cover types, particularly near highly developed urban areas, we further refined the model by clipping the binary shapefile by the most recent available National Land Cover Database (NLCD 2019) data. Land cover categories excluded ("Clipped") from modeled habitat included open water, perennial ice/snow, developed (low, medium, and high intensity), and barren land (sand, rock, clay).

Northern Long-eared Bat Model

To develop the model, we compiled all available northern long-eared bat summer capture (foraging) and roost occurrence data for Michigan's Lower Peninsula and applied a 1-km spatial filter as a minimum distance between occurrence records to reduce the potential for biased results from over-represented sites. After filtering the occurrence data, 56 locations remained.

We screened a diverse set of candidate variables (30 m resolution) representing different habitat elements, including land cover, hydrology, and elevation. First, we identified and removed highly correlated variables (>0.75) with the 'corSelect' function in the fuzzySim R package, keeping the better performing variable from each correlated pair. We further evaluated the remaining variables using the jackknife of variable importance and training gain output in Maxent. The final northern long-eared bat variables were mean canopy at 100 m, canopy range at 500 m, percentage of emergent wetland at 50 ha, percentage of forested wetland at 5 ha, wetland diversity index at 25 ha, and wetland diversity index at 1,000 ha.

Once the occurrence data were thinned, we used a buffered region to clip the selected variable rasters to serve as the area for background point selection by ecospat. We used a 25-km buffer for background point selection (10,000 random points). The sample size was low enough (n=56) that we opted to use the R package ecospat, that was developed for datasets with few occurrences. Ecospat uses an ESM approach where separate models are produced with each pair of variables before an ensemble is created under a weighting scheme. We used Maxent and ANN for the ecospat ESMs. The ecospat models used five-fold cross validation (80% training partitions). We used Boyce Index implemented in ecospat as the primary model selection metric using the 'ecospat.boyce' function for the ESMs. Finally, we converted the continuous habitat suitability values from each species SDM to a binary raster of habitat and non-habitat to represent the distribution of habitat patches. We used the maximum sum of sensitivity and specificity (MSSS) threshold for the ecospat ESM models (equivalent to the maximum true skill statistic (TSS)).

Combined Listed Bat Model

To combine and further refine the habitat models, we created a grid of five-acre hexagons for Michigan using the "Generate Tessellation" tool in ArcPro 2.9. Five acres was selected as the patch size based on available literature and data suggesting that Indiana and northern long-eared bats are unlikely to occupy an isolated forest stand of less than five acres. The total acres of modeled habitat were summarized by hexagon using the "Summarize Within" tool. Hexagons with less than one acre of either bat's habitat were then removed. These small model fragments were typically isolated from other modeled hexagons, likely artifacts of imprecise raster data, and were considered unlikely to provide sufficient habitat to support roosting listed bats. Hexagons containing more than one acre of modeled habitat of either species were retained, helping to fill gaps and buffer edges among smaller but closely connected modeled patches and increasing the overall acreage of modeled habitat across the state.

The remaining hexagons were then aggregated using the "Dissolve" tool allowing for multipart features. The "Summarize Within" tool was run again to obtain acres of modeled habitat within each hexagon cluster. We then ran a "Near Neighbor" analysis to identify forest patches that were greater than 1,000 feet from forested areas to remove isolated patches unlikely to be used by roosting listed bats. We removed hexagons that were more than 1,000 feet from their nearest neighbor and that contained less than five acres of modeled habitat. These isolated forest patches are considered unlikely to support roosting listed bats due to their insufficient size and distance from other suitable, modeled areas. The final layer was then checked against known listed bat roosting areas and detections. An additional three hexagons were added to the model to capture locations that fell outside of the modeled habitat.

Appendix F: Projects that may Cause Indirect Adverse Effects/Harm to ESA-listed Bats

Indiana bat (*Myotis sodalis*), northern long-eared (*M. septentrionalis*), and tricolored bat (*Perimyotis subflavus*) are forest dependent and require a network of forested tracts for roosting, commuting, and foraging. The U.S. Fish and Wildlife Service (Service) defines suitable roosting habitat for Indiana bats as forest patches containing trees of 5 inches diameter at breast height (DBH) or larger, and suitable roosting habitat for the northern long-eared bat as forest patches containing trees of 3 inches DBH or larger. Roosting habitat for tricolored bats is characterized as forests, woodlots, and linear features (e.g., fencerows and riparian corridors) containing live or recently dead trees with live or dead leaf clusters, Spanish moss [*Tillandsia usneoides*], or beard lichen [*Usnea trichodea*]). Additional forest types, including early successional habitat with small diameter trees, may also be used as important foraging and/or commuting habitat by listed bats.

Indiana, northern long-eared, and tricolored bats exhibit high interannual site fidelity, with maternity colonies roosting together in the same area over multiple years (USFWS 2007, Foster and Kurta 1999, Johnson et al. 2009, Silvis et al. 2015). Because tree roosts are naturally ephemeral, listed bats are expected to be adapted to some amount of roost loss. However, largescale loss or degradation of occupied habitat could lead to maternity colony fragmentation and/or reproductive failure if a substantial number of roost trees (particularly primary maternity roosts) are removed or if a sufficient amount of suitable roosting, foraging, swarming/staging, and/or commuting habitat will no longer be available, even if the clearing takes place during times of the year when bats are not present on the landscape (inactive season).

Although project specifics (e.g., timing, availability of nearby habitat, quality of remaining habitat, etc.) can modify a risk assessment, the Michigan Ecological Services Field Office generally views the following project activities as having potential to cause adverse effects and/or harm to federally listed bats if they are present (or when assuming potential presence without survey data[35]) without further site-specific review and considerations. In other words, projects involving the following activities are not eligible to receive automated concurrence through our All-Species Michigan Dkey:

1. Clearing >10 contiguous[36] acres of modeled habitat within 5 miles of a known listed bat hibernaculum;
2. Clearing >10 contiguous[37] acres of modeled bat habitat in the Indiana bat range;
3. Clearing >20 contiguous[38] acres of modeled bat habitat outside the Indiana bat range;
4. Fragmenting[39] a connective corridor (e.g., tree line) between two or more forest patches of at least 5 acres

[35]Surveys conducted in accordance with the Service's Range-wide Indiana bat and Northern Long-eared Bat Survey Guidelines may be used to demonstrate presence or probable absence of listed bats within a project area. Lacking presence/absence survey data, presence is assumed in suitable habitat.
[36]Connected by 1,000 feet or less
[37]Connected by 1,000 feet or less
[38]Connected by 1,000 feet or less
[39]Creating a gap of 1,000 feet or more between previously connected forest

Acreage Thresholds

To better characterize potential habitat and focus conservation efforts, the Michigan Ecological Services Field Office developed a habitat suitability model for the Indiana and northern long-eared bat in Michigan (see Appendix E). Potentially suitable habitat for these species and tricolored bat may occur outside of modeled areas, but occupancy of such areas is expected to be less likely (including for tricolored bat, since the final variables selected for the Indiana and northern long-eared bat models, including canopy cover and wetland variables, are also ecologically relevant to tricolored bat[40]).

As listed bat maternity home ranges contain multiple primary and secondary roost trees and Michigan provides abundant suitable habitat for listed bats, it is extremely unlikely that loss of up to 10 contiguous acres of habitat would eliminate all primary roost trees within a maternity roosting area anywhere in Michigan. Based on NLCD 2021 USFS Tree Canopy Cover data for the CONUS (Dewitz 2023), median tree canopy cover by county in Michigan is 41% across the state and 62% across the Upper Peninsula, where northern long-eared and tricolored bats are most likely to occur; moreover, most of the forestland across Michigan [18.9 of approximately 19.3 million forested acres] is modeled as suitable for Indiana and/or northern long-eared bat. Available literature suggests that northern long-eared bat maternity colonies can tolerate loss of a single primary roost or up to 20% of available secondary roosts in the inactive season before abandoning roosting areas or substantially altering roosting behaviors (Silvis et al. 2014, 2015), and Indiana and tricolored bats are expected to respond similarly. Loss of up to 10 contiguous acres of habitat is also unlikely to noticeably degrade the quality of an occupied roosting or foraging area or render a travel corridor unsuitable anywhere in Michigan. For these reasons, the Michigan Ecological Services Field Office believes it is extremely unlikely that loss of up to 10 contiguous acres of forest during the inactive season would lead to detectable adverse effects/harm, even where listed bats are most likely present (e.g., in modeled habitat within 5 miles of known hibernacula) and forest habitat is most limited/fragmented (e.g., modeled habitat within the Indiana bat range, where median tree canopy cover by county is 25% [average: 26%; range: 12-52%]).

Based on the abundance of forested habitat outside the Indiana bat's range (i.e., northern Lower Peninsula and Upper Peninsula, where median tree canopy cover by county is 53%), we believe a higher threshold is warranted. We have been using a threshold of up to 20 contiguous acres of modeled habitat during the inactive season to screen projects outside of the Indiana bat's range and hibernacula buffers in our Dkey. While in many cases, a higher threshold may be justified (e.g., up to 100 acres), a 20-acre threshold has been working well in Michigan for initial project screening. We prefer to manually review projects that are larger in scale to ensure other listed species and other Federal wildlife laws are adequately considered. Many projects that cannot receive automated concurrence through our statewide Dkey due to this threshold will be able to receive concurrence outside the Dkey.

Michigan projects that will clear >10 contiguous acres of modeled habitat in the Indiana bat range or between 0.25 and 5 mi of a known listed bat hibernaculum and/or >20 contiguous acres

[40] It is not possible to develop a habitat suitability model for the tricolored bat in Michigan since no summer data exist for the species. However, given their rarity in Michigan and ecological similarities to the other listed bats, tricolored bats are not expected to occur outside modeled habitat for Indiana and northern long-eared bat.

of modeled habitat outside the Indiana bat range/hibernacula buffers or that will fragment a connective corridor between two or more forest patches of at least 5 acres may warrant further project-specific consideration or coordination with the Service in order to evaluate and minimize potential impacts.

Minimum Patch Size

Based on life history information and available literature for Indiana bats (e.g., average foraging distances and occupied forest patch sizes), the Service believes that it is unlikely that an isolated forest stand of 10 acres or less would provide sufficient resources for an Indiana bat. However, available data indicate that Indiana bats may infrequently use isolated forest patches as small as 5.6 acres (Keith Lott, personal communication). The Michigan Ecological Services Field Office believes a conservative minimum patch size of 5 acres is appropriate for both Indiana and northern long-eared bats. Although listed bats rarely traverse non-forested areas of 1,000 feet or more, they are frequently observed using vegetated corridors, such as tree lines, to travel among suitable forest patches. Because they may connect important foraging and roosting habitats, removal of forested corridors (regardless of size/area of corridor) could severely fragment available habitat and result in adverse effects or indirect take of listed bats. Therefore, projects that remove connective corridors between forest patches warrant project-specific consideration and coordination with the Service.

Supporting Documents

The following Service web pages provide further information and background on the potential for indirect adverse effects via habitat loss or fragmentation.

- Section 7 Technical Assistance, Summary of Indiana Bat Ecology
- Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects
- Range-wide Indiana bat and Northern Long-eared Bat Survey Guidelines
- Standing Analysis and Implementation Plan for the Range-wide Northern Long-eared Bat and Tricolored Bat Assisted Determination Key

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Appendix G: Bat Ecosystem Services

Implementing protective measures for bats, including both federally listed and non-listed species, indirectly helps to protect Michigan's agriculture and forests. Bats are significant predators of nocturnal insects, including many crop and forest pests. For example, Whitaker (1995) estimated that a single colony of 150 big brown bats (*Eptesicus fuscus*) would eat nearly 1.3 million pest insects each year. Boyles et al. (2011) noted the "loss of bats in North America could lead to agricultural losses estimated at more than $3.7 billion/year, and Maine and Boyles (2015) estimated that the suppression of herbivory by insectivorous bats is worth >1 billion USD globally on corn alone. In captive trials, northern long-eared bats were found to significantly reduce the egg-laying activity of mosquitoes, suggesting bats may also play an important role in controlling insect-borne disease (Reiskind and Wund 2009). Mosquitoes have also been found to be a consistent component of the diet of Indiana bats and are eaten most heavily during pregnancy (6.6%; Kurta and Whitaker 1998). Taking proactive steps to help protect bats may be very valuable to agricultural and forest product yields and pest management costs in and around a project area. Such conservation measures include limiting tree clearing during the bat active season (varies by location) and/or the non-volant period (June through July), when young bats are unable to fly, and minimizing the extent of impacts to forests, wetlands, and riparian habitats.

For more information, see **Bats are one of the most important misunderstood animals | U.S. Fish & Wildlife Service**

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Appendix H: Differences Between the Michigan Dkey and the Range-wide Northern Long-eared Bat and Tricolored Bat Dkey

The Range-wide Northern Long-eared Bat (NLEB) and Tricolored Bat (TCB) Dkey (Range-wide Dkey) is currently in production IPaC and fully applicable to TCB if a final rule to list the species as endangered is published (see https://www.fws.gov/library/collections/northern-long-eared-bat-and-tricolored-bat-range-wide-determination-key for further details).

The All-Species Michigan Dkey generally replicates the effects pathways and determinations found in the Range-wide Dkey for NLEB and TCB and adds Indiana bat, which is found in the southern five county tiers and along the western coast of the Lower Peninsula. The Michigan Dkey does differ from the Range-wide Dkey in a few ways, however, due to our ability to use Michigan-specific data and our intention to be consistent with the approach taken by the Michigan Department of Natural Resources under their authorities. The areas where the Michigan Dkey is inconsistent with the Range-wide Dkey are discussed in this appendix, by topic. Although this may appear to add complexity to our approach, the intent is to provide maximum flexibility to project proponents and ensure alignment with state requirements. This is possible in a state-focused Dkey (rather than a range-wide Dkey), because we are able to target our conservation measures to a smaller geographic area and utilize local data with more specificity. These deviations provide additional options for project proponents and are less restrictive than what is in the Range-wide Dkey, as described below.

Transportation Activities

Details	Range-wide Dkey	Michigan Dkey	Difference
Actions that introduce a new or increased risk of vehicle collision (new roads, increase in travel lanes, increase in traffic near suitable habitat)	Gives MA determination due to increased risk of collision	Transportation activities can receive automatic NLAA determination by following all suggested BMPs for tree/vegetation removal, lighting, and removal or modification of suitable bridges	The Michigan Dkey is less restrictive, covering more transportation projects

Reason for Difference:
The risks of vehicle collision to NLEB and TCB in Michigan as a result of transportation projects (including increased traffic) is extremely low and not quantifiable. In areas with greater numbers of bats, this may be a concern; however, in Michigan, despite significant survey efforts across the state, few potential summer populations of either species have been documented post-White Nose Syndrome (WNS), and most of these are unconfirmed acoustic records. Regular winter census data from 50 Michigan hibernacula demonstrated overall post-WNS declines of

93.9% for hibernating TCB and 98.5% for NLEB by 2020 (Kurta and Smith 2020), and both species' populations are suspected to have further declined since then.

Although the FHWA/FRA/FTA Section 7 Range-wide Consultation for Indiana Bat and Northern Long-eared Bat does not cover new transportation corridors, the 2018 Biological Opinion acknowledges that collision risk is difficult to quantify and primarily of concern in limited situations where there is known listed bat activity and road profiles are elevated into flight corridors. The Lake States Forest Management Bat Habitat Conservation Plan (Lake States HCP; ICF 2023) covers construction and maintenance of forested roads and trails in Michigan but considers take from vehicle collisions unlikely due to maximum speeds on forestry related roads. We expect (e.g., based on our listed bat habitat suitability model), that roads most likely to intersect or occur near occupied bat habitat in Michigan will be low in traffic volume and speeds, further reducing the potential for collisions; whereas new high-traffic roads are most likely to occur in already developed areas far from occupied habitat. Consistent with our informal programmatic consultation with the Michigan Department of Transportation (MDOT), we discount the potential for road work to result in any measurable increase in vehicle collisions.

Summer Occupancy Dates

Details	Range-wide Dkey	Michigan Dkey	Difference
Period when listed bats may be present in suitable forested habitat outside 5-mi buffers around known hibernacula within the Indiana bat's Michigan range	Summer occupancy dates are April 1 through September 30	Summer occupancy dates are April 15 through September 30	The summer occupancy period within the Indiana bat's range is two weeks longer in the Range-wide Dkey than the Michigan Dkey. As such, actions that may affect habitat for listed bats (e.g., tree cutting) are more restricted in early April in the Range-wide Dkey

Reason for Difference:
According to Michigan bat expert Dr. Allen Kurta (pers. comm. 2/24/2022), with whom our field office consulted on the October 1 through March 31 inactive season previously used in Michigan, this period within the Indiana bat's Michigan range could be safely extended to April 15 in areas >5 miles from known hibernacula. Historical data suggest that bats hibernating in Tippy Dam (the only known Indiana bat hibernaculum in Michigan and only significant hibernaculum in the Indiana bat's Michigan range) remain in hibernation until mid-April, and bats that summer in southern Michigan and hibernate in adjacent states (including Indiana, Ohio, and Kentucky) are not expected to arrive in Michigan before April 15. In Dr. Kurta's book, Mammals of the Great Lakes, Third Edition (2020), he writes of the Indiana bat: "Most males stay close to their hibernaculum in summer, but many females migrate northward into the Great Lakes basin beginning in late April." Although spring bat surveys are relatively infrequent, available data support a lack of listed bat activity prior to April 15. Therefore, we consider the potential for project activities to directly affect listed bats in the first two weeks of April to be discountable.

Nonvolant Pup Season

Details	Range-wide Dkey	Michigan Dkey	Difference
Nonvolant pup season dates for Michigan	May 15 through July 31 (Indiana bat range) or June 1 through August 15 (outside Indiana bat range)	June 1 through July 31 throughout the state	Michigan dates are less restrictive, based on Michigan-specific data and expert opinion, and consistent with state DNR recommendations. Range-wide dates would extend this period by two weeks on either side (depending on whether the project is within or outside the Indiana bat range) and are based on the entire ranges of the species

Reason for Difference:
According to Michigan bat expert Dr. Allen Kurta, all bats in Michigan give birth in June, or less commonly, in very early July and never in May (pers. comm. 6/15/2024). The earliest reported date of birth for any bat species in Michigan (big brown bat; *Eptesicus fuscus*) was June 3rd. There are also records of little brown bats giving birth in early June in both in the Lower and Upper Peninsulas. However, other species, such as Indiana and northern long-eared bats, typically do not give birth until June 15th or later, likely since they most commonly roost in trees, whereas big and little brown bat reproductive females commonly roost in buildings with warmer and more stable temperatures. Although we have no summer maternity data for tricolored bats in Michigan, it is expected that parturition in this species would align with other foliage-roosting species such as eastern red (*Lasiurus borealis*) and hoary bats (*Lasiurus cinereus*), which give birth in June in Michigan.

We have been using June 1 through July 31 as the nonvolant pup season in Michigan for many years (since before the northern long-eared bat was listed as Federally threatened). Many conservation partners are familiar with this date range and have used it to develop internal guidance for avoiding and minimizing bat impacts. This date range is consistent with Michigan DNR recommendations for state-listed bats and the Lakes States HCP. Changing it would result in confusion for many project proponents, including our state-assumed wetland permitting program.

One of the ways our Dkey and state guidance has been applying the nonvolant pup season dates is in the implementation of a habitat suitability model we developed with Grand Valley State University for Indiana bat and NLEB in 2021 using historic state occurrence data (see Appendix E). Because of the low likelihood of listed bats occurring outside modeled habitat, Michigan project proponents are advised to avoid impacts to potential habitat only during the pup season if the project area does not overlap with modeled habitat. Within modeled habitat, we recommend that project proponents avoid impacts during the entire summer occupancy period or conduct a presence/probable absence survey to determine occupancy. As with the Range-wide Dkey, we recommend project proponents avoid impacts during spring staging through fall swarming within 5 miles of known hibernacula for any of the listed bats.

Although the habitat suitability model did not consider TCB roosting habitat (based on an absence of summer roosting data for TCB in Michigan), we consider TCB unlikely to occur

outside known hibernacula buffers and/or modeled summer habitat for Indiana bat/NLEB. TCB are speculated to be a relatively recent resident of the central Great Lakes Basin, most likely colonizing Michigan from the southwestern Lower Peninsula and/or northwestern Upper Peninsula during the mid-twentieth century (Burt 1957, Kurta et al. 2007, Brown and Kurta 2013). The species was first observed in Michigan in 1965, and until the local invasion of WNS, was regularly reported in or near hibernacula during winter and fall migration period. The consistent presence of both males and females and the species' typically short migration range suggests a breeding population may have occurred and may still occur year-round in parts of the state; however, the species was always rare in Michigan (Brown and Kurta 2013). Hibernating populations have been small (i.e., <10 individuals per site) since before WNS, and Michigan's hibernating TCB population had declined by nearly 94% by 2020 (Kurta and Smith 2020). With very few exceptions, the species has not been observed in Michigan in the summer, and no maternity colonies have been documented, despite repeated and extensive mist netting and mortality monitoring at wind turbines across much of the southern Lower Peninsula. If TCBs do summer in Michigan, it is the opinion of local experts that they likely do so within close proximity of known hibernacula and/or modeled summer habitat for Indiana bat/NLEB. Therefore, we expect our existing Dkey conservation measures for Indiana bat/NLEB and hibernacula buffers to be fully protective of TCB in Michigan.

Tree Clearing Thresholds

Details	Range-wide Dkey	Michigan Dkey	Difference
Acreage thresholds for clearing trees when bats are not present in forested habitat	Percent forest cover in 5-km grid cells; threshold varies based on amount of available habitat with lowest being 0.5 acres (if percent forest cover is less than 10%) and highest being 100 acres (if percent forest cover is greater than 30%)	Within 5 miles of known hibernacula and in the Indiana bat's range, the limit is 10 acres of modeled Indiana bat/NLEB habitat. Outside hibernacula buffers and the Indiana bat's range, actions can remove up to 20 acres of modeled habitat when bats are not present. Tree cutting that is part of ongoing forest management or limited to narrow, linear corridors (e.g., rights-of-way) <1000 feet wide are not subject to clearing thresholds	The Michigan Dkey approach is less complicated and still considers available habitat via average tree canopy cover. We use a similar threshold approach to the Range-wide Dkey (along with other site- and habitat specific data) to further evaluate projects that cannot receive automated concurrence through the Michigan Dkey[41]

Reason for Difference:

[41] It is rare for Michigan projects to exceed the current Dkey thresholds, which have been in place since 2020, but if this becomes a more frequent occurrence, we may modify the Michigan Dkey to allow additional projects to receive automated concurrence (as warranted by local tree cover, modeled habitat, and other habitat features routinely considered when reviewing projects outside the key).

Michigan provides abundant suitable habitat for listed bats throughout much of the state (e.g., only 15 of the 83 counties have an average canopy cover of <20% based on NLCD 2021 USFS Tree Canopy Cover data for the CONUS [Dewitz 2023], all but two within the Indiana bat's range), and the majority of forested areas across the state are modeled as suitable summer habitat for Indiana bat and NLEB based on a habitat suitability model our field office developed with Grand Valley State University in 2021 (see Appendix E). In areas of the state where habitat is sparsest, tree cover tends to be limited to riparian corridors and/or wetlands, which are unlikely to be cut/developed due to state regulations (under which we coordinate closely with the Michigan Department of Environment, Great Lakes, and Energy (EGLE). Moreover, projects are not eligible for automated concurrence through the Michigan Dkey if they will fragment a connective corridor (e.g., tree line) between two or more forest patches of at least 5 acres.

The Michigan Dkey takes a similar approach to the Range-wide Dkey in terms of considering available habitat. Available literature suggests that NLEB maternity colonies can tolerate loss of a single primary roost or up to 20% of available secondary roosts in the inactive season before abandoning roosting areas or substantially altering roosting behaviors (Silvis et al. 2014, 2015), and Indiana bats and TCB are expected to respond similarly. Data suggest that listed bats are very rare in Michigan post-WNS, and maternity colony home ranges contain multiple primary and secondary roost trees. Therefore, is unlikely that loss of up to 10 contiguous acres of habitat would eliminate all primary roost trees within a maternity roosting area anywhere in the state. Loss of up to 10 contiguous acres of habitat is also unlikely to noticeably degrade the quality of an occupied roosting or foraging area or render a travel corridor unsuitable anywhere in Michigan. For these reasons, we have never recommended a presence/absence survey or formal consultation for any project proposing to cut up to 10 contiguous acres when bats are not present, even in areas where listed bats are most likely to occur (e.g., within known summer occurrence buffers ["inner tiers"] or within 5 miles of known hibernacula) or where forest habitat is most limited/fragmented (e.g., within the Indiana bat's range in southern Michigan).

The smaller spatial scale (5-km grid cells) of tree cover classes used in the Range-wide Dkey can create issues in coastal and highly urbanized areas where areas we would not expect bats to be roosting (e.g., open water, downtown Detroit). These areas are considered zero forest cover and significantly reduce the overall forest cover for the cell. Consequently, the Range-wide Dkey threshold approach likely underestimates forest cover along the 3,288 miles of coastal shoreline in Michigan. As explained above, in these coastal and urban areas, we do not have concerns about less than 10 contiguous acres of tree cutting.

Based on the abundance of forested habitat outside the Indiana bat's range (i.e., northern Lower Peninsula and Upper Peninsula, where median NLCD 2021 USFS tree canopy cover by county is 52%), we believe a higher tree clearing threshold is warranted. We have been using a threshold of up to 20 contiguous acres of modeled habitat during the inactive season to screen projects outside of the Indiana bat's range/hibernacula buffers since publishing our Dkey in 2020. Over five years of implementing the Dkey and auditing over 9,500 projects, we never became concerned about a project proposing to cut up to 10 contiguous acres outside of the relevant occupancy period (when direct effects are avoided). While we could increase the cutting threshold in areas with >20% tree cover to be more consistent with the upper thresholds of the Range-wide Dkey, we decided to retain our 20-acre threshold because it has been working well in Michigan for initial project screening. We prefer to manually review projects that are larger in

scale to ensure other listed species and other Federal wildlife laws are adequately considered. We use a similar threshold approach to the Range-wide Dkey (along with other site- and habitat specific data) to further evaluate projects that cannot receive automated concurrence through the Michigan Dkey, and most are cleared without the need for further surveys or analysis on the part of the project proponent. Additionally, the Dkey clearing thresholds do not apply to forest management activities (e.g., timber harvest) that implement basic retention practices and maintain forested habitat, or projects with narrow (<1000 feet wide), linear clearing limits, as such activities are not expected to significantly reduce, degrade, or fragment available habitat and may in many cases indirectly enhance habitat. Although narrow, linear projects may clear/convert small amounts of forest, small roads/trails and rights-of-way may provide additional foraging/commuting corridors and/or increase solar exposure and microclimate suitability of potential roost trees.

Activities Covered Under the Lake States Forest Management Bat Habitat Conservation Program (Lake States HCP)

Details	Range-wide Dkey	Michigan Dkey	Difference
Actions covered by the Lake States HCP	N/A	Gives "MA Submittable" Determination	Only the Michigan Dkey covers actions covered by the Lake States HCP

Reason for Difference:
The Service has evaluated potential effects to NLEB and TCB as a result of actions covered by the Lake States HCP in an existing Section 7 consultation: *Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Habitat Conservation Plan and the issuance of associated Endangered Species Act section 10(a)(1)(B) permits (Lake States Forest Management Bat Habitat Conservation Plan)*. As such, no further consultation or coordination with the Service is needed to address potential effects to federally listed/proposed bats. Projects that use the Michigan Dkey for activities covered under the Lake States HCP and agree to implement all applicable HCP conservation measures can obtain a "MA Submittable" determination for NLEB, TCB, and Indiana bat (HCP covered species), indicating that although potential effects to these species are possible, those effects were previously evaluated under ESA Section 7.

Sustainable Forest Management Activities

Details	Range-wide Dkey	Michigan Dkey	Difference
Tree cutting/trimming as a part of continuing forest land-use	N/A	Allows users to reach an automated NLAA determination by applying less restrictive conservation measures than required for clearing/conversion	Only the Michigan Dkey explicitly covers forest management activities

Reason for Difference:
Although range-wide Sustainable Forest Management Guidance is available, forest management activities are not addressed in the Range-wide Dkey. After draft range-wide guidance and tools were published in 2024, several landowners and conservation partners in Michigan (e.g., Michigan DNR, Michigan EGLE, NPS, and NWRs) requested more explicit forest management guidance (e.g., recommended cutting/burning dates) and expressed interest in the Michigan Dkey covering sustainable forest management activities (e.g., tree cutting/trimming and/or prescribed burning as a part of continuing forest land-use). Some projects requiring Michigan EGLE permits (e.g., temporary stream crossings) are associated with timber harvest or other forest management activities, and addressing these through the Michigan Dkey greatly streamlines the permit review process.

The Service recognizes that sustainable forest management is essential for long-term conservation of bats, and most forest management activities confer long-term benefits to NLEB, TCB, and Indiana bat. In order to qualify for an automated NLAA determination, Michigan Dkey projects that include tree cutting/trimming limited to that associated with sustainable forest management must: (1) retain all snags and cavity trees and (2) restrict tree cutting to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July), if not entirely covered by the Lake States HCP through an Incidental Take Permit (ITP) or Certificate of Inclusion (see "**Activities Covered Under the Lake States Forest Management Bat Habitat Conservation Program (Lake States HCP)"** above). Retaining snags and cavity trees effectively preserves potential roost trees for Indiana bat and NLEB, and potential effects of cutting non-suitable roosts (e.g., healthy live trees) are expected to be insignificant. Consistent with the Range-wide Key, avoiding tree cutting/trimming during the non-volant pup season is expected to avoid potential adverse effects to tricolored bats and further reduce the potential for adverse effects to NLEB and Indiana bat.

Although it does not explicitly cover sustainable forest management activities, the Range-wide Dkey covers actions that include prescribed fire if (1) it is conducted outside the pup season, (2), it is conducted only when temperatures are ≥40 degrees Fahrenheit (F), and (3) average flame lengths are ≤ 8 feet in Michigan (these flame lengths are anticipated to be equivalent to conducting prescribed fire at low to medium intensity). To qualify for an automated NLAA determination, Michigan Dkey projects that include prescribed burning within 200 feet of forested habitat (both as a part of continuing forest land-use or otherwise) must apply conservation measures consistent with the Range-wide Dkey. That is, qualifying Michigan projects must: (1) restrict burning to the period of August 1 through May 31 (avoiding the nonvolant "pup season" of June through July) when temperatures are ≥40 degrees F, and (2) to the extent practicable, keep flame heights below 8 feet, if not entirely covered by the Lake States HCP. The Michigan Dkey applies a 200-foot buffer from forested habitat to clarify the distance by which smoke, heat, and gases could indirectly affect bats present in suitable summer habitat. This distance is not specified in the rangewide key; rather, the user must determine whether their project will impact suitable summer habitat. Our intention is to provide specificity and clarity with this buffer rather than leaving it open for the user's interpretation.

Removal of Listed Bats from Structures

Details	Range-wide Dkey	Michigan Dkey	Difference
Actions that include intentional removal of NLEB or TCB from a building or structure	Gives MA determination	The Michigan Dkey requires users to acknowledge that purposeful take (e.g., intentional removal) is not covered (users are not able to use the Michigan Dkey if they don't acknowledge this)	Effectively, no difference

Reason for Difference:
The act of intentional removal is covered by a qualifying question in the Michigan Dkey. Users cannot use the key if their action includes purposeful take. In addition, the Michigan Dkey provides a "may affect" (MA) determination if the action includes removal or modification of a structure known to contain roosting bats (of any species).

Bridges and Culverts

Details	Range-wide Dkey	Michigan Dkey	Difference
Considerations for bridges and culverts that may be used by roosting NLEB/TCB	Gives MA for actions that may affect a suitable bridge or suitable culvert that has not been assessed for bat use following USFWS guidelines or was assessed and found to have signs of bat use. Also gives MA for any actions that occur within 0.25-mile of a known occupied culvert	Gives MA for actions that may affect suitable bridges within the southern three Michigan county tiers; does not consider effects to culverts	Culverts are considered potentially suitable for roosting NLEB/TCB in the Range-wide Dkey but not the Michigan Dkey, where state-specific data has demonstrated that they are unlikely to be used. Additionally, the Michigan Dkey only considers bridges potentially suitable in southern Michigan, whereas the Range-wide Dkey considers their potential use throughout the state

Reason for Difference:
The Michigan Dkey considers bridges potentially suitable for roosting Indiana bats/NLEB if they are located below the third county tier of Michigan, within 1,000 feet of suitable forested habitat, and contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). Culverts were also previously considered suitable in southern Michigan if they were at least 4 feet (1.2 meters) high and 50 feet (15 meters) long (dimensions consistent with the Range-wide Dkey).

Based on available literature, consultation with bat expert Dr. Allen Kurta, and existing bridge inspection data from the Michigan Department of Transportation (MDOT), we only consider bridges potentially suitable for day-roosting listed bats within the southern three Michigan county tiers. Across the range of NLEB/TCB, several studies report only a relatively small percentage of bridges used as day roosts by any bat species. For example, about 10% of randomly selected bridges in Georgia had use by any bat species (Cleveland and Jackson 2013). Feldhamer et al. (2003) evaluated use of bridges as day roosts in southern Illinois and "derived

an estimated usage rate of about 10% of the 232 bridges surveyed" for all bat species (NLEB made up <3% of the total number of bats found using bridges). Upon randomly checking the type of bridges in Florida thought most likely to support bats, Gore and Studenroth (2005) found that 5.4% (16 out of 299) bridges were occupied by bats of any species. Of 77 bridges assessed across the southern three Michigan county tiers for transportation projects during the summer occupancy period between August 2021 and July 2024, only two were positive for bats or signs of bats, and only a single big brown bat was observed (USFWS unpublished data).

A large meta-analysis across 25 US states suggests bridge use by day-roosting bats declines rapidly north of 42 degrees north latitude (Keeley and Tuttle 1999). The southern three county tiers of Michigan roughly align with this latitude, and our approach to only considering bridge use by bats in this part of the state was supported by Michigan bat expert Dr. Allen Kurta. According to Dr. Kurta (pers. comm. 2015), temperature is important for roosting habitat, especially for reproductive females, and most bridges in Michigan probably don't warm sufficiently in summer. Around 2005, one of Dr. Kurta's graduate students assessed most bridges within two southeastern Michigan counties to evaluate bat use. Only three had signs of possible use, one of which could be verified to contain reproductive day-roosting little brown bats as well as big brown bats of unknown sex/reproductive status.

Although culverts within the southern three county tiers were previously considered potential roosts in the Michigan Dkey, we recently omitted questions relating to culverts with updates to the Dkey following the NLEB Interim Consultation Period, based on recent research conducted by MDOT in coordination with this office. During June 15- August 15, 2023, MDOT assessed 26 priority culverts in southern Michigan to assess use by bats (Grabarkiewicz 2023). Culverts were prioritized by their likelihood of use based on proximity to modeled Indiana bat/NLEB habitat, aerial review of potential suitability, and the presence of favorable characteristics, including concrete box or three-sided culverts with a rise of at least four feet and length of at least 50 feet. No bats of any species or signs of bat use were observed in any of the 26 culverts, nor has bat use of culverts been documented in Michigan by any bat species in any other report. As such, we now consider use of culverts by listed bats in Michigan to be discountable.

Hibernacula Buffers

Details	Range-wide DKey	Michigan Dkey	Difference
Protective buffer around known bat hibernacula	Uses 0.5-mile buffer	Uses 0.25-mile buffer	Michigan Dkey approach is less restrictive but still fully protective of hibernaculum conditions and suitability

Reason for Difference:
Our Michigan Dkey approach is consistent with that of the previous NLEB 4(d) Rule and Range wide Dkey, our state DNR's approach, and the Lake States Forest Management Bat HCP. John DePue (state bat coordinator) is arguably the most knowledgeable person in Michigan regarding the conditions and subterranean layout of known Michigan hibernacula (primarily abandoned mines in the western UP) and their surrounding landscapes. Mr. DePue supports the conclusion that the potential for any action to impact hibernaculum structure, microclimate, or suitability

between 0.5 and 0.25 mi of any Michigan hibernaculum entrance is discountable (pers. comm. June 2024).

Our Michigan Dkey approach is consistent with that of the previous NLEB 4(d) Rule and Range-wide Dkey, our state DNR's approach, and the Lake States Forest Management Bat HCP. John DePue (state bat coordinator) is arguably the most knowledgeable person in Michigan regarding the conditions and subterranean layout of known Michigan hibernacula (primarily abandoned mines in the western UP) and their surrounding landscapes. Mr. DePue supports the conclusion that the potential for any action to impact hibernaculum structure, microclimate, or suitability between 0.5 and 0.25 mi of any Michigan hibernaculum entrance is discountable (pers. comm. June 2024).

Water-borne Contaminant or Point Source Discharge

Details	Range-wide DKey	Michigan Dkey	Difference
Actions that involve creation of a new water-borne contaminant source, a new point source discharge from a facility other than a water treatment plant or storm water system	Gives MA	The Michigan Dkey requires users to acknowledge that they are complying with state law (users are not able to use Michigan Dkey if they don't acknowledge this)	Michigan Dkey does not explicitly ask such questions

Reason for Difference:
Actions that involve creation of a new water-borne contaminant source or a new point source discharge are regulated by state law in Michigan (state-assumed implementation of NPDES/Clean Water Act). By complying with state and Federal laws (other than ESA), effects as a result of these activities are expected to be discountable.

Noise

Details	Range-wide DKey	Michigan Dkey	Difference
Chronic or intense nighttime noise, and military training that affects NLEB/TCB habitat	Gives MA for both	None	The Michigan Dkey does not include noise-related questions

Reason for Difference:
We discount the effects of noise (we would not consider an HCP or formal consultation for road noise, trains, loud music, crowds, etc. outside of the Dkey) due to the rarity of these bats and the pervasiveness of suitable forested habitat across the species' Michigan AOIs and most of the entire state. Additionally, we consider effects of military training during Sykes Act coordination and INRMP review (therefore not needed in Dkey).

As noted above, few potential summer populations of NLEB/TCB have been documented in Michigan post-WNS, despite significant survey efforts across the state, and most of these are unconfirmed acoustic records. Although NLEB were common in Michigan pre-WNS, the statewide population has declined dramatically post-epidemic. Regular winter census data from 50 Michigan hibernacula demonstrated an overall post-WNS decline of 98.5% for hibernating NLEB (Kurta and Smith 2020), and statewide abundance was estimated at only 5,428 in the 2023 biological opinion/conference opinion on the Lake States HCP. TCB were uncommon in Michigan even before WNS, and winter data show the species has declined by at least 94% post-WNS (Kurta and Smith 2020). The 2023 Lake States BO (USFWS 2023) estimated the species' statewide abundance at only 6 individuals (note, however, that 7 TCB were counted in Tippy Dam in February 2023 and 5 in February 2024—this site appears to be resistant to the typical effects of WNS). Based on NLCD 2021 USFS Tree Canopy Cover data for the CONUS, median tree canopy cover by county in Michigan is 41% across the state and 62% across the Upper Peninsula, where northern long-eared and tricolored bats are most likely to occur; moreover, most of the forestland across Michigan [18.9 of approximately 19.3 million forested acres] is modeled as suitable for Indiana and/or northern long-eared bat.

Summary

A statewide Dkey approach allows for use of Michigan-specific data and ensures consistency with the approach taken by the Michigan Department of Natural Resources for state listed species. For the most part, our determination key mirrors the NLEB/TCB Range-wide Dkey. In a few areas, as described above, we deviate from the Range-wide Dkey based on our internal Michigan-specific analysis and local data. Our Dkey provides the same approach that our office takes for consultations outside of the Dkey, and we believe it provides the maximum flexibility and options for Michigan project proponents.

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APPENDIX I: MONARCH BUTTERFLY BEST MANAGEMENT PRACTICES

Consider monarch and other pollinators in your project planning when possible. Many pollinators are declining, including species that pollinate key agricultural crops and help maintain natural plant communities. Planting a diverse group of native plant species will help support the nutritional needs of Michigan's pollinators. We recommend a mix of flowering trees, shrubs, and herbaceous plants so that something is always blooming and pollen is available during the active periods of the pollinators, roughly early spring through fall (mid-March to mid-October). To benefit a wide variety of pollinators, choose a wide range of flowers with diverse colors, heights, structure, and flower shape. It is important to provide host plants for any known butterfly species at your site, including native milkweed for Monarch butterfly. Incorporating a water source (e.g., ephemeral pool or low area) and basking areas (rocks or bare ground) will provide additional resources for pollinators.

Many pollinators need a safe place to build their nests and overwinter. During spring and summer, leave some areas unmowed or minimize the impacts from mowing (e.g., decrease frequency, increase vegetation height). In fall, leave areas unraked and leave plant stems standing. Leave patches of bare soil for ground nesting pollinators.

Avoid or limit pesticide use. Pesticides can kill more than the target pest. Some pesticide residues can kill pollinators for several days after the pesticide is applied. Pesticides can also kill natural predators, which can lead to even worse pest problems.

Planting native wildflowers can also reduce the need to mow and water, improve bank stabilization by reducing erosion, and improve groundwater recharge and water quality.

Resources:

https://www.fws.gov/initiative/pollinators/save-monarch

https://www.fws.gov/initiative/pollinators