

ENVIRONMENTAL REPORT

FOR

MATTAWAN DEPARTMENT OF PUBLIC WORKS

**MATTAWAN WATER RESOURCE RECOVERY
FACILITY PROJECT**

VAN BUREN COUNTY, MICHIGAN

OCTOBER 2020

Prepared by Rural Community Assistance Program
through a grant from the USDA Technitrain Program.

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1. PURPOSE AND NEED OF PROJECT

1.1 Proposed Project Description

For reasons outlined in Section 1.2, the proposed project includes the construction of a wastewater treatment facility on a 1.65 acre vacant parcel and installation of approximately 2 miles of force main to connect the existing collection system to the new facility. The proposed SBR facility will include a pre-equalization basin, two SBR basins, post-equalization basin, aerobic digester, a small building for screening, and a building to house the disk filters, UV disinfection and effluent lift station. A control building, chemical building and sludge handling building will also be located adjacent to the basins.

1.2 Purpose and Need of Project

Aging infrastructure is the primary purpose for this project. The Village owns and maintains a wastewater collection system, which serves residents and businesses within the Village limits. The system was constructed in the late 1990s, and includes 7 lift stations in addition to its gravity sewer. Currently, wastewater from the Village is pumped to the City of Kalamazoo for treatment through approximately 6.6 miles of 16 inch force main, primarily located in the I-94 right of way. The force main has a number of air release valves along the route and lacks isolation valving to the service line. These valves are reaching the end of their design life and have had several recent failures. Replacement costs will be very high due to the dynamics of bypassing such large flows over such an extended distance. The high cost to service and the eventual replacement of existing force main, combined with the treatment costs from Kalamazoo, prompted the Village to investigate other alternatives.

The current state of the force main system poses a threat to public health and safety. This force main is the sole vehicle for wastewater conveyance from Mattawan to Kalamazoo, and it is only a matter of time before a failure will occur, causing a catastrophic emergency. In addition, access to the force main is difficult due to its location in the I-94 corridor. Any related construction will likely require lane closures on a major interstate freeway to protect the workers.

2. **ALTERNATIVES TO PROPOSED ACTION**

Alternative 1: No Action

This alternative would not make any improvements. This would result in potential system failures, lack of reliability and increased risk of non-compliance and equipment failures. Therefore, this option was not further considered.

Alternative 2: Replace Existing 16 inch Force Main from Mattawan to Kalamazoo

This alternative would replace approximately 6 miles of the 16 inch force main within the I-94 right-of-way. This would include replacement of all air release valves and check valves. The Village would continue to maintain its collection system and contract with the City of Kalamazoo for wastewater treatment. Issues with this alternative include access to the force main. Access gates along I-94 are no longer allowed due to safety issues, so it must now be accessed from the expressway. Total construction costs are nearly \$21 million for this alternative, plus nearly \$900,000 in O&M costs.

Alternative 3: Sequential Batch Reactor (SBR) Treatment Facility

This alternative proposes the construction of a SBR facility on Village-owned property, which will achieve the required levels of treatment before discharge to Hayden Creek. In this scenario, incoming wastewater is screened, conveyed to a pre-equalization basin, then fed to one of two SBR basins for BOD reduction and nitrification/denitrification of wastewater. Effluent is discharged to a post-equalization basin and then passed through tertiary treatment and through a UV disinfection system. Solids are pumped from the SBR basins to a common-walled aerobic digester. Digested solids are dewatered on site and transferred to a dumpster for disposal in a landfill. Total construction costs are approximately \$15.5 million, with \$455,000 annual O&M costs.

Alternative 4: Sequox BNR

This alternative proposes a Sequox BNR (Sequential Oxidation Biological Nutrient Removal) facility. This a flow-through facility with two parallel treatment trains. The wastewater flows by gravity from one tank to the next via weirs. The requisite concrete tankage can be either precast and shipped to the site and/or cast in place by the contractor. Incoming wastewater is conveyed to a Bio-P Fermentation Tank and aerated. From there, it enters the Bio-P Selector Tank, where it's mixed with submersible mixers. Wastewater is then separated and flows into the two 1st Stage Aeration Basins, which are sequentially aerated. It is then passed over a weir into the 2nd Stage Aeration Basin, and then to the 3rd Stage Aeration Basin. Finally, the wastewater flows from the aeration basins to the Clarifier Tank, where solids are allowed time to settle and then are dewatered and disposed at a landfill. Estimated costs for this alternative are approximately \$16.5 million in construction and \$466,000 annual O&M.

Alternative 5: Moving Bed Biofilm Reactor (MBBR) and Dissolved Air Flotation (DAF) System

This alternative proposes the following processes and technologies as a means to achieve the required levels of treatment before discharge. Incoming wastewater is passed through a fine screen, and then conveyed to a 4-stage MBBR for BOD reduction and nitrification/denitrification of wastewater. A Dissolved Air Flotation (DAF) clarifier will follow the MBBR to achieve solids separation. Solids handling equipment and solids storage equipment will be constructed onsite to handle the solids waste stream from the DAF and MBBR. Tertiary treatment will be required to obtain required discharge limits. Final treatment will be done by disk filters and UV disinfection. Cost estimates for this alternative are approximately \$19 million for construction and \$455,000 in annual O&M.

Recommended Alternative

Alternative 3, SBR facility, is the recommended alternative. Force main will be installed from Lift Station #1 to re-route the wastewater to the proposed treatment site. Force main will also be installed from the treatment facility to the proposed outfall location on Hayden Creek. This is the most viable alternative due to costs, operations, and land requirements.

All of the proposed construction will be done within the existing limits of the publicly-owned WWTP site as identified on the maps in Section 6. Disturbed areas will be restored with topsoil, grass, sidewalks, curbing, roadway, etc., to return the area to its original state.

3. AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

3.1 Land Use/Important Farmland/Formally Classified Lands

3.1.1 Affected Environment

The Village of Mattawan is located within Antwerp Township in Van Buren County. It is located on I-94, roughly 5 miles east of Michigan highway M-40 and 9 miles west of US Highway 131.

The Mattawan wastewater system serves approximately 563 residential, 64 commercial users and one large industrial user. It is approximately 18 miles south of Grand Rapids and 28 miles north of Kalamazoo on the US 131 corridor. According to the zoning map, residential and commercial development dominates the existing land use in and around the WWTP. The land on which the WWTP is proposed is vacant and owned by the Village.

Based upon review of the soils map, the soil type identified in the WWTP project area is Coloma loamy sand, 0-6% slope. This is not classified as a prime farmland and, therefore, the proposed project will not affect prime or unique farmland.

All lands in the project area have been converted to non-farm use, and there are no prime rangelands or forestlands in the project area. All areas of ground disturbing activities for this project will occur on publicly-owned property and road rights-of-way.

A soils map and classifications are included in Section 6 of this report.

3.1.2 Environmental Consequences

The proposed project area for the existing WWTP is entirely on publicly-owned, property that is not classified as prime rangeland, forestland or farmland. Force main locations are in road rights-of-way that are already pre-disturbed. No environmental consequences are anticipated as a direct result of this project.

3.1.3 Mitigation

No mitigation measures are necessary with regard to prime and important soils and farmland preservation as no direct impact is anticipated in association with the proposed improvements project.

3.2 Floodplains

3.2.1 Affected Environment

All areas of the proposed project for construction will be constructed within publicly-owned property and road rights-of-way. According to the web soil survey, the majority of the project area is Coloma loamy sand, which has a high capacity to transmit water, has no frequency of flooding or ponding. The attached excerpts from FEMA floodplain maps 26159C0250C and 26159C0375C (Section 6) indicate there are no floodplains in the project area. Therefore, no adverse impacts to the floodplain are anticipated.

3.2.2 Environmental Consequences

All areas of the proposed project for construction will be constructed within publicly-owned property and road rights-of-way. As such, no environmental consequences are anticipated as a direct result of this project. However, any necessary permits will be obtained prior to construction.

3.2.3 Mitigation

Disturbed areas will be restored with topsoil, grass, etc., to return the area to its original state and land contours. No mitigation measures are anticipated with regards to floodplains as the project will be constructed in publicly-owned property and road rights-of-way where it does not appear a floodplain exists. However, any construction will be in accordance with Michigan DEQ standards and permitted as required.

3.3 Wetlands

3.3.1 Affected Environment

Based upon review of the soils map (Section 6), it appears that there are no hydric or alluvial soils in the project area.

According to the attached Wetlands Inventory Map in Section 6, it appears there are wetland properties in the area of Hayden Creek for the proposed discharge outfall. However, no wetlands will be disturbed as result of this project, and the anticipated discharge criteria will be protective of the creek's water quality. The permitting process through the Michigan Department of Environment, Great Lakes and Energy (EGLE) will ensure that any impacts are permitted and done in accordance with Michigan EGLE's wetland regulation.

3.3.2 Environmental Consequences

As construction will take place in publicly-owned property and road rights-of-way, no long term environmental consequences to wetlands are anticipated in association with the proposed improvement project.

3.3.3 Mitigation

No mitigation measures are necessary as no direct impact is anticipated as a result of this project. However, all required permits will be obtained and followed.

3.4 Cultural Resources

3.4.1 Affected Environment

An archaeological records check and Phase 1A archaeological reconnaissance review was conducted by RESCOM Environmental Corp. in July 2020. (Section 6) The result of this was the conclusion that there were no historical or archaeological sites in the project area. A Section 106 review request was submitted to the Michigan State Historical Preservation Office, who concurred with that finding. Therefore, there are no cultural resources in the project area and “no historic properties are affected” as per correspondence from the Michigan State Historic Preservation Office (Section 5). Furthermore, USDA has concluded in their tribal consultation that no historic properties will be affected.

3.4.2 Environmental Consequences

No environmental consequences are anticipated in association with this proposed project as no known cultural resources will be impacted by it. The State Historic Preservation Officer (SHPO) was provided an opportunity to review the project and has provided clearance for it to proceed, indicating that no historic properties are affected within the areas of potential effect of this undertaking. USDA has also conducted the THPO review and has made a finding of no effect.

3.4.3 Mitigation

No mitigation measures are necessary with regard to cultural resources as no impact to any known cultural resource is anticipated in relation to this project.

3.5 Biological Resources

3.5.1 Affected Environment

The proposed project will be constructed within publicly owned property, easements and existing road rights-of-way. An IPaC review was conducted, the report from which is attached (Section 5). It identified several known endangered, proposed endangered and candidate species that exist within Van Buren County. These include the endangered species of the Indiana bat, the Piping Plover and the Mitchell’s Satyr Butterfly; the threatened species of the Northern long-eared bat, Rufa red knot, Eastern massasauga snake and Pitcher’s

thistle. The report also indicated that there are no critical habitats, refuge lands or fish hatcheries within the project area under USFWS's jurisdiction.

During the winter, Indiana bats hibernate in caves, mines, or similar structures in the winter, with most major hibernacula for the species found in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia. Michigan is home to a single known Indiana bat hibernaculum, in Manistee County, well outside the project area. There is no designated critical habitat for the species in Michigan. Summer habitat consists of a wide variety of forested/wooded habitats 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. The project area for the WWTP is vacant, but will require some tree clearing, which will only take place before May or after October. General design guidelines as outlined by USFWS will be followed. Therefore, the project will not impact this species.

The Piping Plover is a small shorebird that nests in the 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. This project is far from the shores of the Great Lakes and, therefore, will not affect the Piping Plover.

The Mitchell's Satyr Butterfly that is found in prairie fen habitat. The project area is vacant property and road rights-of-way and does not exhibit any features similar to the habitat of the Mitchell's Satyr Butterfly. Therefore, the project will not impact this species.

The Northern long-eared bat hibernates in caves and mines, swarming in surrounded wooded areas in autumn. They roost and forage in upland forests in spring and summer. The project area for the WWTP is vacant, but will require some tree clearing, which will only take place before May or after October. General design guidelines as outlined by USFWS will be followed. Therefore, the project will not impact this species.

The Rufa red knot is a shoreline bird with one of the longest migration distances of any animal. Restrictions are only during its migratory pattern of May 1 through September 30. However, this project is not located on the Great Lakes shoreline and will, therefore, not affect the red knot.

Pitcher's thistle is a native thistle that grows on the beaches and grassland dunes along the shorelines of Lakes Michigan, Superior, and Huron. The project is not near the Lake Michigan shoreline and, therefore, will not affect the plant.

The Eastern massasauga rattle snakes live in wet areas including wet prairies, marshes and low areas along rivers and lakes. They usually hibernate below the

frost line in crayfish or small mammal burrows, in or along the edge of wetlands or in adjacent upland areas with high water tables. As described in section 3.2.1, the majority of the project area is Coloma loamy sand, which has a high capacity to transmit water, and has no frequency of flooding or ponding. There are also no hydric soils in the project area. The only wetlands that appear in the project area are at the location of the proposed discharge point to Hayden Creek. Although it is believed that the project does not exhibit habit for the Massasauga, it is recognized that the use of wildlife-safe materials for erosion control and site restoration will be used, such as eliminating plastic mesh netting or similar materials. There will be no conversion of wetlands in the project area. Best management practices as identified in the attached general project guidelines will be followed.

The attached report also identified number of migratory birds that can potentially be found within a 10 kilometer radius. However, the report also shows a very limited probability of presence of any of these birds. The project will take place on publicly-owned property and in road rights-of-way. As such, the project is not habitat conducive to these birds nor will it affect any of these species.

3.5.2 Environmental Consequences

No environmental consequences are anticipated in association with this proposed project as no known species will be impacted by it. However, best management practices identified in the attached project design guidelines will be followed.

3.5.3 Mitigation

No mitigation is required as endangered and threatened species will not be affected by the project.

3.6 Water Quality Issues

3.6.1 Affected Environment

This project involves the construction of a new WWTP and force main installation. All construction will adhere to effluent guidelines as outlined in the National Pollutant Discharge Elimination System (NPDES) Permit issued by the Michigan EGLE. The project will address an existing threat to public health and safety by abandoning the current aging force main.

There are no sole source aquifers in the project area.

An initial review of the MDEQ underground storage tank database indicates no leaking storage tanks in the project area.

3.6.2 Environmental Consequences

This project has a potential water quality benefit by eliminating potential failures from aging infrastructure.

This project should not have any negative impact on the general surface or ground water quality in the area as a result of the proposed actions. No environmental consequences are anticipated as a result of this project.

3.6.3 Mitigation

No mitigation measures are necessary with regard to water quality as no negative impacts are anticipated to result from the proposed project. All NPDES requirements will be followed.

3.7 Coastal Resources

3.7.1 Affected Environment

There are no coastal management zones in the project area, which is approximately 30 miles east of Lake Michigan.

3.7.2 Environmental Consequences

No environmental consequences are anticipated as there are no coastal management zones.

3.7.3 Mitigation

No mitigation measures are necessary because there are no coastal resource impacts anticipated to result from this project.

3.8 Socio-Economic/Environmental Justice Issues

3.8.1 Affected Environment

The Mattawan wastewater system serves residents and businesses in the Village of Mattawan. The US Census estimates a population of 1,997, and a Median Household Income of \$43,643.

All customers of the system are charged flat rate plus a commodity rate per 1,000 gallons. The planned improvements of this project will benefit all residents within the district equally. The cost of the project will be distributed across all users. No segment of the population will be treated differently than any other, and discrimination is prohibited. The proposed project will be kept as affordable

as possible for this community by maximizing grant funds and/or low interest loans for the project.

3.8.2 Environmental Consequences

No environmental consequences are anticipated with regard to socio- economic/ environmental justice issues relating to this project. All residents and users of the system will be treated equally and all will share equally in the benefits and cost of the improvements proposed.

3.8.3 Mitigation

No mitigation measures are necessary as no socio-economic/environmental justice impacts are anticipated in relation to this project.

3.9 Miscellaneous Issues

3.9.1 Air Quality

3.9.1.1 Affected Environment

The proposed project is limited to the property identified on the attached maps. There are no air quality issues associated with this project.

3.9.1.2 Environmental Consequences

During construction, there will be short term air quality impacts from fugitive dust as is common with any construction project; however, these impacts will be mitigated through the use of best management practices during construction, such as dampening of the soil to limit dust and use of diesel powered equipment that will be fueled with low sulfur diesel oil. Additionally, contractors will be encouraged to limit idling time during the operation of heavy equipment to reduce air quality impacts from exhaust.

3.9.1.3 Mitigation

No mitigation measures are necessary with regard to impacts to air quality as there will be no long lasting impacts to the air quality in the area resulting from this project.

3.9.2 Transportation

3.9.2.1 Affected Environment

The Village of Mattawan is located within Antwerp Township in Van Buren County. It is located north of I-94, the primary east-west route; roughly 5 miles east of Michigan highway M-40; and 9 miles west of US Highway 131, both north-south routes.

located approximately 2 ½ miles west of the project site. The primary east-west route closest to the project is Red Arrow Highway. Local transportation is conducted through local streets and roads. Local transportation may be temporarily affected during construction in the road rights-of-way, but that will be temporary in nature.

3.9.2.2 Environmental Consequences

The project may have a temporary effect on local transportation due to construction equipment using these roads to gain access to the construction site, although not expected to disrupt normal traffic flow. This project is not anticipated to have any lasting impacts on transportation patterns. Although not anticipated, if street closures or detours are necessary, these will be coordinated with the Michigan Department of Transportation, the local street department and/or the Van Buren County Road Commission. These should be highly publicized and well-marked, if necessary, during construction.

3.9.2.3 Mitigation

No mitigation measures are necessary in relation to the proposed project with regard to transportation, as no long term impacts are anticipated.

3.9.3 Noise

3.9.3.1 Affected Environment

The proposed project is limited to the site of the proposed WWTP and the road rights-of-way. Any noise generated from this project will be limited to the construction and will be temporary in nature, occurring only during regular business hours.

3.9.3.2 Environmental Consequences

No new sound generating equipment is anticipated in the proposed project. However, during construction, noise levels will increase due to the construction activities and heavy equipment use. The use of best management practices should limit the unnecessary noise from construction by limiting idling time of heavy equipment, and unnecessary noise from construction workers during construction. Construction will be limited to normal daylight hours as well, which will limit the disruption of the normal quiet nature of the community.

3.9.3.3 Mitigation

No mitigation measures are necessary in association with noise control related to this project as no long term impacts are anticipated.

3.9.4 Solid Waste Disposal

3.9.4.1 Affected Environment

Solid waste disposal will not be impacted by this project. During construction, construction crews should be responsible for the clean-up of debris on a daily basis, as well as at the end of the construction during the clean-up and restoration phases. There are no new permanent sources of solid waste materials associated with this project.

3.9.4.2 Environmental Consequences

No environmental consequences are anticipated as a result of this project. Solid waste generated by the project will be managed in an appropriate manner as required in the construction agreements. The general contractor will be responsible for adequate and appropriate disposal of all wastes generated during construction. No long term impact on solid waste are anticipated, other than those that will be subject to permitting processes currently in place locally or statewide.

3.9.4.3 Mitigation

No mitigation measures are necessary as no impacts are anticipated to result from the proposed project.

4. **SUMMARY OF MITIGATION**

No mitigation measures are necessary in relation to this project as no long-term, negative impacts are anticipated to result from the proposed actions. All necessary permits will be obtained prior to construction. Best management practices to avoid potential negative environmental consequences include:

Construction

1. Construction specifications and other contract provisions will require:
 - a. control of necessary noise;
 - b. dust control;
 - c. temporary siltation control, including minimizing disturbed areas and using prompt temporary seeding when needed, and the use of straw bale barriers and silt fences where required;
 - d. restoration of disturbed areas to preconstruction conditions.
2. Construction techniques and mitigation measures specific in any necessary permits must be followed.
3. The following permits will be required and obtained prior to construction:
 - a. EGLE NPDES Permit
 - b. EGLE Part 41 Permit for Wastewater Construction
 - c. Soil Erosion and Sedimentation Control Permit from Van Buren County Drain Commission
 - d. Right-of-Way Construction Permit from Van Buren County

Floodplains

1. Disturbed areas will be restored with topsoil, grass, etc., to return the area to its original state and land contours. No mitigation measures are required with regards to floodplains as there are no floodplains in the project areas.

Wetlands

1. The only apparent wetlands are in the area of the proposed outfall at Hayden Creek. No impact to the wetlands is anticipated and all permits will be obtained and adhered to.

Biological Resources

Although no mitigation is required as endangered and threatened species will not be affected by the project, best management practices as identified in the attached project design guidelines (Section 6) will be followed.

5. CORRESPONDENCE

5.1 State Historic Preservation Response and THPO Review

5.2 IPaC Species Review/Report



GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
MICHIGAN STRATEGIC FUND
STATE HISTORIC PRESERVATION OFFICE

MARK A. BURTON
PRESIDENT

October 6, 2020

ANDREW GRANSKOG
ENVIRONMENTAL COORDINATOR
USDA RURAL DEVELOPMENT OFFICE
3001 COOLIDGE ROAD SUITE 200
EAST LANSING MI 48823

RE: ER20-1024 Mattawan 2020 Wastewater Improvement Project, Sec. 2 & 3, T3S, R13W, Sec. 34 & 35,
T2S, R13W, Mattawan, Van Buren County (USDA/RD)

Dear Mr. Granskog:

Under the authority of Section 106 of the National Historic Preservation Act of 1966, as amended, we have reviewed the above-cited undertaking at the location noted above. Based on the information provided for our review, the State Historic Preservation Officer (SHPO) concurs with the determination of the USDA/RD that **no historic properties are affected** within the area of potential effects of this undertaking.

This letter evidences the USDA/RD's compliance with 36 CFR § 800.4 "Identification of historic properties," and the fulfillment of the USDA/RD's responsibility to notify the SHPO, as a consulting party in the Section 106 process, under 36 CFR § 800.4(d)(1) "No historic properties affected." **If the scope of work changes in any way, or if artifacts or bones are discovered, please notify this office immediately.**

We remind you that federal agency officials or their delegated authorities are required to involve the public in a manner that reflects the nature and complexity of the undertaking and its effects on historic properties per 36 CFR § 800.2(d). The National Historic Preservation Act also requires that federal agencies consult with any Indian tribe and/or Tribal Historic Preservation Officer (THPO) that attach religious and cultural significance to historic properties that may be affected by the agency's undertakings per 36 CFR § 800.2(c)(2)(ii).

The State Historic Preservation Office is not the office of record for this undertaking. You are therefore asked to maintain a copy of this letter with your environmental review record for this undertaking.

If you have any questions, please contact Brian Grennell, Cultural Resource Management Coordinator, at 517-335-2721 or by email at GrennellB@michigan.gov. **Please reference our project number in all communication with this office regarding this undertaking.** Thank you for this opportunity to review and comment, and for your cooperation.

Sincerely,

Brian G. Grennell
Cultural Resource Management Coordinator

for Brian D. Conway
State Historic Preservation Officer

SAT:BGG





October 6, 2020

SUBJECT: SHPO ER20-1024 Mattawan 2020 Wastewater Improvement Project, Sec. 2 & 3, T3S. R13W.Sec. 34 & 35, T2S, R13W, Mattawan, Van Buren County (USDA/RD)
Section 106 Historic Review & Tribal Coordination

TO: Kelli Mosteller, Citizen Potawatomi Nation
Rhonda Hayworth, Ottawa Tribe of Oklahoma
Earl Meshigaud & Kenneth Meshigaud, Hannahville Indian Community
Kade Ferris & Darrel Seki, Red Lake Band of Chippewa Indians
Jonnie Sam, Little River Band of Ottawa Indians
Sarah Jones, Saginaw Chippewa Indian Tribe
Paula Carrick, Bay Mills Indian Community
Gary F. Loonsfoot, Keweenaw Bay Indian Community
Aron Payment, Sault Ste. Marie Tribe of Chippewa Indians
Alvin Pedwaydon & Derek Bailey, Grand Traverse Band of Ottawa/Chippewa Indians
Melissa Wiatrolic, Little Traverse Bay Bands of Ottawa Indians
Sharon Detz, Grand River Band of Ottawa Indians
Dan Green & Homer Mandoka, Nottawaseppi Huron Band of Potawatomi
Matthew Bussler, Pokagon Band of Potawatomi Indians
Jill Hoppe, Fond du Lac Band Reservation
Amy Burnette, Leech Lake Band of Chippewa
Edith Leoso, Bad River Band of Lake Superior Chippewa
Rosemary Berens, Bois Forte Band of Chippewa
Harold Frank, Forest County Potawatomi
Norman DesChamps & Maryann Gagnon, Grant Portage Band of the Minnesota Chippewa Tribe
William Quackerbush, Ho-Chunk Nation of Wisconsin
Louis Taylor, Lac Courte Oreilles Band of Lak Superior Chippewa Indians of Wisconsin
Melinda Young, Lac Du Flambeau Band of Lake Superior Chippewa
Edmond Pigeon, Match-e-be-nash-she-wish Band of Potawatomi Indians
Dan Shepherd, Little River Band of Ottawa Indians
Liana Onnen, Prairie Band of Potawatomi Nation
Ronald Johnson, Prairie Island Indian Community
Paul Barton, Seneca-Cayuga Nation
Larry Balber, Red Cliff Band
Chris McGeshick, Sokaogon Chippewa (Mole Lake) Community of Wisconsin
Wanda McFaggen, St. Croix Chippewa Indians of Wisconsin
Cayla Olson, White Earth Band of the Minnesota Chippewa Tribe
Diane Hunter, Miami Tribe of Oklahoma
Natalie Weyaus, Mille Lacs Band of Ojibwe
David Grignon, Menominee Indian Tribe of Wisconsin
Larry Heady, Delaware Tribe of Indians

Under the authority of Section 106 of the National Historic Preservation Act of 1966, as amended, the State Historic Preservation Office (SHPO) has reviewed the above-mentioned project and concluded that:

- No historic properties are affected by the project (36 CFR § 800.4 (d) (1)), or
 The project will have no adverse effect on historic properties (36 CFR § 800.5)

Part of the SHPO review of this project included a review by the Office of the State Archaeologist (OSA). The OSA review process includes looking at the presence and/or proximity of known archaeological sites near to and within the project area. To do this, they consider a variety of information, including the distribution of archaeological sites in the surrounding region, the amount of previous archaeological surveys in the vicinity and the results of that survey work, topography, surface water, soil types, the presence of old transportation features such as railroad grades and road beds, as well as other factors which may inform on the potential presence or absence of archaeological sites.

As a standard requirement of all USDA Rural Development contracts, in the event that historic or archaeological resources are uncovered during excavation, the project engineer and USDA Rural Development will be immediately notified. Construction shall

3001 Coolidge Road • Suite 200 • East Lansing, MI 48823
Phone: (517) 324-5156 • Fax: (855) 813-7741 • TDD: (800) 649-3777 • Web: <http://www.rurdev.usda.gov/mi>

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To file a complaint of discrimination write USDA, Director, Office of Civil Rights
1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD).



United States Department of Agriculture

be temporarily halted pending the notification process and further directions issued by USDA Rural Development after coordination with the SHPO and interested tribes.

Based on the SHPO review and opinion, USDA Rural Development is issuing a finding as noted above for the above-mentioned project. If you have site specific information that causes your tribe to disagree with this opinion, please contact our office at (517) 324-5209 within thirty days.

Sincerely,

Andrew H. Granskog, PE
State Environmental Coordinator

cc: USDA-RD Area Office; Martha MacFarlane-Faes--SHPO Environmental Review Coordinator



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443

<http://www.fws.gov/midwest/endangered/section7/s7process/step1.html>

In Reply Refer To:

October 09, 2020

Consultation Code: 03E16000-2021-SLI-0038

Event Code: 03E16000-2021-E-00126

Project Name: Mattawan WW

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The attached species list identifies any federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are several important steps in evaluating the effects of a project on listed species. Please use the species list provided and visit the U.S. Fish and Wildlife Service's Region 3 Section 7 Technical Assistance website at <http://www.fws.gov/midwest/endangered/section7/s7process/index.html>. This website contains step-by-step instructions to help you determine if your project may affect listed species and lead you through the section 7 consultation process.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the ECOS-IPaC website (<http://ecos.fws.gov/ipac/>) at regular intervals during project planning and implementation and completing the same process you used to receive the attached list.

For all **wind energy projects** and **projects that include installing towers that use guy wires or are over 200 feet in height**, please contact this field office directly for assistance, even if no federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Please see the “Migratory Birds” section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibitions include the take and disturbance of eagles. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at <https://www.fws.gov/midwest/eagle/permits/index.html> to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit <https://www.fws.gov/birds/policies-and-regulations/administrative-orders/executive-orders.php>.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
 - USFWS National Wildlife Refuges and Fish Hatcheries
 - Migratory Birds
 - Wetlands
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office

2651 Coolidge Road Suite 101

East Lansing, MI 48823-6360

(517) 351-2555

Project Summary

Consultation Code: 03E16000-2021-SLI-0038

Event Code: 03E16000-2021-E-00126

Project Name: Mattawan WW

Project Type: WASTEWATER FACILITY

Project Description: construction of a wastewater plant and forcemain installation

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/42.23274213343752N85.79573549323183W>



Counties: Van Buren, MI

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ecos.fws.gov/ipac/guideline/design/population/1/office/31410.pdf	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045 General project design guidelines: https://ecos.fws.gov/ipac/guideline/design/population/10043/office/31410.pdf	Threatened

Birds

NAME	STATUS
<p>Piping Plover <i>Charadrius melodus</i></p> <p>Population: [Great Lakes watershed DPS] - Great Lakes, watershed in States of IL, IN, MI, MN, NY, OH, PA, and WI and Canada (Ont.)</p> <p>There is final critical habitat for this species. Your location is outside the critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/6039</p>	Endangered
<p>Red Knot <i>Calidris canutus rufa</i></p> <p>No critical habitat has been designated for this species.</p> <p>This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30. <p>Species profile: https://ecos.fws.gov/ecp/species/1864</p>	Threatened

Reptiles

NAME	STATUS
<p>Eastern Massasauga (=rattlesnake) <i>Sistrurus catenatus</i></p> <p>No critical habitat has been designated for this species.</p> <p>This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> All Projects: Project is Within EMR Range <p>Species profile: https://ecos.fws.gov/ecp/species/2202</p> <p>General project design guidelines: https://ecos.fws.gov/ipac/guideline/design/population/7800/office/31410.pdf</p>	Threatened

Insects

NAME	STATUS
<p>Mitchell's Satyr Butterfly <i>Neonympha mitchellii mitchellii</i></p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/8062</p>	Endangered

Flowering Plants

NAME	STATUS
<p>Pitcher's Thistle <i>Cirsium pitcheri</i></p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/8153</p>	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

-
1. The [Migratory Birds Treaty Act](#) of 1918.
 2. The [Bald and Golden Eagle Protection Act](#) of 1940.
 3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
<p>Bald Eagle <i>Haliaeetus leucocephalus</i></p> <p>This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.</p> <p>https://ecos.fws.gov/ecp/species/1626</p>	Breeds Dec 1 to Aug 31
<p>Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i></p> <p>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p> <p>https://ecos.fws.gov/ecp/species/9399</p>	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

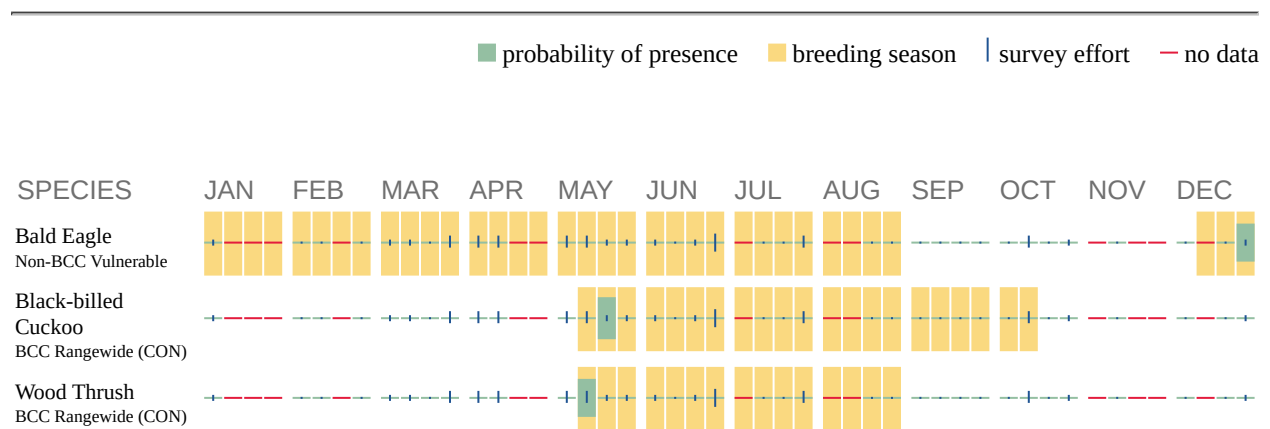
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding

in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In

contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360

Phone: (517) 351-2555 Fax: (517) 351-1443

<http://www.fws.gov/midwest/endangered/section7/s7process/step1.html>

In Reply Refer To:

October 09, 2020

Consultation Code: 03E16000-2021-TA-0038

Event Code: 03E16000-2021-E-00127

Project Name: Mattawan WW

Subject: Verification letter for the 'Mattawan WW' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Lisa Fought:

The U.S. Fish and Wildlife Service (Service) received on October 09, 2020 your effects determination for the 'Mattawan WW' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"^[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Eastern Massasauga (=rattlesnake), *Sistrurus catenatus* (Threatened)
- Indiana Bat, *Myotis sodalis* (Endangered)
- Mitchell's Satyr Butterfly, *Neonympha mitchellii mitchellii* (Endangered)
- Piping Plover, *Charadrius melodus* (Endangered)
- Pitcher's Thistle, *Cirsium pitcheri* (Threatened)
- Red Knot, *Calidris canutus rufa* (Threatened)

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Mattawan WW

2. Description

The following description was provided for the project 'Mattawan WW':

construction of a wastewater plant and forcemain installation

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/42.23274213343752N85.79573549323183W>

**Determination Key Result**

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

No

3. Will your activity purposefully **Take** northern long-eared bats?

No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

Automatically answered

No

5. [Semantic] Is the project action area located within 0.25 miles of a known northern long-eared bat hibernaculum?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency

Automatically answered

No

6. [Semantic] Is the project action area located within 150 feet of a known occupied northern long-eared bat maternity roost tree?

Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency

Automatically answered

No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

1.5

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?
0

6. EXHIBITS/MAPS

6.1 SHPO 106 Review Request

6.1.1 Archaeological Report including aerial, topo maps and photos

6.2 Floodplain Maps 26159C0250C and 26159C0375C

6.3 Wetlands Map

6.4 Soils Report

6.5 Zoning Map

6.6 Project Design Guidelines for Indiana Bat, Northern Long-Eared Bat and Eastern Massasauga

STATE HISTORIC PRESERVATION OFFICE Application for Section 106 Review

SHPO Use Only					
<input type="checkbox"/>	IN	Received Date	___ / ___ / ___	Log In Date	___ / ___ / ___
<input type="checkbox"/>	OUT	Response Date	___ / ___ / ___	Log Out Date	___ / ___ / ___
		Sent Date	___ / ___ / ___		

Submit one copy for each project for which review is requested. This application is required. Please type. Applications must be complete for review to begin. Incomplete applications will be sent back to the applicant without comment. Send only the information and attachments requested on this application. Materials submitted for review cannot be returned. Due to limited resources we are unable to accept this application electronically.

I. GENERAL INFORMATION

THIS IS A NEW SUBMITTAL THIS IS MORE INFORMATION RELATING TO ER#

- a. Project Name: Mattawan Wastewater Improvements Project
- b. Project Address (if available): Mattawan, MI
- c. Municipal Unit: Mattawan County: Van Buren
- d. Federal Agency, Contact Name and Mailing Address (If you do not know the federal agency involved in your project please contact the party requiring you to apply for Section 106 review, not the SHPO, for this information.): Andy Grankskog, PE, USDA-Rural Development, 3001 Coolidge Road, Ste. 200, East Lansing, MI 48823
- e. State Agency (if applicable), Contact Name and Mailing Address:
- f. Consultant or Applicant Contact Information (if applicable) including mailing address: Eric Sanchez, RESCOM Environmental, PO Box 361, Petoskey, MI 49770

II. GROUND DISTURBING ACTIVITY (INCLUDING EXCAVATION, GRADING, TREE REMOVALS, UTILITY INSTALLATION, ETC.)

DOES THIS PROJECT INVOLVE GROUND-DISTURBING ACTIVITY? YES NO (If no, proceed to section III.)

Precise project location map (preferably USGS 7.5 min Quad with quad name, date, and location) with previously recorded archaeological sites visible (this site information is available to qualified archaeologists at the SHPO Office) Portions, photocopies of portions, and electronic USGS maps are acceptable as long as the location is clearly marked.

- a. USGS Quad Map Name: Lawton MI USGS 7.5' quadrangle, Sections 2 & 3, T3S, R13W; Gobles East USGS 7.5' USGS Quadrangle, Sections 34 & 35, T2S, R13W
- b. Township: Range: Section:
- c. Site plan showing limits of proposed excavation. Description of width, length and depth of proposed ground disturbing activity: The layout of an SBR facility will include many common walled tanks, which provide an efficient footprint. The pre-equalization basin will be 68 feet x 46 feet. The two SBR basins will also require a footprint of 68 feet x 46 feet each, and the post-equalization basin will require 46 feet x 30 feet. A 53 feet x 53 feet aerobic digester will share a common wall with the basins. A small building for screening will be required adjacent to the pre-equalization basin, and a building housing the disk filters, UV disinfection, and effluent lift station will be located near the post-equalization basin. A control building, chemical building, and sludge handling building will also be located adjacent to the basins. When possible, the buildings will share common walls with the basins to decrease the cost of construction as well as to decrease the overall plant footprint. Trenches for forcemain will be typically be 8'-15' feet deep x 15'-25' wide
- e. Previous land use and disturbances: site of treatment facility is vacant; areas of forcemain are existing roads and rights-of-way
- f. Current land use and conditions: Site of treatment facility is vacant; areas of forcemain are existing roads and rights-of-way
- g. Did you check the State Archaeological Site Files located at the SHPO? YES NO

III. PROJECT WORK DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)

Note: Every project has an APE.

- a. Provide a detailed written description of the project (plans, specifications, Environmental Impact Statements (EIS), Environmental Assessments (EA), etc. **cannot** be substituted for the written description): The project area consists of a 1.65-acre wooded parcel for the proposed WRRF and 2.15-miles of forcemain sewer installations connecting to the discharge piping from an existing lift station continuing north on the west right-of-way of 25th Street, south right-of-way of Red Arrow Highway, and west right-of-way Co Rd 652 crossing to the east right-of-way under Orchard Dr and back west north of Trestle Creek Ave terminating in an outfall at Hayden Creek; approximately 5.65-acres in total (Figures 4 & 5 of the attached archaeological report).
- b. Provide a localized map indicating the location of the project; road names must be included and legible.
- c. On the above-mentioned map, identify the APE.
- d. Provide a written description of the APE (physical, visual, auditory, and sociocultural), the steps taken to identify the APE, and the justification for the boundaries chosen. The APE is the area identified for location of the proposed treatment facility and the locations in which forcemain will be installed.

IV. IDENTIFICATION OF HISTORIC PROPERTIES

- a. List and date all properties 50 years of age or older located in the APE. **The Section 106 Above-Ground Resources inventory form is the preferred format for providing this information and a completed form should be included as an attachment to this application.** If the property is located within a National Register eligible, listed or local district it is only necessary to identify the district:
 - b. Describe the steps taken to identify whether or not any **historic** properties exist in the APE and include the level of effort made to carry out such steps: An archaeological records check conducted by the Michigan SHPO on behalf of RESCOM shows no archeological resources within the project footprint. Fieldwork was conducted on June 24, 2020 by RESCOM personnel.
 - c. Based on the information contained in "b", please choose one:
 Historic Properties Present in the APE
 No Historic Properties Present in the APE
 - d. Describe the condition, previous disturbance to, and history of any historic properties located in the APE:
-

V. PHOTOGRAPHS

Note: All photographs must be keyed to a localized map.

- a. Provide photographs of the site itself.
 - b. Provide photographs of all properties 50 years of age or older located in the APE (faxed or photocopied photographs are not acceptable).
-

VI. DETERMINATION OF EFFECT

**Note: you must provide a statement explaining/justifying your determination.
Include statement as an attachment if necessary.**

- No historic properties affected based on [36 CFR § 800.4(d)(1)], **please provide the basis for this determination.**
- No Adverse Effect [36 CFR § 800.5(b)] on historic properties, **explain why the criteria of adverse effect, 36 CFR Part 800.5(a)(1), were found not applicable.**
- Adverse Effect [36 CFR § 800.5(d)(2)] on historic properties, **explain why the criteria of adverse effect, [36 CFR Part 800.5(a)(1)], were found applicable.**

***Please print and mail completed form and required information to:
State Historic Preservation Office, Cultural Resources Management Section
Michigan Economic Development Corporation
300 North Washington Square, Lansing, MI 48913***



**ARCHAEOLOGICAL RECORDS CHECK & PHASE IA ARCHAEOLOGICAL
RECONNAISSANCE FOR PROPOSED WATER RESOURCES RECOVERY
FACILITY AND APPROXIMATELY 2.15-MILES OF SEWER INSTALLATION
IN MATTAWAN, VAN BUREN COUNTY, MICHIGAN.**

July 7, 2020

PREPARED FOR:

Moore & Bruggink Consulting Engineers
2020 Monroe Avenue
Grand Rapids, MI 49505

PREPARED BY:

Eric Sanchez
RESCOM Environmental Corp.
P.O. Box 361
Petoskey, Michigan 49770
(231) 409-2563

RESCOM ID: 20030035

A handwritten signature in dark ink, appearing to read "Andrew M. Smith". The signature is written in a cursive style with a long horizontal flourish extending to the right.

Andrew M. Smith, M.A.
Principal Investigator

INTRODUCTION

In response to a request from Moore & Bruggink Consulting Engineers, RESCOM Environmental Corp., has completed a Phase Ia archaeological reconnaissance and records check for a proposed water resources recovery facility (WRRF) and approximately 2.15-miles of forcemain sewer installation Mattawan, Antwerp Township, Van Buren County (Figure 1). The project expands throughout Sections 2 & 3, Township 3 S, Range 13 W, as seen on the Lawton, MI USGS 7.5' topographical quadrangle (Figures 2), and Sections 34 & 35, Township 2 S, Range 13 W as seen on the Gobles East, MI USGS 7.5' topographical quadrangles (Figure 3). The project area consists of a 1.65-acres wooded parcel for the proposed WRRF and 2.15-miles of forcemain sewer installations connecting to the discharge piping from an existing lift station continuing north on the west right-of-way of 25th Street, south right-of-way of Red Arrow Highway, and west right-of-way Co Rd 652 crossing to the east right-of-way under Orchard Dr and back west north of Trestle Creek Ave terminating in an outfall at Hayden Creek; approximately 5.65-acres in total (Figures 4 & 5).

An archaeological records check conducted by the Michigan SHPO on behalf of RESCOM shows no archeological resources within the project footprint. Fieldwork was conducted on June 24, 2020 RESCOM personnel under the supervision of Andrew Smith M.A., Ball State University 2010, Principal Investigator.

This report details the results of the records check and Phase Ia field reconnaissance and presents the conclusions and recommendations of RESCOM concerning any additional archaeological investigations.



Figure 1. Location of Van Buren County within Michigan.

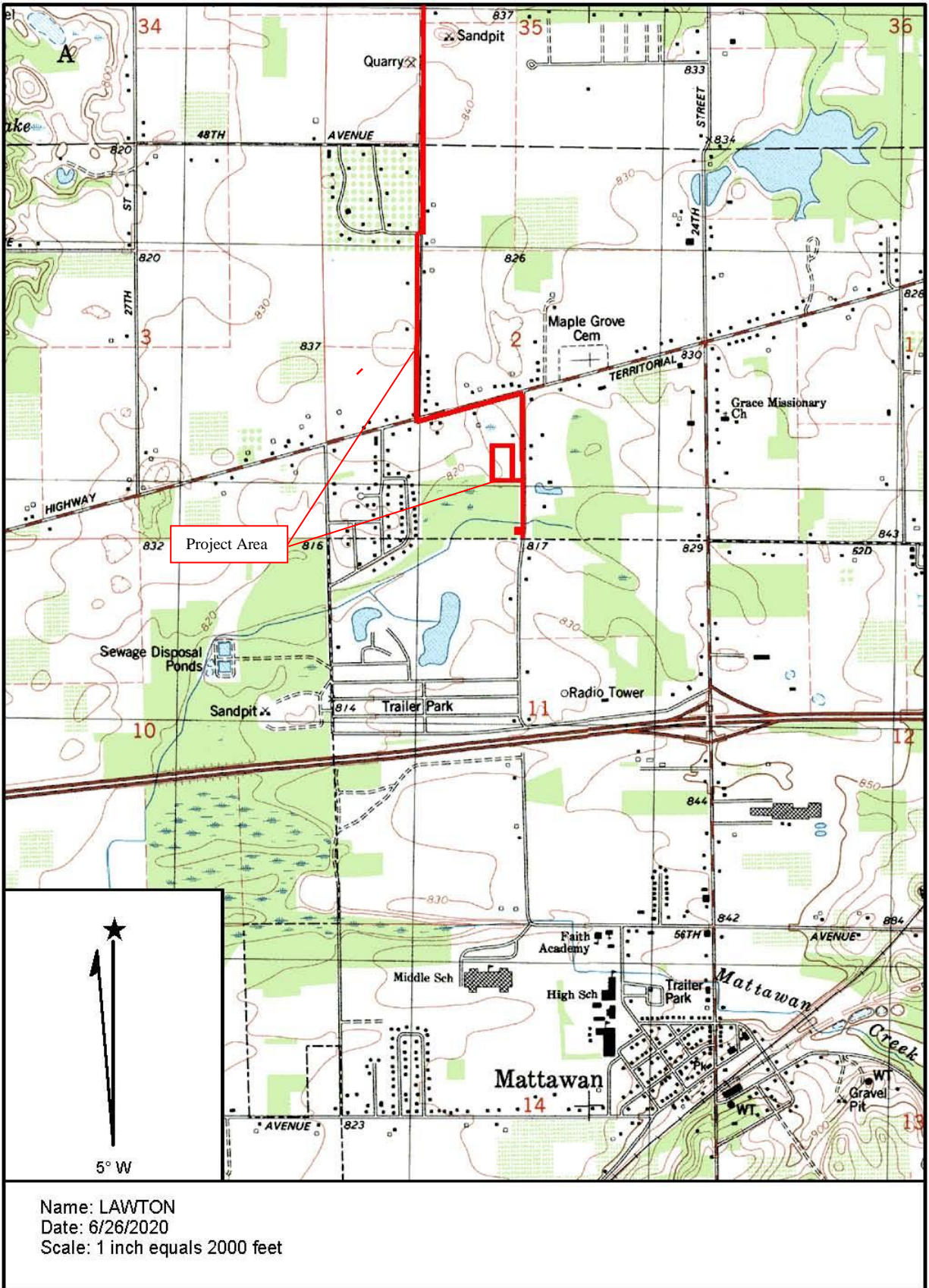


Figure 2. Location of the project area on the 7.5' USGS Lawton, MI, topographic quadrangle.

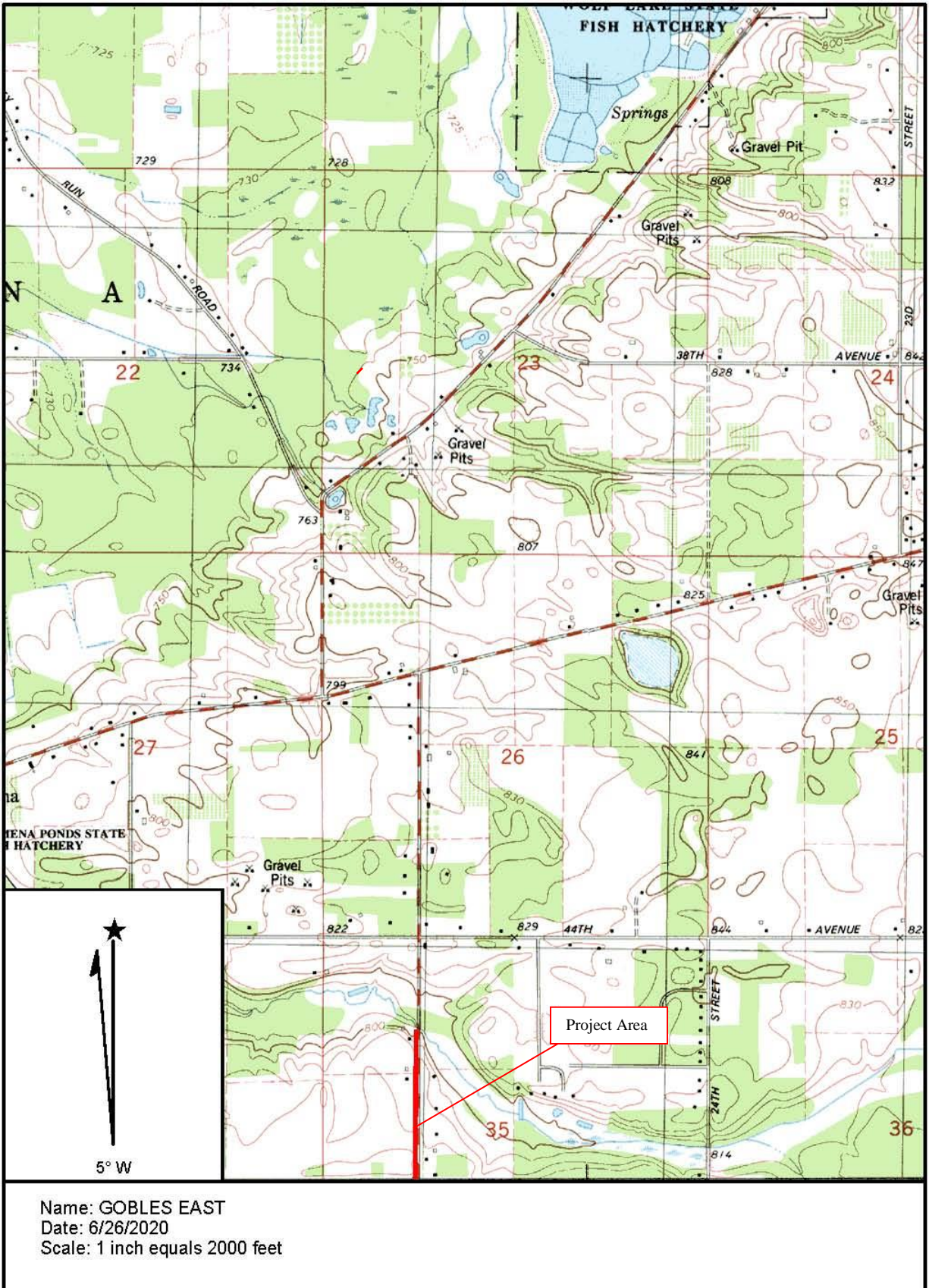


Figure 3. Location of the project area on the 7.5' USGS Gobles East, MI, topographic quadrangle.



Figure 4. Aerial photograph showing the proposed WRRF footprint and existing lift station.

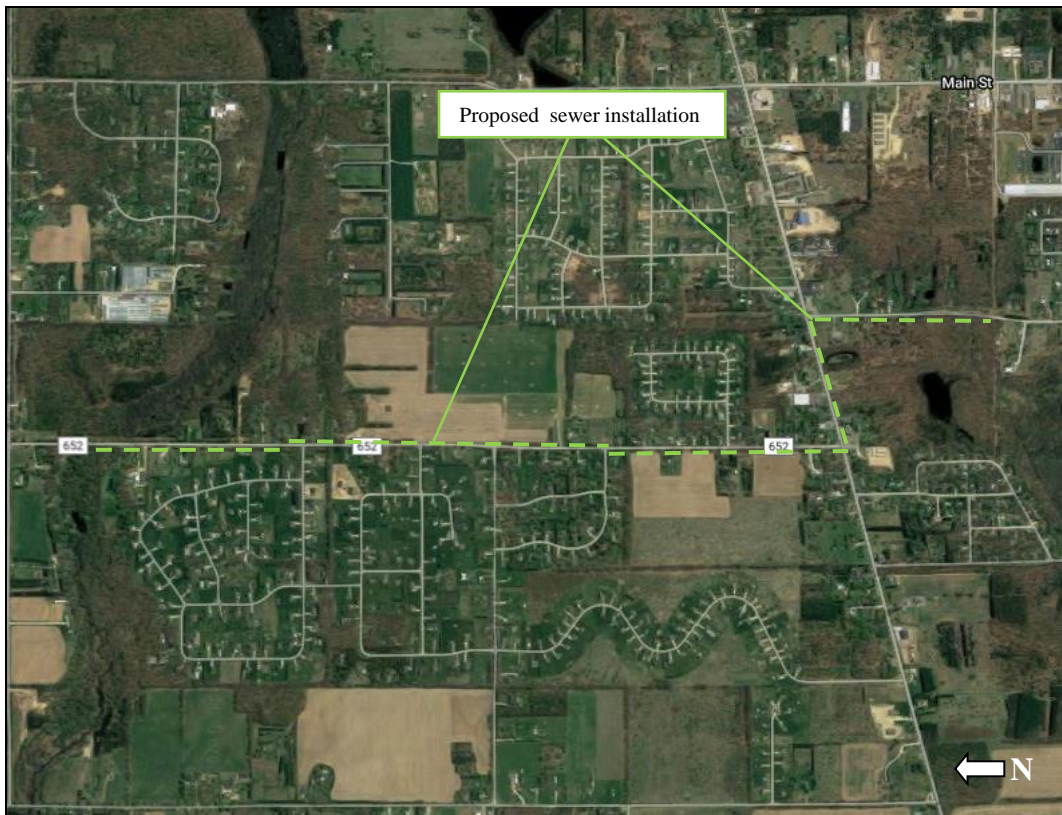


Figure 5. Aerial photograph showing the proposed sewer installations within the road right-of-ways.

NATURAL SETTING

The project area is located on the southwest part of the state on the Niles-Thornapple Spillway within the Southern Lower Peninsula Hills and Plains physiographic region (Schaetzl et al. 2013). This area is characterized by rolling landscapes and glacial hills of low relief underlaying by sandy outwash and gravel. Large portions of wetlands are present throughout the region with very few lakes. Vegetation in the region consists oak-hickory savanna and swamp forests in wetter locations (Schaetzl et al. 2013).

Soils within the wooded parcel for the proposed WRRF and lift station, as well as within the road right-of-ways of 25th St, Red Arrow Highway and portions of Co Rd 652 consists of Coloma loamy sand, 0 to 6 percent slopes (Web Soil Survey; Accessed June 22, 2020). The Coloma series soils are formed in sandy drift and are very deep and excessively drained. Coloma soils are typically found on moraines, outwash plains, deltas, and stream terraces (USDA 2015).

Soils throughout the road right-of-way of Co Rd 652 vary, the southern portion consists of Coloma series soils near the intersection of Red Arrow Highway and a mixture of Oshtemo sandy loam, 0 to 6 percent slopes and Spinks-Oshtemo complex, 0 to 6 percent slopes, as it proceeds north (Web Soil Survey; Accessed June 22, 2020). The Spinks and Oshtemo Series are formed in stratified loamy and sandy deposits and are typically very deep, well drained soils on outwash plains, valley trains, moraines, and beach ridges (USDA 2012 & 2017).

Prior to Euroamerican settlement the area consisted primarily of forests and wetlands, however large portions have been cleared and drained for farming corn and soybeans. Many aquatic as well as mammalian species would have been available throughout the prehistoric period. These species would have been representative of the mixed regional fauna and could have included any of the following: black bear, wapiti (elk), eastern cottontail, woodchuck, gray squirrel, fox squirrel, southern flying squirrel, beaver, raccoon, white-tailed deer, coyote, dog, grey fox, red fox, turkey, salamander, soft shelled turtle, common musk turtle, elegant slider turtle, garter snake, blue catfish, flathead, and several mussel species (Howell 1915).

Given the environmental conditions of the project area and surrounding region, there is the potential for the project area to contain previously unrecognized archaeological sites. The following sections describe previous research conducted in and near the project area and provide a general background of regional Michigan prehistory.

CULTURAL SETTING

The State of Michigan possesses a rich and complex archaeological past which includes resources dating from the earliest Native American occupations of the state, approximately 10,000 years ago during the terminal Pleistocene, to numerous historic European and Euro-American site and numerous shipwrecks throughout the Great Lakes. This general overview will focus the major prehistoric, proto-historic, and early historic cultural developments documented within Michigan.

Paleoindian Period (*ca. 10,000-8,000 BC*)

The first people to reach the interior of the New World are known as Paleoindians. These people produced an efficient lithic tool kit, which included fluted points. These points were first found in association with the remains of mammoths and bison, giving rise to the initial notion that Paleoindians were primarily or exclusively big-game hunters. Subsequent research, however, revealed that Paleoindian peoples hunted and gathered a wide variety of foods, including deer, small mammals, and nuts (Fagan 2000). Large mammals, such as mammoth and bison, were most likely a rare or seasonally taken resource. This research also indicated that Paleoindian groups were highly mobile, traveling across large territories. Population size was small, probably consisting of no more than 25 or 30 related individuals (Fitting 1965:103-104; Ritchie and Funk 1973:336). As a result, Paleoindian sites are often interpreted as areas where small groups of people performed specific tasks for a short duration. Given that this type of site maintains a very low archaeological profile, Paleoindian sites can be very difficult to identify (Faulkner 1972; Justice 1987; Tankersley and Isaac 1990; White 2005). In the state of Michigan, diagnostic fluted projectile points styles include Enterline, Gainey, Barnes, and Holcombe which are similar to those found in the Great Plains and Southwest regions of North America, as exemplified by Clovis Cluster and Lanceolate Plano Cluster points (Buckmaster and Paquette 1996; Mason 1981; Shott and Wright 1999).

However, within Michigan and the Midwest in general, three correlations between geography and Paleoindian sites have been identified. Fluted points are frequently recorded in major stream valleys and in proximity to quality chert resources, but they are only rarely found in extensive swampy lowlands or rugged highlands (Seeman and Prufer 1982). In addition, research by Tankersley (1989) found that the highest frequency of Paleoindian points occurred in riparian areas that overlook such settings. However, Cochran et al. (1990) found that fluted point sites in north-central Indiana are more widely distributed across the landscape. They concluded that data from the glaciated regions indicate that landscape use, as well as raw material acquisition, differs significantly from the prevailing models for the midwestern and eastern United States. For example, their research indicated that early Paleoindian sites throughout the region are distributed on a variety of landforms and that the focus was on abundant, rather than high-quality, lithic raw material sources (Cochran et al. 1990:156). They propose that although early Paleoindians generally utilized the upper Midwest in a manner similar to that of all prehistoric peoples, their density was far lower (Cochran et al. 1990:152), making their occupations more difficult to detect archaeologically. As Michigan was completely glaciated during the last ice age it is likely that correlations from other glaciated areas within the Midwest hold true for Michigan's Paleoindian Period. It is important to note that much of Northern Michigan, particularly the Upper Peninsula remained tundra or was severely impacted by the proximity to ice during much of the Paleoindian Period which would have limited human utilization of portions of the landscape.

Archaic Period (*ca 8,000 - 1,000 BC*)

By the early Holocene, a climatic warming/drying trend began to cause the grasslands and tundra to be replaced by coniferous forests and mixed, deciduous forests, affecting both plant and animal species used by prehistoric populations. Prehistoric groups began exploiting a wider range of subsistence resources and larger portions of ice-free Michigan. These changes in subsistence and settlement strategies, first occurring approximately 10,000 years ago, mark the beginning of the Archaic period. The Archaic is defined here as a temporal period extending from 8,000 to 1,000 BC. Broadly, the Archaic encompasses a period of increasing population density, decreasing mobility, and the appearance of social structures that reach their most pronounced expression in the later Woodland periods. The Archaic is usually partitioned into Early, Middle, and Late subdivisions. These subdivisions correspond to much generalized trends within the Archaic period and are used here to broadly classify and discuss contemporary societies (i.e., these subdivisions pertain to temporal periods rather than cultural stages). Many researchers assign Archaic archaeological manifestations to one of these three sub-periods based on a variety of technological, social, subsistence, and settlement criteria in addition to temporal criteria.

Early Archaic (ca. 8,000-6,000 BC)

The Early Archaic is separated from the preceding Paleoindian period primarily by the final retreat of the Wisconsinan glaciation and by the conspicuous lack of fluted points. However, in the case of Michigan portions of the state remain very influenced by ice and even those that are less influenced are much different today than during the Early Archaic due to isostatic rebound. While the northern part of the state remained influenced by ice and a Paleoindian style subsistence, the boreal and later pine forest were common in the southern portion of the state. Also, during this time, the Chippewa-Stanley low water stage in the Lake Michigan and Lake Huron basins occurs. Large spear points or knives with beveled edges and deep corner notches are found at Early Archaic sites, as are smaller points with bifurcate bases. Common Early Archaic hafted bifaces include those belonging to the Thebes, Kirk Corner Notched, Kirk Stemmed, Rice Lobed, and LeCroy clusters; many distinct varieties have been recognized within these clusters (Justice 1987). The addition of sandstone abraders and mortars to the tool kit also suggests that vegetable food resources were becoming a more substantial part of the diet. Early Archaic societies are usually hypothesized to have been organized into small, highly mobile bands and to have developed from late Paleoindian expressions (Funk 1978:19; Springer 1985). Most sites dating to the Early Archaic period in Michigan are small lithic scatters. As noted by Munson (1986:280), Early Archaic sites are distributed across the landscape, yet seem to be concentrated nowhere, perhaps in parts due to the dense boreal and pine forests throughout the state which did not suit the evolving Archaic adaptive strategies. Additionally, the newly drained lakebed in the Lake Michigan and Huron basins could be a potential factor for the lack of early archaic sites throughout the interior of the state, as the drained lakebed provided easier access to resources than the dense coniferous forest (Fitting 1975).

Middle Archaic (ca. 6,000-3,000 BC)

During the Middle Archaic, a long-term warming and drying trend, called the Hypsithermal Interval, reached its peak. Previously pine-dominated forests were replaced by deciduous forests dominated by oak, hickory, and elm, which are species that are more productive for human use. In addition, all of the major rivers of the southern part of the region and their associated floodplains were established by this time. Due to the availability of these rich resources, people settled along these waterways into larger, more permanent villages. These larger, denser sites of the Middle Archaic period are often interpreted as base camps that were occupied for longer periods of time and used to exploit a broad base of food resources (e.g., Munson 1986). Of note are the large shell midden sites located along major rivers of the southeastern and midwestern United States (Janzen 1977; Sieber et al. 1989). Many of these sites were probably established during the Middle Archaic period.

The Middle Archaic saw an increase in the variety of food resources utilized. The appearance of sites with large quantities of fire-cracked rock and nutshell suggest that stone boiling technology was first used during this period (Munson 1986). With regard to material culture, the inventory of the Middle Archaic includes ground and pecked stone tools (atlatl weights, mortars, pestles, grooved axes, nutting stones, and grinding slabs) as well as Chipped stone tools. Hafted biface types of Middle Archaic age include Raddatz, Godar, Matanzas and a variety of similar sidenotched points (Justice 1987). A low density of Middle Archaic sites could suggest that like the Early Archaic the majority of Middle Archaic sites were located on exposed lakebeds in the Lake Michigan and Huron basins now covered by the modern lakes. (Fairchild 1977; Fitting 1975; Lovis 1999; Lovis and Robertson 1989).

Late Archaic (ca. 3,000-1,000 BC)

The Late Archaic is a period when a number of trends first evident earlier, such as increased population density and decreased mobility, intensify. Perhaps due to population and/or structural dynamics, settlement was not as restricted to the major river valleys as it was during the Middle Archaic period. Upland campsites and rock overhangs were used (Sieber et al. 1989), and sites with denser remains occur in smaller river valleys and other second tier resource zones (Munson 1986). Late Archaic sites tend to be larger and to contain more tools and debris than sites of any preceding time period, and subsurface contexts exist at many of these sites. The domestication of native plants began during this period (Yarnell 1988), and the exploitation of natural food resources intensified. Ground stone tools continued to be used during the Late Archaic, and the number and variety of these increased. Bone, antler, and wood tool technologies also became more varied and complex. Hafted bifaces in use during this period include several stemmed varieties (e.g. Table Rock, Karnak, McWhinney, Ledbetter, and Saratoga), and Lamoka-like points (Justice 1987). The Late Archaic period also saw the first development of pottery in eastern North America.

As a result of exchange networks which had developed by this time, exotic goods such as marine shell from the Gulf and Atlantic coasts, Wyandotte chert from south-central Indiana, native copper from the Upper Great Lakes region, mica from the Middle

Atlantic states, and obsidian from Wyoming are sometimes recovered from Late Archaic sites (Winters 1968). These exotic goods were also a part of more elaborate mortuary ceremonialism. Mortuary-ceremonial complexes in such as Red Ochre, Glacial Kame, and Old Copper suggest a growing interactions throughout the Great Lakes region (Fitting 1975).

Woodland Period (ca. 1,000 BC-1,000 AD)

A diverse range of cultural expression is included under the term Woodland. Very general defining trends or adaptations of the Woodland period include a hunter-gatherer subsistence pattern augmented by an increase in horticulture (eventually including the production of true cultigens), the increased manufacture and use of pottery for food preparation and storage, the production and use of a larger and technologically more diverse stone tool kit, and the rise of elaborate burial practices, including the construction of earthen burial mounds. The Woodland is subdivided into Early, Middle, and Late periods. It is important to note that in northern Michigan a shift to true “Woodland” culture was not fully achievable based on the limited growing season. True horticulture of maize, a plant of tropical origin, and some other domesticates was never necessary, or in some cases possible.

Early Woodland (ca. 1,000-200 BC)

The Early Woodland period often has been distinguished from the Archaic period by the use of pottery, a dramatic increase in the reliance on domesticated plant foods, and an increasing elaboration of ceremonial exchange and mortuary rituals (Dragoo 1976; Griffin 1978). Early Woodland ceramics are thick, plain-surfaced, usually grit-tempered vessels, with either conical or flat bases. Ceramic vessels became more important for food storage and processing as the subsistence base shifted toward cultivation of native plant foods. Although hunting and gathering continued as both a subsistence strategy and a seasonal lifeway, plants that occurred naturally in the environment, such as chenopodium, marsh elder, canary grass, and sunflower, were cultivated for both food and fiber (Yarnell 1964). Other imported cultigens, such as squash, pumpkin, and gourds, also appeared (Dragoo 1976). As this horticultural base improved, settlements became increasingly sedentary, supporting larger populations and more complex societies. Diagnostic Early Woodland projectile points include large, well-made contracting stem points, such as the Adena type (Justice 1987). At some Early Woodland sites, especially of the Adena culture in central Ohio, burial mounds and earthworks were erected. These were often extensive. Interaction with areas outside Michigan are noted in the ceramic assemblage, particularly the latter part of this period. Ceramics with similar characteristics to those found in Illinois and Ohio indicate influences on the Michigan Early Woodland populations (Garland and Beld 1999).

Middle Woodland (ca. 200 BC- AD 500)

The Middle Woodland period represents a time of complex socio-cultural integration across regional boundaries via networks of trade. The period is characterized by elaborate

geometric earthworks, enclosures, and mounds that are often associated with multiple burials containing a wide array of exotic ceremonial goods. The Middle Woodland also is noted for the establishment of the Hopewell “interaction sphere” (Caldwell 1964): artifacts and raw materials such as obsidian and grizzly bear teeth from the Rocky Mountains, copper from northern Michigan, mica and quartz from the Appalachians, shark teeth, pearls, and marine shells from the Gulf of Mexico, and a wide variety of cherts were exchanged throughout most of the eastern United States. Major centers for these activities were the Scioto River valley in south-central Ohio and the Illinois River valley in west-central Illinois. Although the Michigan region was peripheral to each of these two areas, its inclusion as part of the trade network meant that it was influenced by both regions. The extreme south in Eastern Michigan, where both mounds and earthworks are found, was within the Ohio Hopewell expression, while Middle Woodland sites in western Michigan are related to the Illinois, or Havana, tradition.

Subsistence activities also changed during this period, with horticulture becoming a major supplement to the hunting-gathering lifestyle. Although domesticated maize was added to the Eastern agricultural complex (EAC) during this period (e.g., Chapman and Crites 1987; Riley et al. 1994; Smart and Ford 1983; Smith 1992:110), it does not appear to have been an important part of the diet. Goosefoot, sumpweed, and sunflower, however, were actively cultivated. Overall, populations continued to grow: in some areas, Middle Woodland populations lived in large, permanent villages, typically within broad, fertile river valleys; in other areas, settlement occurred in a variety of environmental zones and on a much smaller scale, in temporary/seasonal camps, hamlets, and small villages (Ottesen 1985).

Projectile point types of the Middle Woodland period include Snyders and Lowe varieties (Justice 1987), with Lowe varieties being diagnostic of the later Middle Woodland. Thin lamellar blades, blade cores, and ovate cache blades are also diagnostic of this period. Utilitarian pottery forms from this period are similar to those of the Early Woodland. Typical utilitarian forms are bulbous, wide-mouthed jars, frequently with cordmarked and/or dowel-impressed exteriors. Elaborately incised or stamped designs are common on Hopewell mortuary jars. In the late Middle Woodland, sites in southern portion of the state indicate of a discontinuation of the Norton-Havana Hopewell mound building and mortuary practices, as burials shift from mound internment to ossuary pits in the Brainerd Phase (A.D. 300-600); this shift is noted by general lack of grave goods and the use of ceremonial fire-pits (Garland 1990).

Late Woodland (ca. AD 500-1,000)

The Late Woodland period is a time of apparent breakdown or abandonment of mortuary ritualism and extensive trade networks. The Hopewell interaction sphere was no longer active, and there was a general return to the use of local resources for tool manufacture. Relatively isolated regional development became more widespread, and Late Woodland village occupations often consist of a number of house structures around a circular plaza. Burials lack the elaborate ritualism associated with earlier cultures, and bodies often were interred in natural knolls or placed as intrusive burials into existing mounds. Although the Late Woodland is also a period of increasing dependence upon maize horticulture for subsistence, the uncertain number of frost-free days, especially during the “Little Ice

Age” (Fagan 2000), and the presence of plentiful wetland resources probably made maize less important to the occupants of this area than to people farther south. As a result, regional subsistence patterns continued to include hunting and gathering (Fagan 2000). Ceramics from the period were generally well-made, undecorated, grittempered, cordmarked vessels. In lower Michigan regionally ceramic traditions are noted during this time and including the Spring Creek Tradition throughout the Grand and Muskegon River valleys, the Allegan Tradition in the Kalamazoo River valley, and the Younge Tradition the southeast portion of the state. The bow and arrow was also introduced during this time, and small, triangular, unnotched arrow points were a common tool type (Justice 1987).

Late Prehistoric Period (*ca. AD 1000 to 1492*)

The Late Prehistoric period extends from about AD 1000 to 1492. Though several Late Prehistoric sites containing triangular projectile points have been recorded in the Van Buren County area, a lack of excavated contexts severely limits our present knowledge of the chronological position and affiliation of these cultures. There is evidence that the social landscape in the greater Midwest may have been increasingly unpredictable after AD 1300, as indicated by widespread population movement and dispersal, and evidence for violent conflict (e.g., Emerson 1999; Santure 1990). In Michigan, the Late Prehistoric period is characterized by considerable diversity in settlement size, form, location and ceramic style. Earlier attempts to understand this variability were hampered by a limited amount of (and possibly incorrect) radiocarbon dates, previously unidentified cultural complexes, and a paucity of Late Prehistoric research, which had a profound influence on the interpretation of this time period.

Protohistoric/Historic Indian/European Imperial Period (*ca. AD 1492-1815*)

Prior to the sixteenth century, Michigan was populated by a variety of native groups subsisting on hunting, gathering, and limited agriculture, but archaeologists have noted the increasing evidence for social instability during the period from AD 1400 to 1700 (Brose et al. 2000). Evidence for widespread population movements, subsistence shifts, and warfare in the form of palisaded or enclosed settlements, as well as increasing skeletal trauma in late prehistoric burials, is present throughout the upper Midwest and has often been attributed to climatic changes or diseases (Brown and Sasso 2001, Emerson 1999). Michigan lies in the path of many of these late prehistoric and protohistoric population dispersals and holds the potential for archaeological sites that may shed light on the increasing instability. During the mid-1600s, the Iroquois created vast population movements when they warred on tribes as far west as Illinois in an attempt to control the fur trade. In the early part of the seventeenth century when French explorers first entered the region they estimated approximately 100,000 Native Americans were living in the Great Lakes region. Three primary tribal groups, sometimes referred to as The Three Fires, were encountered by explorers and included the Chippewa (Ojibway), inhabiting primarily the Upper Peninsula and the eastern part of the Lower Peninsula; the Ottawa, along the western part of the Lower Peninsula and the Potawatomi, inhabiting southwestern Michigan. Several other large tribal groups in the

region included the Huron (Wyandot), in southeastern area of Michigan; the Sauk in the Saginaw River valley; the Miami, along the St. Joseph River and the Menominee in the western part of the Upper Peninsula (Dunbar and May 1995, Rubenstein and Ziewacz 1981, Peters 2002).

Quebec founder, Samuel de Champlain, visited the eastern shores of Georgian Bay in the early 17th century and send explorer Etienne Brulé traveling west seeking a potential northwest passage to the orient. Brulé reached the Sault Ste. Marie area in 1618 and returned to Michigan in 1621, traveling as far west as the Keweenaw Peninsula with no success in finding a northwest passage. Samuel de Champlain forged alliances with various tribes that influenced Michigan's settlement for two hundred years (Dunbar and May 1995, Rubenstein and Ziewacz 1981). In 1609, Champlain assisted the Huron in battle against a small group of Mohawks who were part of the Iroquois Nation. As a result of the conflict Champlain made an enemy of Iroquois Nation, which in terms limited French access to the lower Great Lakes. As a result, French traders and explorers had to alter their previous routes along Lake Ontario, Lake Erie, and the Detroit River and travel routes along the Ottawa River and Lake Nipissing. This consequently resulted in Upper Peninsula settlements being established much earlier than in the southern portion of the state (Peters 2002). French missionaries came into the region shortly after the first explorers and traders. They established missions and settlements throughout the lakes and the Mississippi River valley in attempts to convert Native Americans to Christianity (Dunbar and May, Rubenstein and Ziewacz 1981, Peters 2002).

Father Jacques Marquette founded the first permanent settlement in Michigan at Sault Ste. Marie in 1668. In the later part of the 17th century a French military presence grew throughout Michigan and the in the Great Lakes region as a response to a growing British interest in this area. Military establishments such as Fort de Buade and Fort Michilimackinac at St. Ignace and Fort Miami at the mouth of the St. Joseph River were founded in this time (Peters 2002). In 1694, Commandant Antoine de la Mothe Cadillac of the Michilimackinac post establish a fortified settlement at "place du detroit" in response to the growing threat posed by the British-Native Americans alliances. In 1701, Cadillac established Fort Pontchartrain, a major trading post which would lead to the eventual settlement of the region (Dunbar and May 1995, Peters 2002). After the establishment of Fort Pontchartrain, thousands of Native Americans settled near the area as well as several French families. Over the next half a century the area would become subject to raids by several native groups sometimes influenced by the British. By 1754 French and British tensions resulted in the French and Indian War. This would bring to an end the French era in Michigan after almost 150 years and give way to the British era as the French surrendered and ceded all French controlled land to the British in the Treaty of Paris in 1763 (Borneman 2006, Eckert 1992, Peters 2002)

The British era in Michigan brought on a great changes in the way Europeans and Native Americans interacted. While the French had taken a more laissez-faire attitude towards Native Americans, the British took a different approach in dealing with native groups and imposing law by armed hostilities and military activity. The change in interaction with the Europeans and the growing thread of intruding settlers led to Pontiac's Rebellion in 1763. Chief Pontiac of the Ottawa led a loosely united group of Ottawa, Ojibwas, Potawatomis, Huron, Miami, Weas, Kickapoo, Mascouten, Piankashaw, Delaware, Shawnee, Wyandot, Seneca, and Seneca-Cayuga in a series of

attacks against the British. Pontiac's forces had killed or captured more than six hundred people by the fall of 1763. Eight British forts in the had fallen throughout the northwest portion of the country by the end of the 1763 with the exception of Fort Detroit In Michigan, Fort Pitt in Pennsylvania, and Fort Niagara in New York (Taylor 2006, Peters 2002). Hostilities would end in 1764 after an offensive campaign mounted by the English, who sent out two armies. One army into Ohio under Colonel Bouquet and the other to the Great Lakes under Col. John Bradstreet. Bradstreet's attempts at treaties failed, however, Bouquet, succeeded in his campaign and a treaty was concluded with them by Sir William Johnson and the Delaware and Shawnee. Sir William Johnson understood that diplomacy was cheaper than war eventually would negotiate and entice the majority of the involved tribal groups to sign several peace treaties between 1764 and 1766. Pontiac would sign a treaty with Johnson in 1766 after failing to persuade tribes to west and south to join him. (Borneman 2006, Dunbar and May 1995, Eckert 1992, Peters 2002, Taylor 2002)

The American Revolution originally had limited impact on this part of the country as it was sparsely populated and distanced from military engagements occurring in the east coast. With the 1783 Treaty of Paris American Revolution would come to an end and specified an international boundary for the United States that included Michigan (Dunbar and May 1995, Rubenstein and Ziewacz 1981, Peters 2002, Treaty of Paris 1783). The British would not fully relinquish control over the area until 1796 for several reasons including the lucrative fur trade of the Great Lakes and the believe felt that Americans failed to pay pre-war debts and compensation to loyalists for losses during the war time. It was not until General Anthony Wayne defeated the British-backed Indians at the Battle of Fallen Timbers in 1794 which led to the signing of Jay's Treaty in 1794 and the British eventually relinquishing control of Michigan on July 11, 1796. (Dunbar and May 1995, Rubenstein and Ziewacz 1981, Peters 2002, Sword 1985).

Conflict with the British over trade sanctions, maritime conflicts, and impressment as well as British interference in the west and military support for the Native Americans led to the War of 1812 which once again saw Michigan under British control (Peters 2002). Governor Hull turned Detroit over to the British fearing a potential massacre at the hands of British and Native American forces. After British defeat at Lake Erie and the British and Tecumseh's Indian forces at the Thames River the British abandoned Detroit by September 1813. The war with the Treaty of Ghent in 1814 and by 1815 the British had returned Mackinac Island and Fort Collier on Drummond Island to the to the Americans, areas which were previously disputed British territories (Borneman 2004, Peters 2002, Treaty of Ghent 1814).

Modern Michigan (1815 A.D. – Present Day)

Michigan was part of the Northwest Territory and by the 1830s had over 60,000 inhabitants allowing for a state government and the pursuit of statehood (Peters 2002). The growth in population was in part due to the construction of the Erie Canal which connected the Great Lakes with the Hudson River provided an inexpensive way to ship crops and creating new industry. Michigan became a State on January 26, 1837 with Detroit as the first capital, later moving to Lansing in 1847 (Dunbar and May 1995, Rubenstein and Ziewacz 1981). Settlement of the Upper Peninsula trailed behind the

lower portion of the state leaving the Lake Superior basin primary vacant for the first part of the 19th century. Iron and copper were discovered in the Upper Peninsula, the Soo Locks were completed in 1855 enabling ships to travel between Lake Superior and the lower lakes. Mining, agriculture and logging would become large industries in the 19th century throughout the state. In 1899 Henry Ford built his first automobile factory in Highland Park, modern day Detroit, and General Motors was founded in Flint in 1908. Automobile assembly and associated industries became a booming economy in Michigan, particularly Detroit. (Dunbar and May 1995, Rubenstein and Ziewacz 1981, Peters 2002). Van Buren County was founded in 1829 (organized 1837) and the town of Paw Paw serves as county seat.

PREVIOUS INVESTIGATIONS

An archaeological records check conducted by the Michigan State Historic Preservation Office on behalf of RESCOM determined there are no previously recorded archaeological resources or previously conducted investigations overlapping or within a mile of the project area. Additionally, no previously identified architectural resources are present within the project footprint, the nearest historic resource is approximately 1.5-miles south of the project location at 265 Front Street and consists of the NRHP eligible Morgan L. Fitch Warehouse.

METHODS

Fieldwork was conducted on June 24, 2020 by RESCOM personnel. The project area at the time of the field reconnaissance consisted of a wooded parcel with limited surface visibility (approximately 15%) for the proposed WRRF (Figure 6). A shovel testing methodology was employed in this portion of the project area. Thirty-seven shovel tests were conducted in the proposed WRRF footprint and two shovel test for the lift station discharge piping connection (Figure 7). Shovel testing was conducted at a 15-meter intervals on east-west transects and measured at least 35-cm by 35-cm and were excavated well into obvious subsoil following the standards outlined by the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. Soils from shovel tests were screened through ¼-inch mesh and exposed soil profiles were visually examined for cultural materials and/or evidence of buried cultural horizons. Shovel tests were backfilled upon completion.

In addition to the WRRF footprint and lift station connection area, 2.15-miles of road right-of-way were investigated for the proposed forcemain sewer line installation. A pedestrian survey was conducted in this portion of the project area in order to document the varying degrees of prior soil disturbance due to ditching, utility installations, driveways and intersections (Figures 8, 9, 10 & 11). In several areas within the right-of-ways where clear evidence of disturbance was not visible, shovel testing was conducted to confirm. A total of ten shovel tests were conducted road right-of-way (Figure 12).



Figure 6. Proposed WRRF location.

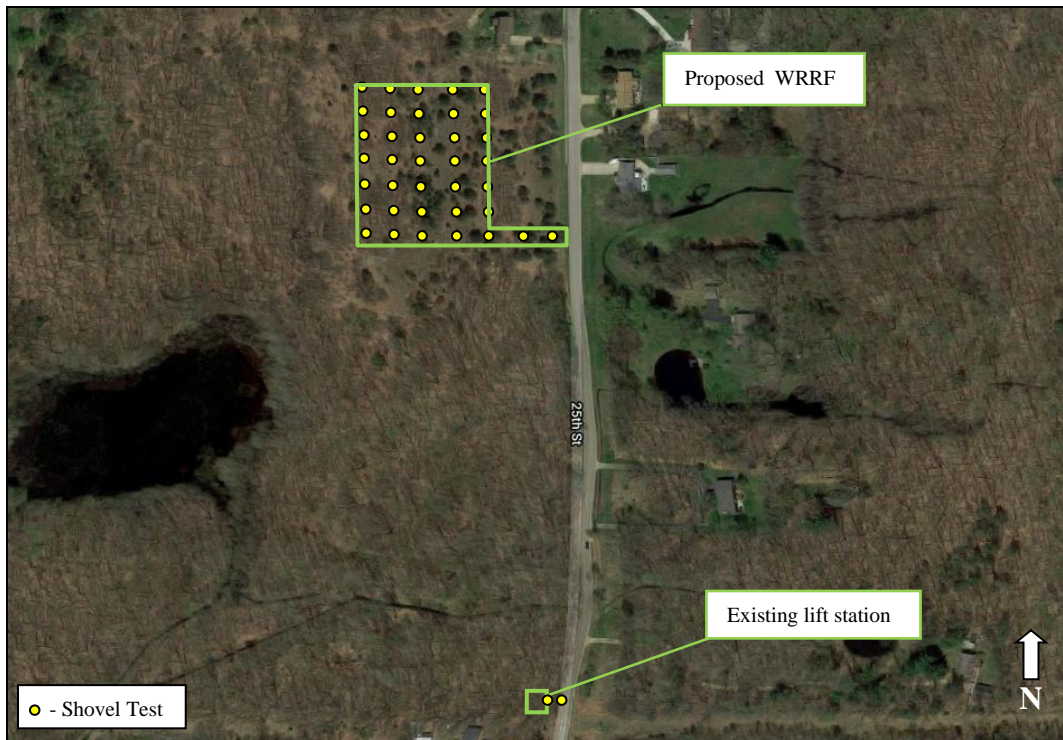


Figure 7. Location of shovel tests within the proposed WRRF footprint and lift station connection area.



Figure 8. Road right-of-way on the west side of 25th St; note ditching.



Figure 9. Road right-of-way on the south side of Red Arrow Highway; note graveling and grading.



Figure 10. Road right-of-way on the west side of Co Rd 652 St; note ditching.



Figure 11. Road right-of-way on the east side of Co Rd 652 St; note ditching.

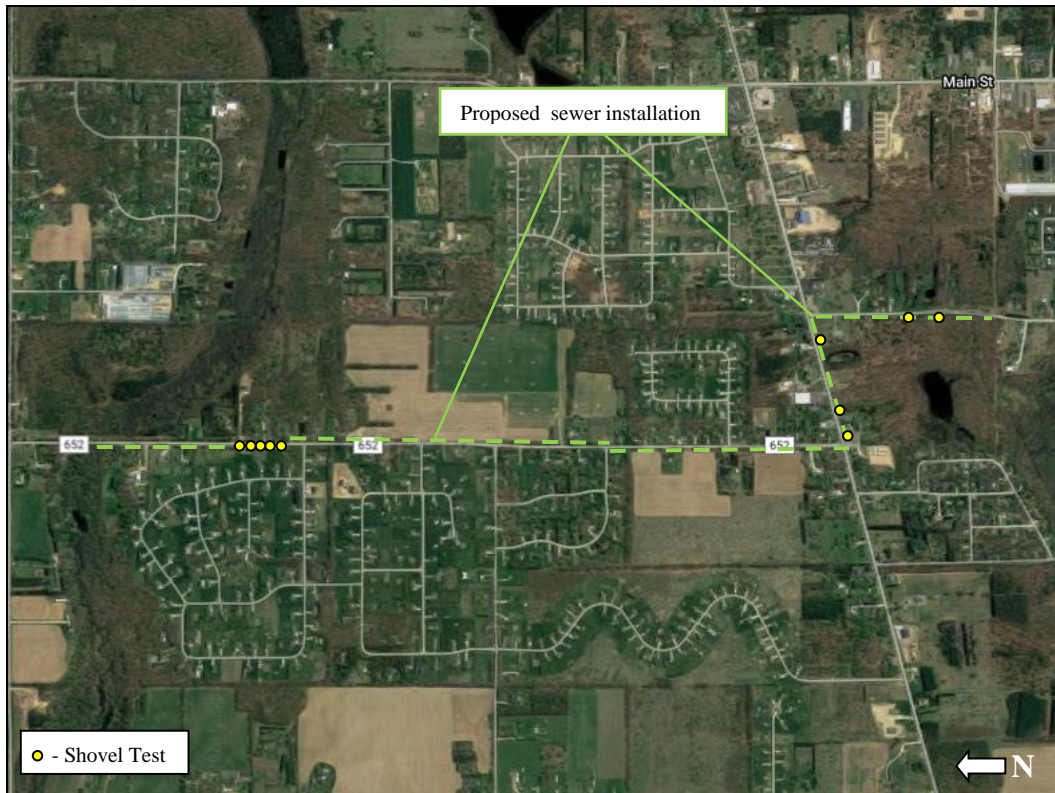


Figure 12. Aerial photograph showing the proposed sewer installations and shovel tests locations.

RESULTS

No cultural materials or features were identified during the pedestrian survey or shovel testing. Soils encountered in the wooded parcel for the proposed WRRF and lift stations connection area were consistent with the Coloma Soil Series. A representative soil profile encountered consisted of A Horizon of light brownish gray (10YR 6/2) loamy sand with small roots and weak structure (0-22cmbs) over a sterile brown (7.5YR 4/4) sand subsoil (Figure 13). The pedestrian survey as well as shovel testing conducted within the road right-of-ways for the proposed forcemain sewer confirm the right-of-ways have been previously disturbed. Ditching is evident along the majority of the right-of-ways, as well as grading and graveling (see Figures 8, 9, 10 & 11). Soils from shovel tests conducted along right-of-ways where ditching was not visibly evident exhibited clear evidence of prior soil disturbance due to road construction, asphalt and gravel as well as mixed soils were noted (Figures 14 & 15).



Figure 13. Representative soil profile in the wooded parcel west of 25th St.



Figure 14. Disturbed shovel test along south side of Red Arrow Highway; note asphalt and road gravel.



Figure 15. Disturbed shovel test along west side of Co Rd 652; note mixed soils and compact pea gravel.

CONCLUSIONS AND RECOMMENDATIONS

In response to a request from Moore & Bruggink Consulting Engineers, RESCOM Environmental Corp., has completed a Phase Ia archaeological reconnaissance and records check for a proposed water resources recovery facility (WRRF) and approximately 2.15-miles of forcemain sewer installation Mattawan, Antwerp Township, Van Buren County. The project expands throughout Sections 2 & 3, Township 3 S, Range 13 W, as seen on the Lawton, MI USGS 7.5' topographical quadrangle, and Sections 34 & 35, Township 2 S, Range 13 W as seen on the Gobles East, MI USGS 7.5' topographical quadrangles. The project area consists of a 1.65-acres wooded parcel for the proposed WRRF and 2.15-miles of forcemain sewer installations connecting to the discharge piping from an existing lift station continuing north on the west right-of-way of 25th Street, south right-of-way of Red Arrow Highway, and west right-of-way Co Rd 652 crossing to the east right-of-way under Orchard Dr and back west north of Trestle Creek Ave terminating in an outfall at Hayden Creek; approximately 5.65-acres in total.

No sites were recorded during the current survey. It is our recommendation that there are no archaeological sites eligible for listing on the National Register of Historic Places within the project area and we recommend archaeological clearance.

REFERENCES CITED

- Anderson, David G. and Glen T. Hanson
1988 Early Archaic Settlement in the Southeastern United States: A Case Study from the Savannah River Valley. *American Antiquity* 53(2):262-286.
- Baerreis, David Albert, and Joan E. Freeman
1958 Late Woodland Pottery in Wisconsin as Seen from Aztalan. *The Wisconsin Archaeologist* 39(1):35-61.
- Borneman, Walter R.
2005 1812: The War That Forged a Nation. Harper Perennial Publishing.

2006 The French and Indian War: Deciding the Fate of North America. New York: Harper Collins Publishers
- Branstner, Mark C.
1992 1990-1991 Cultural Resources Inventory Surveys: Huron-Manistee National Forests (GLR92-02). Great Lakes Research Associates, Inc.
- Brose, David. S., C. Wesley Cowan, and R. C. Mainfort Jr. (editors)
2000 *Societies in Eclipse: Archaeology of the Eastern Woodlands Indians, A.D. 1400-1700*. Smithsonian Institution Press, Washington, D.C.
- Brown, James A., and R. F. Sasso
2000 Prelude to History on the Eastern Prairies. In *Societies in Eclipse: Archaeology of the Eastern Woodlands Indians, A. D. 1400-1700*, edited by D. S. Brose, C. W. Cowan, and R. C. Mainfort Jr., pp. 205-228. Smithsonian Institution Press, Washington, D.C.
- Buckmaster, Marla M., and James R. Paquette
1996 Surface Indications of a Late Pleistocene and Early Holocene Occupation at Silver Lake Basin, Marquette County, Michigan. In *Investigating the Archaeological Record of the Great Lakes State: Essays in Honor of Elizabeth Baldwin Garland*, edited by Margaret B. Holman, Janet G. Brashler, and Kathryn E. Parker, pp. 1-53. New Issues Press, Kalamazoo, Michigan.
- Catton, Bruce
1984 *Michigan: A History*. W. W. Norton & Company, Inc. New York, New York.
- Caldwell, Joseph
1964 Interaction Spheres in Prehistory. In *Hopewellian Studies*, edited by Joseph Caldwell and Robert Hall, pp. 133-143. Scientific Papers, No. 12, Illinois State Museum, Springfield.

- Chapman, Jefferson, and Gary D. Crites
 1987 Evidence for Early Maize (*Zea mays*) from the Icehouse Bottom Site, Tennessee. *American Antiquity* 52(2):352-354.
- Cochran, Donald R., K. D. Richey, and L. A. Maust
 1990 Early Paleoindian Economies in the Glaciated Regions of Indiana. *Research in Economic Anthropology*, Supplement 5, pp. 143-159. JAI Press, Greenwich, Connecticut.
- Dincauze, Dena F. and Mitchell T. Mulholland
 1977 Early and Middle Archaic Site Distributions and Habitats in Southern New England. *Annals of the New York Academy of Sciences*. 288:439-456.
- Dragoo, D.
 1976 Some Aspects of Eastern North American Prehistory: A Review. *American Antiquity* 41:3-27.
- Dunbar, Willis F and George S. May
 1995 *Michigan: A History of the Wolverine State*. William B. Eerdmans Publishing Company, Grand Rapids, Michigan.
- Eckert, Allan W. A
 1992 *Sorrow in Our Heart: The Life of Tecumseh*. New York: Bantam Books.
- Emerson, T. E.
 1999 The Langford Tradition and the Process of Tribalization on the Middle Mississippian Borders. *Midcontinental Journal of Archaeology* 24:3-56.
- Fagan, Brian M.
 2000 *Ancient North Americans: The Archaeology of a Continent*. 3rd edition. Thames and Hudson, London, England.
- Fairchild, Jerry D.
 1977 The Schmidt Site: A Pre-Nippissing Village in the Saginaw Valley, Michigan. M.A. Thesis, Department of Anthropology, Western Michigan University, Kalamazoo.
- Faulkner, C. H.
 1972 *The Late Prehistoric Occupation of Northwestern Indiana: A Study of the Upper Mississippian Cultures of the Kankakee Valley*. Prehistory Research Series No. 5. Indiana Historical Society, Indianapolis.

Fitting, J. E.

1965 A Quantitative Examination of Paleo-Indian Projectile Points in the Eastern United States. *Papers of the Michigan Academy of Science, Arts, and Letters* 50:265-371.

1975 *The Archaeology of Michigan: A Guide to the Prehistory of the Great Lakes Region*. Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Fritz, G. J.

1999 Gender and the Early Cultivation of Gourds in Eastern North America. *American Antiquity* 64(3):417-429.

Funk, Robert E.

1978 Post-Pleistocene Adaptations. In *Northeast*, edited by Bruce G. Trigger, pp. 16-27. *Handbook of North American Indians*, vol. 15, William C. Sturtevant, general editor, Smithsonian Institution Press, Washington, D.C.

Garland, Elizabeth B.,

1990 Early Post-Hopewell Ceremonialism at the Sunnerville Mounds Site (20CS6): The Brainerd Phase in Southwestern Michigan. *The Michigan Archaeologist*: 36.

Garland, Elizabeth B., and Scott G. Beld

1999 The Early Woodland: Ceramics, Domesticated Plants, and Burial Mounds Foretell the Shape of the Future. In *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State*, edited by John R. Halsey. Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Griffin, James B.

1978 The Midlands. In *Ancient North Americans*, edited by J. D. Jennings, pp. 240-301. Freeman and Co., San Francisco, California.

Hall, Robert L.

1987 Type Descriptions of Starved Rock Collared. *Wisconsin Archaeologist* 68:67-70.

Howell, A. H

1915 *North American Fauna*. No 37. U.S. Department of Agriculture. Bureau of Biological Survey.

Janzen, Donald E.

1977 An Examination of Late Archaic Development in the Falls of the Ohio River Area. 188 In *For the Director: Essays in Honor of James B. Griffin*, edited by C. E. Cleland, pp. 123-143. *Anthropological Papers* 61. Museum of Anthropology, University of Michigan, Ann Arbor.

Justice, Noel D.

- 1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States: A Modern Survey and Reference*. Indiana University Press, Bloomington.

Lovis, William A.

- 1999 The Middle Archaic: Learning to Live in the Woodlands. In *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State*, edited by John R. Halsey, pp. 83-94. Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Lovis, William and James Robertson

- 1989 Rethinking the Archaic Chronology of the Saginaw Valley, Michigan. *Midcontinental Journal of Archaeology* 14(2):226-260.

Lovis, William, W Thomas Langhorne and Sara Van Arsdel

- 1978 *A Cultural Resource Overview of the Huron-Manistee National Forest, Michigan*. 32. Michigan State University Museum, Archaeological Survey Report.

Mason Ronald J.

- 1981 *Great Lakes Archaeology*. Academic Press, New York.

Michalek, Michael

- 2012 Geomorphic Interpretation of the Montcalm Rolling Hills Physiographic Region. Research Paper. Michigan State University Geology Department.

O'Shea, John M.

- 1989 Report of a Phase One Archaeological Survey of a Parcel in Section 31 (T3S, R10E), Wayne County, Michigan. Museum of Anthropology, University of Michigan.

Ottesen, Anne I.

- 1985 Woodland Settlement Patterns in Northwestern Kentucky. In *Woodland Period Research in Kentucky*, edited by David Pollack, Tom Sanders, and Charles Hockensmith, pp. 166-186. Kentucky Heritage Council, Frankfort.

Peters, Roger W

- 2002 *Michigan Manual, 2001-2002*. Legislative Service Bureau.

Prufer, Olaf H. and Sara E. Pedde

- 2001 Introduction: Archaic Problems in Eastern North America. In *Archaic Transitions in Ohio and Kentucky Prehistory*, edited by Olaf H. Prufer, Sara E. Pedde, and Richard S. Meidl, pp. 1-9. The Kent State University Press, Kent, Ohio.

Rieck, Richard and Harold Winters

- 1993 Drift Volume in the Southern Peninsula of Michigan-A Prodigious Pleistocene Endowment. *Physical Geography* 14(5):478-193.

Riley, Thomas J., Gregory R. Walz, Charles J. Bareis, Andrew C. Fortier, and Kathryn E. Parker

- 1994 Accelerator Mass Spectrometry (AMS) Dates Confirm Early *Zea mays* in the Mississippi River Valley. *American Antiquity* 59:490-498.

Ritchie, W. A., and R. E. Funk

- 1973 *Aboriginal Settlement Patterns in the Northeast*. Memoir 20. New York State Museum and Science Service, New York State University, Albany.

Rubenstein, Bruce A., and Lawrence Ziewacs

- 1981 *Michigan, A History of the Great Lakes State*. Forum Press, Arlington Heights, Illinois.

Santure, Sharron K.

- 1990 Social Conflict. In *Archaeological Investigations at the Morton Village and Norris Farms 36 Cemetery*, edited by Sharron K. Santure, Alan D. Harn, and Duane Esarey, pp. 154-159. Reports of Investigations 45. Illinois State Museum, Springfield.

Schaetzl, Randall, Helen Enander, Michael D. Luehmann, David P. Lusch, Carolyn Fish, Michael Bigsby, Mark Steigmeyer, Jennifer Guasco, Claire Forgacs and Aaron Pollyea

- 2013 Mapping the Physiography of Michigan with GIS. *Physical Geography* 34:1-38.

Schott, Michael J., and Henry T. Wright

- 1999 The Paleo-Indians: Michigan's First People. In *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State*, edited by John R. Halsey. Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Seeman, M. E., and O. H. Prufer

- 1982 An Updated Distribution of Ohio Fluted Points. *Midcontinental Journal of Archaeology* 17(2):155-169.

Sieber, Ellen, Cheryl A. Munson, and Edward E. Smith

- 1989 *Archaeological Resource Management Overview for the Hoosier National Forest, Indiana*. Reports of Investigations 89-9. Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington.

Simons, Donald B.

- 1979 *New Data on the Satchell Complex from the Pinegrove Cemetery Site (20GS28) in Genesee County, Michigan*. Paper presented at the Eastern States Archaeological Federation meetings, Ann Arbor, Michigan.

- Simons, Donald B., Michael J. Shott and Henry T. Wright
 1984 The Gainey Site: Variability in a Great Lakes Paleo-Indian Assemblage. *Archaeology of Eastern North America* 12:266-279.
- Smart, Tristine Lee, and Richard I. Ford
 1983 Plant Remains. In *Recent Excavations at the Edwin Harness Mound, Liberty Works, Ross County, Ohio*, by N'omi Greber, pp. 55-58. Midcontinental Journal of Archaeology Special Papers 5. Kent State University Press, Kent, Ohio.
- Smith, Bruce D.
 1992 Prehistoric Plant Husbandry in Eastern North America. In *The Origins of Agriculture: An International Perspective*, edited by C. Wesley Cowan and Patty Jo Watson, pp. 101-119. Smithsonian Institution, Washington, D.C.
- Springer, J. W.
 1985 Site Distribution, Environmental Adaptation, and Environmental Change along the Northern Edge of the Prairie Peninsula. *Wisconsin Archeologist* 66:1-46.
- Sword, Wiley.
 1985 President Washington's Indian War: The Struggle for the Old Northwest, 1790- 1795. Norman: University of Oklahoma Press.
- Tankersley, Kenneth B.
 1989 *Late Pleistocene Lithic Exploitation and Human Settlement Patterns in the Midwestern United States*. Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington.
- Tankersley, Kenneth B., and B. L. Isaac (editors)
 1990 *Early Paleoindian Economies of Eastern North America*. Research in Economic Anthropology Supplement 5. JAI, Greenwich, Connecticut.
- Tanner, Helen H. (editor)
 1987 *Atlas of Great Lakes Indian History*. University of Oklahoma Press, Norman.
- Taylor, Alan.
 2006 *The Divided Ground: Indians, Settlers and the Northern Borderland of the American Revolution*. New York: Alfred A. Knopf,.
- Treaty of Ghent
 1814 International Treaties and Related Records, 1778-1974; General Records of the United States Government; Record Group 11; National Archives.

Treaty of Paris

- 1783 International Treaties and Related Records, 1778-1974; General Records of the United States Government, Record Group 11; National Archives.

United States Department of Agriculture (USDA)

- 2015 Coloma Series Soils
https://soilseries.sc.egov.usda.gov/OSD_Docs/C/COLOMA.html
- 2017 Oshtemo Series Soils
https://soilseries.sc.egov.usda.gov/OSD_Docs/O/OSHTEMO.html
- 2012 Spinks Series Soils
https://soilseries.sc.egov.usda.gov/OSD_Docs/S/SPINKS.html
- 2020 Web Soil Survey
<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>; accessed June 22, 2020.

White, Andrew A.

- 2005 *Paleoindian Chronology and Technology in Northeastern Indiana*. Reports of Investigations 501. IPFW Archaeological Survey, Indiana University-Purdue University Fort Wayne, Fort Wayne, Indiana.

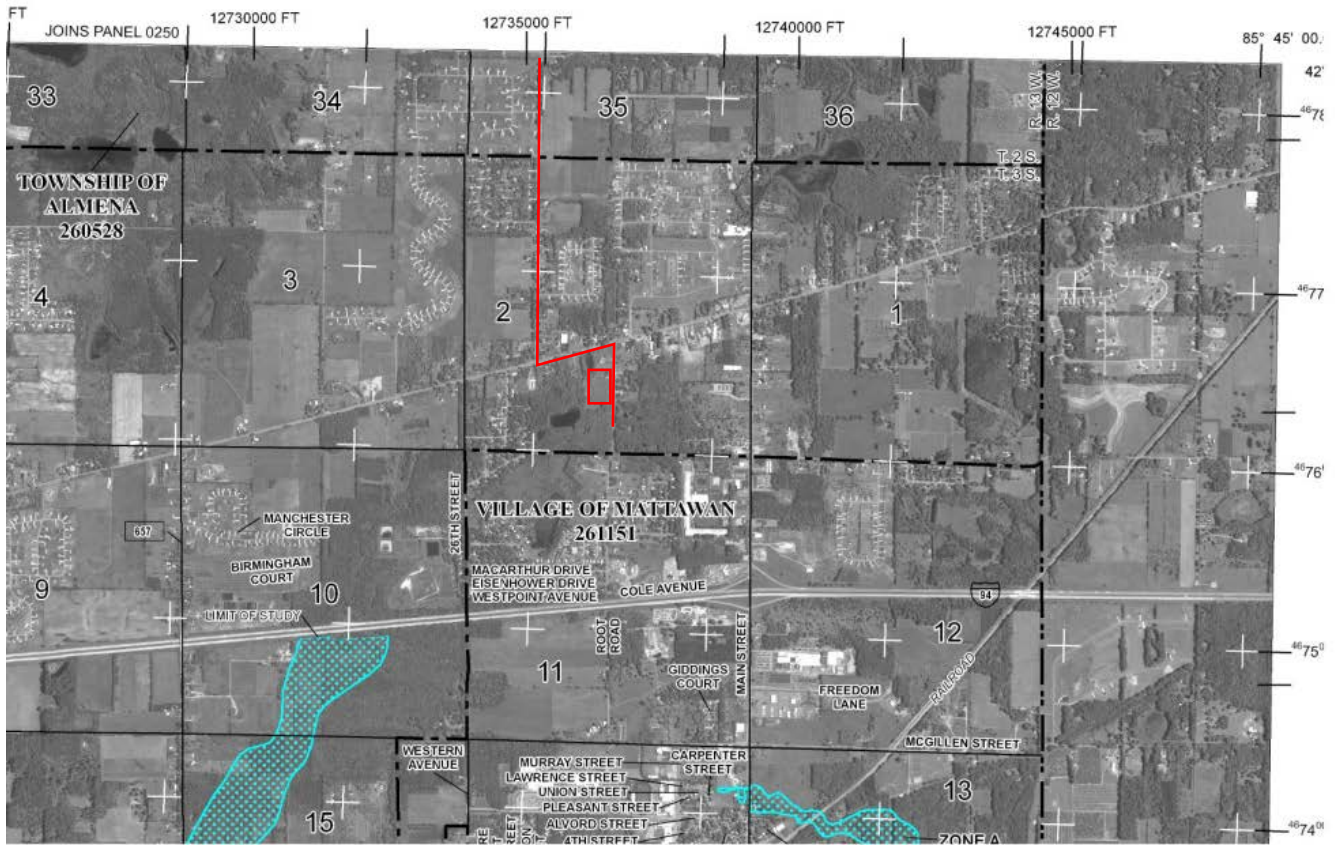
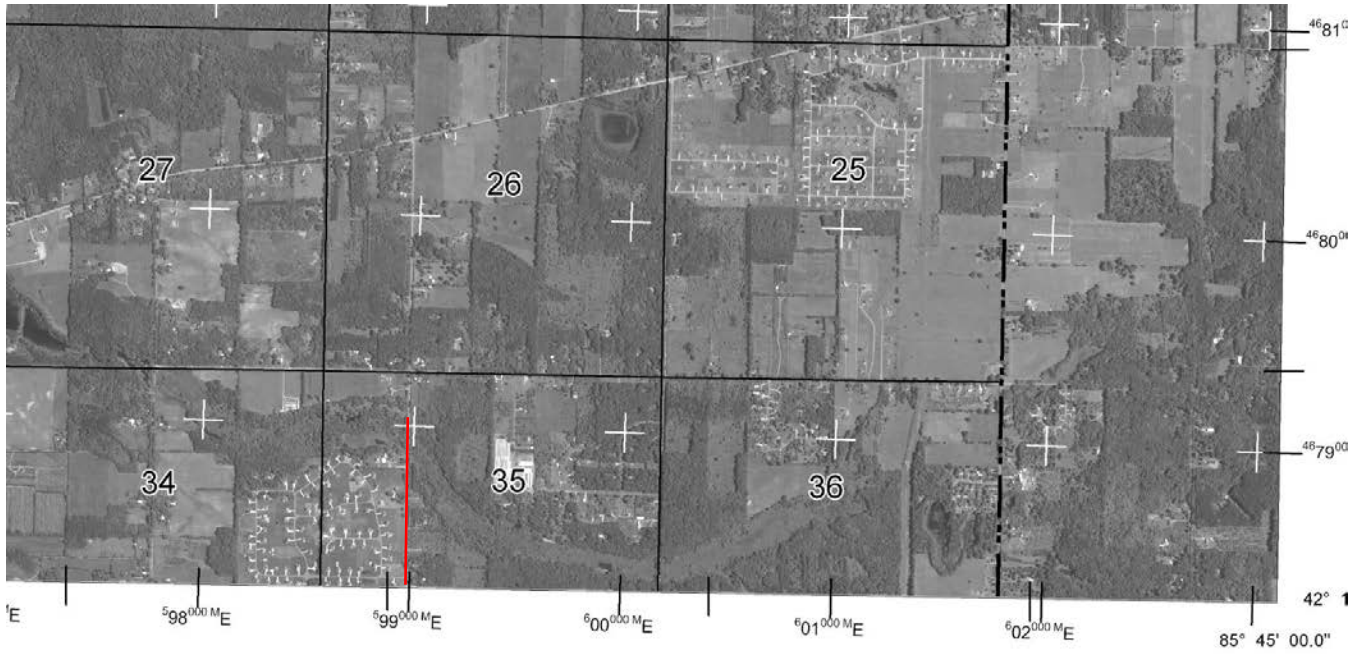
Winters, Howard D.

- 1968 Value Systems and Trade Cycles in the Late Archaic of the Midwest. In *New Perspectives in Archaeology*, edited by S. R. Binford and L. R. Binford, pp. 175-21. Akine, Chicago.

Yarnell, R.

- 1964 *Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region*. Anthropological Papers 23. Museum of Anthropology, University of Michigan, Ann Arbor.
- 1988 The Importance of Native Crops during the Late Archaic and Woodland. Paper presented at the Southeastern Archaeological Conference, New Orleans, Louisiana.

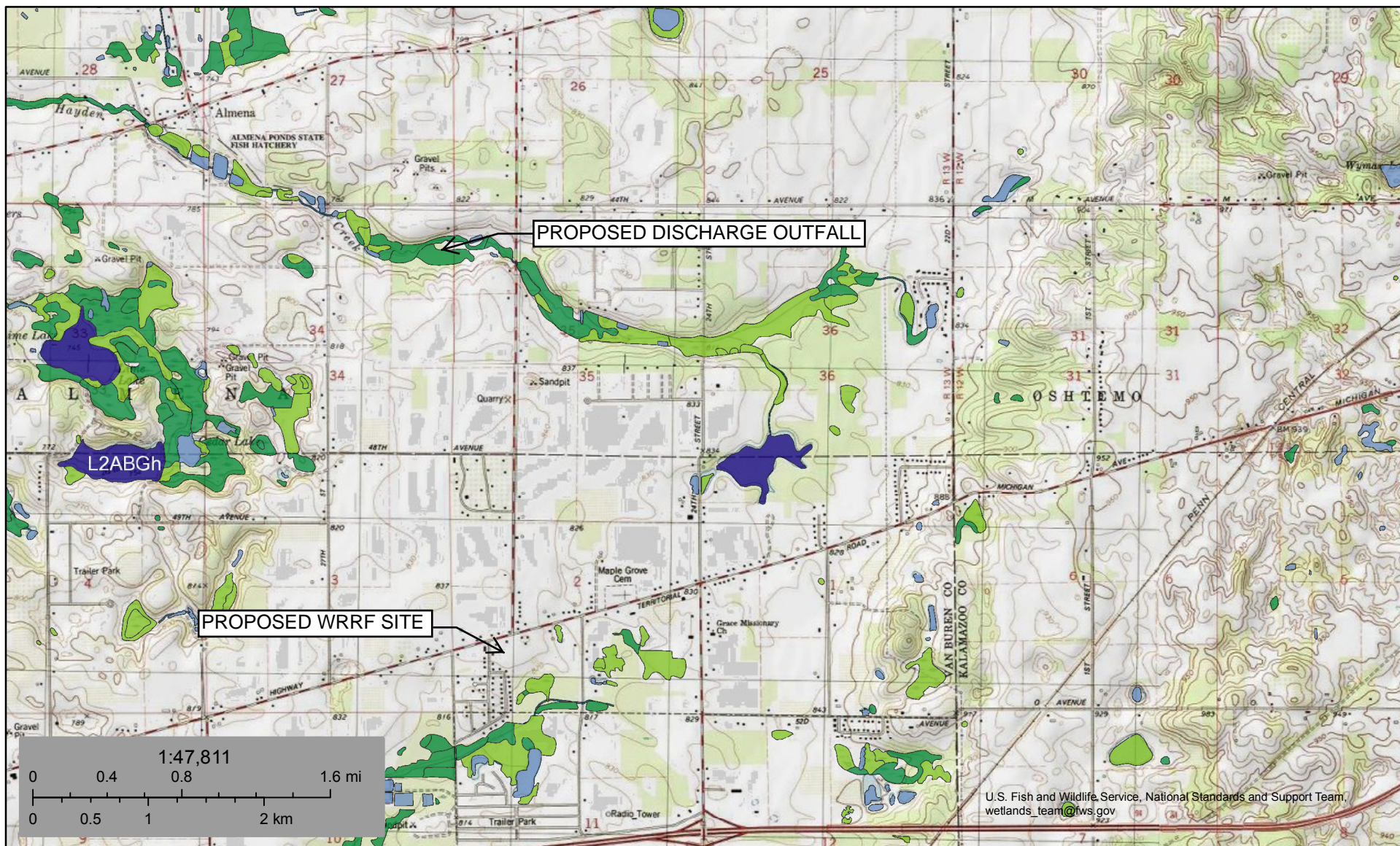
Mattawan Floodplain Map 26159C0250C



Mattawan Floodplain Map 26159C0375C



FIGURE 4
Hayden Creek



March 5, 2020

Wetlands

- | | | | | | |
|---|--------------------------------|---|-----------------------------------|---|----------|
|  | Estuarine and Marine Deepwater |  | Freshwater Emergent Wetland |  | Lake |
|  | Estuarine and Marine Wetland |  | Freshwater Forested/Shrub Wetland |  | Other |
|  | Freshwater Pond |  | Freshwater Pond |  | Riverine |

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.



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Natural
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A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Van Buren County, Michigan**



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

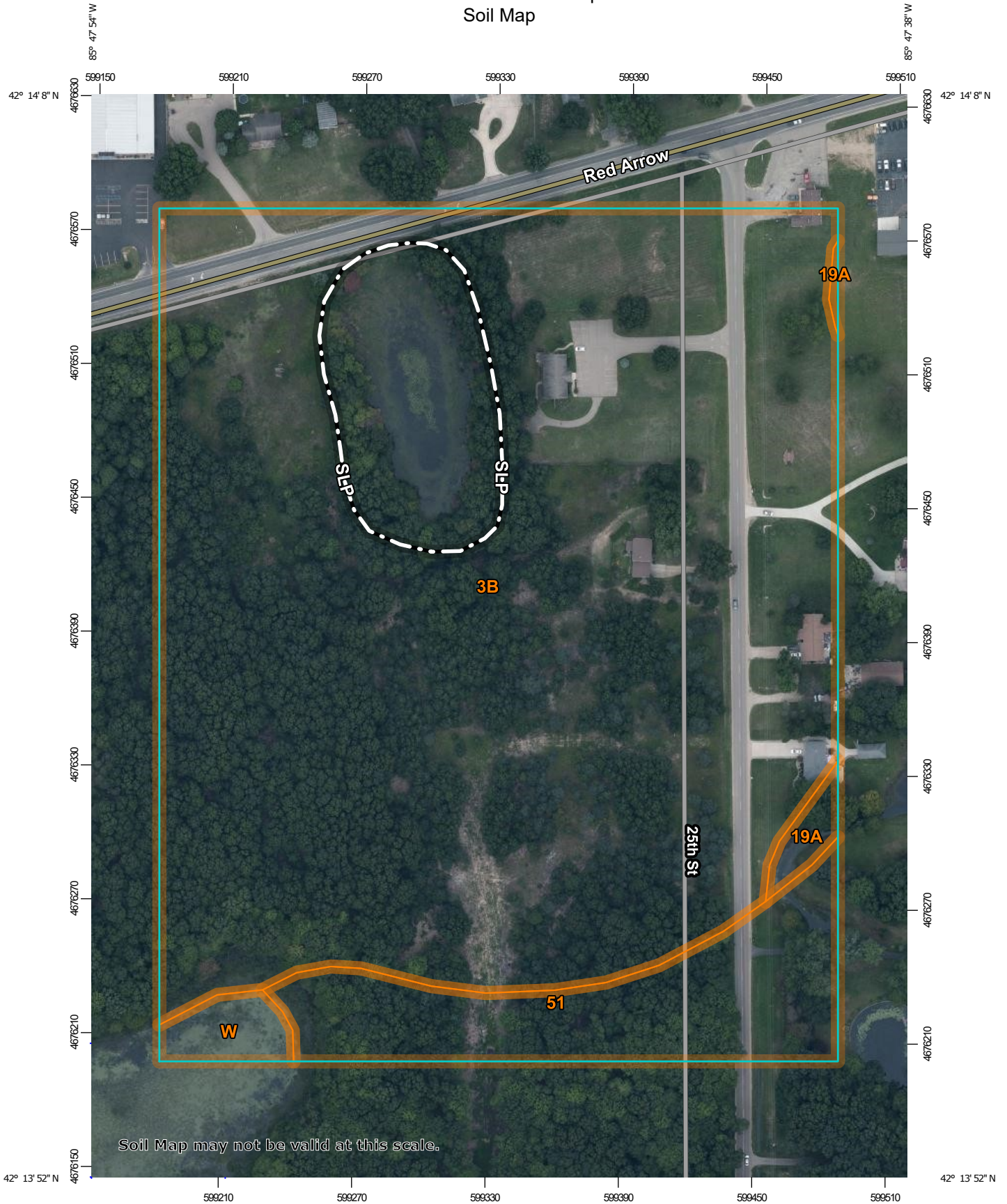
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

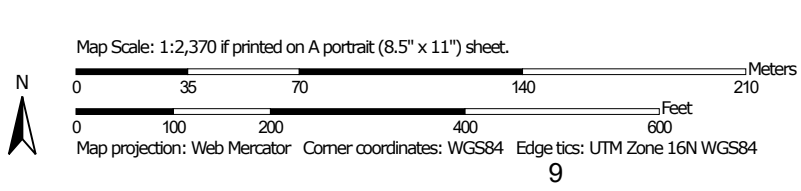
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

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Soil Map



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)


Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot


 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot


 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals


Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Van Buren County, Michigan
 Survey Area Data: Version 16, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 5, 2018—Sep 4, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3B	Coloma loamy sand, 0 to 6 percent slopes	25.5	87.9%
19A	Ottokee loamy fine sand, 0 to 3 percent slopes	0.2	0.8%
51	Kingsville loamy sand	2.9	9.9%
W	Water	0.4	1.3%
Totals for Area of Interest		29.0	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

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landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Van Buren County, Michigan

3B—Coloma loamy sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2w643
Elevation: 610 to 970 feet
Mean annual precipitation: 30 to 41 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Coloma and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Coloma

Setting

Landform: Outwash plains, moraines
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve, side slope, head slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Sandy outwash

Typical profile

Ap - 0 to 9 inches: loamy sand
Bw - 9 to 33 inches: sand
E and Bt - 33 to 80 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 0.1 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Minor Components

Oshtemo

Percent of map unit: 8 percent
Landform: Outwash plains, moraines
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve, side slope, head slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Elmdale

Percent of map unit: 1 percent
Landform: Moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Thetford

Percent of map unit: 1 percent
Landform: Moraines, outwash plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

19A—Ottokee loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 67vt
Elevation: 610 to 920 feet
Mean annual precipitation: 32 to 36 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 160 to 180 days
Farmland classification: Farmland of local importance

Map Unit Composition

Ottokee and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ottokee

Setting

Landform: Outwash plains
Landform position (three-dimensional): Rise

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Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy outwash

Typical profile

Ap - 0 to 10 inches: loamy fine sand
Bt and E - 10 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F097XA012MI - Moist Sandy Depression
Hydric soil rating: No

Minor Components

Kingsville

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

51—Kingsville loamy sand

Map Unit Setting

National map unit symbol: 67wq
Elevation: 610 to 920 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Farmland of local importance

Map Unit Composition

Kingsville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kingsville

Setting

Landform: Outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

Ap - 0 to 8 inches: loamy sand
Bg - 8 to 30 inches: sand
Cg - 30 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

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United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

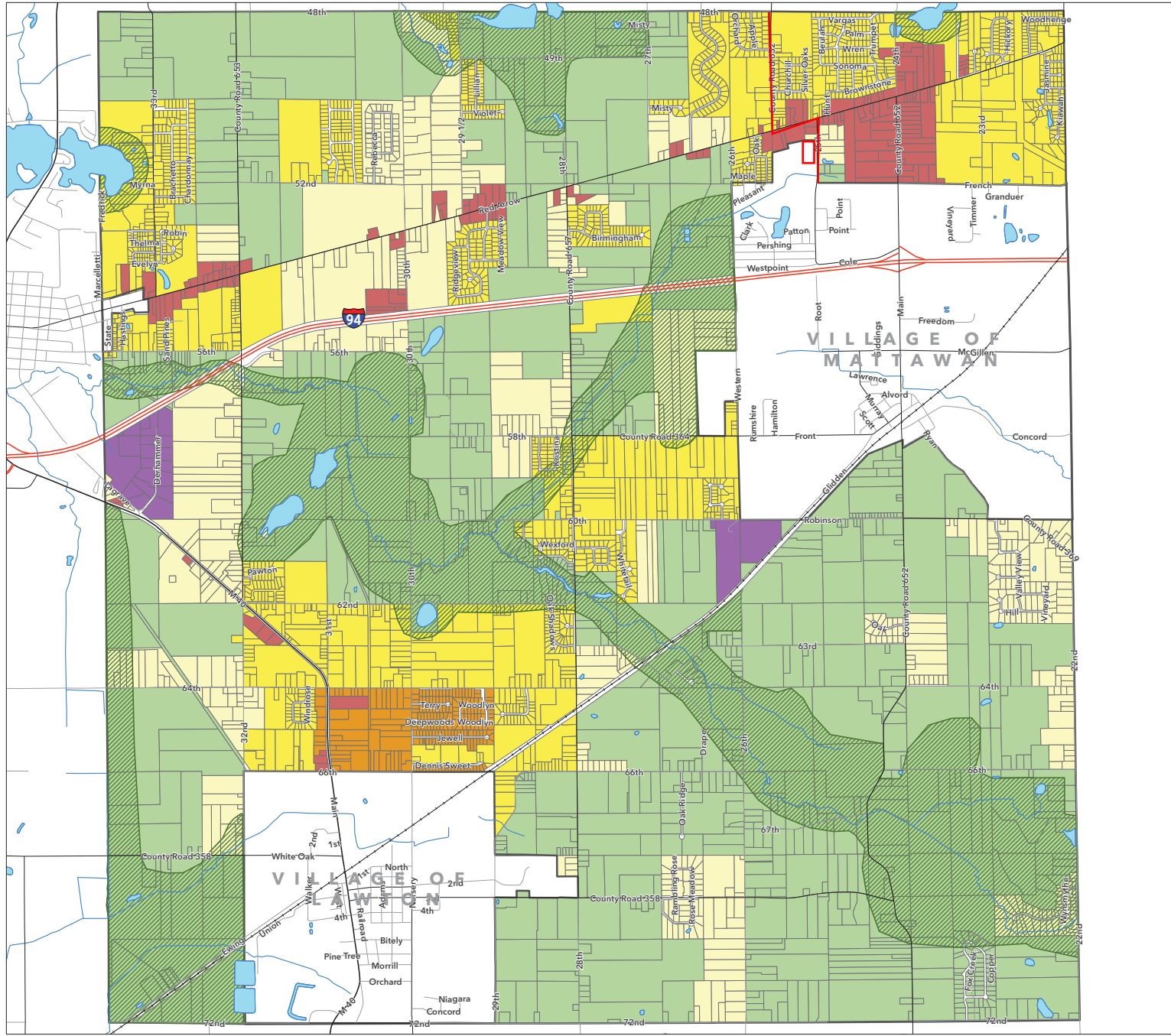
Antwerp Township

Van Buren County, Michigan

Zoning Map

Adopted: February 8, 2011

Effective: December 21, 2018



- Municipal Boundary
- Environmental Protection Overlay
- AG - Agricultural and Open Space Residential
- R1 - Rural Estate Residential
- R2 - Single Family Residential
- R3 - Single and Multiple-Family Residential
- GC - General Commercial
- LI - Light Industrial

★ - Use Subject to Conditional Rezoning Agreement

CO - Commercial Corridor Overlay District applies to all properties with frontage along M-40 or Red Arrow Highway except those parcels zoned GC - General Commercial.

Updated: January 4, 2019



Source: State of Michigan, Southwest Michigan Planning Commission **williams&works** engineers | surveyors | planners

Mattawan WW

General Project Design Guidelines (3 Species)

Generated October 09, 2020 10:18 AM MDT, IPaC v unspecified



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Species Document Availability

Species with general design guidelines

Eastern Massasauga (=rattlesnake) *Sistrurus catenatus*

Indiana Bat *Myotis sodalis*

Northern Long-eared Bat *Myotis septentrionalis*

Species without general design guidelines available

Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii*

Piping Plover *Charadrius melodus*

Pitcher's Thistle *Cirsium pitcheri*

Red Knot *Calidris canutus rufa*

Environmental Screening for Eastern Massasauga Rattlesnake in Michigan March 14, 2017

Background

The Eastern Massasauga Rattlesnake (EMR) is listed as a threatened species under the U.S. Endangered Species Act (Act). The Act protects the EMR and their habitat by prohibiting “take” and may require agencies to coordinate with the U.S. Fish and Wildlife Service (Service) before authorizing or funding an activity affecting the species. To streamline coordination, the Service’s Michigan Ecological Services Field Office has developed a set of Best Management Practices (BMPs) for specific activities potentially impacting EMR in Michigan. These BMPs are voluntary and just one of the ways that compliance with the Act may be achieved.

Projects may...

- have no effect to EMR and no need for additional ESA compliance considerations.
- have potential for adverse effects, but use BMPs to avoid adverse effects (i.e., “not likely to adversely affect” EMR) or minimize the adverse effects.
- use surveys to confirm probable absence of EMR (contact the Service for survey guidance).
- use “Informal Consultation” with Service (for actions requiring a Federal permit or funding).
- use “Formal Consultation” with Service (for actions requiring a Federal permit or funding).
- develop a Habitat Conservation Plan and seek an ESA permit, if adverse effects cannot be avoided.

For activities not listed in the BMPs, please contact the Service for project-specific recommendations. In some cases implementation of BMPs may not be sufficient to avoid all adverse impacts to EMR and additional consultation with the Service may be required. The Service can assist planners in determining whether adverse effects are likely as a result of proposed projects, and whether implementation of BMPs is sufficient to remove the risk of adverse effects.

Additional information on compliance with the Act can be found:

For Federal actions/section 7 consultation:

<https://www.fws.gov/midwest/Endangered/section7/s7process/index.html>

For non-Federal actions:

<https://www.fws.gov/midwest/endangered/permits/index.html>

For questions or comments you may contact the Service below:

U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823
Phone: (517)351-2555
Email: eastlansing@fws.gov

Definitions

Active Season: The active season begins in the spring when snakes emerge from hibernation, generally when maximum air temperatures are above 50°F, and ends in the fall when EMR have returned to their hibernacula and temperatures are consistently below 45°F. In Michigan, the active season is generally April through October. The active season dates will vary by location and weather. **Contact the Service for project-specific dates based on location when work in EMR habitat is planned near the start or end of the active season.**

Affecting hydrology: We consider “affecting hydrology” to include projects that are likely to appreciably change the elevations of surface water upstream or downstream, or in the local ground water (as estimated pre-project vs. post-project). The concern is for changes to local hydrology (e.g., creating new ditches, creating a new impoundment) that might harm EMR hibernating at or near ground water, or actions that significantly alter available suitable habitat either through flooding or drying of EMR wetlands.

Hibernacula: Areas suitable for EMR to overwinter. For most EMR populations, the locations of hibernacula are not known, but these areas are critical to protect. Unfortunately, we lack information on how to reliably identify these areas. EMR usually hibernate below the frost line in crayfish or small mammal burrows, tree root networks or rock crevices in or along the edge of wetlands or in adjacent upland areas with presumably high water tables (areas where the soil is saturated but not inundated). Following egress from hibernacula in the spring, EMR typically remain aboveground in the vicinity for a week or two, and return to these areas in the fall for several weeks prior to entering hibernation. Surveys in the spring (shortly following egress) or fall (prior to ingress) when snakes are congregating in the vicinity may help identify these important areas. Maintaining stable hydrology of these areas is important during the inactive season.

IPaC: “Information for Planning and Conservation” is a project planning tool available on-line to the public that streamlines the Service’s environmental review process.

EMR Habitat: “Eastern Massasaugas have been found in a variety of wetland habitats. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are known from open wetlands and lowland coniferous forests, such as cedar swamps. Some populations of Eastern Massasaugas also utilize open uplands and/or forest openings for foraging, basking, gestation and parturition (i.e., giving birth to young). Massasauga habitats generally appear to be characterized by the following: (1) open, sunny areas intermixed with shaded areas, presumably for thermoregulation; (2) presence of the water table near the surface for hibernation; and (3) variable elevations between adjoining lowland and upland habitats.” From Michigan Natural Features Inventory (Website: mnfi.anr.msu.edu)

Tier 1 Habitat: Areas known to be occupied by EMR or highly likely to be occupied by EMR.

Tier 2 Habitat: Areas with high potential habitat and may be occupied by EMR.

Within the known range: EMR can occur throughout the Lower Peninsula and on Bois Blanc Island in Mackinac County. Areas within the known range but outside of Tier 1 and Tier 2 are considered less likely to be occupied. 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. It is likely that there are additional and yet-unknown occurrences throughout the Lower Peninsula of Michigan. Mapped habitats are subject to change based on new information identifying current Tier 1 and 2 areas as unsuitable, or based on discovery of new EMR occurrences.

EMR Environmental Screening Step-wise Process

Step 1. Determine if EMR may be present in the action area

- ✓ Determine whether the project is in potential EMR habitat using <https://ecos.fws.gov/ipac>
 - You can search for your project location and define the action area by drawing a polygon or uploading a shapefile.
 - IPaC will give you a list of species that may be present in the area you identified. If you click on the thumbnail for EMR, it will tell you if your project is within Tier 1 or Tier 2 habitat, or within the known range of EMR. If EMR is not listed, you do not need to consider this species. Effects to other listed species should also be considered; contact the Service if you need assistance.
 - If EMR is listed, it does not necessarily mean that the entire action area is potential habitat, only that some potential habitat is within the action area entered. For large-scale (e.g., county-wide or multi-county projects) consider coordinating the Michigan Ecological Services Field Office for direct assistance.

If your project is within the known range of EMR, including Tier 1 or Tier 2 habitat, continue to step 2:

Step 2. Determine if the project has the potential to affect EMR

Projects have no effect on EMR when...

- ✓ There is no suitable EMR habitat in the project area and no potential impact off-site (e.g., water discharge into adjacent EMR habitat). If project site conditions are determined to be wholly unsuitable for EMR (e.g., project is in regularly mowed turf grass, row crop, graveled lot, existing building, or industrial site), it is not suitable EMR habitat.
- ✓ The project occurs within suitable habitat, but the action will have absolutely no effect on the habitat or EMR.
- ✓ In suitable EMR habitat, but the site is entirely unoccupied by the species. This is typically confirmed through surveys (contact the Service for more information). In some cases it may be easier to assume EMR are present and use BMPs than to conduct surveys for the species.

For projects where there is a potential for effects to EMR, continue to the section of the document as follows:

For Tier 1 Habitat Page 5

For Tier 2 Habitat Page 6

Within the range of EMR Page 7

For projects with a combination of Tier 1 and Tier 2 habitat, follow the instructions for Tier 1.

Tier 1 Habitat

Tier 1: Project will not affect EMR if all of the following apply:

1. Project will not result in any changes to suitable EMR habitat quality, quantity, availability or distribution, including changes to local hydrology
2. If EMR are present in the project area, they are not likely to have any response as a result of exposure to the action or any environmental changes as a result of the action
3. Project includes all General Best Management Practices:
 - a. Use wildlife-safe materials for erosion control and site restoration (see Erosion Control Resources side panel). In Tier 1 habitat, immediately eliminate use of erosion control products containing plastic mesh netting or other similar material that could entangle EMR.
 - b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/-PFnXe_e02w), or review the EMR factsheet (available at <https://www.fws.gov/midwest/endangered/reptiles/eam/pdf/EMRfactsheetSept2016.pdf> or by calling 517-351-2555.
 - c. Require reporting of any EMR observations, or observation of any other listed threatened or endangered species, during project implementation to the Service within 24 hours.

Tier 1: Project Not Affecting EMR Coordination

Recommendation: No pre-project coordination with Service needed. Document the steps above for your records.

Tier 1: All Other Projects: For any other projects in Tier 1 habitat that may affect EMR or its habitat, contact the Service for assistance in evaluating potential impacts. Best Management Practices (starting on page 8) are included for many actions to help with project planning, but may not be sufficient to avoid all adverse impacts. The Service can determine whether additional measures are necessary after a project-specific review.

Erosion Control Resources

There are a variety of products that can be used for soil erosion and control requirements. These products may incorporate plastic mesh netting to help maintain form and function. This plastic netting has been demonstrated to entangle a wide variety of wildlife from birds to small mammals. In Michigan, soil erosion control netting has resulted in the documented mortality of a number of imperiled amphibian and reptile species including the EMR and the Eastern Fox Snake (State Threatened).

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 in a manner that allows wildlife to wiggle free. For more information regarding wildlife-safe erosion control measures contact the [USFWS Michigan Ecological Services Field Office](#).

Tier 2 Habitat

Tier 2: Project is not likely to adversely affect EMR if all of the following apply:

1. Project does not impact more than 1 acre of wetland habitat and includes all applicable activity-specific BMPs (starting on page 8), and
2. Project will not appreciably affect hydrology
3. Project includes all General Best Management Practices:
 - a. Use wildlife-safe materials for erosion control and site restoration (See Erosion Control Resources side panel, page 4). In Tier 2 habitat, eliminate the use of erosion control products containing plastic mesh netting or other similar material that could ensnare EMR as soon as is feasible but no later than January 1, 2018.
 - b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/-PFnXe_e02w), or review the EMR factsheet (available at <https://www.fws.gov/midwest/endangered/reptiles/eama/pdf/EMRfactsheetSept2016.pdf> or by calling 517-351-2555.
 - c. Require reporting of any EMR observations, or observation of any other listed threatened or endangered species, during project implementation to the Service within 24 hours.

Tier 2: Project Not Likely to Adversely Affect EMR Coordination Recommendation: Informal consultation with Service for actions requiring a Federal permit or funding. For non-Federal projects, document the steps above for your records, but no pre-project coordination with the Service needed.

Tier 2: All Other Projects: Coordinate with the Service for a project-level review to determine potential impacts and whether additional conservation measures are needed to avoid adverse effects.

Within the known range of EMR

For projects within the known range of EMR, but outside of Tier 1 and Tier 2 habitat:

To help ensure your project is unlikely to affect EMR:

1. Project applies the General Best Management Practices:
 - a. Use wildlife-safe materials for erosion control and site restoration (See Erosion Control Resources side panel, page 4). By January 1, 2019, eliminate the use of erosion control products containing plastic mesh netting or other similar material that could ensnare EMR (within the known range but outside of Tier1 or Tier 2 habitat).
 - b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/-PFnXe_e02w), or review the EMR factsheet (available at <https://www.fws.gov/midwest/endangered/reptiles/eama/pdf/EMRfactsheetSept2016.pdf> or by calling 517-351-2555).
 - c. Require reporting of any EMR observations, or observation of any other listed threatened or endangered species, during project implementation to the Service within 24 hours.
2. Project will not have significant impacts to dispersal, connectivity, or hydrology of existing EMR potential habitat, i.e., filling less than 1 acre of wetland habitat or converting less than 20 acres of uplands of potential EMR habitat (uplands associated with high quality wetland habitat) to other land uses.

Within the Known Range, but Outside Tier 1 or 2 Coordination Recommendation:

Document the steps above for your records and no pre-project coordination with the Service needed. If you cannot implement the General Best Management Practices contact the Service for assistance in evaluating potential impacts.

Activity-Specific Best Management Practices

For Tier 1, BMPs are included; however, even with implementation of the BMPs, project-specific review may be needed to determine whether they are sufficient to avoid all adverse impacts

- In Tier 1 habitat, contact the Service regarding the potential applicability of surveys to determine EMR absence in suitable habitat. In Tier 2, surveys can be conducted to confirm the presence of suitable habitat and/or the presence/probable absence of EMR. If onsite habitat is determined to be wholly unsuitable via desktop analysis (e.g., entirely mowed lawn, row crop, graveled lot, and industrial site), then it can be classified as unoccupied and the BMPs will not be necessary.
- Minimize work in Tier 1 and Tier 2 EMR habitat. When feasible, do not route new construction projects, such as pipelines, facilities, or access roads, through potential EMR habitat. Implement the use of wildlife-friendly corridors (e.g., oversized culverts) into new road design to maintain or enhance habitat connectivity.
- Projects should be designed to minimize the potential for disturbance to EMR during project activities.

Maintenance Activities (includes nominal modifications to existing roads and infrastructure)

1. Ground Disturbing Activities

a. All

- i. No known EMR hibernacula are destroyed or disturbed at any time of year. Because these areas are often not known:
 1. For Tier 1: contact the Service to determine whether adverse impacts are likely as a result of ground disturbing work in Tier 1 habitat.
 2. For Tier 2: when operating in potential hibernation areas (e.g., EMR wetlands and adjacent areas with crayfish burrows, rodent holes, small mammal burrows, etc.), work is conducted well within the active season (June – August) to avoid when snakes are likely to be present. During this time, they are most likely to be able to move out of the way of disturbance and have greater chances to find alternative hibernation sites. Destroying potential hibernacula may still impact snakes indirectly. Potential hibernation areas should be avoided to the extent possible.

b. Grading

- i. When working during EMR active season, use exclusionary fencing to separate EMR habitat from the work site to prevent EMR from accessing the disturbance area. For example, in linear projects exclusionary fencing should run parallel to the disturbance, creating a barrier to snake movement. Each end of the exclusionary fencing should be angled away from the area of disturbance to direct snakes traveling along fencing away from the site. The

- exclusionary fencing will typically be traditional silt fence that is set up outside of all areas of disturbance and other types of fencing (i.e., snow fence used to delineate the work zone). Do not use fencing materials that can entangle or injure snakes.
- ii. Any areas using exclusionary fencing should first be “cleared” by a qualified individual¹ before beginning construction activities. Fencing should be installed a minimum of 1 day before construction activities occur and walked weekly to ensure the integrity of the fence. If snakes are seen within the work zone, activity should stop until the snake can be safely moved, and the fence examined for breeches.
 - iii. Revegetate all disturbed Tier 1 and Tier 2 habitat 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.
 - iv. In Tier 1 and Tier 2, avoid spread of invasive species into EMR habitat by following best practices. This includes inspecting and cleaning equipment and vehicles between work sites as needed to avoid the spread of invasive plant materials.
- c. Trenching
- i. In Tier 1 and Tier 2, avoid trenching in EMR wetlands when possible. In Tier 1, if open trenching is required install exclusionary fencing (follow measures 1(b)(i)-(iv)) and ensure the area is clear prior to trenching.
- d. Fill
- i. In Tier 1 and Tier 2, ensure all imported fill material is free from contaminants or invasive species could affect the species or habitat through acquisition of materials at an appropriate quarry or other such measures.
 - ii. In Tier 1 and Tier 2, use exclusionary fencing around the area to be filled and have the site “cleared” prior to placing fill by a qualified individual (as in 1(b)(i)-(ii)).
- e. Ditching
- i. For Tier 1 and Tier 2, conduct work well within the active season (June-August) when snakes are not likely to be near hibernation sites and can escape disturbance, or contact Service for project specific recommendations.
 - ii. For Tier 1, use exclusionary fencing around the area to be cleared/graded and have the site cleared by a qualified individual prior to construction activities.
 - iii. For Tier 1, contact the Service for work greater than 200’ for project specific recommendations.

¹ A qualified individual is someone who has received training on the identification and life history of EMR.

2. Site Access with vehicles (both Tiers)
 - a. Limit operating vehicles/equipment, clearing trees, etc., in EMR habitat to the inactive season when the ground is frozen. During this time, under these conditions, EMR are most likely underground and will not be impacted by these activities. When possible, use low-impact equipment such as light weight track mounted vehicles with low ground pressure. In Tier 1, if the ground isn't completely frozen (due to weather conditions during the inactive season or if working near seeps and springs that are less likely to freeze), or if working near potential hibernacula, manual access (on foot) may be required.
 - b. Strictly control and minimize vehicle activity in known/presumed occupied EMR habitat to the extent possible. During EMR active season, speed limits at facilities and access roads (i.e., 2-track and gravel) in occupied habitat should be <15 MPH.
 - c. In Tier 1 and Tier 2 habitat areas, drivers should be aware of the potential danger to the driver of swerving to intentionally drive over snakes as well as legal and conservation implications.

3. Heavy Equipment (both Tiers)
 - a. Spill Prevention for oils/fluids
 - i. Site staging areas for equipment, fuel, materials, and personnel at least 100 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials). If a reportable spill has impacted occupied habitat:
 1. Follow spill response plan;
 2. Call MDEQ and the National Response Center (800-424-8802), and the Service's Michigan Ecological Services Field Office (517-351-2555) to report the release.
 - b. Do not use large equipment or perform earth-moving activities, water withdrawal and discharge for hydrostatic testing, or other activities that substantially affect the ground or water levels in potential EMR hibernacula areas. Avoidance measures may include, but are not limited to, re-routing of pipeline and appurtenance facilities, boring or drilling, and timing/weather-related restrictions. Measures will be determined on a site-specific basis, based on local habitat conditions, contact Service for more information.

4. Hydrology impacts (both Tiers)
 - i. Water levels in known/presumed occupied habitats should not be artificially manipulated during the inactive season.

- ii. Where applicable, water levels should be allowed to flow naturally and not be artificially stabilized. This allows for the restoration of early successional habitats.

Habitat Management and Restoration

5. Vegetation Management

a. Mowing

- i. In Tier 1, mow during the inactive season.
- ii. For Tier 2, mowing is unrestricted during the inactive season. During the active season, follow daytime mowing restrictions and mow during times of day when snakes are less likely to be active (Figure 1). Increase mower deck height to >8 inches to reduce likelihood of injury to snakes. Higher deck height will reduce the risk of death or injury to snakes in the area.
- iii. In areas with turf grass or areas where trying to discourage EMR (e.g., in areas around buildings), mow regularly and keep grass relatively short (less than 4-6 inches) to reduce its suitability for EMR. If starting with longer grass (greater than 6 inches), mow during the inactive season initially, and then maintenance mowing can occur during the active season (as long as it is regularly maintained and kept shorter than 4-6 inches, so that EMR is unlikely to use those areas). Unmaintained/longer grass may be used by snakes and make them vulnerable to mortality during the next mowing event.

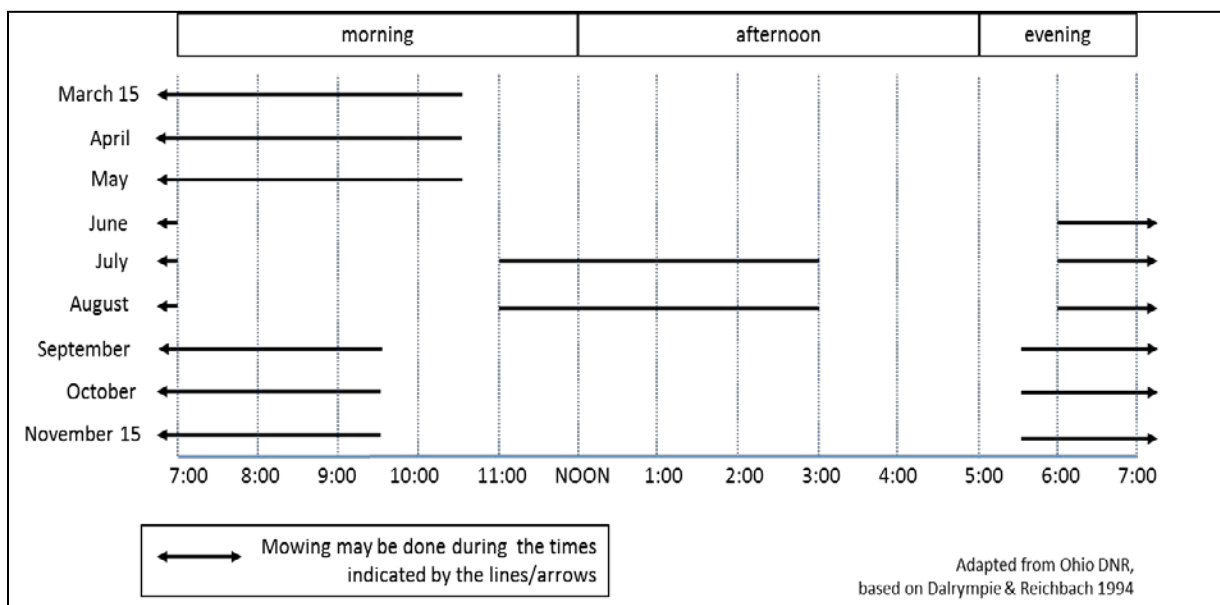


Figure 1. EMR Active season mowing schedule (NiSource Biological Opinion, page 273, USFWS 2015)

- b. Cultivation (e.g., disking)
 - i. In Tier 1 habitat, disking should be limited to the inactive season, and areas within 50 m of known or potential hibernacula should be avoided. In Tier 2, disking can occur in the active season if area is mowed during the inactive season and maintained shorter than 4-5 inches.
- c. Brush/Tree Removal
 - i. In Tier 1, conduct brush or tree removal in known/presumed EMR habitat during the inactive season, when the ground is frozen (such that soils can be left undisturbed).
 - ii. Use low impact harvest methods in Tier 1 and Tier 2 wetlands to cut and remove individual trees. This includes using low-impact equipment such as light weight track mounted vehicles with low ground pressure. In Tier 1, if the ground isn't completely frozen (due to weather conditions during the inactive season or if working near seeps and springs that are less likely to freeze), or if working near potential hibernacula, use hand tools and access site on foot.
 - iii. In Tier 1 and Tier 2, do not burn brush piles during the active season. Dispose of brush offsite or leave in place.
- d. Herbicides
 - i. Follow all appropriate label instructions regarding which herbicide formulation to use in potential EMR habitat. 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.).
 - ii. Avoid broadcast applications of herbicides in Tier 1. Spot spraying or wicking can be used to control invasive plants in occupied habitat. If using broadcast spray in Tier 2, limit the area of exposure to less than half of the available EMR habitat to allow for untreated areas to provide potential areas of refugia from exposure. Contact the Service if you need help in determining this.
- e. Prescribed burning (Tier 1 and Tier 2)
 - i. Conduct prescribed burns during the inactive season before snakes emerge from hibernation. Walk the burn unit following the burn and report any dead or injured EMR to the Service within 24 hours. Burn only a portion (e.g., one-third) of available EMR habitat in any year to leave suitable cover for EMR and its prey.
 - ii. Establish fire breaks using existing fuel breaks (roads, rivers, trails, etc.) to the greatest extent possible. Cultivation (disking or roto-tilling) of burn breaks will be minimized to the extent that human health and safety are not jeopardized. Cultivation and mowing to establish fire breaks will occur during the inactive season.

6. Erosion control
 - a. Use wildlife-safe erosion control blankets (without plastic mesh netting in the layers of material) as required in the general BMPs. Remove all silt fence used for erosion control once soils are stable to reduce barriers to EMR movement.
7. Revegetation
 - a. Revegetate all disturbed Tier 1 and Tier 2 habitat 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.
8. Invasive species
 - a. In Tier 1 and Tier 2, avoid spread of invasive species into EMR habitat by following best practices. This includes inspecting and cleaning equipment and vehicles between work sites as needed to avoid the spread of invasive plant materials.
9. Wetland restoration
 - a. Restoring natural hydrology in areas that have been drained by tiling and ditching may greatly benefit EMR habitat. Conduct tile breaking or excavation well within the active season to avoid potential hibernacula. Have a qualified individual walk in front of the equipment to clear the area. Work with the Service for Tier 1 habitat to ensure no indirect adverse effects are expected as a result of restoration efforts.
10. Water-level manipulation
 - a. Water levels should not be artificially manipulated during the inactive season to avoid impacts to hibernating snakes. Contact the Service in Tier 1 habitat when water levels will be manipulated during the inactive season or will result in significant alterations to EMR habitat during the active season.

Indiana Bat Project Review in Michigan

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I. BACKGROUND INFORMATION

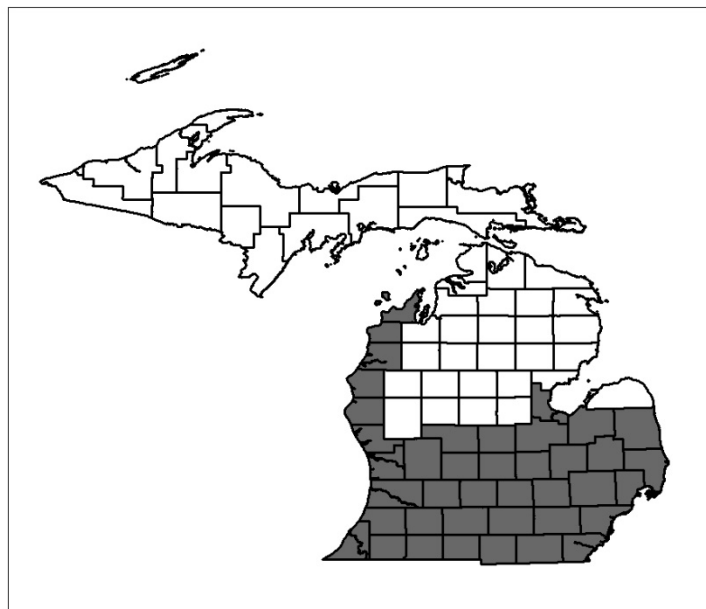
The Indiana bat was listed as endangered under the Endangered Species Act (ESA) in 1967 due to episodes of people disturbing hibernating bats in caves during winter, which resulted in the death of substantial numbers of bats. Indiana bats are vulnerable to disturbance because they hibernate in large numbers in only a few sites, with major hibernacula supporting 20,000 to 50,000 bats. Since it was listed as endangered, 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 Bat in Michigan

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 (see range map below). 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 adjacent states, such as Indiana and Kentucky.

Like their overwintering sites, Indiana bats exhibit strong fidelity to their summer home ranges; however, we do not have knowledge of all of these summering areas in Michigan. Therefore, unless presence/absence surveys conducted in accordance with U.S. Fish and Wildlife Service (Service) guidelines

(<https://www.fws.gov/MIDWEST/Endangered/mammals/inba/inbasummersurveyguidance.html>, and also available via IPaC) indicate the probable absence of the species, Indiana bats are considered potentially present wherever suitable habitat exists within their range.



Range of the Indiana Bat in Michigan

Suitable Habitat for Indiana Bats:

During the winter, Indiana bats hibernate in caves, mines, or similar structures. Most major hibernacula for the species are found in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia, and critical (winter) habitat has been designated in these states. Michigan is home to a single known Indiana bat hibernaculum, in Manistee County, and there is no designated critical habitat for the species in Michigan.

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 1000 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.

II. VOLUNTARY CONSERVATION MEASURES

Voluntary conservation measures that benefit the Indiana bat include protecting, creating, and enhancing mature forest, particularly hardwood/mixedwood stands containing standing snags, dying trees, vertical complexity, midstory/understory flight space, and waterbodies such as streams, ponds, and forested wetlands. As Indiana bats are known to avoid traversing large open areas outside of migration, preserving wooded corridors (such as tree lines) can be extremely beneficial in connecting fragmented patches of suitable roosting/foraging habitat.

Conserving Indiana bat habitat likely benefits the Federally threatened northern long-eared bat (*Myotis septentrionalis*) and other native bat species, several of which are experiencing recent population declines as a result of WNS and/or other factors. As significant predators of nocturnal insects, including many crop and forest pests, bats are important to Michigan's agriculture and forests. For example, Whitaker (1995)¹ 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)² noted that the "loss of bats in North America could lead to agricultural losses estimated at more than \$3.7 billion/year," and using their data for Michigan alone, we totaled the estimated value at over \$500 million per year (assuming standard crop pest survival). Taking proactive

¹ Whitaker, J.O. 1995. Food of the Big Brown Bat *Eptesicus fuscus* from Maternity Colonies in Indiana and Illinois. *American Midland Naturalist* 134(2):346-360.

² Boyles, J.G., P.M. Cryan, G.F. McCracken, and T.H. Kunz. 2011. Economic Importance of Bats in Agriculture. *Science* 332:41-42.

steps to help protect bats may be valuable to agricultural and timber producer yields and pest management costs.

Continue to the following sections for ESA guidance on Federal and non-Federal projects in Michigan. For more information on the Indiana bat, including life history information, designated critical habitat and draft recovery plan, please visit:

<https://www.fws.gov/midWest/Endangered/mammals/inba/>

III. ESA GUIDANCE: PRIVATE LANDOWNERS/NON-FEDERAL PROJECTS

The Service does not require private landowners to conduct surveys for ESA-listed bats on their lands in Michigan. However, the bats and the habitats where they are known to occur are protected by the ESA. Under Section 9 of the ESA, it is unlawful for any person to “take” an endangered species. The term “take” is defined as, “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” “Harm” is further defined to include “significant habitat modification or degradation where it actually kills or injures wildlife by significantly impacting essential behavioral patterns, including breeding, feeding, or sheltering.”

In general, activities that impact suitable Indiana bat habitat have the potential to result in take. One of the most common activities impacting Indiana bat habitat is tree clearing during the summer season. Typically, incidental take associated with tree removal (i.e., trimming, cutting, girdling, burning) can be avoided by scheduling these activities during the winter hibernation period (October 1 through March 31), when Indiana bats have departed from summer habitat. As long as the scope of winter tree removal, in terms of acres, is not significant enough to constitute “harm,” effects to Indiana bats can be kept minimal or beneficial.

Permits and authorizations are required whenever incidental take of Indiana bats is reasonably certain to occur. If your project is likely to result in the take of Indiana bats, please contact the Michigan Ecological Services Field Office to determine if a permit pursuant to the ESA is warranted. For general information about take permits, visit:

<https://www.fws.gov/Midwest/Endangered/permits/index.html>.

As a means to determine the likelihood of take, project proponents may be interested in documenting whether potential habitat is, in fact, occupied by Indiana bats. In such cases, presence/absence surveys conducted in accordance with current Service guidelines (<https://www.fws.gov/MIDWEST/Endangered/mammals/inba/inbasummersurveyguidance.html> and also available via IPaC) can inform project-specific conservation measures and the need for a permit.

Please note that projects that require State permits or authorizations that implement Federal laws or are supported by Federal funds (e.g., Clean Water Act, transportation projects) may have additional requirements under or similar to Section 7 of the ESA, as described in the following [section: IV. ESA GUIDANCE: FEDERAL PROJECTS](#).

IV. ESA GUIDANCE: FEDERAL PROJECTS

1. Standard Section 7 Consultation:

Under the ESA, requirements for Federal projects (i.e., projects funded, authorized, permitted, or implemented by a Federal agency) are different than requirements for wholly private or otherwise non-Federal projects. The ESA mandates all Federal departments and agencies to conserve listed species and to utilize their authorities in furtherance of the purposes of the ESA. Section 7 of the ESA, called “Interagency Cooperation,” is the mechanism by which Federal agencies ensure the actions they conduct, including those they fund or authorize, do not jeopardize the existence of any listed species.

Federal agencies must request a list of species and designated critical habitat that may be present in the project area from the Service (i.e., via IPaC, on our website at <https://www.fws.gov/midwest/Endangered/section7/sppranges/MIs7listrequest.html>, or by contacting our office). Then they must determine whether their actions may affect those species or critical habitat. If a listed species or critical habitat may be affected, consultation with the Service is required.

Please note that Section 7 or similar obligations may also apply to State permits or authorizations that implement Federal laws or projects that are supported by Federal funds (e.g., Clean Water Act, transportation projects).

For general guidance on Section 7 obligations for Federal projects, and step-by-step instructions on the process, visit:

<https://www.fws.gov/midwest/Endangered/section7/s7process/index.html>.

2. Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat (optional for Federal transportation projects that may affect Indiana Bats):

The U.S. Fish and Wildlife Service and Federal Highway Administration (FHWA) have standardized their approach to assessing impacts to Indiana bats and northern long-eared bats (NLEB) from highway construction and expansion projects; then avoiding, minimizing and mitigating those impacts. This landscape-level conservation strategy encompasses the ranges of both bat species and provides transparency and predictability to FHWA and state Departments of Transportation (DOTs) through proactive planning. Information provided by this consultation and conservation strategy allows transportation agencies to strategically avoid projects in high impact or high-risk areas for the Indiana bat and NLEB. For projects that cannot avoid impacts, project proponents receive information on ways to minimize impacts and preclude the need to revise projects later in their development. For large-scale projects or projects with greater impacts, priority conservation areas may be identified to offset and minimize the impacts of the take. This approach is intended to increase the consistency of both project design and review, reduce consultation process timeframes and delays, and contribute meaningfully to the conservation of both species.

Please note that use of the Range-wide Programmatic Consultation for Indiana Bat and NLEB is optional for Federal transportation projects, and transportation agencies may choose to follow standard section 7 procedures instead. For more information on the Range-wide Programmatic Consultation for Indiana Bat and NLEB, including User Guide and Project Submittal Form documents, visit:

<https://www.fws.gov/Midwest/endangered/section7/fhwa/index.html>

V. MICHIGAN ECOLOGICAL SERVICES FIELD OFFICE CONTACT INFORMATION

Please contact the Michigan Ecological Services Field Office for more information on potential impacts to listed bats as a result of any projects occurring in Michigan.

U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823
Phone: 517-351-2555
Fax: 517-351-1443
TTY: 1-800-877-8339 (Federal Relay)
e-mail: EastLansing@fws.gov

Northern Long-eared Bat Project Review in Michigan

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I. BACKGROUND INFORMATION

The northern long-eared bat (NLEB) is one of the species of bats most impacted by the disease white-nose syndrome (WNS). Due to declines caused by WNS and continued spread of the disease, the NLEB was listed as threatened under the Endangered Species Act (ESA) on April 2, 2015. The U.S. Fish and Wildlife Service (Service) also developed a final 4(d) rule, which was published in the *Federal Register* on January 14, 2016. The 4(d) rule specifically defines “take” prohibitions for the species.

For more information on NLEB, its listing and the 4(d) rule, visit:

<https://www.fws.gov/Midwest/endangered/mammals/nleb/>

NLEB in Michigan

The NLEB is documented in many Michigan counties and is believed to range throughout the entire state. Therefore, unless presence/absence surveys conducted in accordance with Service guidelines

(<https://www.fws.gov/MIDWEST/Endangered/mammals/inba/inbasummersurveyguidance.html>, and also available via IPaC) indicate the probable absence of the species, NLEB are considered potentially present wherever suitable habitat exists within the state.

Suitable Habitat for NLEB:

During the winter, NLEB hibernate in mines, caves, or similar structures. Many NLEB hibernacula have been documented in Michigan; however, our knowledge of these overwintering areas throughout the state is likely incomplete.

Suitable summer habitat for NLEB consists of a wide variety of forested 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 roost trees (i.e., live trees and/or snags ≥ 3 inches DBH that have exfoliating bark, cracks, crevices, and/or cavities), 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 1000 feet of other forested/wooded habitat. NLEB have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes; therefore, these structures should also be considered potential summer habitat.

For more information on NLEB, its listing and the 4(d) rule, visit:

<https://www.fws.gov/Midwest/endangered/mammals/nleb/>

II. VOLUNTARY CONSERVATION MEASURES

NLEB benefit from the promotion of mature forest habitat, particularly hardwood/mixedwood stands containing standing snags, dying trees, and waterbodies such as streams, ponds, and forested wetlands. As NLEB are known to avoid traversing large open areas outside of migration, the protection and creation of wooded corridors (such as tree lines) can be extremely beneficial in connecting fragmented patches of suitable roosting/foraging habitat.

In general, projects that involve the trimming, burning, girdling, or clearing of suitable roost trees are encouraged to schedule these activities outside of the summer roosting period, which is generally April through September in Michigan. When winter tree removal is not feasible, avoiding the months of June and July (period when young bats are unable to fly) likely offers some protection for roosting NLEB that may be present.

Implementing conservation measures for NLEB helps to protect other native bat species, several which are experiencing recent population declines as a result of WNS and/or other factors. As significant predators of nocturnal insects, including many crop and forest pests, bats are important to Michigan's agriculture and forests. For example, Whitaker (1995)¹ 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)² noted that the "loss of bats in North America could lead to agricultural losses estimated at more than \$3.7 billion/year," and using their data for Michigan alone, we totaled the estimated value at over \$500 million per year (assuming standard crop pest survival). Taking proactive steps to help protect bats may be valuable to agricultural and timber producer yields and pest management costs.

Continue to the following sections for ESA guidance for Federal and non-Federal projects in Michigan.

III. ESA GUIDANCE: PRIVATE LANDOWNERS/NON-FEDERAL PROJECTS

NLEB use a wide variety of forested habitats but are not found in all wooded areas in Michigan. The species' local distribution and abundance is influenced by both the distance to hibernacula and the quality of available habitat. Although it can be difficult to predict where the species may occur, once NLEB colonize a forest habitat for raising their young (pups), they will often return to the same areas annually.

As a result of this fidelity to specific locations, the Service's approach to implementation of the ESA is based in part on "known" locations where important habitat for NLEB has been documented; namely, hibernacula and maternity roost trees.

¹ Whitaker, J.O. 1995. Food of the Big Brown Bat *Eptesicus fuscus* from Maternity Colonies in Indiana and Illinois. *American Midland Naturalist* 134(2):346-360.

² Boyles, J.G., P.M. Cryan, G.F. McCracken, and T.H. Kunz. 2011. Economic Importance of Bats in Agriculture. *Science* 332:41-42.

Please note that projects that require State permits or authorizations that implement Federal laws, or are supported by Federal funds (e.g., Clean Water Act, transportation projects), may have additional requirements under or similar to Section 7 of the ESA, as described in [section: IV. ESA GUIDANCE: FEDERAL PROJECTS](#).

Additionally, please contact the Michigan Ecological Services Field Office (contact information at the end of this document) for project-specific recommendations for wind development projects. Utility-scale wind turbines may attract and cause mortality of NLEB and warrant additional considerations.

In Michigan, what is required if there are no known NLEB hibernacula or roost trees near my project?

The Service does not require private landowners to conduct surveys for ESA-listed bats on their lands, nor do we require our guidelines for NLEB to be followed on lands where no roosts or hibernacula are known to occur. However, our records of these locations in Michigan are limited, and we expect NLEB roosts to be present in many locations in addition to those listed in this document.

NLEB 4(d) Rule Take Prohibitions

The definition of “take” pursuant to the ESA includes to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect (see 50 CFR 17.3 for details). Our implementing regulations further define the term “harm” to include any act which actually kills or injures fish or wildlife, and emphasize that such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns of fish or wildlife.

The final 4(d) rule for the NLEB (50 CFR 17.40(o)) was published on January 14, 2016. Under the final rule, prohibitions in Michigan include:

- Actions that result in the incidental take of NLEB in known hibernacula.
- Actions that result in the incidental take of NLEB by altering a known hibernaculum’s entrance or interior environment if it impairs an essential behavioral pattern, including sheltering NLEB.
- Tree-removal activities that result in the incidental take of NLEB when the activity: (1) occurs within 0.25 mile of a known hibernaculum; or (2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius of the maternity roost tree, during the pup season (June 1 through July 31).

Please note that not all tree-removal activities within the buffer of a hibernaculum or maternity roost tree will result in take. The timing and extent of tree removal may be an important consideration in those circumstances; please contact the Michigan Ecological Services Field Office to discuss your project plans in more detail. If your activity may result in incidental take that is prohibited based on the above, we will work with you to determine whether a permit pursuant to the ESA may be applicable.

Michigan Known Hibernacula and Roost Tree Locations for NLEB

We have compiled location information for NLEB hibernacula and known roosts trees in Michigan. This information can be used to help project planners in determining the applicability of provisions of the NLEB final 4(d) rule under the ESA. Please use the tables below to see if we have information that may be applicable to your project.

If you are planning a project that may impact suitable habitat in the Michigan townships below, please contact our office with more specific information on the location of your project, and we will confirm for you whether there are any known hibernacula within ¼ mile of your project or any known roost trees within 150 feet of your project.

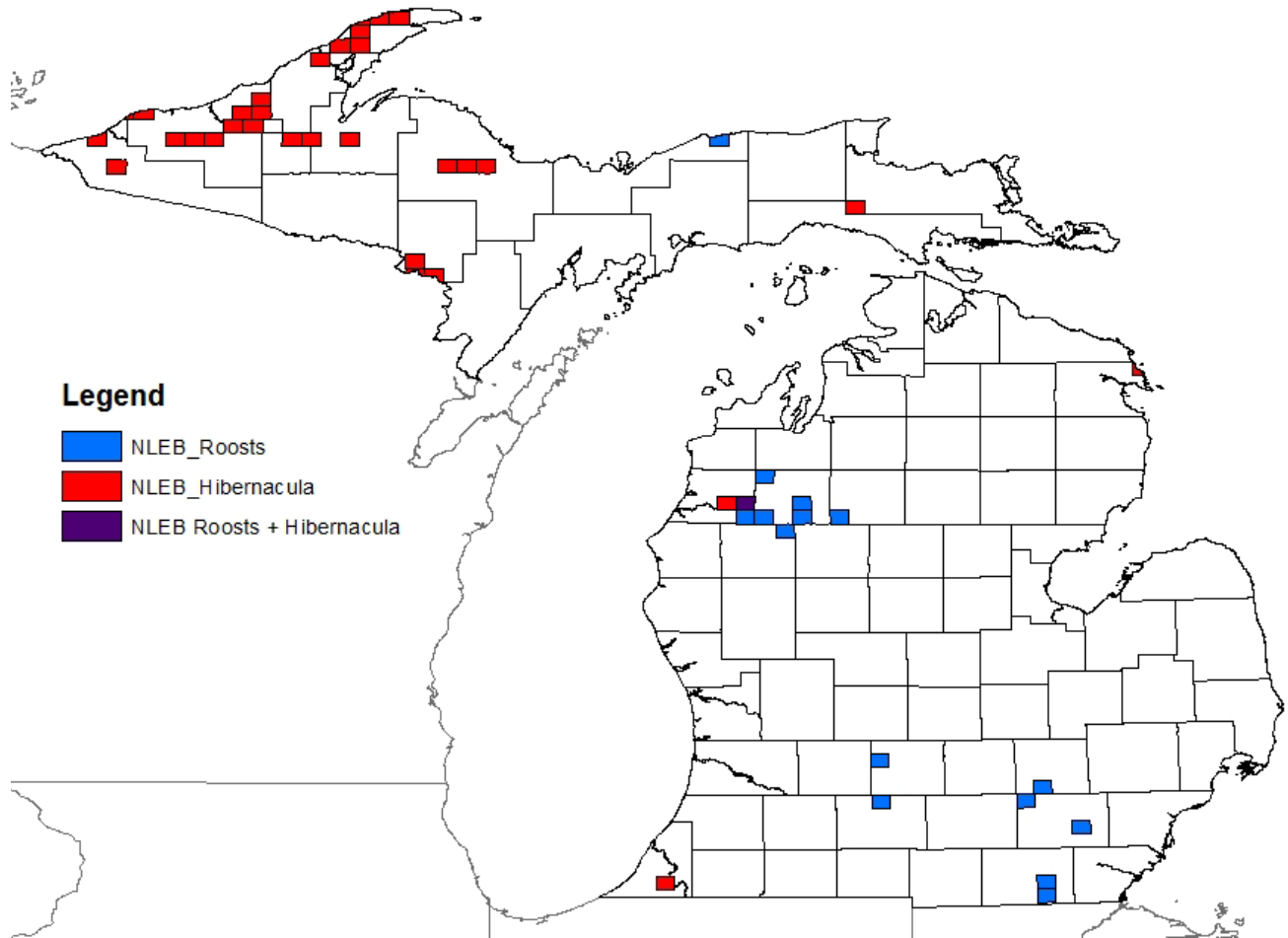
Where are the known NLEB hibernacula in Michigan?

Known NLEB in Michigan			
County	Townships Containing Hibernacula and/or Buffer Areas	Number of Hibernacula	Landownership Within Buffer(s)
Alpena	Alpena (T32NR9E)	1	Public
Baraga	L'Anse (T49NR33W)	1	Private
Berrien	Buchanan (T7SR18W)	1	Private
Dickinson	Breitung (T40NR30W, T39NR30W), Norway (T39NR29W)	8	Private (8)
Gogebic	Ironwood (T49NR46W); Bessemer/Wakefield (T47NR45W)	2	Private (1), public (1)
Houghton	Adams/Quincy/Franklin/Stanton (T55NR34W); Calumet (T56NR33W); Laird (T49NR35W, T49NR36W); Schoolcraft (T56NR32W)	3	Private (1), public (2)
Keweenaw	Allouez (T57NR32W, T58NR32W); Eagle Harbor/Grant (T58NR30W); Eagle Harbor/Houghton (T58NR31W)	10	Private (9), private + public (1)
Mackinac	Hendricks (T44NR7W)	4	Public (4)
Manistee	Dickson (T22NR14W, T22NR13W)	1	Private + public
Marquette	Ely (T47NR28W); Tilden (T47NR27W); Richmond (T47NR26W)	3	Private (3)
Ontonagon	Bohemia (T52NR37W); Carp Lake (T51NR44W, T51NR43W); Greenland (T51NR37W, T51NR38W, T50NR38W); Matchwood (T49NR41W, T49NR42W); Rockland (T50NR39W, T49NR40W)	42	Private (20), public (8), private + public (16)

Where are the known NLEB roost trees in Michigan?

Known NLEB Roost Tree Locations in Michigan			
County	Townships Containing Roosts and/or Buffer Areas	Number of known roosts	Landownership Within Buffer(s)
Alger	Burt (T49NR14W)	5 (all female)	Public (5)
Calhoun	Convis (T1SR6W)	1	Public (1)
Eaton	Vermontville (T3NR6W)	1 (female)	Private (1)
Lake	Dover (T20NR11W)	4 (all female)	Public (4)
Lenawee	Ogden (T8SR4E), Palmyra (T7SR4E)	81	Private (81)
Livingston	Putnam (T1NR4E)	2 (1 female)	Private (1), public (1)
Manistee	Dickson (T22NR13W), Norman (T21NR13W)	4 (all female)	Private (2), public (2)
Missaukee	Richland (T21NR8W)	4 (all female)	Private (4)
Washtenaw	Lyndon (T1SR3E), Pittsfield (T3SR6E)	3 (2 female)	Private (2), public (1)
Wexford	Cherry Grove (T21NR10W), Selma (T22NR10W), South Branch (T21NR12W), Wexford (T24NR12W)	20 (16 female)	Private (17), public (3)

Map of Known NLEB Occurrence, Roosts, and Hibernacula in MI



***Map last updated 7/22/2016. Map will be updated as additional information becomes available.**

IV. ESA GUIDANCE: FEDERAL PROJECTS

1. Standard Section 7 Consultation:

Under the ESA, requirements for Federal projects (i.e., projects funded, authorized, permitted, or implemented by a Federal agency) are different than requirements for wholly private or otherwise non-Federal projects. The ESA mandates all Federal departments and agencies to conserve listed species and to utilize their authorities in furtherance of the purposes of the ESA. Section 7 of the ESA, called “Interagency Cooperation,” is the mechanism by which Federal agencies ensure the actions they conduct, including those they fund or authorize, do not jeopardize the existence of any listed species. Federal agencies must request a list of species and designated critical habitat that may be present in the project area from the Service (i.e., via IPaC, on our website at <https://www.fws.gov/midwest/Endangered/section7/spranges/MIs7listrequest.html>, or by contacting our office). Then they must determine whether their actions may affect those species or critical habitat. If a listed species or critical habitat may be affected, consultation with the Service is required. For general guidance on Section 7(a)(2) obligations for Federal projects, and step-by-step instructions on the process, please visit: <https://www.fws.gov/midwest/Endangered/section7/s7process/index.html>

Please note that Section 7 obligations or similar requirements may also apply to State permits or authorizations that implement Federal laws or projects that are supported by Federal funds (e.g., Clean Water Act, transportation projects).

2. NLEB Streamlined Consultation (optional for Federal projects that may affect but will not involve prohibited take of NLEB):

Federal actions that involve incidental take not prohibited under the final 4(d) rule for the NLEB may still result in effects to individual NLEB. As discussed above, section 7 of the ESA requires consultation with the Service if a Federal agency's action may affect a listed species. This requirement does not change when a 4(d) rule is implemented. However, for the NLEB 4(d) rule, the Service has provided a framework to streamline section 7 consultations when Federal actions may affect the NLEB but will not cause prohibited take. Federal agencies have the option to rely upon the finding of the programmatic biological opinion for the final 4(d) rule to fulfill their project-specific section 7 responsibilities by using the framework.

For more information on the NLEB Streamlined Consultation process and to download a Streamlined Consultation Form, visit: <https://www.fws.gov/Midwest/endangered/mammals/nleb/s7.html>

Please note that use of the streamlined framework is optional, and an agency may choose to follow standard section 7 procedures instead. Even when take of NLEB is exempt, we encourage Federal agencies to implement voluntary conservation measures (i.e., winter tree removal) and avoid adverse effects to the species whenever possible.

If your project may result in prohibited take of NLEB (see “[NLEB 4\(d\) Rule Take Prohibitions](#)” above), standard section 7 procedures apply and this framework cannot be used.

3. Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat (optional for Federal transportation projects that may affect NLEB):

The U.S. Fish and Wildlife Service and Federal Highway Administration (FHWA) have standardized their approach to assessing impacts to Indiana bats and NLEB from highway construction and expansion projects; then avoiding, minimizing and mitigating those impacts. This landscape-level conservation strategy encompasses the ranges of both bat species and provides transparency and predictability to FHWA and state Departments of Transportation (DOTs) through proactive planning. Information provided by this consultation and conservation strategy allows transportation agencies to strategically avoid projects in high impact or high risk areas for the Indiana bat and NLEB. For projects that cannot avoid impacts, project proponents receive information on ways to minimize impacts and preclude the need to revise projects later in their development. For large-scale projects or projects with greater impacts, priority conservation areas may be used to offset and minimize the impacts of the take. This approach is intended to increase the consistency of both project design and review, reduce consultation process timeframes and delays, and contribute meaningfully to the conservation of both species.

Please note that use of the Range-wide Programmatic Consultation for Indiana Bat and NLEB is optional for Federal transportation projects, and transportation agencies may choose to follow standard section 7 procedures instead. For more information on the Range-wide Programmatic Consultation for Indiana Bat and NLEB, including User Guide and Project Submittal Form documents, visit:

<https://www.fws.gov/Midwest/Endangered/section7/fhwa/index.html>

V. MICHIGAN ECOLOGICAL SERVICES FIELD OFFICE CONTACT INFORMATION

Please contact the Michigan Ecological Services Field Office for more information on any projects occurring in Michigan.

U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823
Phone: 517-351-2555
Fax: 517-351-1443
TTY: 1-800-877-8339 (Federal Relay)
e-mail: EastLansing@fws.gov