ATTACHMENT M

Bad River Band of Lake Superior Chippewa
Mashkiiziibii Natural Resources Department
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THREATENED AND ENDANGERED SPECIES REPORT

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I. INTRODUCTION

This report was prepared by Abi Fergus, Louis Lozinski, and Zakkary Zander for purposes of submission to the United States Army Corps of Engineers ("Corps") Public Notice on the permit application for the Enbridge Line 5 Wisconsin Segment Relocation Project ("Project"). Abi Fergus is currently a Wildlife Specialist at Mashkiiziibii Natural Resources Department ("MNRD"), a role they have held for two and a half years. Prior to this role, they served as a Wildlife Program staff member for four years. Abi is CyberTracker Tracker III certified and has a Master's in Environment and Resources. Louis Lozinski is currently an Ornithology Specialist, a role he has held for two months. Zakkary Zander is currently a Wetlands Specialist, a role they have held for seven months. Prior to this role, they were part of the Non-Local Beings Program for three months.

II. RELEVANT DATA

The data for this report was collected by the MNRD Wildlife Department for the following species:

Ma'iingan (Gray Wolf; *Canis Lupus*)

- Ma'iingan track surveys; Ma'iingan trail camera data; Ma'iingan howl surveys; Historic radio collar data.

Canada Lynx (*Lynx canadensis*)

- Observational data in Odanah by Wildlife Specialist during summer 2021.

Wood Turtle (*Glyptemys insculpta*)

- On Reservation surveys; WDNR conducted surveys.

Piping Plover

- Annual restoration and monitoring with season reports since 2007.

Red Knot

- The Band does not have data.

Migizi (Bald Eagle; *Haliaeetus leucocephalus*)

- Nest surveys; heavy metal testing from feathers.

Bineshiinh (General birds)

- The Band has limited data on inland birds.

Braun's Holly Fern (*Polystrichum braunii*)

- Observational data showing populations.

Sweet Coltsfoot (*Petasites sagittatus)*

- Observational data showing populations.

III. REVIEW

Wildlife Species

- WDNR Draft Environmental Impact Statement for the Line 5 Segment Relocation Project, §§ 5.14 and 6.14.
- Army Corp Public Notice for the Line 5 Segment Relocation Project.

Plant Species

- WDNR DEIS sections 6.14 and 6.11 reviewed, Army Corps' Public Notice.

IV. FINDING

There are several problems with the data that the Corps provided in the Public Notice. As for wildlife, the Public Notice does not identify all species put at risk by the project and writes off impacts to the Piping Plover and neglects to assess impacts to State and Tribally protected species. Moreover, the Corps must reconsider impact to Ma'iingan given reinstated federal protections.

For threatened and endangered plant species, it is likely that species are missing from the Corps assessment. In the Corps' threatened and endangered section many plant species that could be impacted during the reroute project were not included. Overall, this section only vaguely claims that avoidance protocols will be implemented to reduce or prevent harm to various species without providing adequate detail as to why they make that claim and what the protocol entails. Further, the MNRD notes the following specific issues:

- Enbridge did not follow the WDNR protocol for Wood Turtle surveying and conducted Wood Turtle surveys at the wrong time of year resulting in a gross under estimation of population.
- There have been no comprehensive assessments of eagle nest sites along the route with the last Bald Eagle survey conducted in 2019 and the survey was only for active nests.
- The survey for Loggerhead Shrike occurred late in the season well after they had started nesting which would result in a reduced detection rate.
- There was no mention of the state endangered or threatened wildlife. This would then exclude Kirtlands Warbler, Upland Sandpiper, Yellow Rail, and Spruce Grouse.
- Both the incurvate emerald and Extra-striped Snaketail were left off the list of potentially affected threatened and endangered species despite a potential loss of 28.19 acres and 92.72 acres of habitat respectively.
- The Wisconsin Department of Natural Resources intends to rely on its Natural Heritage Inventory ("NHI") to determine which species exist in northern Wisconsin. The NHI is not a complete resource. Data from the MNRD is more reliable because MNRD staff are continuously monitoring wildlife data in the project region.

The Corps and other agencies may need to conduct surveys following correct protocols for documenting different kinds of threatened, endangered, and special status species that may exist in the project area. Without adequate data, the Corps cannot expect to understand the impacts of the project to endangered, threatened, and special concern species. Surveys should report not only evidence or sightings of species but also potential suitable habitat in a comprehensive, clear, way to the USACE and select tribal representatives. For now, the MNRD provides our analysis of the possible impacts to threatened and endangered species in the project area. The Corps must still conduct its own, thorough, evaluation in consultation with the Band. A federal EIS is necessary to understand the impacts of the Project to threatened, endangered, or special status species.

A. Wildlife Species

Below are the threatened, endangered, or special status wildlife species that could be affected by this Project based on a preliminary review of MNRD data. Please note, that this is not an exhaustive list of species that appear in the Band's records and we may find additional species as our surveys continue.

Ma'iingan (Gray Wolf; *Canis Lupus*)

- Ma'iinganag have been documented to frequently use the Line 5 corridor throughout the Bad River Reservation.
- Ma'iinganag require waterways for pursuing prey including Waawaashkeshi (White-tailed Deer; *Odocoileus virginianu*s) and Amik (Beaver; *Castor canadensis*) and to establish dens nearby.
- Ma'iinganag are tribally protected under the Mashkiiziibii Ma'iingan Relationship Plan **(Attachment 1)** regardless of federal or state listing status; Ma'iinganag had federal Endangered Species Act ("ESA") protections restored throughout the Great Lakes Region on 2-10-22. Army Corp must reevaluate impacts given this listing change.

Canada Lynx (*Lynx canadensis*)

- The Wildlife Specialist has witnessed Canada Lynx presence on the Reservation in the summer of 2021.
- Lynx rely on boreal spruce and fir habitat which are threatened in our sub-boreal region by climate change and development, meaning developmental impacts by Enbridge to these ecosystems are a negative impact from the proposed work.
- Concern for snowshoe hare populations in the region are rising and are a major food source not only for Lynx but also Bobcat, Coyote, and Wolf causing potential for increased competition and greater impacts if development projects displace Lynx from their niche.

Wood Turtle (*Glyptemys insculpta*)

- Turtles experience disproportionate harm as a result of development and changing climate and the Wood Turtle is a Threatened Species in Wisconsin.

- The Wood Turtle is declining across its range, but has not been federally listed, probably due to limitations of the ESA resulting in very few species ever reaching a recovered status to make room for new species of concern.
- More than half of the world's 300 turtle species are vulnerable to extinction, according to the International Union for the Conservation of Nature (IUCN).
- The use of heavy machinery is listed by the Fish and Wildlife Service ("USFWS") as a major threat to the Wood Turtle.
- The USFWS also lists pollution as a major threat and oil, chemical, and Horizontal Directional Drilling (HDD) spills are likely threats related to pipeline construction based on occurrences along Line 5.
- Wood Turtles are sensitive to habitat impacts and are selective for muddy banks and early successional forests.
- Wood Turtle hatchlings may still be overwintering in their riverbank nests until late Spring resulting in them being undetectable and unavoidable.
- Adult Wood Turtles overwinter in exposed tree roots beneath undercut riverbanks and don't become terrestrial until late spring.

Piping Plover

- The Bad River and all other waterways that flow north and are crossed by Line 5 through the Bad River Watershed are identified as oil spill hazard zones. Some of these waterways are still crossed by the proposed reroute and all drain into Lake Superior. Plovers live on the Lake Superior shore along Chequamegon Point **(Attachment 2)**.

- "For rivers that intersect the pipeline and the land hazard zone it is assumed that the entire stretch of river could be impacted by oil up to and including any lakes that the river flows into. The presence of two dams in a potentially impacted river are considered sufficient to stop downstream oil flow. The entire area of lakes that intersect the land hazard zone and potentially impacted rivers are considered potentially impacted. Finally, all sections of wetlands that intersect the land hazard zone and border potentially impacted rivers or lakes, are considered as potentially impacted by spilled oil" **(Attachment 3)**.

- Currents in streams and rivers transport oil downstream, and thus impacts are likely to occur over greater areas than in lakes or ponds. The Saskatchewan River spill of 2016 had oiling impacts up to 217 miles downstream of where oil entered the river. The distance that spilled oil travels in flowing water can be considerable and the specific morphology and flow of a stream will determine downgradient oil impacts **(Attachment 3)**.

- The Corps has not provided a justification for its finding of no impact for the Piping Plover.

Loggerhead Shrike (*Lanius ludovicianus*)

- Loggerhead Shrikes are a passerine bird that predates upon small mammals, reptiles, and insects. They return to Wisconsin and mate in late March and early April. They used to be abundant throughout Wisconsin but in the last half century their numbers have dropped considerably with only 2-8 nesting pairs a year observed.
- Loggerhead Shrikes utilize open woodlands and fields with small trees and shrubs to perch and predate from, as well as for nesting.
- Loggerhead Shrikes are endangered in the state of Wisconsin and have a required avoidance period from April 20- August 1.

Migizi (Bald Eagle; *Haliaeetus leucocephalus*)

- Migizi have been documented nesting along the bad river and other accessible bodies of water south of the Bad River Reservation.
- Migizi require open water for food and stands of conifer trees to provide proper nesting habitat.
- Migizi is protected under the Bald and Golden Eagle Protection Act, which prohibits the disturbance of eagles. This protection also extends to nests even if they are inactive. If a nest is found, permitting from the USFWS is required to remove or relocate it.

Kirtland warbler (*Setophaga kirtlandii*)

- Kirtland warblers are a small passerine bird found throughout Wisconsin and Michigan. They mainly forage for insects and fruit in their habitats.
- They are found primarily in young jack pine forests living among the dense under-growth.
- Kirtland warblers were removed from the federal endangered species list in the fall of 2019 but remain listed as an endangered species in the state of Wisconsin.

Upland Sandpiper (*Bartramia longicauda*)

- The Upland Sandpiper is a shorebird that feeds mainly on insects. In recent years they have shown a decline in population in the eastern United States.
- They occupy upland grasslands, peatlands, and flood plains. Dense vegetation is re-quired for nesting.
- The Upland Sandpiper is a state threatened birds. The biggest threats are habitat loss from the loss of grassland habitats, as well as habitat fragmentation.

Yellow Rail (*Coturnicops noveboracensis*)

- Yellow Rails are a secretive marsh bird living on a mixed diet of aquatic invertebrates and grasses.

- They occupy sedge meadows using the sedges to create their nest and for food.
- The Yellow Rail is a state threatened bird species with an avoidance period of May 1st – July 15th. The biggest threats they face are habitat fragmentation and succession.

Spruce Grouse (*Falcipennis canadensis*)

- Spruce grouse are an upland game bird. The begin mating in late winter early spring utilizing conifer trees for their mating display.
- Grouse inhabit structurally complex conifer forests comprised mainly of black spruce or jack pines.
- The Spruce Grouse is a state threatened species with a required avoidance period of May 1st through July 1st. The biggest threat to spruce grouse is habitat loss and fragmentation.

Bineshiinh (General birds)

- The Migratory Bird Treaty Act protects most birds that are native to the United States. Active nests are also protected, and removal requires a depredation permit from the USFWS.

Extra-striped Snaketail (*Ophiogomphus anomalus*)

- The Extra-striped Snaketail is a state endangered dragonfly species with an univoltine life cycle.
- They occupy fast moving streams in heavily forested areas with larvae occupying the stream and dispersing as adults.
- The Extra-striped Snaketail is a state endangered species and is threatened by habitat loss and fragmentation as well as pollution due to the sensitivity of Club-tailed dragonflies (*Gomphidae*).

Incurvate Emerald (*Somatochlora incurvata*)

- Incurvate Emeralds are a state endangered dragonfly species with a univoltine lifecycle
- They occupy sedge meadows and fens favoring habitat with sphagnum mosses.
- The Incurvate Emerald is a state endangered species and is mainly threatened by habitat loss and pollution due to the sensitivity of emerald dragonflies (*Corduliidae*).

Diving Beetle (*Rhantus sericans*)

- Special Concern species in Wisconsin.
- Right of Ways (ROWs) on the Bad River Reservation have been shown to disrupt wetlands and the hydrological processes that support ephemeral waterbodies which disrupt semi-aquatic life including diving beetles and amphibians. DEIS does not address this issue in relation to wildlife.

B. Plant Species

Below are the threatened, endangered, or special status plant species that could be affected by this project based on a preliminary review of MNRD data. Please note, that this is not an exhaustive list of species that appear in the Band's records.

Braun's Holly Fern *(Polystrichum braunii*)

- Braun's Holly Fern is a state threatened fern.
- They grow on steep forested slopes near riverine bottoms. These are sensitive habitats that would not be practicable to restore.
- MNRD with help from Great Lakes Indian Fish & Wildlife Commission ("GLIFWC") and our contractor found at least 35+ Braun's Holly Fern individuals on the Iron County Forest Lands that the reroute would go through from County Line Road. There were roughly 11 different sites, with 3 of the sites falling within Enbridge's "survey corridor" and 2 of those three falling within proposed workspace areas. Many of the other populations/individuals located were adjacent to and downstream of impacts. We have submitted our data to GLIFWC who has submitted it to NHI for inclusion in that database. The location for the Braun's Holly Fern found by the company's contractors is approximately 100150 ft southwest of where we found Braun's Holly Fern on the proposed centerline. So, this is a different population, and they did not even find the two that would be most impacted.

Sweet Coltsfoot (*Petasites sagaittatus*)

- State threatened member of the Asteraceae family.
- They are sensitive to changes in hydrological conditions, this means that even if the plants are not directly impacted by the installation of the pipeline, they could still face habitat loss due to a change in hydrology.
- They are found in Sedge meadow as well as Alder thickets.

Large water-starwart (*Callitriche heterophylla)*

- State Threatened member of the Plantaginaceae family.
- The large water-starwart is found in a variety of wetland habitats, usually in areas with slow moving water.
- They would have been hard to identify during the times when the delineation took place.

Water-thread Pondweed (*Potamogeton diversifolius)*

- Special Concern member of the Potamogetonaceae family.
- The optimal time for identifying this plant is mid-July to early September, which is after the delineations took place.

- They are found in shallow water wetlands.

Oakes' pondweed (*Potamogeton oakesianus*)

- Special Concern member of the Potamogetonaceae family
- Found in acidic quiet water.

Robbin's spike rush (*Eleocharis robbinsii*)

- Special concern member of the Cyperaceae family
- An emergent sedge that grows in mucky soils in lagoons and lakes.

Tea leaved Willow (*Salix planifolia*)

- State threatened member of the Salicaceae family
- Found in along streams and rivers with shallow bedrock.

V. FURTHER INFORMATION REQUIRED

Additional information is needed in order for MNRD to develop informed findings on project impacts and permitted decisions as listed below:

- For all wildlife species surveying is needed along the entirety of the proposed reroute with a focus on Ma'iingan, Wood Turtle, Canada Lynx, Bald Eagle, Loggerhead Shrike, Kirtland Warblers, Yellow Rail, Spruce Grouse, Incurvate Emerald, Extra-striped Snaketail.

- Surveys should be done for inactive eagle nests as they are still protected under the Bald and Golden Eagle Protection Act.

- Army Corp must complete their own review of pipeline impacts (construction, maintenance, and operation phases) and spill likelihood and complete a federal EIS rather than leaning on WDNR's heavily flawed and lacking DEIS.

- Vegetation surveys should be done during peak growing season to ensure that the largest number of species can be identified. Additional surveys should be done early in the growing season to include early blooming species such as orchids. As well as later in the season to allow important structures to develop in members of the Potamogetonaceae family. Surveys should also report potential suitable habitat in a comprehensive, clear way to the WDNR and be reviewable by select tribal representatives.

The Mashkiiziibii Natural Resources Department reserves the right to update this report once additional, and more accurate, data becomes available.

VI. REFERENCES & ATTACHMENTS

References

- Wisconsin Dep't of Natural Resources, Draft Environmental Impact Statement: Proposed Enbridge Line 5 Relocation Project (Dec. 2021).

- U.S. Army Corps of Engineers, Public Notice MVP-2020-00260-WMS (Jan. 6, 2022).

Attachments

Attachment 1, Abigail Fergus and Lacey Hill-Kastern, *Mashkiiziibii Ma'iingan (Gray Wolf) Relationship Plan* (Edition 2) (2019), available at http://www.badriver-nsn.gov/wp-content/uploads/2020/01/NRD_MaiinganPlan_2019.pdf.

Attachment 2, Esteban Chiriboga, *Spill Map Book, in* PIPE-LINES IN THE CEDED TERRITORIES (2021), available at https://storymaps.arcgis.com/stories/3fc4d29577284948a9ff569bba7f8546.

Attachment 3, Esteban Chiriboga, *Section 3.1 - Assessment of Cumulative Environmental Risk for Crude Oil and Natural Gas Transmission Pipelines in the Ceded Territories, in* PIPE-LINES IN THE CEDED TERRITORIES (2021), available at https://storymaps.arcgis.com/stories/3fc4d29577284948a9ff569bba7f8546.

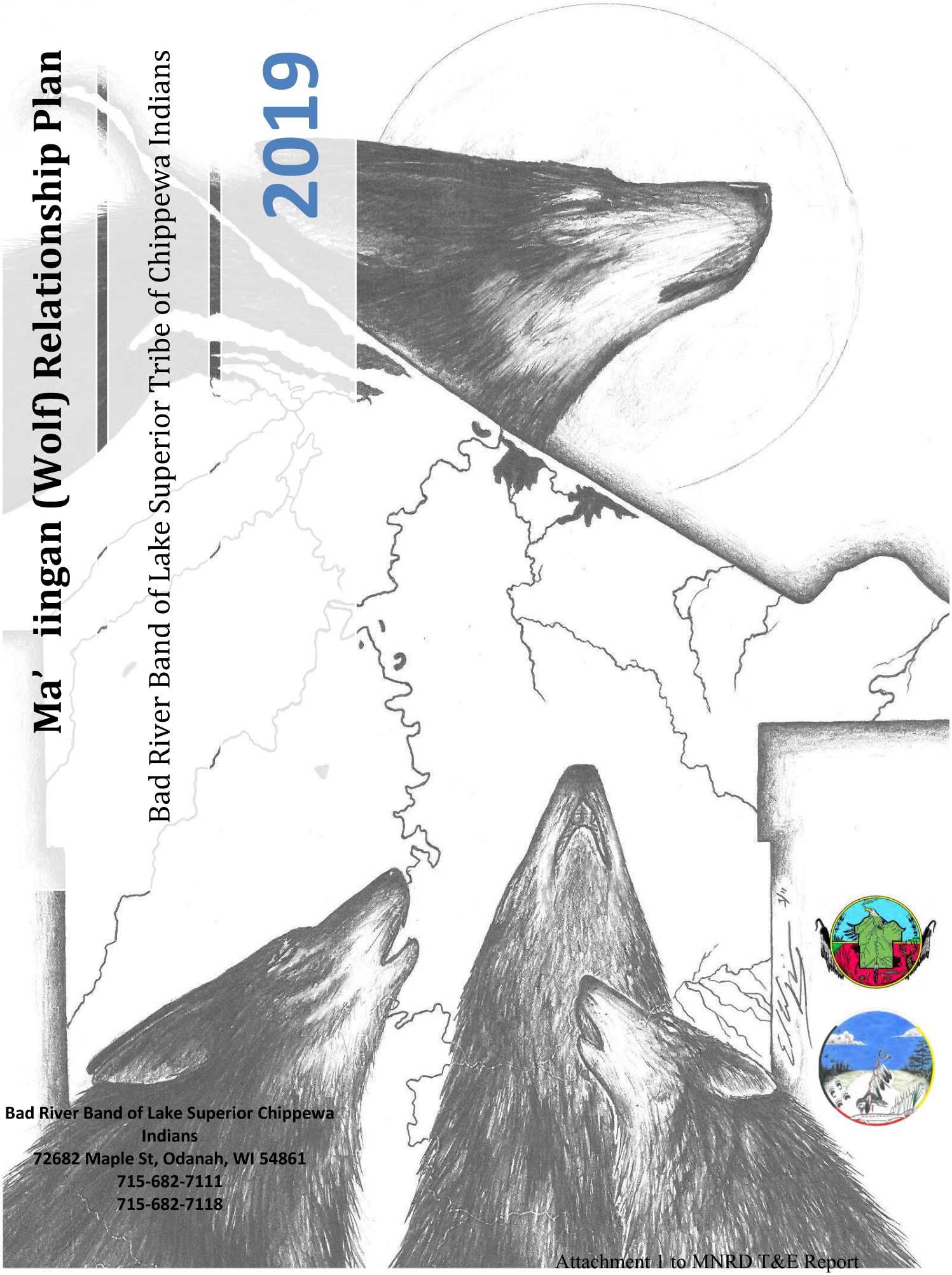
MNRD THREATENED AND ENDANGERED SPECIES REPORT

ATTACHMENT 1

Ma' iingan (Wolf) Relationship Plan

Bad River Band of Lake Superior Tribe of Chippewa Indians

2019



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Suggested Citation:

Fergus, A and Hill, L. (2019). Mashkiiziibii Wildlife Program. *Mashkiiziibii Ma'iingan (Gray Wolf) Relationship Plan* (Edition 2). Odanah, WI: Bad River Band of Lake Superior Tribe of Chippewa Indians, Mashkiiziibii Natural Resources Department.

Contents

Major Findings and Conclusions

I. Within Mashkiiziibing (Bad River Indian Reservation), including tribal lands on Mooninwaane'akaaning Minis (Madeline Island), Ma'iinganag is listed as a "Tribally Protected Species."

II. Classification of Ma'iingan and the contents of this relationship plan will be revisited by the Tribal Council and Mashkiiziibii Wildlife Program (MWP) every 5 years or sooner if deemed an emergency by Mashkiiziibii Tribal Council and MWP.

III. The Mashkiiziibii Wildilfe Program honors Ma'iingan and guides its actions based on Traditional Ecological Knowledge and scientific knowledge.

IV. The Mashkiiziibii Wildlife Program will not manage Ma'iinganag at a specific number, but will work with humans in a way that fosters human-wildlife coexistence on and around Mashkiiziibing. MWP has set a minimum Ma'iingan population goal: at least three packs within Mashkiiziibing, as has historically been the case.

V. The Mashkiiziibii Wildlife Program will continue to coordinate Ma'iingan conservation activities with tribal, state, and federal agencies as well as private landowners, to ensure the future of Ma'iinganag in Mashkiiziibing, in the state of Wisconsin, and in the Great Lakes Region.

VI. The Mashkiiziibii Tribal Wildlife Specialist is responsible for coordinating livestock or Ma'iingan mortality co-investigations within the exterior boundaries of the reservation and within the six mile buffer zone surrounding Mashkiiziibing.

VII. Any conflicts with Ma'iinganag within Mashkiiziibing or within the buffer area of Mashkiiziibing shall be reported to the Mashkiiziibii Wildlife Specialist within 24 hours of occurrence by either the individual involved in the conflict or by the immediate responding agency (WDNR or USDA-WS) dependent on location of incident.

VIII. In the event that a dead Ma'iingan is found anywhere in Mashkiiziibing or within the six mile buffer zone surrounding the reservation, the Mashkiiziibii Wildlife Specialist must be notified immediately by

either the individual that found the carcass or by the immediate investigating agency (WDNR or USDA-WS).

IX. If Ma'iingan is incidentally trapped, it shall be released immediately, if alive. If Ma'iingan is found to be dead, it shall be turned in and reported immediately to the Mashkiiziibii Wildlife Specialist.

X. The Mashkiiziibii Wildlife Specialist can assist in seeking livestock reimbursement from the state or federal agencies after a loss to a predator and MWP can offer carnivore coexistence consultation and free rental deterrent devices.

XI. MWP and the Bad River Tribal Council have placed a moratorium on collaring Ma'iingan, based on concerns for the ethical, scientific, and cultural appropriateness or lack there of in this research practice. Instead, MWP will work to understand reservation Ma'iinganag through track, scat, howl, and flying surveys as well as reports from tribal members.

Acknowledgements

Miigwech to The Creator for giving us a brother in Ma'iingan. Miigwech to Ma'iingan for teaching and protecting us. Miigwech to Lacey Hill-Kastern for creating the original Mashkiiziibii Ma'iingan Relationship Plan and for mentoring and training Abi Fergus. Miigwech to the Mashkiiziibii community for helping to shape this plan and for teaching Abi Fergus. Miigwech to Edward Benton-Banai and Joe Rose Sr. for teaching us about Ma'iingan. Miigwech to Edith Leoso, Anthony Corbine, and Stephanie Julian for providing knowledge for this plan. Miigwech to Suzi Smith of the Mashkiiziibii Natural Resources Department for reviewing the plan. Miigwech to Erick Arnold of the Bad River Legal Department for reviewing the plan. Miigwech to Philomena Kebec, Peter David and Travis Bartnick of the Great Lakes Fish and Wildlife Commission for reviewing the plan. Miigwech to Mashkiiziibii Tribal Council for reviewing and approving the plan.

Goal of the Mashkiiziibii Ma'iingan Relationship Plan

The goal of this Ma'iingan relationship plan is to set a framework of guiding principles for the Bad River Band of Lake Superior Chippewa Indians to understand and coexist with Ma'iingan and to teach others to do the same. In the 2019, the plan was renamed the Ma'iingan *Relationship* Plan. Ma'iingan is a relative and you don't "manage" a relative, you build a relationship with a relative.

Ma'iingan and Anishinaabe told by Mashkiiziibii Elder Joe Rose

"Maybe I should start by talking about the creation. The great spirit came down to the earth, took dust, took it back to the sky world. Breathed life into the dust of Mother Earth, creating Anishinaabe: spontaneous or original man. And then Gichi Manido lowered Anishinaabe to meet his mother. And so the first steps that he ever took was out of love and honor and respect, because the earth was his mother. And so it was the Great Spirit who sent a companion to travel with Anishinaabe: Ma'iingan."

Ma'iingan and Anishinaabe told by Edward Benton-Banai

Available online: https://www.upress.umn.edu/book-division/books/the-mishomis-book

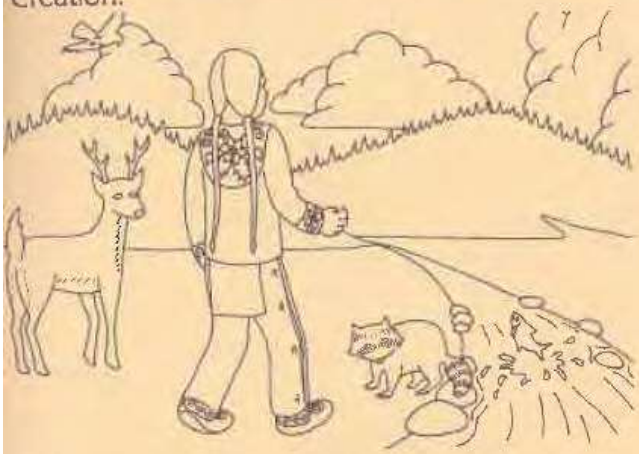
Chapter 2

Original Man Walks The Earth

Boozhoo, I have more Ojibway stories to tell you. These e-ki-na-ma'-di-win' (teachings) have been handed down to me by my Grandfathers. In the last chapter we learned of how Original Man was created and lowered to the Earth by the Creator, Gitchie Manito.

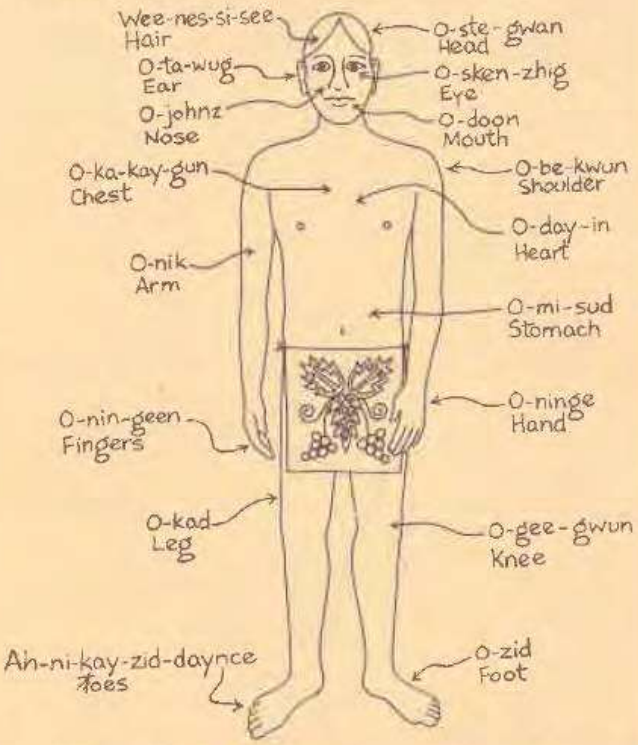
After Original Man was placed on the Earth, he was given instructions by the Creator. He was told to walk this Earth and name all the o-way-se-ug' (animals), the plants, the hills, and the valleys of the Creator's gi-ti-gan' (garden).

Original Man had no name of his own yet. Later, people would refer to him as Anishinabe and, still later, Way-na-boo'-zhoo. But at this early time, he who had no name would name all the Creation.



As Original Man walked the Earth, he named all of the ni-bi' (water). He identified all the rivers, streams, ponds, lakes and oceans. He learned that there were rivers that ran underground. These are the veins of Mother Earth. Water is her life blood. It purifies her and brings food to her.

Original Man also named all the parts of the body. He even named the o-kun-nug' (bones) and organs inside the body.



While Original Man was carrying out the instructions given to him by the Creator, he noticed that the Earth had four seasons. All life was part of a never-ending cycle.

The plants were given new life in the spring. With the coming of summer, they blossomed and bore the seeds for the next generation. Some of the plants produced fruits.

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In the fall season, the leaves of many of the plants turned from green to many spectacular colors. The leaves gradually fell to the ground as the gee-zhi-gad-doon′ (days) got shorter and the dee-bee-kad-doon′ (nights) got colder.

In winter, the cold winds of the Gee-way′-din (North) brought the purifying snows that cleansed Mother Earth. Some of the plants died and returned their bodies to their Mother. Other plants fell into a deep sleep and awoke only when Grandfather Sun and the warm winds of the Zha-wa-noong′ (South) announced the coming of spring.

As Original Man traveled the Earth, he identified what fruits were good to eat and what was not to be eaten. As he went, he found that some o-gee′-bic-coon′ (roots) were good for food. Others were good for mush-kee-ki′ (medicine). Some roots could be used to make dyes of different colors and flavorings for food. Other roots could be used as a strong thread in sewing and in making tools.

As he walked, Original Man talked with the animals. He named them as he went. He noted that some animals were good for we-sin′-ni-win′ (food) and medicine. He noticed that each type of animal had its own individual kind of wisdom. He did not know what all of these plants and animals would play an important part for all the people that would be coming to live on the Earth at a later time.

Original Man traveled everywhere. There was not one plant, animal, or place that was not touched by him.

In his travels, Original Man began to notice that all the animals came in pairs and they reproduced. And yet, he was alone.

He spoke to his Grandfather the Creator and asked, "Why am I alone? Why are there no other ones like me?"

Gitchie Manito answered, "I will send someone to walk, talk and play with you."

He sent Ma-en′-gun (the wolf).

With Ma-en'-gun by his side, Original Man again spoke to Gitchie Manito, "I have finished what you asked me to do. I have visited and named all the plants, animals, and places of this Earth. What would you now have me to do?"

Gitchie Manito answered Original Man and Ma-en'-gun, "Each of you are to be a brother to the other. Now, both of you are to walk the Earth and visit all its places."

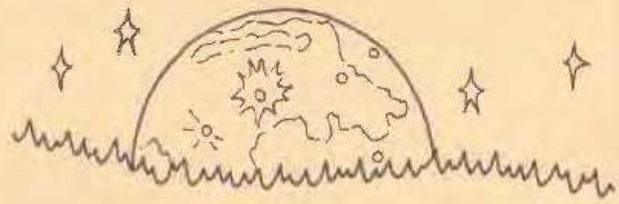
So, Original Man and Ma-en'-gun walked the Earth and came to know all of her. In this journey they became very close to each other. They became like brothers. In their closeness they realized that they were brothers to all of the Creation.

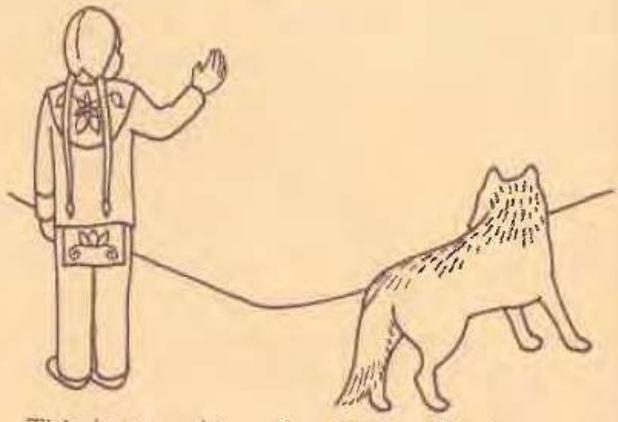
When they had completed the task that Gitchie Manito asked them to do, they talked with the Creator once again.

The Creator said, "From this day on, you are to separate your paths. You must go your different ways.

"What shall happen to one of you will also happen to the other. Each of you will be feared, respected and misunderstood by the people that will later join you on this Earth."

And so Ma-en'-gun and Original Man set off on their different journeys.





This last teaching about the wolf is important for us today. What the Grandfather said to them has come true. Both the Indian and the wolf have come to be alike and have experienced the same thing. Both of them mate for life. Both have a Clan System and a tribe. Both have had their land taken from them. Both have been hunted for their wee-nes'-si-see' (hair). And both have been pushed very close to destruction.

We can tell about our future as Indian people by looking at the wolf. It seems as though the wolf is beginning to come back to this land. Will this prove that Indian people will cease to be the "Vanishing Americans?" Will Indian people emerge to lead the way back to natural living and respect for our Earth Mother?

Background

Coexisting with Ma'iingan is complicated by conflicting relationships that humans have with Ma'iingan. Ma'iingan and Anishinaabe are brothers, but colonization brought a Western mindset of fear and hate toward Ma'iingan to Turtle Island.

Few, if any, Ma'iinganag live their entire life within the boundaries of Mashkiiziibing (Bad River Indian Reservation); because of Ma'iingan's large territory sizes and dispersal characteristics, Ma'iinganag may only spend a short period of their lives within the boundaries of the reservation. In addition, Mashkiiziibing includes not only lands owned by the tribe and tribal members, but also lands owned by private non-tribal individuals and corporations. Contrasting cultural perspectives on Ma'iingan, fragmented ownership of reservation land, and Ma'iingan range sizes underline the complexity of Ma'iingan conservation within and around the reservation and the necessity of coordinating efforts and understanding with the State of Wisconsin.

Introduction

The Mashkiiziibii Tribe is a self-governing entity with which the Federal government relates to on a government-to-government basis. Mashkiiziibii has the sovereignty to develop its own Ma'iingan relationship plan independent of state jurisdiction (Federal Register, 2000).

Mashkiiziibing is located within the Lake Superior Basin and is within the 1842 treaty ceded territory in far northern Wisconsin. The reservation is comprised of 125,000 acres (505 km^2) of land in

Figure 1: Location of the Mashkiiziibing.

Ashland and Iron Counties. Mashkiiziibing is 77% forested, 11% is wetlands and sloughs, and the remainder consists of farmland, residential communities, and roads (Elias, 2001).

Anishinaabeg have a deep spiritual and cultural bond with Ma'iingan. **The purpose of this relationship plan is to foster the lasting presence of Ma'iingan in Mashkiiziibing by supporting coexistence with Ma'iingan.** Due to the research-intensive nature of this plan it is recommended the plan be revisited every five years as new research is made available and as the Mashkiiziibii Reservation continues to change through time.

"Both will be feared, respected, and misunderstood by the people that will later join you on this Earth."

History of Ma'iinganag in Mashkiiziibing and in Wisconsin

Ma'iingan and Anishinaabe

Anishinaabe, the original man, was created to walk the earth and name everything (Benton-Banai, 1988). The Original Man grew lonely and asked the Creator why he was alone. The Creator sent Ma'iingan to Anishinaabe as a companion. They traveled the Earth together as directed by the Creator. Once everything was named, Ma'iingan and Original Man were told they must now travel separate paths, but what would happen to one would happen to the other (Benton-Banai, 1988).

This relationship has held true. Peter David, wildlife biologist for Great Lakes Indian Fish and Wildlife Commission (GLIFWC), outlined the relationship in his writings. He illustrated the correlation between populations of Ma'iinganag rising and of Anishinaabeg gaining recognition of treaty rights (David,2009; figure 2).

Many people today view predators, especially Ma'iinganag, as a competitor for Waawaashkeshii (white-tailed deer). Historically, that was not the case. Ma'iinganag in northern Wisconsin depend on deer for survival and it was traditionally believed that if Ma'iingan tracks were found or Ma'iingan howling was heard in an area that the hunting would be fruitful because these signs indicated that the hunters were in deer country (David, 2009).

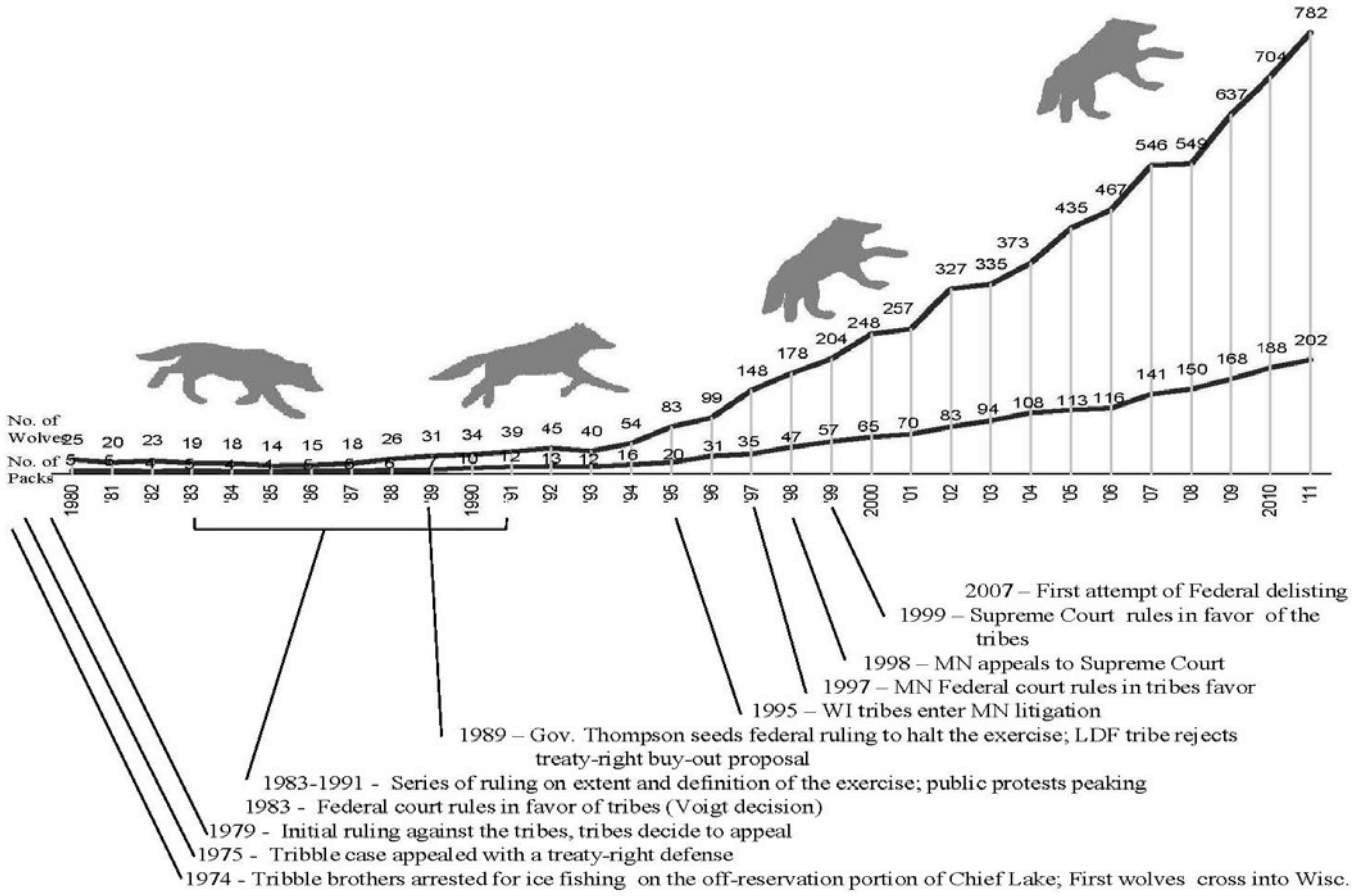


Figure 2: Timeline of battle for Anishinaabe off-reservation treaty rights and the recovery of the Ma'iingan population in Wisconsin provided by Peter David, GLIFWC.

Ma'iingan in Wisconsin

Ma'iinganag were historically present throughout the entire modern State of Wisconsin. Ma'iinganag population estimates for the state ranged from 3,000 to 5,000 individuals before European colonization (Wydeven, 2011). The war against Ma'iinganag in the United States started shortly after Europeans began colonizing the East Coast (Mech and Boitani, 2003). The hatred of Ma'iingan was brought from Europe where humans cleared the habitat of Ma'iingan and Ma'iingan's prey, causing Ma'iinganag to prey on livestock (Linnell and Cretois, 2018). The first Ma'iingan bounty was established in 1630 and by 1700 Ma'iinganag were exterminated from New England (Mech and Boitani, 2003). As colonists moved West, they brought with them their livestock and the war on Ma'iinganag. Mashkode-Bizhiki (American bison; *Bison bison*), Omashkooz (American elk; *Cervus elaphus*), Mooz (Moose; *Alces alces*), Waawaashkeshi (White-tailed deer; *Odocoileus virginianus*), and Adik (Caribou; *Rangifer tarandus*) existed in Wisconsin before European colonization. As Wisconsin was colonized, the land was logged. By 1880, Waawaashkeshiwag were the only large prey species available for Ma'iinganag in Wisconsin (Wydeven, et al. 2009).

The State of Wisconsin first initiated a bounty on Ma'iinganag in 1865 (Thiel, 1993). In 1957, the Wisconsin legislature gave Ma'iingan full protection in the state of Wisconsin (Schanning, 2009). Unfortunately, this was not enough to prevent the last known Ma'iingan in the State from being killed in 1959 (Thiel, 1993). In 1974, Ma'iingan was listed as endangered under the newly adopted federal Endangered Species Act (1973) (USFWS, 1992).

Shortly after federal protections were put into place, Ma'iingan started making a slow comeback in Wisconsin. Ma'iinganag re-entered the state from the remnant Minnesota population. The United States Fish and Wildlife Service (USFWS) developed the 1978 Timber Wolf Recovery Plan, which was last revised in 1992. The Wisconsin Department of Natural Resources (WDNR) began officially monitoring the state's Ma'iingan population in 1979 when there were an estimated 5 packs in the state (WDNR, 1999). A State Recovery Plan

was created by the WDNR in 1989. Wisconsin adopted a State Wolf Management Plan in 1999 (Wydeven et al, 2009).

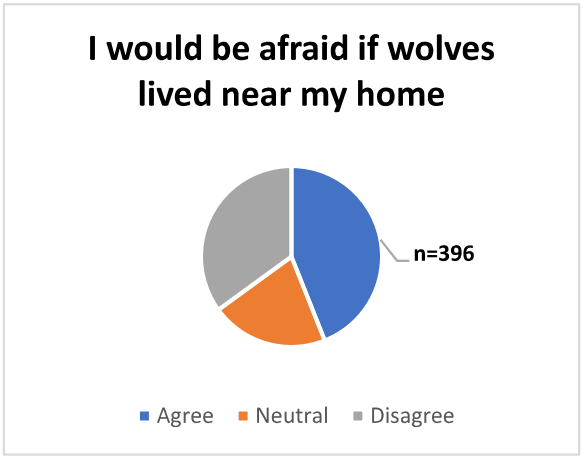
Since the inception of the Endangered Species Act, the listing status of Ma'iingan has changed many times. Ma'iingan have been listed and delisted based in two different regions: Northern Rocky Mountains and Western Great Lakes (Gray Wolf, n.d.). The Service is also involved in the experimental recovery of a sub-species of Ma'iingan, the Mexican Gray Wolf, in New Mexico and Arizona (Mexian Wolf, n.d.). At the time of drafting the 2019 update to the Ma'iingan Relationship Plan, Ma'iingan was delisted in the Northern Rockies and listed as endangered in Wisconsin and Michigan and threatened in Minnesota. The federally listed status of Ma'iingan affects reservation Ma'iingan, because the federal government holds primary conservation responsibility when Ma'iingan is listed as threatened or endangered. When Ma'iingan is delisted, states and tribes hold this sovereignty. Historically, the Service has been sued by groups such as the Humane Association in order to get Ma'iingan re-listed following delistings, because states have not always demonstrated an ability to responsibly conserve Ma'iingan. As of the drafting of this plan revision, the Wisconsin Department of Natural Resources is legally required to hold a harvest of Ma'iingan if Ma'iingan is not federally listed according to Wisconsin State Law, Chapter 29.185 . This law is not scientifically or culturally responsible to Ma'iingan.

As of the 2019 update of the plan, the Fish and Wildlife Service was considering the delisting Ma'iingan across the United States, where they are not already delisted. This proposed delisting received a record number of public comments (1.8 million) and the 5 scientific peer reviews of the proposed delisting largely argued that the population and the Great Lakes States were not ready for the status change (Earthjustice, 2019; Atkins, 2019).

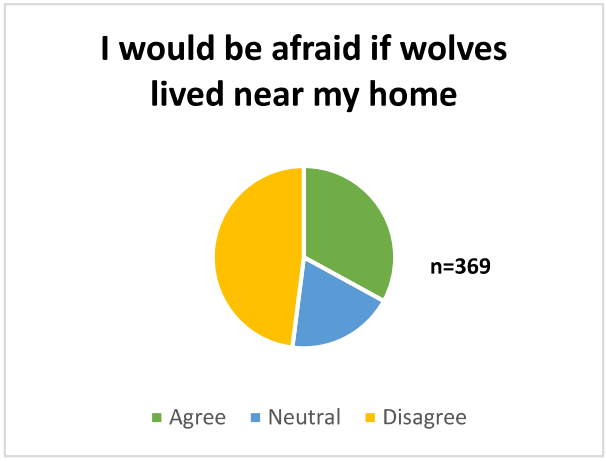
Tribal Views (A Study by Victoria Shelley)

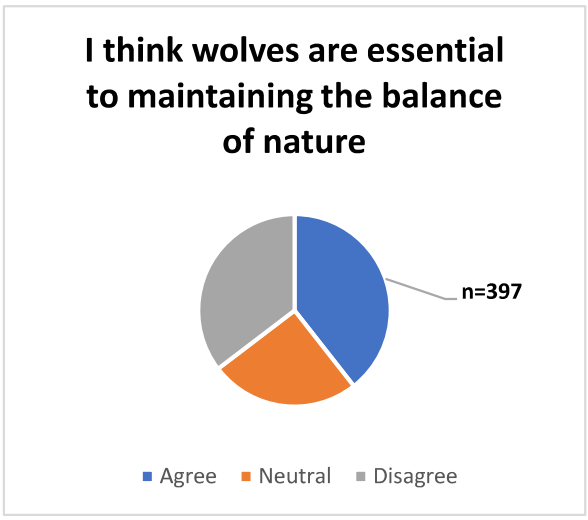
Researchers have been documenting and studying human intolerance of carnivores for many years. Carnivores are often viewed as competition for a food source or as dangerous. In 2009, Victoria Shelley, a graduate student of the Carnivore Coexistence Lab of the University of Wisconsin – Madison, conducted her dissertation research within Mashkiiziibing. Her dissertation was titled, "The Influence of Culture on Attitudes to Wolves and Wolf Policy among Ojibwe Tribal Members and Non-tribal Residents of Wisconsin's Ma'iingan Range" (Shelley, 2011). She completed this study by randomly mailing out questionnaires to Mashkiiziibii Tribal members and randomly selecting non-tribal members that live in Ma'iingan's current range in Northern Wisconsin. A community Ma'iingan Information Meeting was held at the Mashkiiziibii Casino & Convention Center on December 8, 2009 to discuss the study and its results. The study demonstrated that Mashkiiziibii Tribal members were more supportive of protective Ma'iingan policy and less supportive of a proposed Ma'iingan harvest than the non-tribal respondents (figure 3; Shelley, 2011).

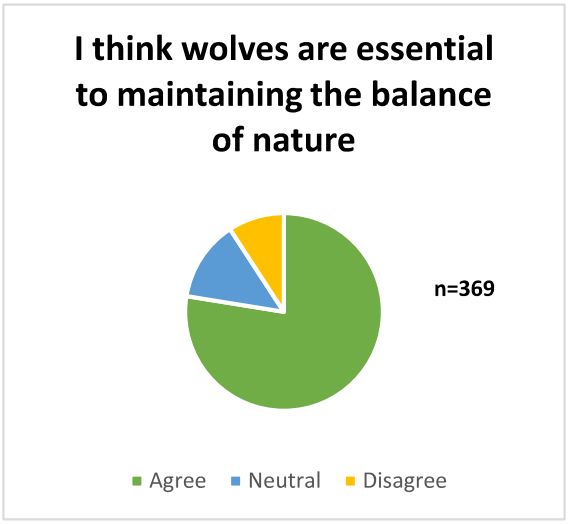
Non Tribal Respondents

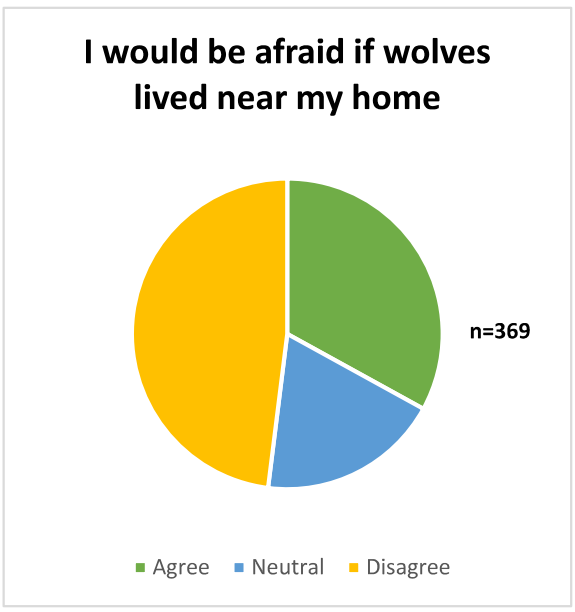


Tribal Respondents



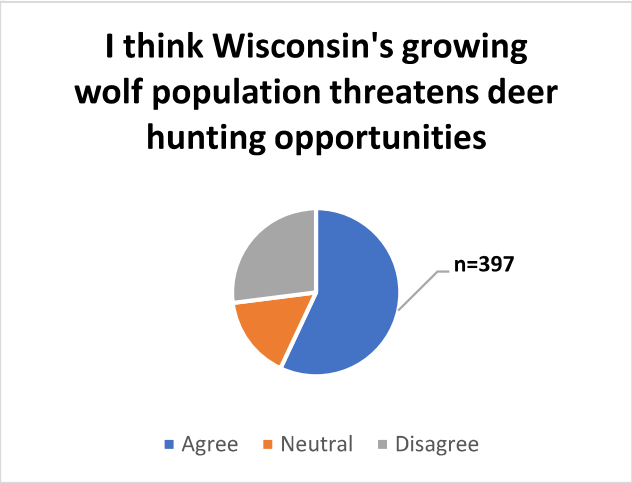


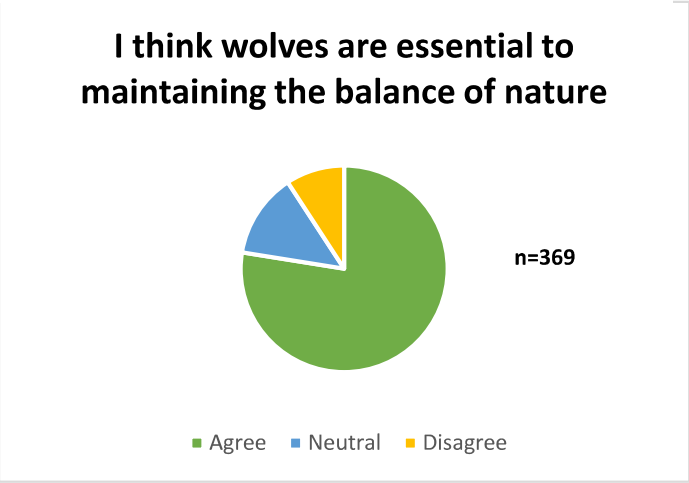


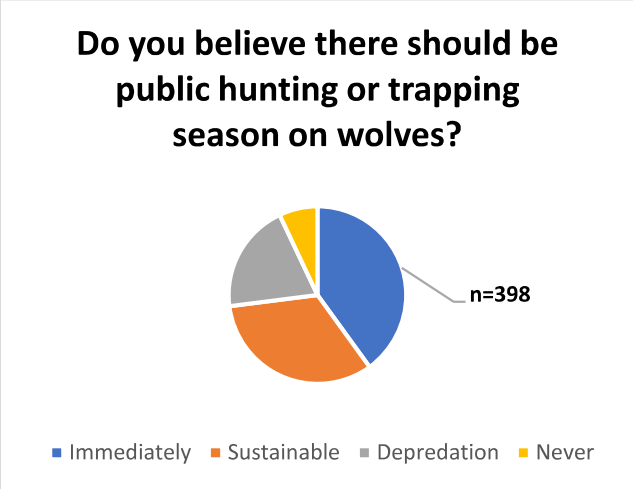


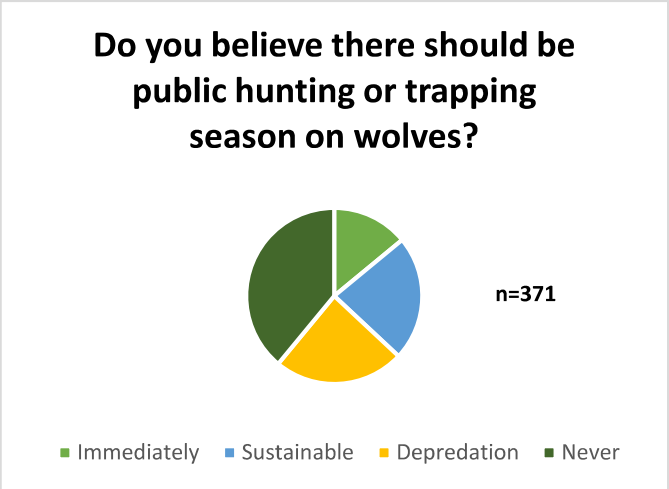
Non Tribal Respondents

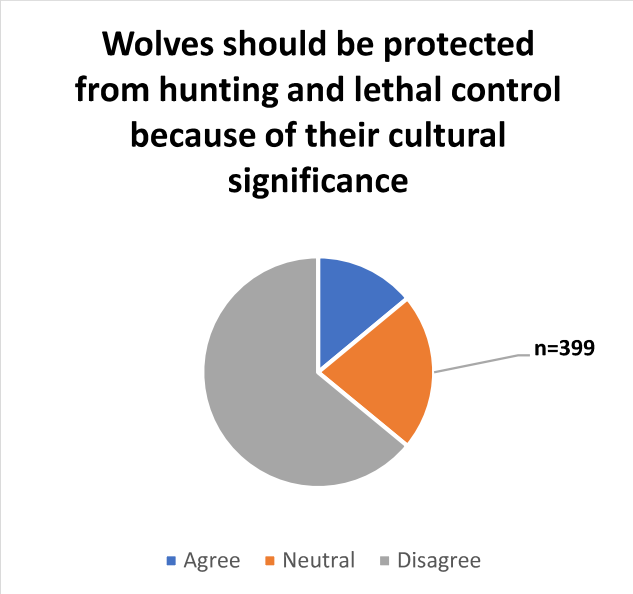
Tribal Respondents

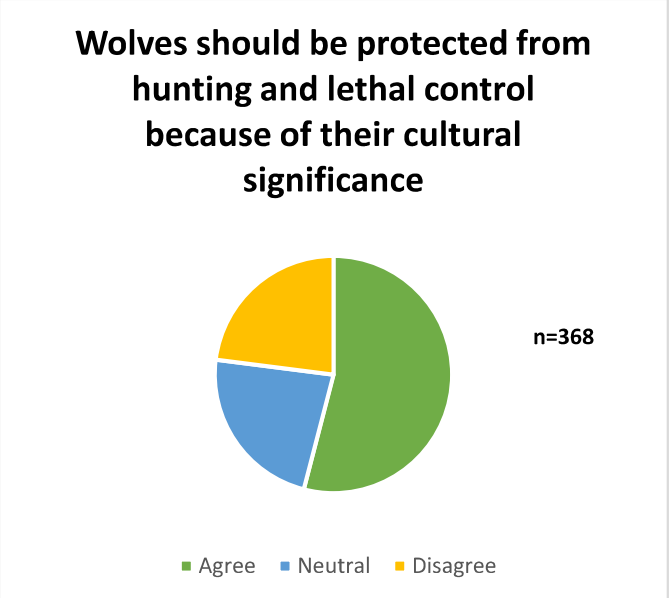






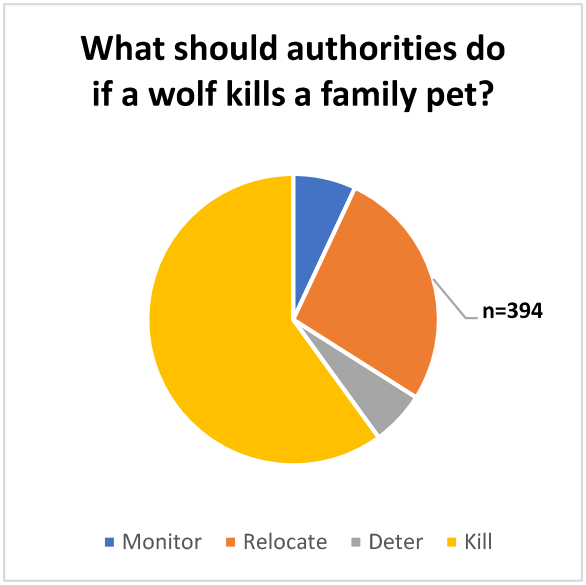


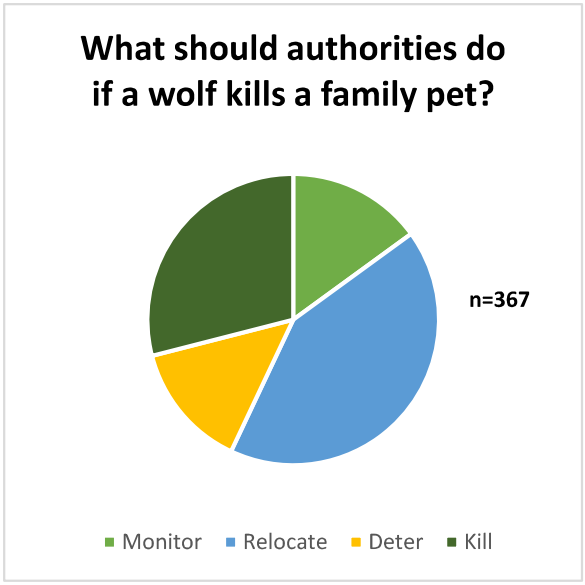


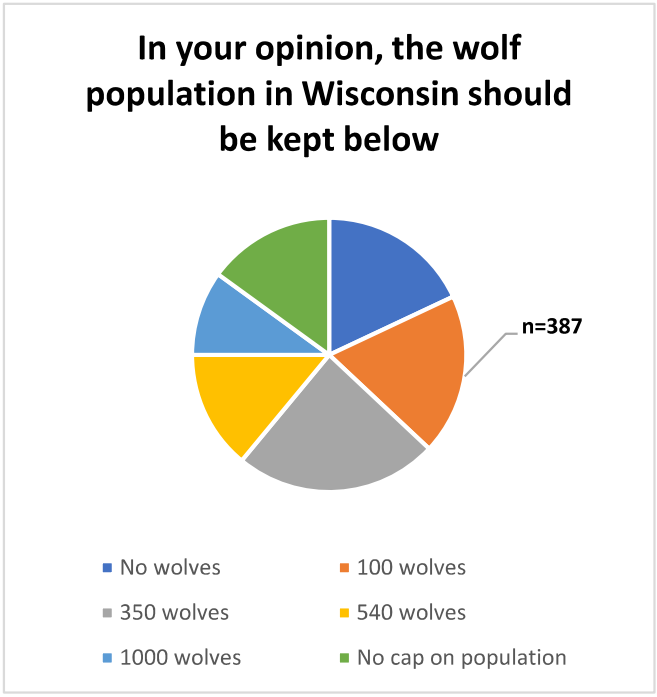


Non Tribal Respondents

Tribal Respondents







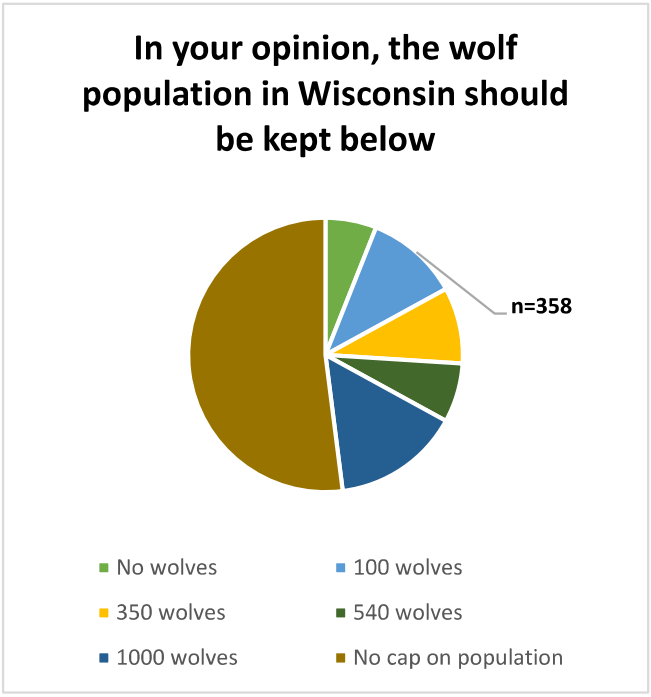


Figure 3: Results from 2009 Victoria Shelley survey of Non Tribal Northwoods residents and Mashkiiziibii Tribal Members

This study showed Mashkiiziibii Tribal members to be more supportive of protective Ma'iingan policy and to have a higher tolerance for Ma'iinganag than non-tribal members (Shelley, 2011). This relationship plan was written to support the strong relationship that Mashkiiziibii tribal members have with Ma'iingan. The Creator told Original Man and Ma'iingan that what happened to one would also happen to the other. Many Mashkiiziibii members believe that the recovery of Ma'iingan and that changing attitudes directly reflect the recovery and treatment of Anishinaabeg.

Livestock Owner, Tribal Member, and Wolf Biologist Views (A Study by Abi Fergus)

A small study of attitudes was also conducted in the summer of 2017 regarding Ma'iingan and the Tribe's Ma'iingan Management Plan. Abi Fergus was a senior at Alma College working as an intern for the Mashkiiziibii Wildlife Program at the time, and sought input from wolf biologists, tribal members, and non-tribal farmers to be considered for the 2019 update of the Ma'iingan Management Plan (Fergus, 2017).

Out of 30 farming operations contacted, three owners gave interviews on their sentiments regarding gray wolves and their conservation. Local wolf biologists were contacted once and all individuals except a representative with the WI DNR responded for an interview. This resulted in four scientists being interviewed. An official count of tribal members offered an interview in person was not kept. Around 1,800 tribal members live on the reservation and every member encountered at the tribal offices and at the daily elder lunch was offered an interview resulting in four members interviewed. A Facebook post detailing the study and providing population information on reservation Ma'iingan was also shared by the former Chief Tribal Warden and the former Tribal Wildlife Specialist as an attempt to gain more interviewees. Many members explained that they felt they were not the right person to speak on Ma'iingan. All but one interviewee had seen a wolf at least once, even if briefly. Most respondents, despite their self-reported attitude, described the event of seeing a wolf as a unique and interesting experience (Fergus, 2017).

Respondents seemed to have the most trouble answering questions relating to how the depredation of pets, livestock, and hunting dogs should be handled. It appeared that interviewees would initially answer

one way if looking at the three categories of animals in an emotional manner and then another way when processing the question with the owner's responsibility to take care of the animal or the owners' financial loss in mind. Costs to government and the historical handling of depredations by government were also discussed in responses by interviewees. Often, the interviewees came to the conclusion that s/he wasn't sure how depredation situations should be handled (Fergus, 2017).

When asked how pet, hunting dog, and livestock owners should protect against wolves killing their animals, answers varied including the following responses (Fergus, 2017):

- Animal owners shouldn't be expected to prevent depredations
- Animal owners can't prevent depredations
- Animal owners should keep animals under control with leashes/fencing
- Animal owners should guard animals with dogs/donkeys/range riders
- Animal owners should use deterrents such as fladry (flagging) and flashing lights
- Animal owners should keep animals near the house, and they should provide a small amount of food for wolves so that they are not tempted by the live animals

In addition to addressing depredations, respondents identified the key aspects of wolf management as being education, communication, wolf monitoring, habitat preservation, effective policy, hands off methods, and understanding the connection between Ma'iingan and Anishinaabeg. A number of wolf scientists, in particular, raised the need to diversify sources of wolf management funding in order to prevent disproportionate control in the issue by a stakeholder group such as hunters, who often pay for conservation via the purchase of hunting tags. Several respondents across stakeholder groups offered applying for grants, fundraising, taxing outdoor hobbyist supplies, collecting donations, finding cheaper management methods, and using funds from special license plates as venues to achieve broader funding (Fergus, 2017).

History of Ma'iingan in Mashkiiziibing

The MWP first began conducting Ma'iingan research within Mashkiiziibing in 1996. The Tribe determined that it was imperative to gain more knowledge on the movements and behavior of Ma'iingan, such as where Ma'iingan dens and rendezvous sites were located, in the face of timber sales, home development, and snowmobile trail establishment on the reservation. In 1996, the MWP determined three Ma'iingan packs spent time within Mashkiiziibing boundaries. These packs became known as the Potato River, West Firelane, and Morrison Creek (or Little's Girls Point Packs in Michigan). Later on, the Kakagon Sloughs pack was also identified within the reservation (Doolittle, 2001).

Figure 4: Photograph of tracking Ma'iinganag using radio telemetry from an airplane, provided by Lacey Hill-Kastern.

Since 1999, MWP has put radio collars on 10 Ma'iingan in order to learn about their habitat use, denning and rendezvous patterns, mortality causes, total population, and pack distribution on the reservation. In 2019, the Wildlife Program put an indefinite moratorium on collaring Ma'iingan, unless it can clearly be determined that collaring Ma'iingan will have direct benefits for Ma'iingan that outweigh the burden and risks that VHF and GPS collars pose. The MWP continues its historical use of howl surveys and track surveys to understand reservation Ma'iingan.

Ma'iingan Biology and Ecology

Description

At first glance, some may mistake a large Ma'iingan for a large Animosh (domestic dog; *Canis lupus familiaris*). Ma'iinganag are the largest members of Canidae (dog family), in North America. They can stand 26 to 38 inches (66 to 96 cm) high at the shoulder, with a body length of 40 to 58 inches (101 to 147 cm) long, and weight of 60 to 100 pounds (27 to 45 kg) (Busch, 1995). Ma'iinganag differ from Animoshag in several ways. Ma'iingan differs from a domestic dog in that it has longer legs, larger feet, a narrower chest, a straight tail, and tufts of hair on the sides of his or her face extending from below the ear (Paquet and Carbyn, 2003).

Other members of the dog family that are found in Mashkiiziibing include Wiisagi-Ma'iingan (coyote; *Canis latrans), Waagosh* (red fox; *Vulpes vulpes*), and the gray fox (*Urocyon cinereoaryenteus*). Ma'iinganag are much larger than any of these species. Wiisagi-Ma'iingan has a narrower face and pointier ears than Ma'iingan. Ma'iinganag may be mistaken for Waawaashkeshi due to their long legs. Ma'iingan's eyes are golden brown, and when you shine the eyes at night, they appear greenish-orange in color and appear closer together than Waawaashkeshki eyes do (Busch, 1995).

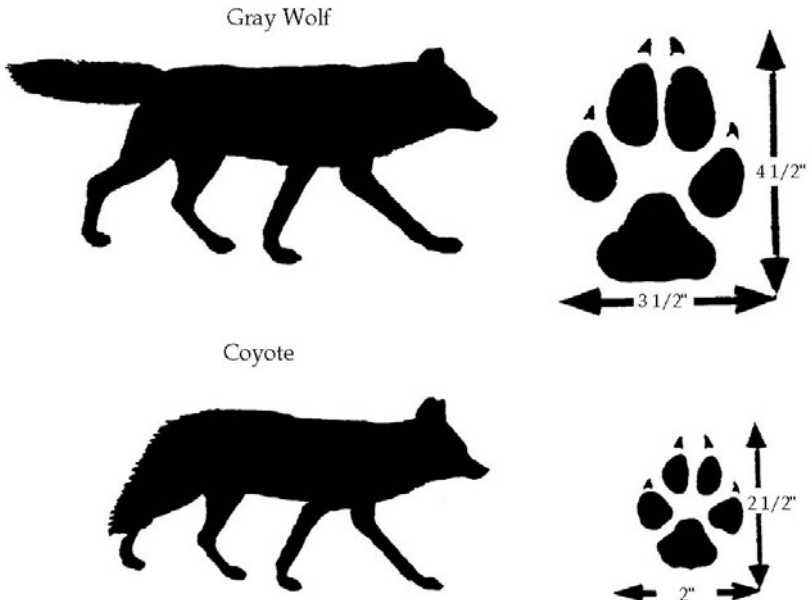


Figure 5: Ma'iingan and Wiisagi-Ma'iingan silhouettes and tracks (Paul and Gibson, 1994).

Ma'iinganag can be various shades of gray, tan, brown, white, and even all black. Each of these colorations have been observed and documented among the various packs on the reservation. Black Ma'iinganag are more common in the northern part of their range and can comprise up to one-third of the northern Ma'iingan population (Busch, 1995).

Track and Scat Identification

Ma'iingan tracks looks similar to those of Animosh. Each track consists of a pad, four toe prints, and 4 indentations above the toe pads (marks left by claws). Ma'iingan's track size is typically 4.5 to 5.5 inches (11 to 14 cm) in length and 3.5 to 5 inches (8 to 12.5 cm) in width, which is an unmistakably large paw print (Forrest, 1988). The print of Wiisagi-Ma'iingan is substantially smaller, typically 2.5 to 3.5 inches (6 to 9 cm) in length and 2 to 2.8 inches (5 to 7 cm) in width (Forrest, 1988) (Fig 5). Some Animosh breeds can leave a track similar in size to Ma'iingan. Animosh's toes point slightly outward, whereas Ma'iinganag toes will point straight ahead (Busch, 1995). Ma'iinganag also have more direct paths of travel and their tracks will often appear in a straight line versus Animosh, which will tend to wander.

Ma'iingan scat may appear similar to that of Animosh in size, but Ma'iingan scat is mostly comprised of hair and bone fragments. The feces are 0.5 to 6 inches (1 to 15.25 cm) in length and 1 to 1.5 inches (2.5 to 4 cm) in diameter and have tapering ends (Busch, 1995; Forrest, 1988). Wiisagi-Ma'iingan scat may appear similar, but is rarely over 4 inches (7.6 cm) in length or 1 inch (2.5 cm) in diameter (Forrest, 1988) (Fig 6).

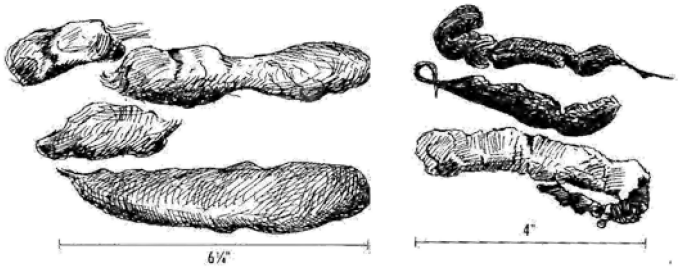


Figure 6: Ma'iingan vs Wiisagi-Ma'iingan scat (Paul and Gibson, 1994)

Mashkiiziibii's first Wildlife Specialist, Tom Doolittle, gathered habitat use data from the first three Ma'iingan to be collared and tracked on the reservation in the late 90s and early 2000s. Pack structures on the

reservation have changed since his writing, but Doolittle offers insight into reservation Ma'iingan's tie to waterways.

> "Regardless of the agency gathering relocation data from the air, all but four of 46 points were within riparian zones as defined by the IRMP set of buffers. Reservation GIS vegetation data also supports use within 200m of wetland types. Home ranges included 90% of the described vegetation types on the reservation. Sixty percent of air observations of wolves on the ground had a coniferous component in their respective habitat. Wolves avoided agricultural areas, main State highways and entered the reservation in the southeast quadrant of the reservation." (Doolittle, 2001).

Ma'iinganag are considered to be "habitat generalists" and can survive in a variety of habitat types, dependent on prey availability (Gehring and Potter, 2005; Mladenoff et al., 1999). Ma'iinganag require large tracts of land with adequate prey populations. Ma'iingan's diet has not been studied in Wisconsin since the 1980s, when Ma'iingan was first returning to Wisconsin after being extirpated. At the time of the master's dissertation study, Ma'iingan was found to be primarily eating Waawaashkeshiwag and secondarily preying on Amik (American beaver; *Castor canadensis*) with some Waabooz (snowshoe hare; *Lepus americanus*) in the diet (Mandernack, 1983). Ma'iingan's population and habits in the ceded territory have changed since this diet study, and it is a goal of the Mashkiiziibii Wildlife Program to study the diet of reservation Ma'iinganag. In more modern studies that took place elsewhere in North America, Ma'iinganag have been known to supplement their diet with rodents, birds, eggs, fish, berries, carrion, and other carnivores such as bears and river otters (Paquet and Carbyn, 2003; Chavez and Gese, 2006; Gable et al., 2019; Gable et al, 2018). A study out of Voyageurs National Park in Minnesota found that one Ma'iingan pack ate 38-42 percent of Amikwag within the pack's home range (Gable and Windels, 2017).

Ma'iinganag, as apex predators, can influence more evenly dispersed grazing by ungulates (Ripple and Beschta, 2012). Not only does this have the potential effect of preventing all individuals of a plant species from

existing only in disease-susceptible clusters, but it also can establish critical habitat. The even spread of ungulate browsing due to predation pressure from wolves may bring other benefits. For example, the woody plants that have been found to grow more successfully after wolves reoccupied Yellowstone provide shade over rivers, which cools water. This phenomenon supports cold water fish such as trout (Wilmers et al., 2012). This theory of how wolves shape an ecosystem, called top-down trophic cascades, needs to be further researched in geographical locations outside of Yellowstone, but it is an influence that various large predators around the world seem to have on their respective ecosystems (Dyer and Letourneau, 2002; Pace et al, 1999; Ripple and Beschta, 2012).

Despite the common belief that wolves are competing with people for venison, they can be beneficial for prey populations (Burt, 1952; DelGiudice, 2010; Wilmers et al., 2012). Wolves cull the old, sick, and very young from the herd, which can stimulate productivity by freeing more food and cover to support a healthy population of deer (Kurta, 1995). Various studies have shown conditions in which wolves act as compensatory predators, killing prey that would have otherwise died from causes such as disease or age (Griffin et al., 2011; Sand et al., 2012; Wright et al., 2010). Humans don't usually hunt in this way. Waawaashkeshi fawns are important prey for Ma'iinganag in the summer. Research conducted in Minnesota found that nine fawns are eaten per adult Ma'iingan and each Ma'iingan has an estimated kill rate of eighteen Waawaashkeshiwag per year (DelGiudice, 2010). However, the kill rate is not universal and is dependent on location, winter severity, and a number of other factors (DelGiudice,2010; Metz et al., 2012). Ma'iinganag are not efficient hunters of Waawaashkeshi and studies have shown that most hunts are brief and unsuccessful (Stark, 2009).

Chronic Wasting Disease (CWD) and Ma'iingan

Ma'iingan may play a part in controlling disease within prey species. One example is chronic wasting disease (CWD), an illness that degrades the brains of cervids (deer species) and leads to certain mortality (Geist et al., 2017). CWD has been a growing issue for Cervidae, such as Waawaashkeshiwag and

Omashkoozwag in North America. Similar to mad cow disease, CWD is understood to be caused by the misfolding of a protein (called a prion) and can be transferred directly between infected individuals and indirectly from contaminated habitat where the individual browsed, defecated, or died. This prion disease is classified as transmissible spongiform encephalopathy (TSE), which means it can be spread between individuals and causes holes in the nervous tissue. The contagions can then remain in the environment for years. Human hunting of contaminated cervids is not as likely to reduce the prevalence or spread of CWD as Ma'iingan predation is, because humans cannot visually detect a CWD-infected deer unless it is in the late clinical stages of the disease. Humans are not likely to control CWD because we tend to harvest the healthiest individuals rather than the young, old, or sick individuals. Current trends in CWD prevalence seem to be unaffected by human hunting practices once the disease has become established on the landscape. The disease is contagious before its symptoms in infected animals are apparent to humans. Within weeks of infection, a cervid individual may become contagious, but signs of clinical-stage infection visible to humans do not manifest until 6 to 11 months after the initial infection. The disease takes 18 to 36 months to run its course, ending with the death of the cervid (Wild et al., 2011).

Ma'iinganag may be able to pick up on CWD disease cues earlier than humans, because prey individuals that carry disease or parasites often are conspicuous to non-human predators. If Ma'iingnag were to selectively prey on Waawaashkeshiwag with CWD, this could contribute to a more stable cervid population. This is because mortality would be more consistent if caused largely by predation rather than by disease. Even if Ma'iinganag do not actually have the capability of early disease detection, Ma'iingan predation on cervid populations might CWD in check by reducing population density and thus the spread of disease. Predation behavior research, however, indicates that Ma'iinganag prefer preying on young, old, and diseased individuals and this indicates that they may be capable of detecting CWD. Canines seem to break down the CWD prion within the digestive tract rather than take up the disease or continue its spread (Wild et al., 2011).

One model projects Ma'iingan, rather than humans, having a superior ability to suppress the disease within a population of cervids. This is based on the condition that Ma'iinganag remove 15 percent of the deer

population per year. This study was by no means perfect. Future research should model the risk of CWD spread from cervid carcasses, in addition to live Waawaashkeshiwag, as an indicator for the prevalence of the disease in an environment (Wild et al., 2011). In another study that took place in Spain, cattle and wild boar within Ma'iingan range were found to have less prevalence of tuberculosis (Tanner et al., 2019). Modeling showed that if Ma'iingan populations remained stable, that tuberculosis would remain controlled, but if the Ma'iingan population crashed the disease would rebound (Tanner et al., 2019).

In a closed population of Omashkooz (American elk; *Cervus elaphus*) within Rocky Mountains National Park (which is comparable in size to the Bad River Reservation), one researcher's modelingg showed that wolves could eradicate CWD in elk within 19 years (Hobbs, 2016). Omashkoozwag seem to have a slower transmission rate than Waawaashkeshkiwag and CWD seems to transfer more through indirect means such as scat (Hobbs, 2016). Still, this study is helpful to consider as Mashkiiziibii Wildlife Program has a goal to return Omashkoozwag to Mashkiiziibing, and their relationship to CWD is an important consideration. The restoration of Omashkoozwag to Mashkiiziibing may even cause a more dispersed Waawaashkeshiwag population on the reservation, and thus reduce the potential for direct transmission between Waawaashkeshkiwag.

The latest estimate of Ma'iingan predation on Waawaashkeshkiwag was done by the WI DNR in 2009 (WDNR, 2009). This study found that Ma'iingan was only preying on about 1.3% of the Waawaashkeshiwag population when the Ma'iingan population in the state was estimated by the WI DNR to be about 626-662 individuals (WDNR, 2009). Though the Ma'iingan population in 2018 was estimated to be about 905-944 individuals, this population would still not reach 15 percent predation on the 2019 estimate of 1.8 million Waawaashkeshiwag in Wisconsin (WDNR, 2009; WDNR, 2019).

Causes of Ma'iingan Mortality

In a given year, approximately 70% of Ma'iingan pups die, while deaths among Ma'iinganag one year or older averages 25% of the population segment (Wydeven et al. 2012). According to Wisconsin's 2018 Year

End Ma'iingan Population Monitoring Summary, 36 adult Ma'iinganag were found dead in the state during the year, 4% of the year end count population of 925-952 Ma'iinganag. Of the 36 dead Ma'iinganag: 39% were killed by vehicles and 19% were illegally shot. Humans caused 72% of 2018's Ma'iingan mortality. More disease caused deaths occurred in 2018 than in the previous two years, with 16% of deaths attributed to disease out of 28% of deaths being attributed to natural causes as a whole (Wiedenhoeft, 2018).

Ma'iinganag are susceptible to many diseases and parasites. Canine distemper, canine parvovirus, lyme disease, and blastomycosis have all been documented in Ma'iinganag in Wisconsin (WDNR, 1999). Sarcoptic mange has also been frequently observed on Ma'iinganag and has been documented in Mashkiiziibing (Jimenez, 2010; Doolittle, 2001). Ma'iinganag are also susceptible to external parasites such as flies, ticks, fleas, mosquitoes, and mites. Historically in Wisconsin, humans are the number one cause of Ma'iingan death via poaching and car accidents (Treves et al., 2019).

Ma'iingan Behavior and Social Structure

Ma'iinganag are social animals and live in family units known as "packs." By definition, a pack always consists of at least a breeding pair (formerly known as an alpha pair). Pack size changes on an annual basis and most often consists of the pups produced that year, the previous year's surviving offspring, and sometimes older offspring that have not dispersed or an unrelated adult that was accepted into the pack. The average ma'iingan pack in Wisconsin has 3 to 4

Figure 7: Gimiwan (it rains), a breeding male reservation ma'iingan, provided by Ad Fergus

members, not including pups (Paquet and Carbyn, 2003).

Ma'iinganag typically mate from January to April. A female is in estrus for five to seven days (Paquet and Carbyn, 2003). Ma'iinganag can become breeders between one to three years of age, but not all will breed. Often, 2-3 year old Ma'iinganag disperse from their packs in order to find breeding opportunities. Ma'iingan can find a mate in a new territory or form its own pack. Ma'iingan can be accepted into a pack and wait for a breeding opportunity, or it can oust a pack breeder and take over that position (Mech, 2003).

Definition:
Tribally Protected Species – *Any species that may or may not exist on the Mashkiiziibii Reservation, that the Mashkiiziibii Tribal Council and Mashkiiziibii Wildlife Program determine needs additional protections against hunting and other harms.*

Pups are born from early April to early June after a 62-63 day gestation period (Paquet and Carbyn, 2003). Litter sizes vary from one to eight pups, with an average litter size being six (Paquet and Carbyn, 2003). At four weeks old, pups will begin to leave the den; pups are able to travel

up to a mile from the den at five weeks old (Busch, 1995). Pups are moved to a "rendezvous site" once they are physically able to make the journey. A rendezvous site is an area where the pups stay while the rest of the pack hunts; it can also be referred to as a summer "nursery" site. One pack may have several rendezvous sites in its territory. At 3 months, pups will accompany adults on hunts; by seven to eight months pups actively hunt as a member of the pack (Busch, 2005).

Mashkiiziibii Ma'iingan Relationship Policy

Prior to the Ma'iingan Relationship Plan, the Tribe's Ma'iingan relationship policy had been to follow federal policy and to work cooperatively with the state, USFWS, and GLIFWC. After being delisted, Ma'iinganag were classified as a "*tribally protected species*" by the Mashkiiziibii Tribal Council. This classification, along with the Ma'iingan Relationship Plan, will be revisited every 5 years by the Mashkiiziibii

Tribal Council and MWP. Classification can be revisited sooner if deemed an emergency by Tribal Council and MWP.

MWP will honor the relationship between Ma'iingan and Anishinaabeg. MWP will not work towards a specific Ma'iingan population in and around Mashkiiziibing, but instead will work to ensure the long-term presence of Ma'iingan by supporting coexistence. MWP will work for a minimum ma'iingan population goal of three packs in Mashkiiziibing, as there historically have been three year round packs and one seasonal pack on the reservation. Non-lethal tactics, such as guard animals and deterrent devices, will be used to respond to and prevent conflict between Ma'iingan and domesticated animals. Under this plan, the only legal killing of Ma'iinganag will occur in circumstances where non-lethal methods have not worked or are not deemed feasible by MNRD staff to protect domesticated animals.

MWP will continue to use both traditional ecological knowledge and western science in monitoring the Ma'iingan population in Mashkiiziibing. The tribe will also continue to work with tribal, state, and federal agencies as well as with private landowners to ensure the sustainability of Ma'iinganag in Mashkiiziibing, in the state of Wisconsin, and in the Great Lakes Region.

If the Population Falls Below the Minimum Goal

MWP will not set a population cap on the Ma'iingan population in Mashkiiziibing or in the buffer zone. Since 1996, Mashkiiziibii Wildlife Program has monitored three to four Ma'iingan packs utilizing the lands within the reservation. Mashkiiziibii Wildlife Program has set a minimum population goal of at least three packs partially occupying the reservation.

If the population falls below this goal, immediate consultation will occur with the United States Fish & Wildlife Services and the WI DNR. Monitoring efforts and a possible reason for the population decline will be evaluated by MWP. MWP will seek to identify any major habitat changes, prey population declines, and/or possible disease outbreaks. The status of Ma'iingan outside of the reservation will also be evaluated.

Traditional Ecological Knowledge

> "In order to be involved with wolf conservation, the State and Federal government need to understand how to take care of wolves. That's what the Anishinaabe have done for years by observing and learning. Conservation of wolves is a part of our history. If we allow them to be killed, we allow ourselves to be killed." – Edith Leoso, 2017

This statement by Tribal Elder and Historic Preservation Officer Edith Leoso underlines the importance of Traditional Ecological Knowledge (TEK). TEK is passed down through generations of indigenous peoples (Service et al., 2014). This knowledge is formed over long periods of time in which an indigenous nation lives on a landscape (Adams et al., 2014). Anishinaabeg are believed to have finished the great migration to Mooninwaane'akaaning Minis (known as Madeline Island in English) around 1400 (About Anish:Timeline), but had shared the landscape of modern North America with Ma'iingan for more than 8,000 years (Our Proud History).

Generally, indigenous peoples of North America lived in a sustainable manner before colonization occurred and influenced this way of life (Wood and Wilckers, 2008). Hunter-gatherer lifestyles gave indigenous peoples an intimate knowledge of their dependency on other life, from predators to prey (Wood and Wilckers, 2008). Anishinaabeg have learned skills and morals from Awesiinhyag (animals) and animal Manidoog (spirits) (Benton-Banai, 1988). Anishinaabeg hold a wealth of knowledge in coexisting with Ma'iingan held by tribal members and in traditional stories.

In addition to the Anishinaabe creation story involving Ma'iingan, various other stories involve Ma'iingan teaching lessons to Anishinaabeg (Usik, 2015). These stories often reflect what environmental values Anishinaabeg have traditionally held. The analysis of these stories and the lessons Anishinaabeg gain from them may also help to shed light on how they successfully co-inhabited North America with Ma'iingan. One Anishinaabe value these stories exemplify is that humans are lesser than other members of their ecosystem, because of the dependence humans have on other biota to survive. This contrasts with Western attitudes of dominance over the natural world, which much the scientific community is influenced by.

The wildlife program will pursue TEK on Ma'iingan, value it along with the scientific method, and incorporate it into its conservation work. Thus far, this knowledge has been pursued at elder lunches, community events, and a conversation circle leading up to the 2018 update of the Ma'iingan Management plan. The wildlife program will accept knowledge that may help inform Ma'iingan conservation at any time. Adams et al. (2014) outlines a framework we can use to form research questions based on TEK while using the scientific method so that those who have not yet accepted TEK for its inherent value may accept the same knowledge in the form of scientific results.

Mashkiiziibii's Policy on the Harvest of Ma'iinganag

To Anishinaabeg, the loss of one Ma'iingan is equal to that of a loss of a brother/sister. All ma'iinganag are sacred to Anishinaabeg, therefore the Mashkiiziibii Tribe does not support the killing of Ma'iinganag, but does understand the importance of protecting one's animal companions.

At the Mashkiiziibii Tribal Council meeting on May 9th, 2012, the Tribal Council and the community members present spoke out against the sport killing of Ma'iinganag. At that meeting, the Mashkiiziibii Tribal Council approved an emergency rule prohibiting the harvest of Ma'iinganag within the exterior boundaries of Mashkiiziibing. The Bad River Band of Lake Superior Chippewa Indians is opposed to the recent State of Wisconsin Ma'iingan hunts and the interpretation of the 350 Ma'iingan population number in the Wisconsin Wolf Management Plan as being an upper limit on Ma'iingan's population (Appendix A). The Mashkiiziibii Tribe knows that there should be no population cap placed on Ma'iingan and that the State should focus on supporting coexistence with Ma'iingan.

Mashkiiziibii Wildlife Program Responsibilities

The Mashkiiziibii Wildlife Specialist will be responsible for the implementation of this plan. The Wildlife Specialist, with the assistance of Tribal Wardens, will also be responsible for co-investigations conducted within the buffer area surrounding the reservation, depredation investigations within the exterior

boundaries of the reservation, the coordination of inter-agency monitoring and conservation activities, and the annual recording of the reservation Ma'iingan population.

The Wildlife Specialist will also be responsible for participating in any state, federal, tribal and regional meetings regarding Ma'iingan. Summaries of these meeting will be kept on file at the MNRD office and updates will be provided to the MNRD Department Director on an annual basis. MWP will continue to provide comments on proposed state and federal Ma'iingan conservation strategies and documents. Routine coordination will occur with federal, state, and surrounding land managers to ensure proper protections for Ma'iinganag are taking place to ensure protection of the local population.

Regulations under this Ma'iingan Relationship Plan will be enforced by Mashkiiziibii Tribal Wardens and necessary coordination with federal, state, and local authorities will occur under the guidelines of this plan.

What makes a Ma'iingan a "Reservation Ma'iingan?"

During the delisting process and the introduction of Wisconsin Act 169 2011, the term "reservation wolf" or "reservation pack" was commonly used. MWP defines a reservation Ma'iingan as a Ma'iingan or pack whose home range is found, at least in part, within the exterior boundaries of Mashkiiziibing. This information has been confirmed by radio collar locations and combined tracking efforts between MNRD and WDNR. These packs shall be protected when they travel off-reservation as well as when they remain on reservation.

Conservation Responsibility in the Buffer Zone

Mashkiiziibii has sovereignty over the reservation and holds rights to hunt, fish, and gather in the ceded territory, which makes up roughly the northern third of modern-day Wisconsin. Ma'iingan does not recognize human political boundaries. Mashkiiziibii Ma'iingan research dating back to 1996 shows that reservation wolves regularly travel off reservation. The following map of a collared Ma'iingan demonstrates how reservation Ma'iinganag travel throughout the six mile buffer of Mashkiiziibing.

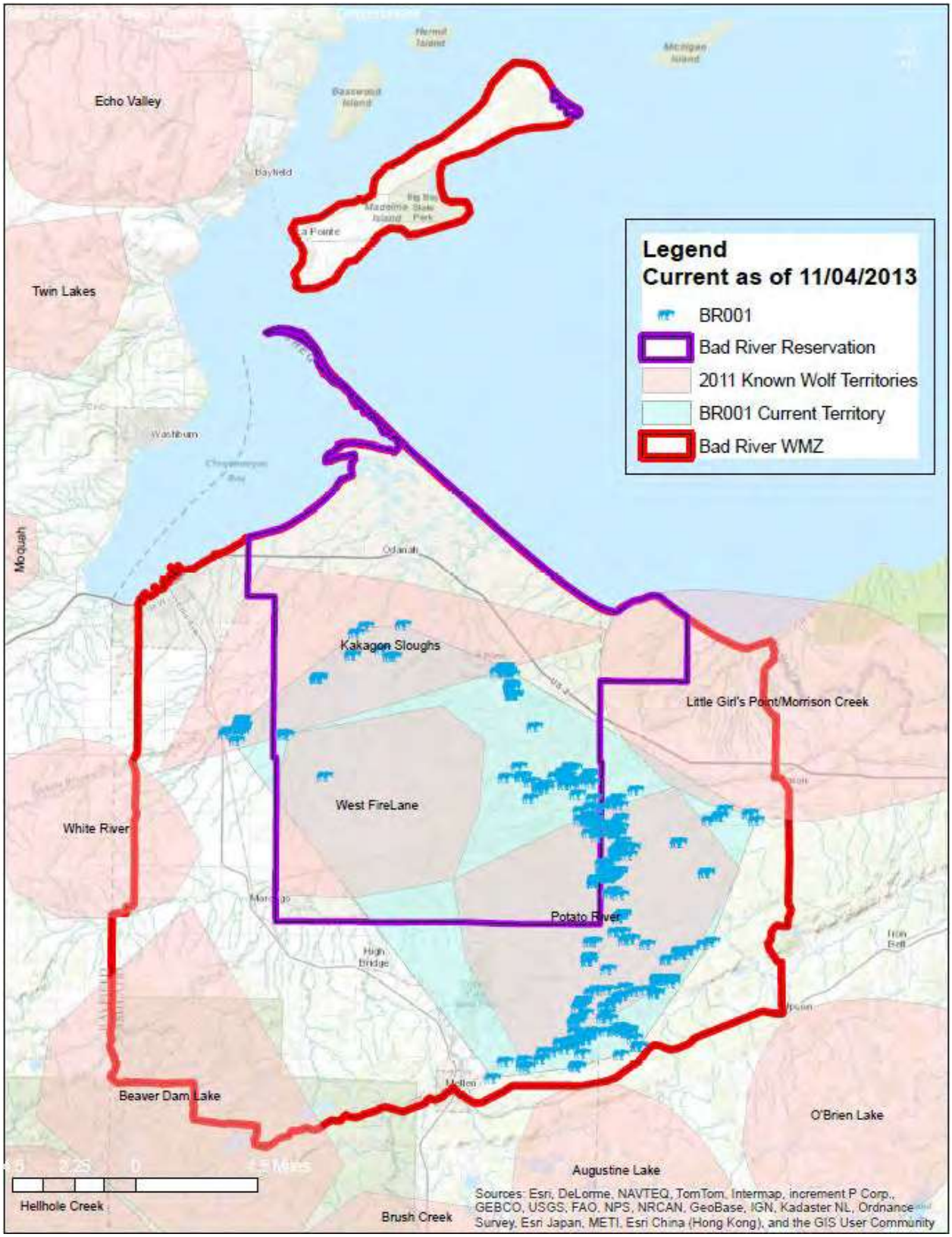


Figure 8: Movement of a formerly radio collared ma'iingan on the Mashkiiziibii reservation

For Mashkiiziibii's sovereignty to be honored, extended protections for reservation Ma'iingan must be recognized by the state. Mashkiiziibii has been advocating to the State of Wisconsin for the protection of reservation wolves, which also travel off reservation, at least since the early 2000s (when Ma'iingan was temporarily federally delisted) (Doolittle, 2001).

In the State of Wisconsin, the WDNR, APHIS-WS, and tribes with large reservations have been working cooperatively on reservations, within a six mile buffer of the reservations, and within the ceded territories. If there is a conflict between people and Ma'iinganag within six miles of a reservation (Bad River, Red Cliff, Lac Courte Oreilles, Lac Du Flambeau, Menominee, Stockbridge-Munsee), tribal representatives are to be notified and to be given the opportunity to investigate the scene with APHIS-WS professionals. At an investigation, a reactive depredation control method is discussed with all parties including the landowner.

The Mashkiiziibii Ma'iingan Relationship Plan extends beyond the reservation's boundaries, encompassing six miles around the reservation's borders (Figure 9). The buffer zone boundary runs along easily distinguishable roads to reduce possible confusion. The unit runs from Chequamegon Bay along Hwy 112, to Ashland-Bayfield County Line Road, to Mineral Lake Road, to Co Rd GG, to Hwy 77, then back along Hwy 122, and ends at the Wisconsin-Michigan border. A portion of Mashkiiziibing is located on Mooninwaane'akaaning Minis (Madeline Island). Ma'iingan is not currently known to live on Mooninwaane'akaaning Minis, but Ma'iingan has been document on Stockton Island (the largest of the Apostle Islands) and the buffer zone extends around the reservation land on Mooninwaane'akaaning Minis (Allen et al., 2016). Within this zone, there shall be a zero quota for public harvest. The Tribe does recognize the importance of private landowners and their need to protect their domesticated animals. Therefore, the tribe is understanding of the issuance of an individual landowner permit to kill Ma'iingan **as a last resort**, as long as the following circumstances apply:

- Domesticated animal depredations have occurred within the last six months and there was tribal representation on the investigation
- Other non-lethal abatement methods were tried and documented but found unsuccessful
- Multiple domesticated animal damages (adverse health effects or death resulting from a verified ma'iingan attack) have occurred and have been verified to have been caused by ma'iingan by co-investigations with tribal staff
- After co-investigations with APHIS-WS and MNRD, it has been determined that lethal methods are appropriate

MWP understands that there are diverse, non-lethal tactics to coexist with Ma'iingan and which are ethically, scientifically, and culturally better options than lethal action. The Mashkiiziibii Wildlife Specialist needs to be involved in depredation investigations within the buffer zone. Because of the small number of Ma'iinganag associated with Mashkiiziibing and their frequent use of both on and off-reservation lands, the impact of depredation control is significant.

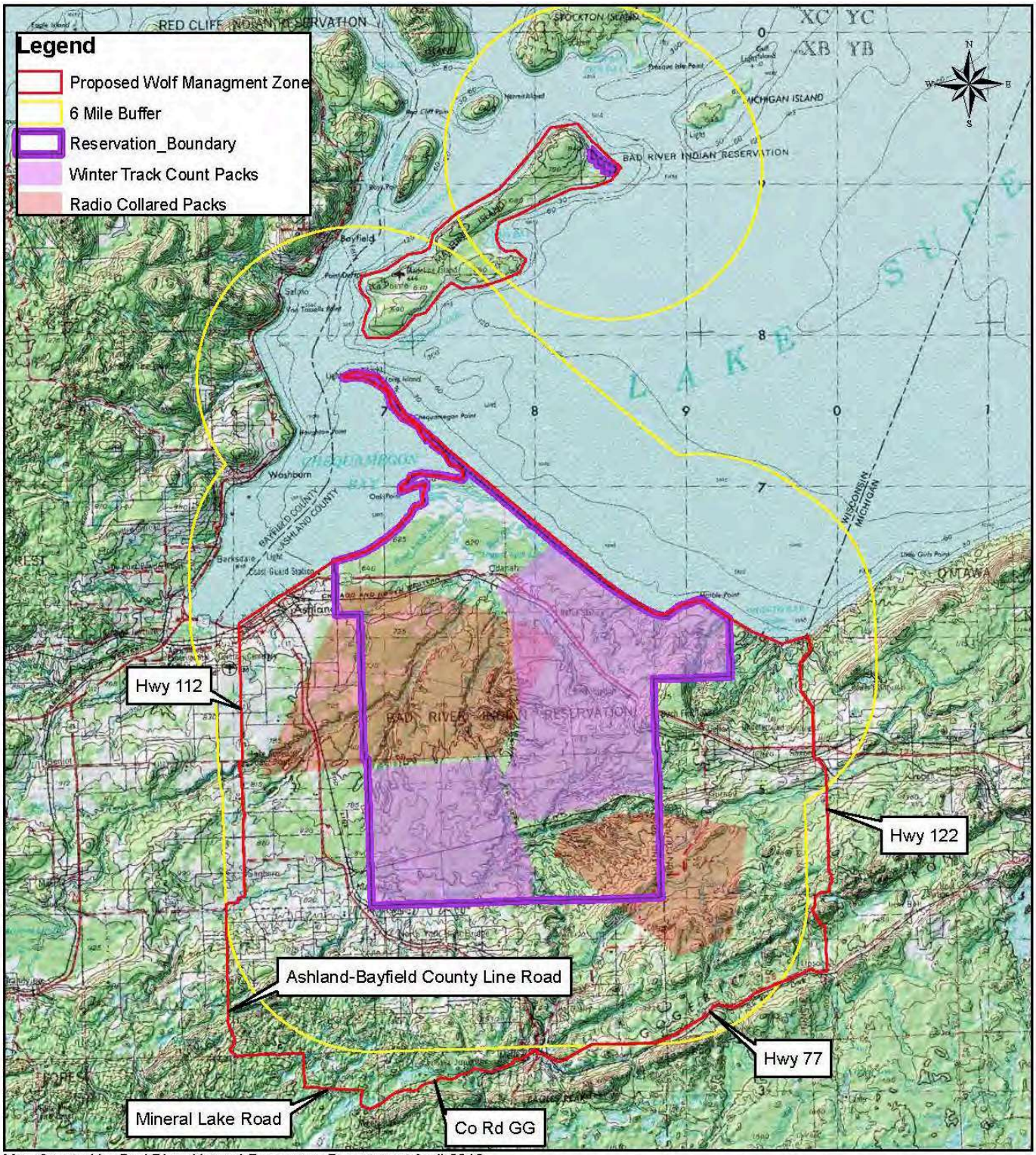


Figure 9: Map of buffer zone and reservation packs

Ma'iingan and Livestock

In the most recent 5 year report from the USDA on cattle mortality, a historic trend continued in which predators accounted only for a small percentage of cattle deaths (Figure 10; USDA, 2017).

Figure 10: USDA data on cause of cattle mortality

More than 30 livestock operations surround the reservation within the buffer zone (Figure 9), making Ma'iingan-livestock conflict an area of concern in Ma'iingan conservation. Many factors go into whether a population of Ma'iinganag shows a preference for livestock or for their natural prey. In some cases, high populations of a single natural prey species are less appealing to Ma'iinganag than livestock predation, but multiple and smaller populations of native ungulates will draw Ma'iingan more than farm animals will (Treves et al., 2004; Meriggi and Lovari, 1996). One reason for this predation trend may be that a single species experiencing constant predation from Ma'iingnag may learn more quickly how to evade the predator. For example, Waawaashkeshi retain instinctual responses to lower their vulnerability to predation (Nelson and Mech, 1994). Domesticated animals, though, have lost their ancestor's natural defenses against predation, thanks to selective breeding (Smith-Thomas, 2016). This presents an argument for returning historically native cervids, such as Omashkooz (American elk; *Cervus elaphus*), to Mashkiiziibing.

A three-year Minnesota study of Ma'iingan movements showed that the majority of instances of the animal on pasture lands were by chance passing (Chavez and Gese, 2006). These results were based on comparisons to simulations of what random activity would look like in Ma'iingan movement. Not all Ma'iingan visits to livestock in entailed a case of depredation. During the three years of the study, eight young or vulnerable farm animals were killed by Ma'iingnag (Chavez and Gese, 2006). Chance passing of livestock land in the pursuit of natural prey, though, can result in livestock depredation due to the fact that they are an easier meal for Ma'iingan (Amirkhiz et al., 2018).

Habitat variables and secondary prey may influence whether Ma'iingan pursues livestock or natural prey. There have been studies that both show Ma'iingan to prey more heavily on livestock despite a healthy availability of natural prey (Treves et al., 2004) and show Ma'iingan to prey more heavily on natural, secondary prey despite livestock being more readily available (Chavez and Gese, 2005). In the first study, the reason for heavy livestock predation was hypothesized to be due to the landscape consisting largely of pasture rather than being intermingled with forest, wetlands and open water (Treves et al., 2004; Treves et al., 2011). In the second study Wazhashk (Muskrat; *Ondatra zibethicus*) made up the second largest percentage of Ma'iingan's

diet, which may indicate that presence of secondary prey helps to reduce livestock predation (Chavez and Gese, 2005). More research is needed to understand wolf predation on livestock, its influencing variables, and its prevention. Still, it seems that conserving biodiversity, and thus giving Ma'iingan varied prey options, may help to prevent Ma'iingan conflict with livestock.

It's also important to note that Ma'iingan predation on livestock and native prey may be overemphasized by those who have bad feelings toward Ma'iingan. Depending on the location, Makwag may prey on just as many Waawaashkeshi fawns as Ma'iingan does (Kunkel and Mech, 1994). Wiisagi-Ma'iingan are known to be a significant cause of sheep and goat depredation (Mitchell, Jaeger, and Barret, 2004).

Coexistence

Encouraging coexistence with Ma'iingan is essential to an effective relationship plan, because human caused mortality is the number one killer of Ma'iingan in Wisconsin (Treves et al., 2019). Additionally, Ma'iinganag and other predators can kill and eat domestic animals, including sheep, cows, chickens, and dogs. It doesn't happen often, but it can have great impacts to the individual experiencing the loss. Any conflicts with Ma'iinganag or other predators in Mashkiiziibing or within the buffer zone surrounding the reservation shall be reported to the MNRD Wildlife Specialist (see appendix for contact information) within 24 hours of the occurrence by either the individual or the immediate responding agency.

In order for conflict investigations to remain consistent, MNRD will follow the verification procedures provided by APHIS-WS and the WDNR and will ensure all parties are notified of predator-livestock conflict in a timely manner. Authority to make reactive decisions after Ma'iingan conflict in Wisconsin (outside of reservations) is held by the Wisconsin Department of Natural Resources (WDNR). Authority to make reactive decisions after Ma'iingan conflict on Mashkiiziibii lands is held by the MNRD. On private lands within the exterior boundaries of Mashkiiziibing and within the designated buffer area surrounding the reservation, authority shall be shared between the State and MNRD.

If a depredation does occur, all traffic in the vicinity must be kept to a minimum and the depredated animal must be covered with a tarp until designated staff are able to arrive and complete a thorough investigation. Photos shall be taken of the incident and an incident report shall be completed and kept on file at the MNRD. Copies of these reports shall also be provided to all parties involved in the conflict, and copies of reports from other agencies shall also be collected and placed on file at the MNRD.

If Ma'iinganag are again delisted federally, private landowners will have the right to shoot and kill Ma'iinganag in the act of killing, wounding, or biting a person's domesticated animals on their own private property as stated by Wisconsin NR code 10.02(1)(b). In this event, the Mashkiiziibii Wildlife Specialist and appropriate staff from WDNR and APHIS-WS must be notified immediately by the landowner or current caretaker of the property where damage has occurred to investigate the scene. See Appendix D for contact information. Any Ma'iinganag killed for the above listed reasons shall not be kept by the responsible party. All Ma'iinganag shall be respectfully handled by the Mashkiiziibii Wildlife Specialist and/or the MNRD Tribal Game Wardens.

The Tribe does not provide financial assistance for animals lost to or injured by Ma'iinganag. The MNRD can offer assistance and education on prevention tactics and on state and federal reimbursement programs. Conflict issues will be dealt with on a case by case basis. As a federal agency, APHIS-WS will co-investigate any depredation occurring within the exterior boundaries of the reservation as well as any occurring within the designated buffer area surrounding the reservation with the Mashkiiziibii Wildlife Specialist.

Preventing and Responding to Depredations on Livestock

A goal of MWP is to help identify non-lethal solutions to prevent predator-livestock conflict. The killing of individual animals that may have caused a depredation can lead to more issues, instead of effectively protecting livestock (Treves et al., 2015). Ma'iingan packs may break up if a member, especially the breeding

female, is killed (Treves et al., 2015). The breakup of a Ma'iingan pack can lead to young, dispersing Ma'iinganag or to wisagi-ma'iingan replacing the pack's niche. Young, dispersing Ma'iinganag have been shown to be more likely to go after livestock (Vucetich et al., 2013). A more promising solution is to understand the individual predators we share the landscape with and to establish an understanding with them that livestock are not acceptable prey items. This can be done with a menu of husbandry and deterrent practices.

The key to determining a long term, non-lethal solution is to determine the mechanism that is driving these depredations to occur. The impact that Ma'iinganag have on farms across Ma'iingan country is minimal compared to other negative impacts, but to one farm that has repeated depredations by Ma'iinganag, it can be emotionally and financially devasting (Breck and Meier, 2004). After an investigation has occurred in cooperation with MWP, APHIS-WS, and WDNR, the cooperating agencies will work with the landowner on site to develop a Depredation Prevention Plan with a list of recommendations to reduce the future risks of depredations. Recommendations will vary depending on the landowner and the circumstances. The Mashkiiziibii Wildlife Specialist is also available for depredation prevention consultation before and incident has occurred. This may entail signing an agreement between MWP and the livestock owner to lend out deterrents such as light makers and noise makers when available, free of charge.

In 2019, Abi Fergus began her master's education at University of Wisconsin-Madison in the Nelson Institute and Carnivore Coexistence Lab. She studied the potential of non-lethal deterrents to keep Ma'iingan and other predators away from livestock operations surrounding the reservation. By the 2023 update of the Ma'iingan Plan, findings from our research will be available to inform future carnivore-livestock coexistence on the reservation and in the buffer zone.

Disturbance Protection

Studies have shown that Ma'iinganag do not tolerate human activity around den sites (Paquet and Carbyn, 2003). MWP will establish a 1.5 mile (2.4 km) buffer around known, active Ma'iingan den locations from March 1st to July 1st. Since pups are more mobile later in summer, and since packs usually have multiple rendezvous sites, there will be no human disturbance restrictions on rendezvous sites. The buffer area around den sites will be considered when MNRD staff reviews proposed timber sales, development proposals, and certain access permits.

Incidental Ma'iingan Capture or Mortality

In the event of a trapper incidentally catching Ma'iingan, it shall be immediately released or the aid of Mashkiiziibii wardens and wildlife specialist is to be immediately requested. In the event that a dead Ma'iingan is found anywhere in Mashkiiziibing or within the buffer area surrounding the reservation, the MNRD Wildlife Specialist must be notified immediately by the party that found Ma'iingan or by the immediate investigating agency, whether it be APHIS-WS or WDNR. Depending on the location of Ma'iingan, other authorities may also need to be notified. Upon notification, the scene will be investigated by the proper authorities and Ma'iingan's remains will be handled respectfully by MWP.

Any Ma'iinganag found deceased in Mashkiiziibing shall be handled in a respectful way by MWP. Samples may be taken from individuals if deemed necessary for biological studies or law enforcement investigations. MWP will cooperate with a certified lab for necropsies and biological sampling of individuals. Some furs and skulls may be kept for educational and cultural purposes.

How to Obtain a Ma'iingan Fur

Each year, a number of Ma'iinganag are obtained by the WDNR. These Ma'iinganag are either found dead (during periods of delisting) or taken legally by lethal abatement methods conducted by APHIS-WS or private landowners off-reservation. These Ma'iinganag can be made available for educational or cultural uses.

Mashkiiziibii members interested in obtaining Ma'iingan's fur or any parts of Ma'iingan should contact the Maskiiziibii Wildlife Specialist. Distributions of Ma'iingan's fur shall happen on a first come first serve basis and will ultimately need to be approved by the Mashkiiziibii Tribal Council.

Education and Outreach

MNRD shall use a variety of media to help keep the community informed about Ma'iingan in and outside of Mashkiiziibing. These media will include information at public events held by MNRD, updates in the MNRD quarterly newsletter, and information on the Tribe's website. Changes to the Ma'iingan Relationship Plan will also include at least one public meeting to enable the community to comment on the proposed changes (Appendix E). To stay updated on reservation Ma'iingan visit the wildlife website at http://www.badriver-nsn.gov/wildlife/, read Common Ground (http://www.badriver-nsn.gov/news/) the department's quarterly publication, or contact the Wildlife Specialist.

Research and Monitoring of Ma'iinganag in Mashkiiziibing

MWP has been monitoring the Ma'iingan population on the reservation since 1996. The Tribe has worked cooperatively in this effort with the WDNR, USFWS, and APHIS-WS. Methods MWP currently uses are as follows: winter track surveys, howling surveys, scat surveys, and keeping a Ma'iingan observations log book.

Winter track surveys and howling surveys are valuable tools for monitoring the reservation's Ma'iingan population. MWP follows similar winter track survey and howling survey protocols established by the WDNR, which helps in our joint effort to monitor Ma'iinganag both on and off reservation. The protocols for these surveys can be found in Appendix C and the department welcomes any Mashkiiziibii member to participate in these surveys independently or along with the Wildlife Specialist. This data collected by MWP is shared with WDNR and other cooperating agencies to help paint the full picture of how the Ma'iingan population is doing in the Great Lakes region.

MWP also keeps a Ma'iingan observation log. When people report a Ma'iingan sighting on the reservation, the department obtains information on the location, number of animals, color, and size. Following a reported sighting, the Tribal Wildlife Specialist or a Tribal Warden will investigate the sighting and obtain information that can be used to help estimate the reservation's Ma'iingan population. MWP also collects trail cam photos from hunters on the reservation to document Ma'iingan sightings. Photos can be emailed to the Wildlife Specialist at wildlife@badriver-nsn.gov or delivered to the MNRD office in the Chief Blackbird Building.

Scat is collected by MNRD Wildlife program staff when found anywhere on the reservation. This scat can be used to monitor Ma'iingan population health by examining it for viruses, parasite levels, diet, and inbreeding. MWP will coordinate with a certified lab for the analysis of the samples if/when funding is available.

Future Ma'iingan Program Needs

MWP will continue to work with state and federal agencies as well as neighboring landowners in the monitoring of and relationship building with the local Ma'iingan population. MWP will put a continued effort into building a citizen monitoring network to aid MWP in acquiring more knowledge about the resident Ma'iingan packs. Conducting howl surveys is a great opportunity for the community to connect with brother Ma'iingan and citizen monitoring would help relieve the wildlife program to diversify its wildlife monitoring work. Citizen monitoring can also be used as an education/outreach tool for children and local school groups. There is a continued need to study Ma'iingan's local diet by analyzing how many Amikwag and Waawaashkeshiwag Ma'iingan is eating from season to season. Unnatural sources of food such as bait piles and livestock carcass pits have been documented on or near the reservation, further justifying the importance of a diet analysis. Ma'iingan diets have not been studied in Wisconsin since 1980, when the population had not begun its large climb in the 1990s.

With this update to the relationship plan, MWP is moving away from putting GPS and VHF collars on brother Ma'iingan. This is an important time to demonstrate how we can come to understand Ma'iingan with tracks, scat, howls, and trail camera pictures, rather than by using invasive monitoring methods that entail some risk to Ma'iingan. Potential research partners who honor the Anishinaabe value of reciprocity are encouraged to reach out the MWP with proposals for collaborative research.

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Appendix A. Overview of ESA status and state and tribal Ma'iingan conservation

ESA: Western Great Lakes Distinct Population Segment of Gray Wolves

As of the 2019 update of this plan, Ma'iinganag in the Great Lakes Region were federally protected under the Endangered Species Act. When Ma'iingan is delisted, it is the responsibility of states and of tribes to conserve Ma'iingan cooperatively.

Figure 11: Western Great Lakes Distinct Population Segment

Summary Wisconsin's Ma'iingan Relationship Plan (1999)

In 1999, the WDNR developed a Wolf Management Plan to help formalize Ma'iingan relationship in the state. Many components of the plan could not be implemented until after federal delisting occurred. Ma'iinganag in Wisconsin were briefly delisted in both 2008 and 2009, but subsequently relisted following legal challenges, before delisting again in 2012 and then relisting in 2014.

The WDNR chose to use management zones as part of the state-wide Wolf Management Plan. There are currently four wolf management zones in the state of Wisconsin: Zone 1 – The Northern Forest Zone, Zone 2 – The Central Forest Zone, Zone 3 – The wolf buffer area, and Zone 4 – southern area that the State presumes has little to no opportunity for colonization by Ma'iingan packs. Mashkiiziibing is located in Zone 1. Zone 1 includes 634 square miles of Indian reservations, which, in most cases, will remain as protective areas

for Ma'iinganag. Zone 1 is considered to have the most suitable Ma'iingan habitat in the state, because it is a mostly forested landscape with few agricultural and urban areas.

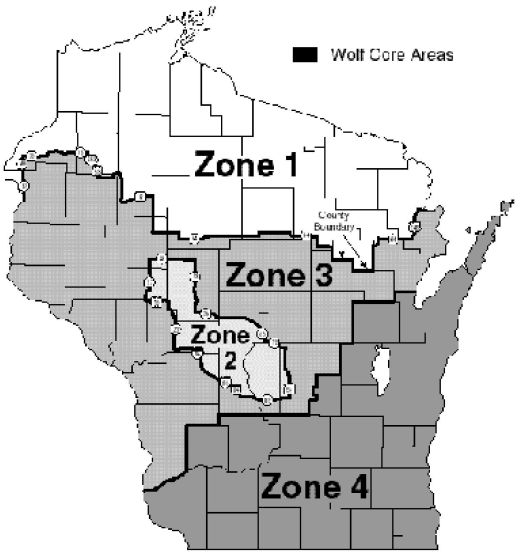


Figure 12: Wolf management zones as documented in 1999 Wisconsin Wolf Management Plan

From 2012 to 2014, when Ma'iingan was delisted in the Great Lakes region, the WI DNR primarily used lethal control at what the agency confirmed as depredation locations. Control of depredating Ma'iinganag can be done by landowners/occupants acting on private land under WDNR permit or by government trappers; landowners can also kill Ma'iinganag that are in the act of attacking pets or livestock on their land under NR 10.02(1)(b).

The WDNR's minimum population goal for the state is 350 Ma'iinganag. Ma'iinganag will be relisted as threatened by the state if the population falls below 250 Ma'iinganag for three years, and as endangered if they fall below eighty. As long as the state's Ma'iingan population remains above target levels, lethal management will continue in areas with a history of depredating Ma'iinganag or a high probability of Livestock-Ma'iingan conflict.

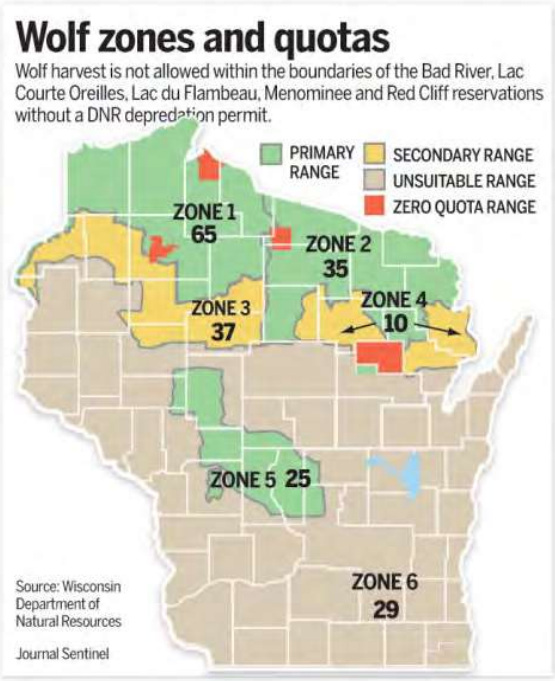


Figure13: 2012 WDNR Proposed Ma'iingan Harvest Zones and Quotas. The quotas are subject to change on an annual basis.

A Ma'iingan Season in Wisconsin

On January 31st, 2012 Senate Bill 411 was introduced by Senators Moulton, Holperin, and Lasee. The bill was related to the hunting and trapping of Ma'iinganag in Wisconsin. On March 30th, 2012 the bill was

presented to the Governor Scott Walker. The bill is now known as 2011 Wisconsin Act 169 which was published on April 16th, 2012. On October 15th, 2012, Ma'iingan hunting and trapping began under a permit/quota system with the exception that the following reservations were closed to harvesting: Mashkiiziibii, Red Cliff, Lac Courte Orielles, Lac du Flambeau, Menominee, and Stockbridge-Munsee.

The Wisconsin Natural Resources Board (NRB) chose a total harvest quota for the 2012 season to be 201 individuals. This quota predicted a reduction in the state Ma'iingan population by 14%. WDNR divided the state into six zones excluding the six reservations previously mentioned, and set there harvest goals for each zone. Twenty percent of the known minimum Ma'iingan population in zones one, two, and five would be harvested, forty percent of zones three and four, and seventy five percent of zone six would be harvested. The percentage was set high for zone six because this is deemed as unsuitable Ma'iingan habitat by the state of Wisconsin due to probability for human-Ma'iingan conflict.

The WDNR then took the quota of 201 individuals and subtracted half of the harvest quota in the ceded territories for the tribes to claim based on the LCO vs. Voigt case requirements. Half of the ceded territory quota amounted to 85 leaving the final 2012 Ma'iingan season quota at 116 individuals. The quota of 116 animals established for state harvesters was reached by December 23rd, 2012; no WI tribe allowed on or off-reservation Ma'iingan seasons for their members in 2012.

The total known human caused mortality of Ma'iinganag for 2012 was 243 individuals. There were 117 killed under the 2012 Ma'iingan hunt, 76 under depredation controls (including landowner permits), 24 documented vehicle collision, 21 known illegal kills, and 5 unknown mortalities. The minimum population count for the 2011-2012 tracking season ranged from 815-880. The midpoint of this would leave use with a minimum population estimate of 847, which would leave us with a 29% human caused mortality of the 2012 minimum population count. Now keep in mind that is a minimum count and does not include pups that were born in the spring of 2012.

Following similar hunts that took place in the modern State of Michigan, a number of well-respected ma'iingan researchers collaborated on a review of the lack of scientific or ethical justification behind the way in which the Michigan Ma'iingan hunts were conducted (which is similar to what occurred in Wisconsin). The Michigan Department of Natural Resources explained that the purpose behind its 2013 Ma'iingan Harvest season was to reduce the potential of conflict between Ma'iingan and livestock or Ma'iingan and humans. The MI DNR did not substantiate its harvest plan with any scientific evaluation. Employing scientific research, the authors of the paper pointed out issues in the reasoning behind and execution of the Michigan Harvest Season. The researchers concluded:

- Hunting Ma'iingan doesn't teach other Ma'iinganag not to visit farms
- In order to reduce the amount of depredations that occur on farms, an unacceptable 20% of the Ma'iingan population would have needed to be hunted
- The Michigan Harvest Plan does not include adaptive management language to change the plan in response to how the hunt would affect the Ma'iingan population

Wisconsin Landowner Ma'iingan Control Permits

When Ma'iingan is delisted in the Western Great Lakes Distinct Population Segment, the WDNR has had authority to issue permits for the shooting or trapping of Ma'iinganag on privately owned property. The criteria for obtaining a Ma'iingan control permit are as follows:

- At least one verified depredation has occurred within the last 2 years on owned or leased land;
- A verified depredation has occurred within one mile of the applicant's property with vulnerable animals within the current calendar year;

- Human safety concern from Ma'iinganag exists on the property as determined by U.S. Department of Agriculture Wildlife Services or WDNR; or
- Harassment of livestock is occurring and based on the judgment of Wildlife Service's a permit should be issued.

Permits are usually valid for 90 days after issuance and can be renewed by the WDNR. Hunting and trapping of Ma'iinganag is allowed under these permits, often with no limit to the number of animals to be removed or destroyed. The following are additional permit conditions:

- Authorized participants are the permittee and resident family members. Up to two additional persons may be designated at the time of permit issuance to assist with the removal of Ma'iinganag. Assistants must be listed on permit.
- Shooting hours will be normal hunting hours, unless Ma'iinganag are in the act of killing or attacking domestic animals.
- Baiting is not allowed. All livestock that is killed must be disposed of pursuant to Section 95.50, Wisconsin Statutes.
- Shooting and trapping will only be permitted on land owned or leased by the permittee.
- All Ma'iinganag shot or trapped must be reported within 24 hours and turned over to the Department.
- A trapping license is required for trapping of Ma'iinganag as are specific trapping techniques and equipment which will be conditions of any trapping permits issued.

As a result, the MWP works with the state and APHIS to investigate reports of potential Ma'iingan depredation both within the reservation's exterior boundary, and within the surrounding buffer zone. While lethal depredation control may be permitted when depredation is verified and non-lethal

methods are considered un-effective, it may also not be approved if the impacts to local packs is deemed exclusive.

Appendix B. Ma'iingan Survey Protocols and Forms

Winter Carnivore Tracking Survey Form and Protocol

Developed using standardized survey methods provided by Wisconsin Department of Natural Resources.

(Wydeven, A., et. al. 2004. Guidelines for Carnivore Tracking During Winter in Wisconsin. Wisconsin Department of Natural Resources. http://www.dnr.state.wi.us/org/land/er/mammals/volunteer/pdfs/tracking_guidelines.pdf)

Introduction

Since wildlife does not know our political boundaries, it is important to work in cooperation with neighboring agencies to better monitor and assess population trends. To standardize survey methods, the tribal survey methodology was modeled after the already existing guidelines provided by the Wisconsin Department of Natural Resources. However, some of the guidelines have been modified to better suit the need of the reservation.

Tools Needed

- Tracking guide book(s)
- Detailed map of the survey area
- Data sheet, clipboard, and pencils
- 6 in ruler and tape measure
- Camera
- GPS

Completing the Data Forms

-Please make sure forms are ***completely*** filled out. If you have any questions pertaining to the forms please call the wildlife specialist @ 715-685-7840 ext 1554

Surveyor(s): Names of people conducting track survey

Date: Month/Day/Year track survey was completed

Survey Block ID: See attached map for survey block ID's.

Survey Start Time: Time survey began.

End Time: Time Survey ended that day.

Temperature: Temperature at the beginning of the survey.

Time of Last Snow Fall: If it snowed within the last 48 hours, write down how many hours it has been since the last snowfall. If it hasn't snowed for more than 48 hours record the number of days since last snowfall.

Snow depth: Record the total snow depth in inches. Avoid areas of plowed, drifted, or under trees were snow depth is affected.

New Snow Depth on Road: Record amount of snow present on the road of survey in inches. This may change as you move onto new roads make sure to record this in the comments section.

Amount of snow from last snowfall: Record in inches how much snow was received our last snowfall.

Percent Cloud Cover: Circle percentage nearest to the amount of cloud cover.

Rate Track Conditions:

Poor: It is snowing heavily, hasn't snowed in a while, heavy crust on snow layer impacting amount of tracks present.
OK: Tracks are visible but lack detail near road, need to follow off road a little ways to identify.
Good: Tracks register well in the snow. Some lack details necessary to distinguish between similar species.
Excellent: Tracks register well and show a good amount of detail. Tracks are easily distinguishable.

When you Encounter Tracks

1) Consult your tracking guide to identify the species that made the tracks.
    a. Some species tracks may look similar so make sure to pay close attention to the gait pattern (sequence of foot movements).
    b. Sometimes it may be necessary to follow the tracks into the woods a short distance to find a better track that is more easily identifiable.
2) When Ma'iingan tracks are encountered follow the protocols in the Ma'iingan tracking guidelines (see attached). A photo of the track next to the ruler should be taken as well as a GPS location.
3) If rare species such as: Elk, Moose, Cougar, Canada Lynx, or wolverines are identified. A GPS location should be taken at the site. (See below for GPS location protocol)
4) For all species but Ma'iinganag, all tracks encountered within 0.3 s of each other should be recorded as one animal.
    a. For Ma'iinganag follow tracks backward and forward until you can get a good count of the number of animals present. Ma'iinganag will often loop around and follow portions of a route more than once, so what appears to be the tracks of four animals may only be two Ma'iinganag.
5) Record any other related sign encountered while tracking. (Carcasses killed or scavenged by carnivores, signs of urinations (raised leg urination or squat urination), evidence of blood in the urine, scat…)

6) If you are uncertain about a track record UNK on the data sheet, record the location, and take a few photographs and ask the Wildlife Specialist about it.

Key Points to Remember

- Canines (dog family) vs. Felines (cat family)
  - To distinguish the difference between these tracks check for claw marks. Members of the cat family have retractable claws and rarely show claw marks in the snow. If they do they appear thin and knifelike.
  - The heel pad on a cat will be asymmetrical and have 3 similar sized lobes on the bottom of the track. A dog's heel pad will be symmetrical, the lobes on the bottom will not be similar in size, and the top of the pad will be more round and pointed.
- Measure any small fisher tracks to make sure they are not marten tracks. Fisher tracks will generally be at least 1.6 inches long and 1.5 inches wide.

Winter Track Survey Form

Mashkiiziibii Natural Resources Department
Questions Contact:
Lacey Hill, Wildlife/GIS Specialist
715-682-7123

Surveyor(s):_____ Date:
Survey Block ID: _____ Survey Start time:_____ End time:
Weather and Tracking Conditions:
Temperature: _____Time of last snow fall (in hours if less than 48 otherwise days**):_____**
Snow Depth (inches): _____New Snow Depth on Road: _____
Amount of Snow from last snowfall (inches): _____
Percent Cloud Cover (circle one): 0% 25% 50% 75% 100%
Rate Tracking Conditions (circle one): Poor OK Good Excellent

Species Key:

Canids: CY = Coyote, D = Dog, F = Fox, W = Ma'iingan **Mustelids:** B = Badger, FI = Fisher, O = Otter, S = Skunk, PM = Pine Martin, OW = Other Weasel **Felids:** BC = Bobcat, CT = Cat, L = Lynx, CO = Cougar **Other:** BR = Bear, BV = Beaver, P = Porcupine, R = Raccoon, WTD = White-tailed deer

Road(s) and Direction(s) of Travel	Mileage	Canids	Mustelids	Felids	Other	Notes and Comments

Ma'iingan Howling Survey Form and Protocol

HOWL SURVEYS FOR MA'IINGANAG IN WISCONSIN

By Adrian P. Wydeven

Howling surveys are conducted to determine general location, home site locations, general abundance and pup production in Ma'iingan packs. Use the article by Harrington and Mech (1982, J. Wildl. Manage. 46: 686-693) as a general guide on doing Ma'iingan howling surveys.

Surveys usually should be done from June 20 through October, with July and August being the best period. Time of day should be from ½ hour after sunset until 1:00 or 2:00 a.m. Areas to be covered should consist of a series of roads that traverse or surround the likely territory of Ma'iinganag. Howl attempts should be made at about 1.5 mile intervals, but can be modified by 0.2 to 0.3 miles to avoid hollows, occupied residences or noisy stream edge, and to take advantage of higher elevations. Also, make special attempts to howl from most intersections.

At each stop, walk about 100 feet from your vehicle. Start off with 4-5 quiet howls for about 25-30 seconds. Wait 90 seconds for a response. If no response, give 4-5 loud howls for 25-30 seconds. Again, wait 90 seconds for a response. Give a second series of loud howls followed by 90 seconds of waiting time if no response occurs. If no responses after this third howling attempt, drive to your next stop.

Use of the Howl Survey Form

General Location: List area being covered, especially the county and pack name.

Start Location: Write the legal description of the first howl attempt stop.

End Location: Write the legal description of the last howl attempt stop.

Date: Date of survey; remember that if you go past midnight the date will change.

Temp: Temperature at start of survey.

Skies: List percentage of cloud cover.

Precip: Indicate any precipitation falling; if moderate to heavy rain occurs, stop survey.

Wind: Indicate approximate wind speed; if winds exceed 8 miles/hr. stop survey.

Previous Day(s) Weather: List high and low of survey day and any precipitation that occurred

Observer(s): List all persons taking part in the survey.

Road Name: Write the name of each road you are surveying and give the odometer reading when you first enter a road.

Other Columns: At each stop, write the odometer reading and time when you initiate the howling attempt. If you get a response from Ma'iinganag write down the time when Ma'iinganag respond to your howling attempt, number of Ma'iinganag responding, direction of response, exact location (legal description) of response, and any comments. Generally the number of Ma'iinganag recorded should be 1, 2 or 2+ adults and/or 1, 2 or 2+ pups; beyond 2 adults or 2 pups it is impossible to accurately count the Ma'iinganag unless you actually get to see them. When you get no responses, under "Time Response" write "none". You may want to record responses from other animals such as owls or coyotes under "Comments". If you are not sure whether you are hearing coyotes or Ma'iinganag, write down that you are not sure.

Totals: List the total miles from the first to last stop; list the total number of stops at which you attempted howls; list the total number of responses you received under "Time Response"; and list the estimated number of Ma'iinganag responding under "Ma'iingan No.".

Equipment

Pen or pencil, clipboard, data sheet(s), watch, flashlight, compass, map of study area at scale of 1:150,000 or larger, and tape recorder with empty tape and Ma'iingan tape (optional).

Do's and Don'ts

Avoid using brights when driving through open country.

Don't attempt to shine flashlights at Ma'iinganag that may approach you.

Attempt to be as quiet and inconspicuous as possible.

Turn off all lights and avoid using flashlights when you arrive at your stops.

Never attempt to walk into an area from where you hear howling.

Don't take a large number of people with you; limit the number of people on the survey to 4 or less.

Generally only one person should do the howling, but you can trade off so no one person needs to do all the howling.

Generally no more than one survey per week per territory should be conducted; unless there is need to gather additional data.

When you have received a response, don't stay at a site too long, and do not keep howling at the same group.

Avoid disclosing exact locations of howling responses to people outside of your survey group.

Ma'iingan Howl Survey **EXAMPLE**

General Location: *Chequamegon N.F., Sawyer Co., Log Creek Area*

Start Location: Section *25* T *40* N, R *3* E or W

End Location: Section *6* T *39* N, R *3* E or W

Date *July 10, 1992* Temp *60-65°* Skies *Clear* Precip *None* Wind *<2mph*

Previous day(s) weather *Warm, high 80° low 55°; clear skies, light wind*

Observer(s) *Jane Brown and John Smith*

Road Name	Odometer	Time Howl	Time Response	Ma'iingan No.	Direction	Comments and Estimated Location, Sec., T, & R
Co. EE & FR 161	*00.0*	----				*Going N on FR 161*
FR 161	*01.5*	*2200*	*none*			
FR 161	*03.0*	*2215*	*none*			
FR 161	*04.5*	*2230*	*none*			
FR 161	*06.0*	*2245*	*2248*	*2A 2+P*	*20°E of N*	*Probably in Sec. 2, T40N R3E*
FR 161	*07.5*	*2300*	*none*			
FR 161 & FR 162	*08.5*	*2315*	*none*			
FR 162	*10.0*	*2330*	*none*			
FR 162	*11.5*	*2345*	*none*			
FR 162	*13.0*	*2400*	*none*			
FR 162	*14.5*	*2415*	*none*			*Stop survey.*
TOTALS	*14.5 miles*	*9 stops*	*1 response*	*4+*		

Appendix C. Websites and Additional Information

For more information about Ma'iingan delisting and the USFWS go to: www.fws.gov/midwest/Ma'iingan/

For more information on the Wisconsin's State Ma'iingan Relationship Plan go to: http://dnr.wi.gov/org/land/er/publications/Ma'iinganplan/toc.htm.

For more information on Land Owner permits you can visit this website: http://dnr.wi.gov/topic/wildlifehabitat/Ma'iingan/permit.html.

2011 Wisconsin Act 169: https://docs.legis.wisconsin.gov/2011/related/acts/169

Federal Register Delisting the Gray Ma'iingan in the Western Great Lakes: http://www.fws.gov/midwest/Ma'iingan/delisting/pdf/FR_grwoWGLDelist28Dec2011.pdf

Mashkiiziibii Tribe Wildlife Program Website: http://badriver-nsn.gov/natural-resources/wildlife-program

Great Lakes Indian Fish & Wildlife Commission Website: http://glifwc.org/

Appendix D. Mashkiiziibii Carnivore Coexistence Program

The following work initiation document is used when farmers enter into an agreement with the Mashkiiziibii Wildlife Program to promote carnivore coexistence with the use of deterrents and evaluation of husbandry to protect both domesticated animals and wild predators.

Mashkiiziibii Wildlife Program Work Initiation Document for Predator Deterrent Deployment	Work Initiation Document Number 1.	Date 2.

3. Cooperator's name:
4. Cooperator's address:
5. Location of work to be performed:

I, the undersigned cooperator or cooperator's representative, do hereby give my consent and concurrence to the Mashkiiziibii Wildlife Program (to include its employees) to use at the site described in 5 the following methods and devices (owned by Mashkiiziibii Wildlife Program):

I, the cooperator or cooperator's representative, have been informed of the methods and the manner in which the devices listed in the above section will be used, and of the possible hazards associated with their use. I understand that Mashkiiziibii Wildlife Program (to include its employees) will: exercise reasonable precautions to prevent injury to animal life; guard against the mishandling of devices and materials; and exercise due caution and proper judgement in all wildlife coexistence operations. I understand that Mashkiiziibii Wildlife Program will provide copies of records or record information promptly upon the property owner's or cooperator's request. I understand that Mashkiiziibii Wildlife Program may collect Global Positioning System (GPS) coordinates, predator presence, and deterrent effectiveness data at the project site as part of anonymized research. I understand that Mashkiiziibii holds insurance for its employees which will cover any accident that may occur on the property outlined in line 5, leaving me with no liability for the potential injury of a Mashkiiziibii employee.

In consideration of these understandings and of the benefits to be derived, I, the cooperator or cooperator's representative assume responsibility for injury to my property under my control, when said injury is not the result of negligence on the part of Mashkiiziibii Wildlife Program; and to give adequate warning of possible hazards to persons I authorize to enter onto my land. Further, in recognition of the benefits to be derived from the use of specified methods and devices authorized by this Work Initiation Document, I, the cooperator or cooperator's representative, agree not to concurrently use or allow to be used upon lands covered by this Work Initiation Document lethal methods. This will allow for the collection of data on the effects of non-lethal deterrents alone. As part of this agreement, the cooperator agrees to provide Mashkiiziibii Wildlife Program a brief review of whether they found the deterrent to be beneficial, based on the impact or lack of impact they saw on their domesticated animals and on predators, within a month of the removal of deterrents.

Special Considerations:

Signature and title (Landowner, lessee, administrator)	Telephone Number	Address	Date
Signature and title (Mashkiiziibii representative)	Telephone Number	Address	Date

Appendix E. Public Comment opportunities for 2019 Update

The first update of the Ma'iingan Relationship Plan was delayed by a year, partially due to a staffing turnover in the wildlife program. Efforts were made to gain community knowledge and input for the update of this plan through the following events:

In November of 2018, former Wildlife Specialist Lacey Hill-Kastern opened a call for public comments for the update of the Ma'iingan Relationship Plan from November 1, 2018 through November 30, 2018.

On October 23, 2018 the Mashkiiziibii Wildlife Program hosted an event at the Casino to gather input for the Ma'iingan Relationship Plan and to discuss a response to Chronic Wasting Disease. Thirteen community members attended this event and mentioned Ma'iingan possibly defending the reservation against Chronic Wasting Disease, but the community members were largely focused on gaining an understanding of Chronic Wasting Disease at this meeting.

From July to August, 2017 current wildlife specialist Abi Fergus worked for Mashkiiziibii as an intern for the wildlife program to collect input for and scientifically review the Ma'iingan Relationship Plan. Fergus interviewed local wolf biologists, livestock owners within the reservation and buffer zone, and tribal members- particularly elders. Fergus has regularly attended elder lunches since this internship to gain insight from Mashkiiziibii elders. Fergus provided a report of her findings to former wildlife specialist Lacey Hill-Kastern as well as her senior thesis, which was written based on her recommended changes to the plan.

Appendix F. Contact Information

USDA-WS Ma'iingan Depredation Hotline: 1-800-228-1368

Mashkiiziibii Wildlife Specialist, Abi Fergus: 715-685-7840 x1554

Mashkiiziibii Natural Resources Department: 1-715-682-7123

Mashkiiziibii Tribal Game Wardens:

Gerald White: 715-292-7822

Brad Bigboy: 715-979-1181

Megan Mihalko: 715-292-1902

Appendix G. Mashkiiziibii Tribal Council Resolution Approving Mashkiiziibii Ma'iingan Relationship Plan

BAD RIVER BAND OF LAKE SUPERIOR TRIBE OF CHIPPEWA INDIANS

CHIEF BLACKBIRD CENTER

P.O.Box 39 • Odanah, Wisconsin 54861

Resolution No. 12-17-19-248

Approval of the 2019 update to the Mashkiiziibii Ma'iingan Relationship Plan

WHEREAS, the Bad River Band of Lake Superior Tribe of Chippewa Indians is a federally recognized Indian tribe with a Constitution enacted pursuant to the Indian Reorganization Act of 1934, 25 U.S.C. Sec. 476; and

WHEREAS, Article VI, Section 1(a) of the Constitution authorizes the Tribal Council to negotiate with Federal, State, and local government on behalf of the Band; and

WHEREAS, Article VI, Section 1(n) of the Constitution directs the Tribal Council to encourage and foster the arts, crafts, traditions, culture, wildlife, and natural resources of the Band, which necessarily includes enhancement and protection of the water resources within the boundaries of the Reservation; and

NOW, THEREFORE, BE IT RESOLVED that the Tribal Council hereby adopts the 2019 update to the Mashkiiziibii Ma'iingan Relationship Plan

Certification

I, the undersigned, as Secretary of the Bad River Band of Lake Superior Tribe of Chippewa Indians, an Indian Tribe organized under Section 16 of the Indian Reorganization Act, hereby certify that the Tribal Council is composed of seven members, of whom 7 members, constituting a quorum, were present at a meeting hereof duly called, noticed, convened, and held on the 17th day of December, 2019; that the foregoing resolution was duly adopted at said meeting by an affirmative vote of 6 members; 0 against; and 0 abstaining, and that the said resolution has not been rescinded or amended.

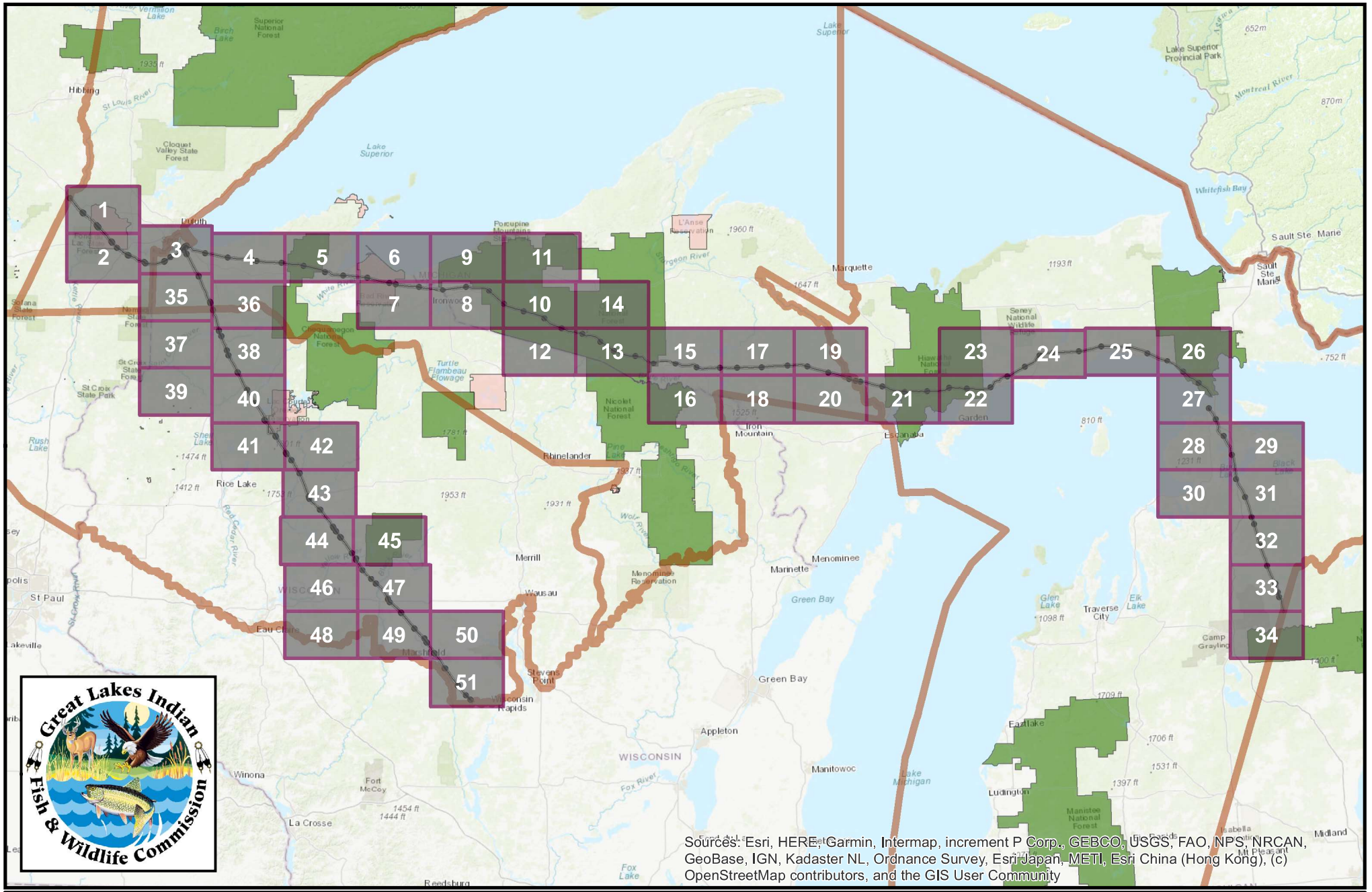
Jay McFee

Jay McFee, Secretary
Bad River Tribal Council

Telephone (715) 682-7123 *Natural Resources Department* Fax (715) 682-7118

MNRD THREATENED AND ENDANGERED SPECIES REPORT

ATTACHMENT 2



Crude Oil Pipeline

Ceded Territory Boundary

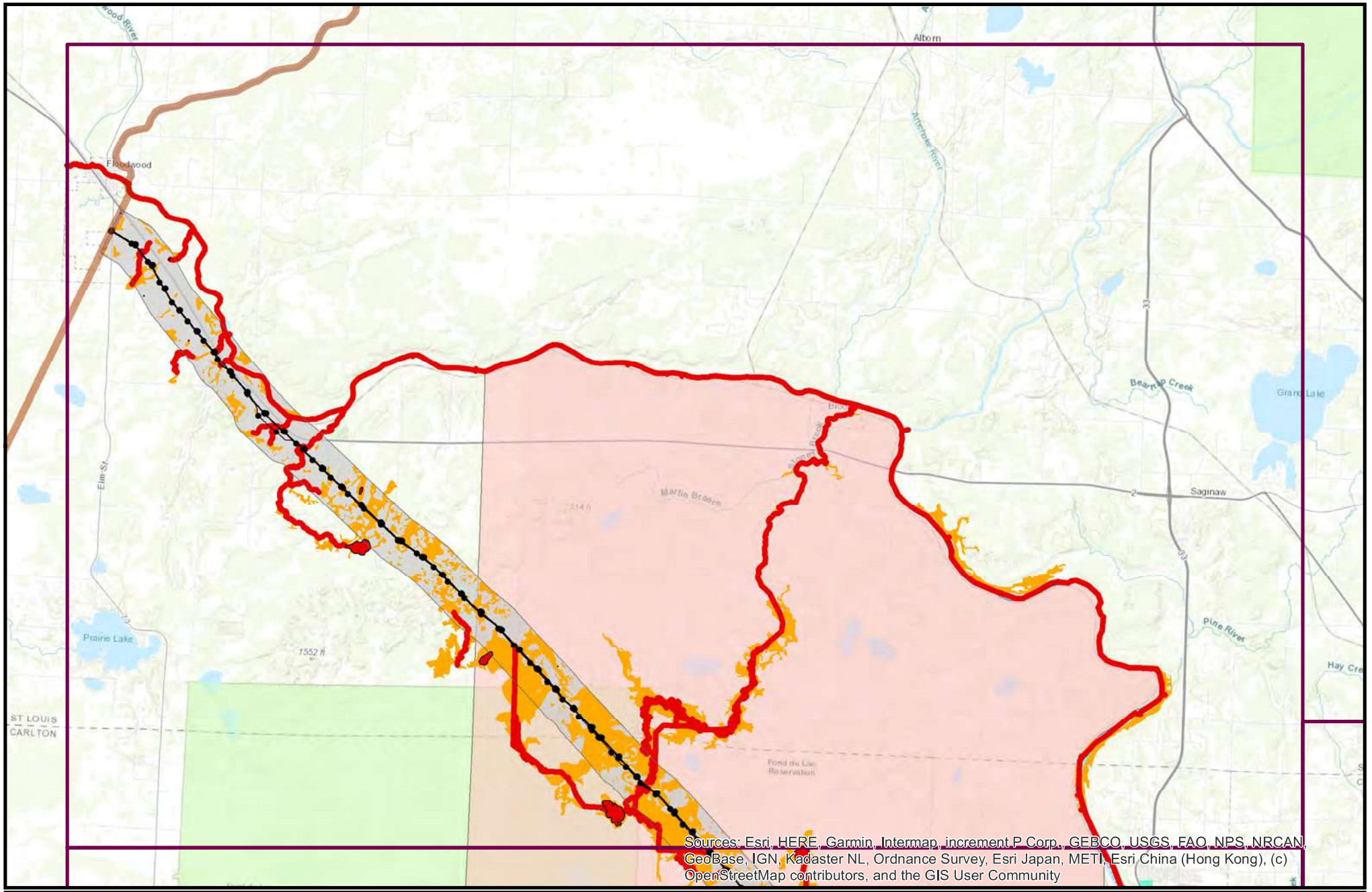
GLIFWC Member Tribal Reservation

National Forest

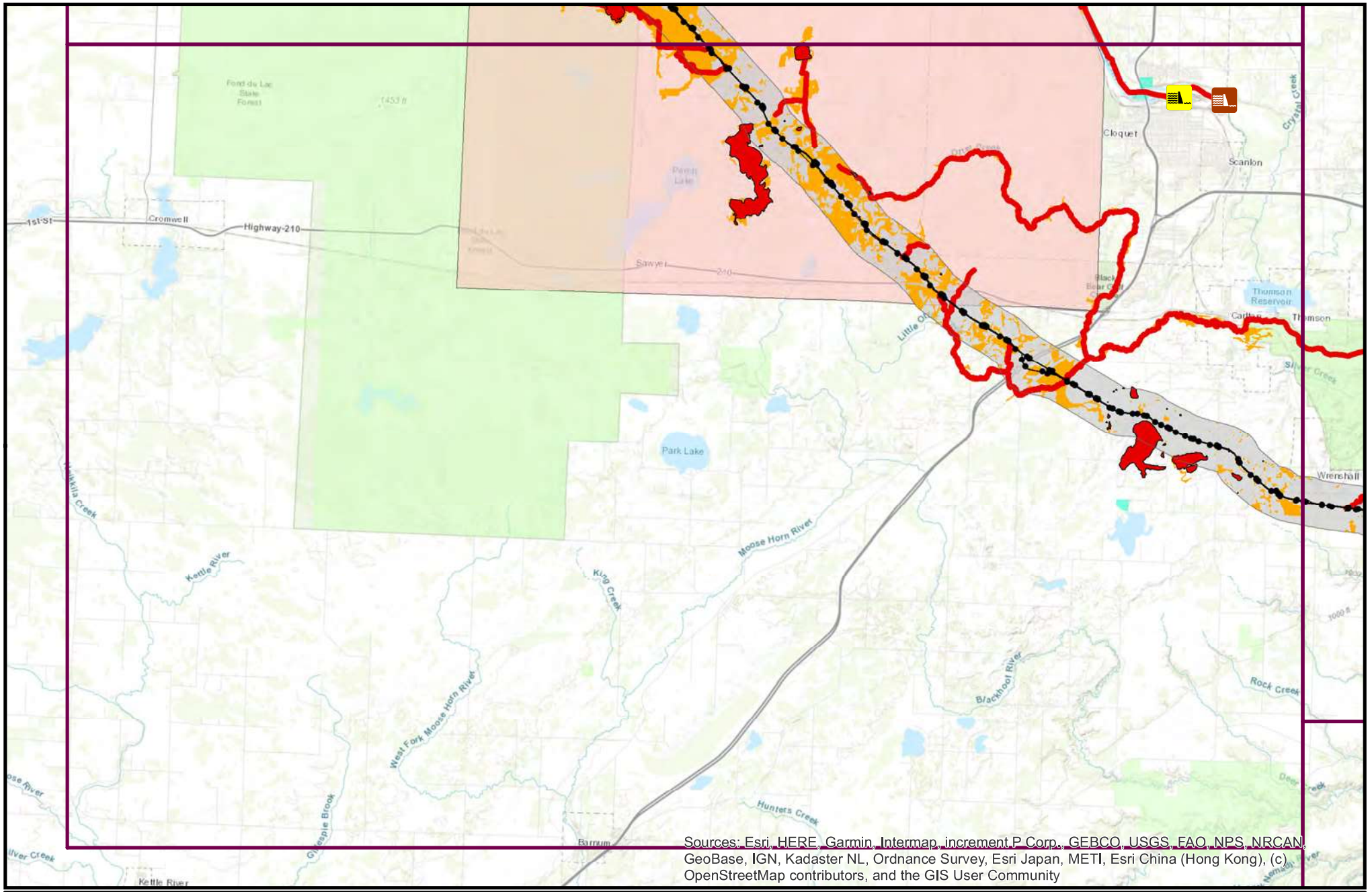
1 Page number

Ceded Territory and tribal reservation boundary information depicted in this map series are representations and may not be the actual legally binding boundaries.

All maps produced by the GLIFWC pipeline team.



Attachment 2 to MNRD T&E Report



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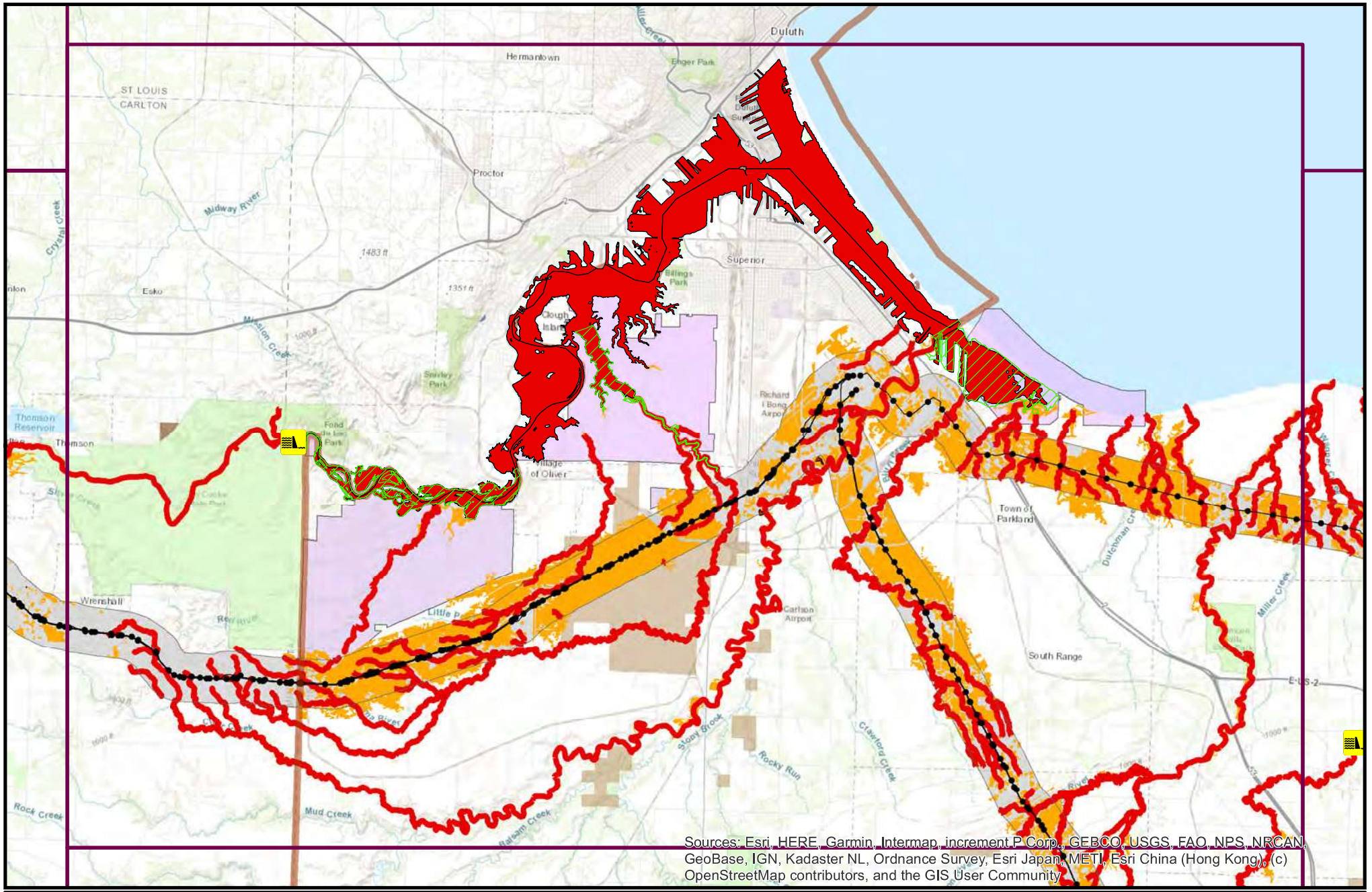

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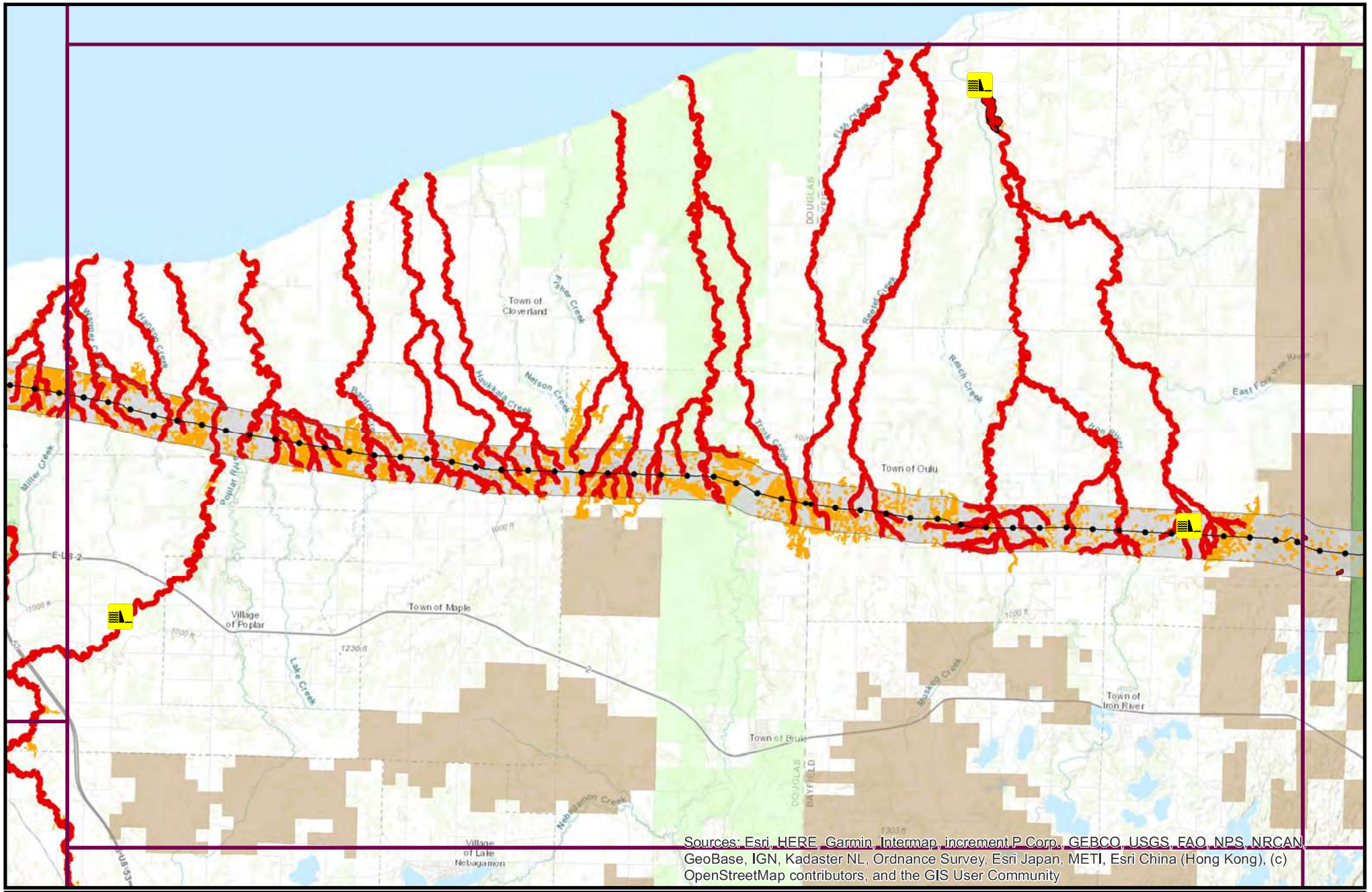

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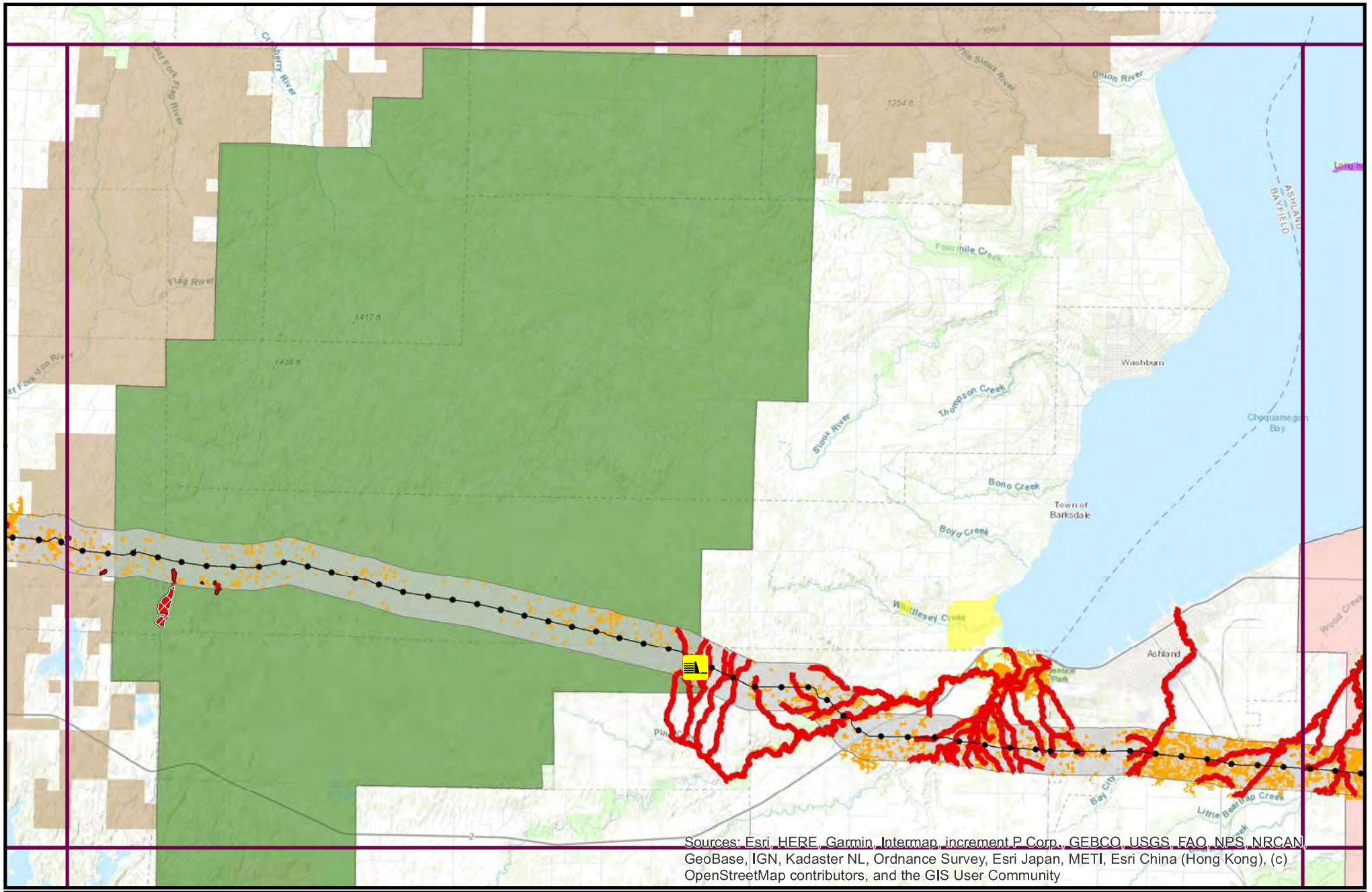

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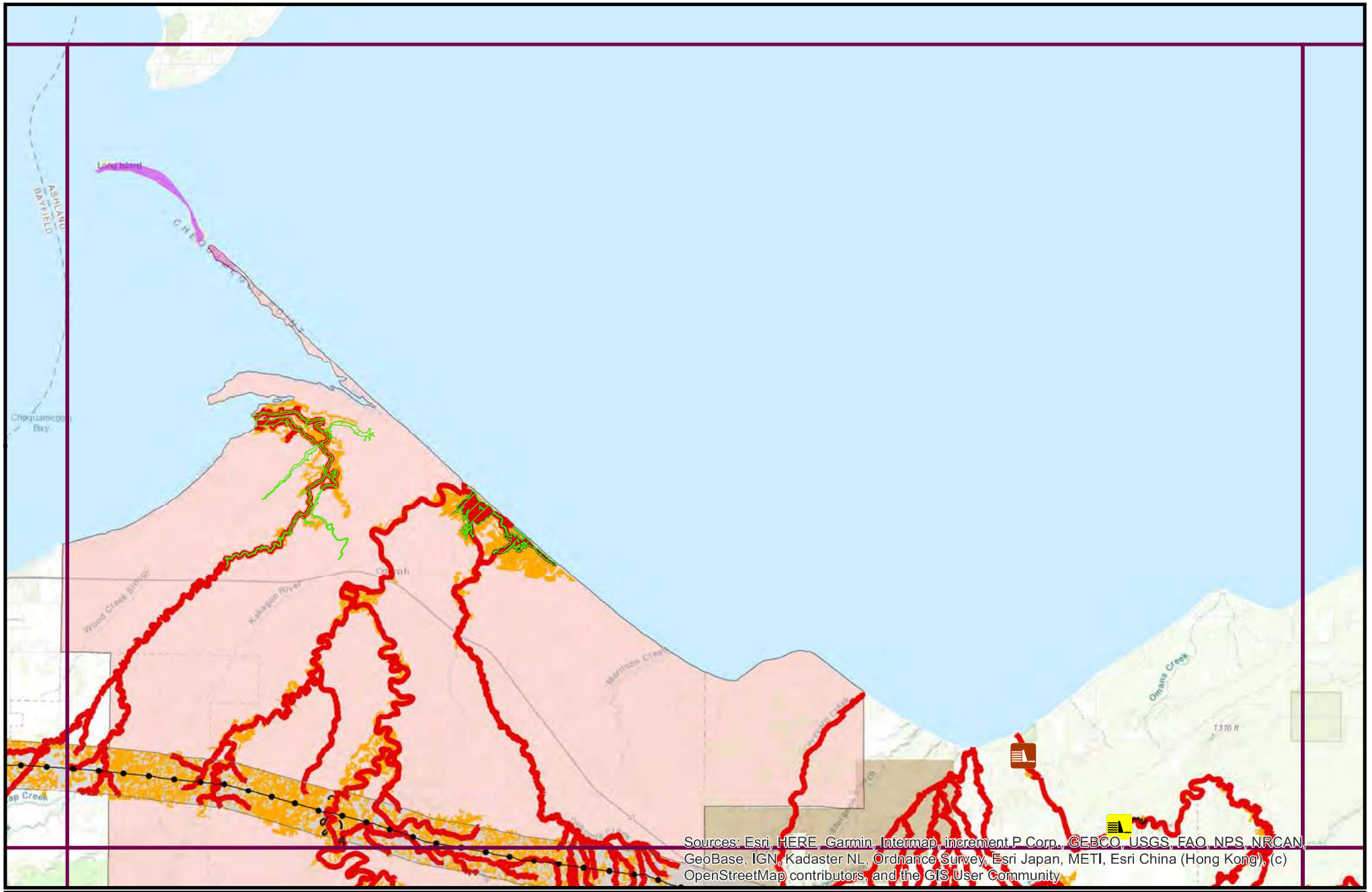

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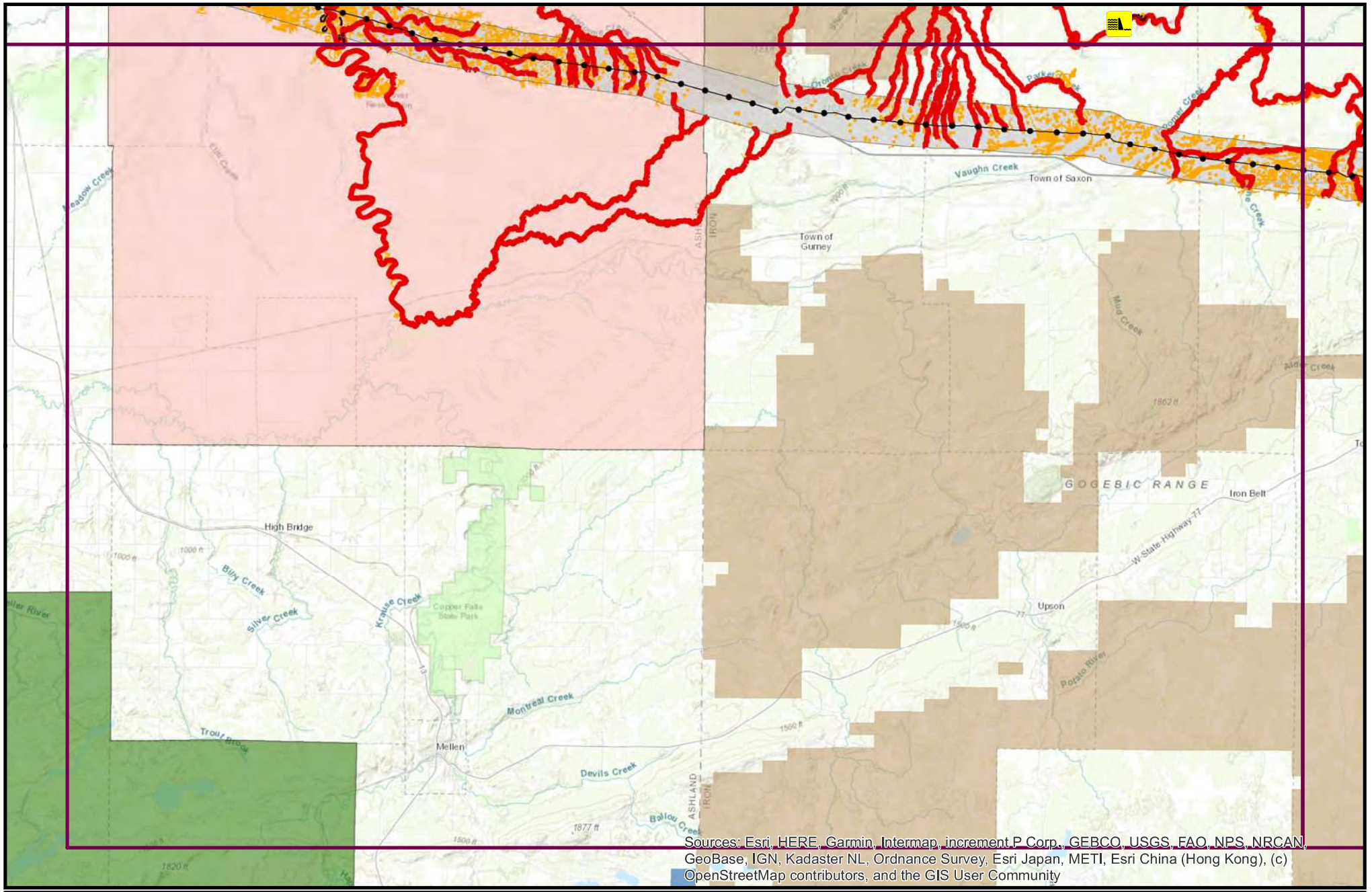

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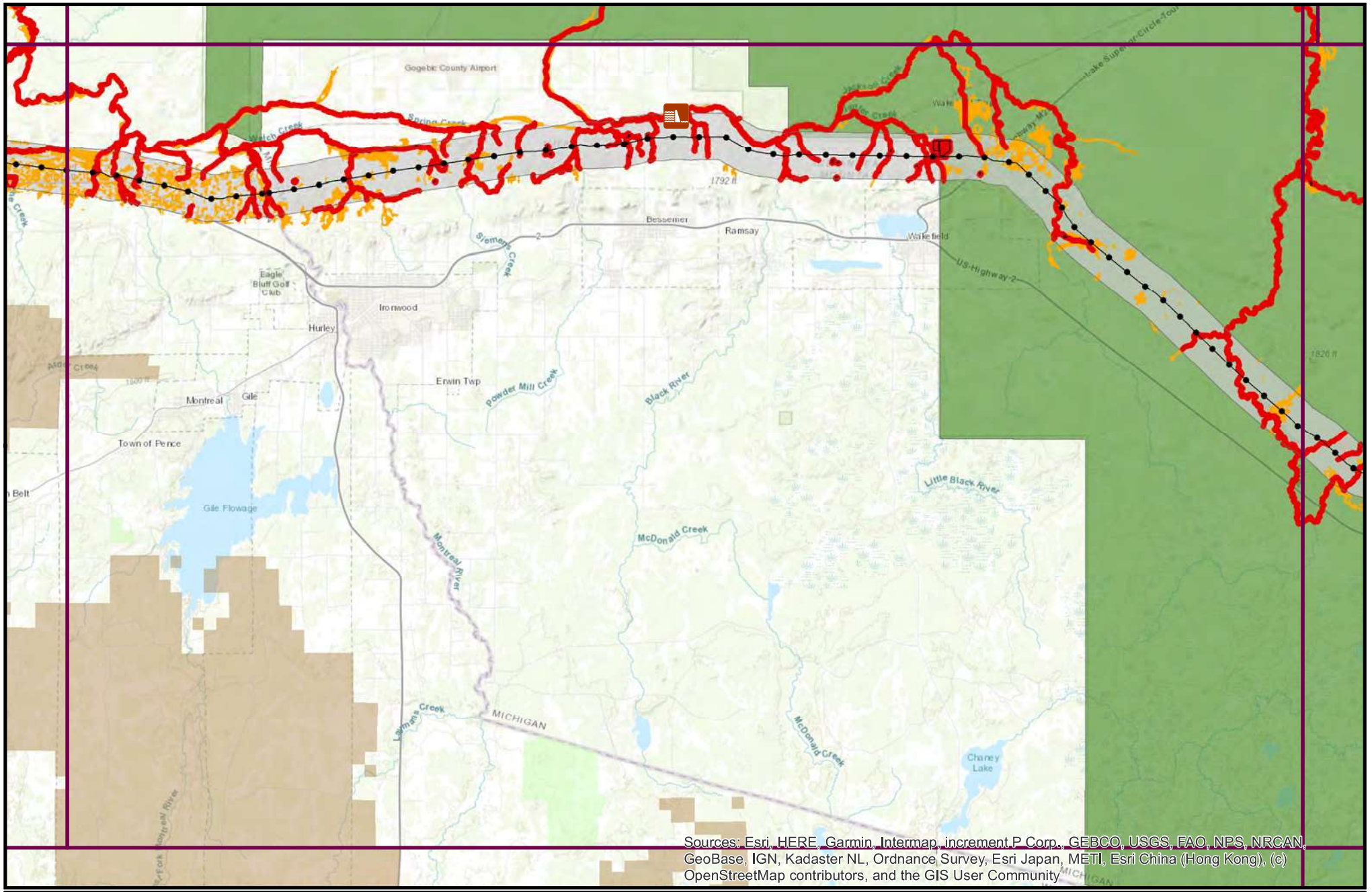

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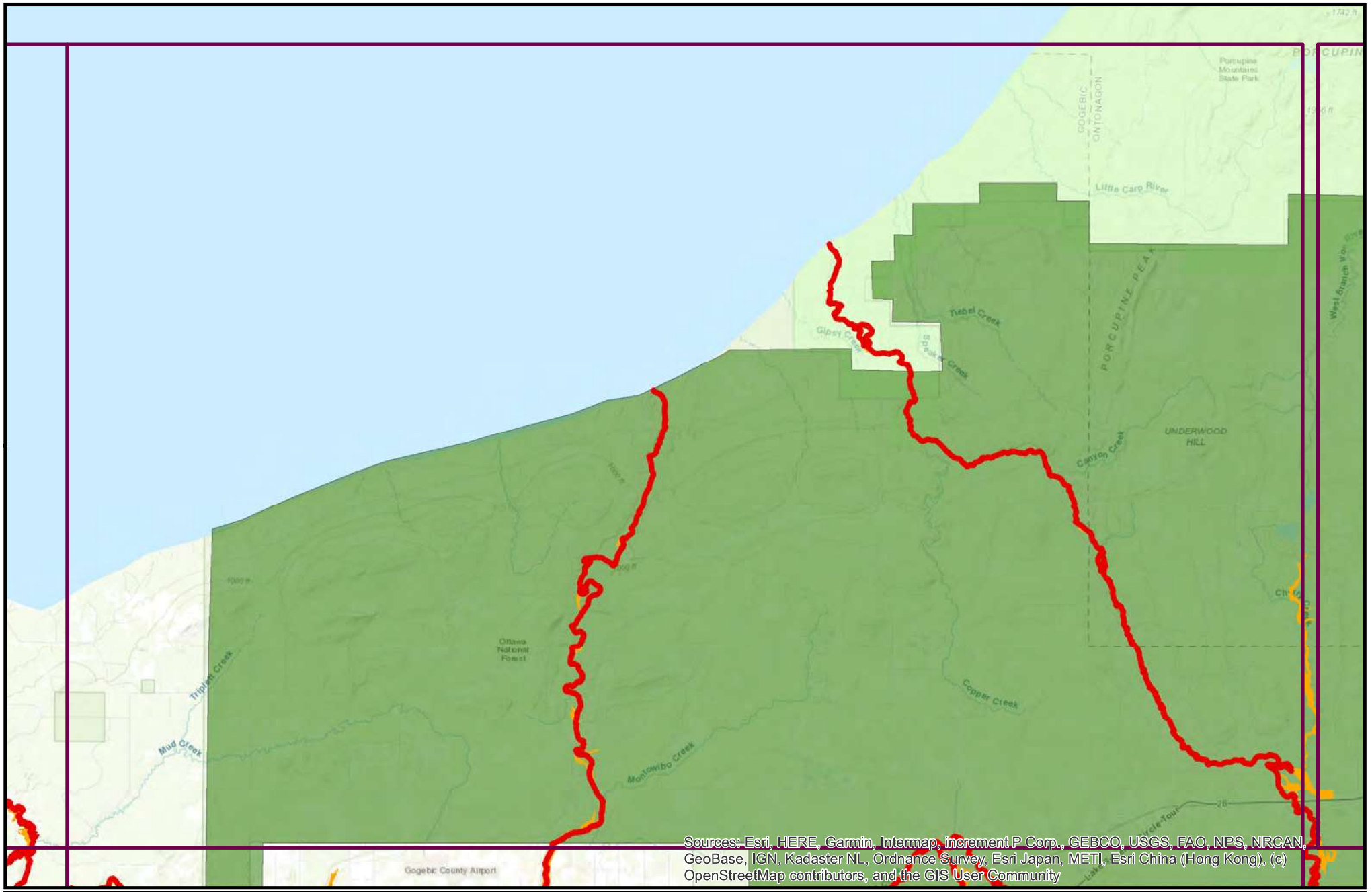

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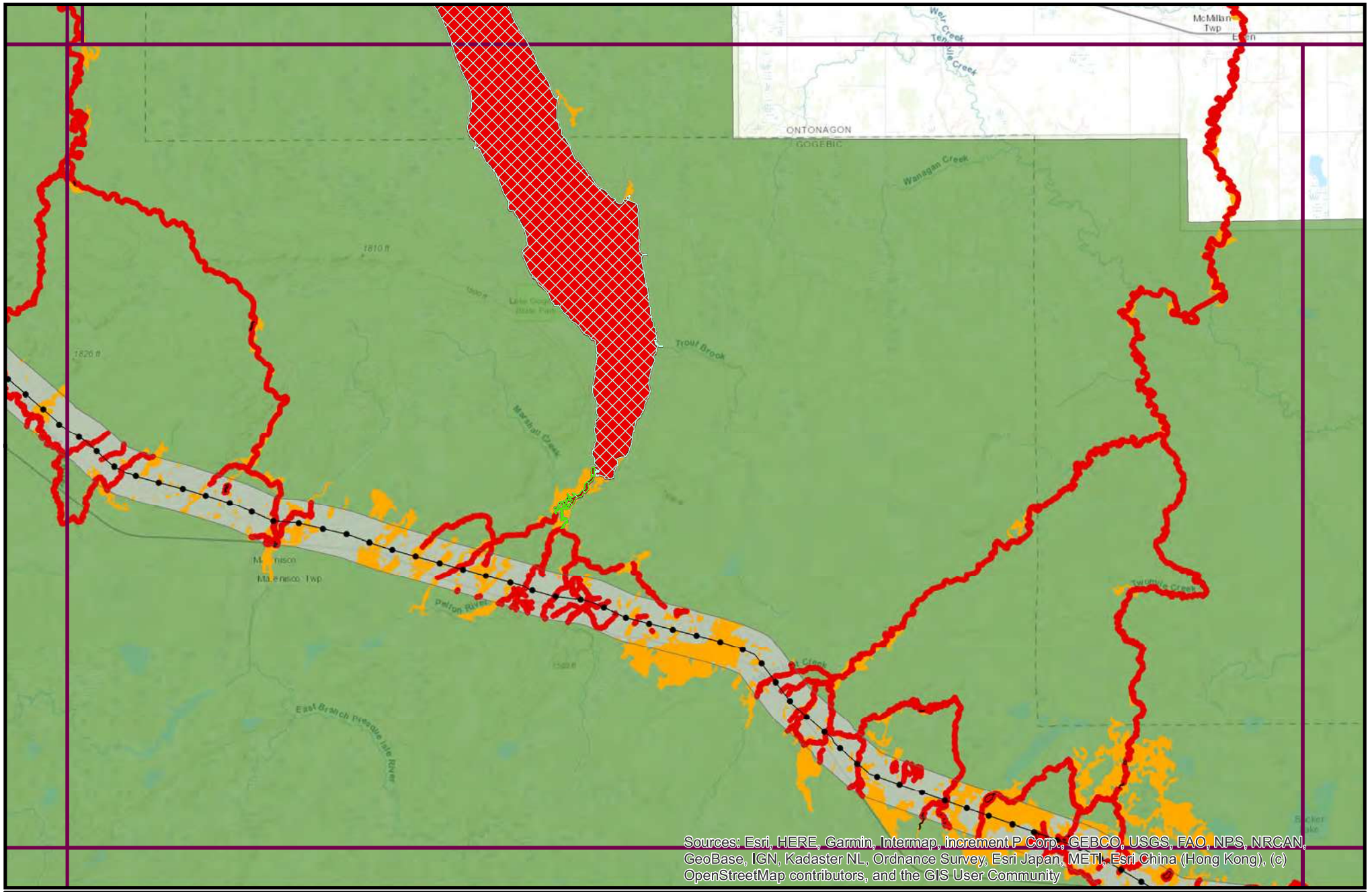

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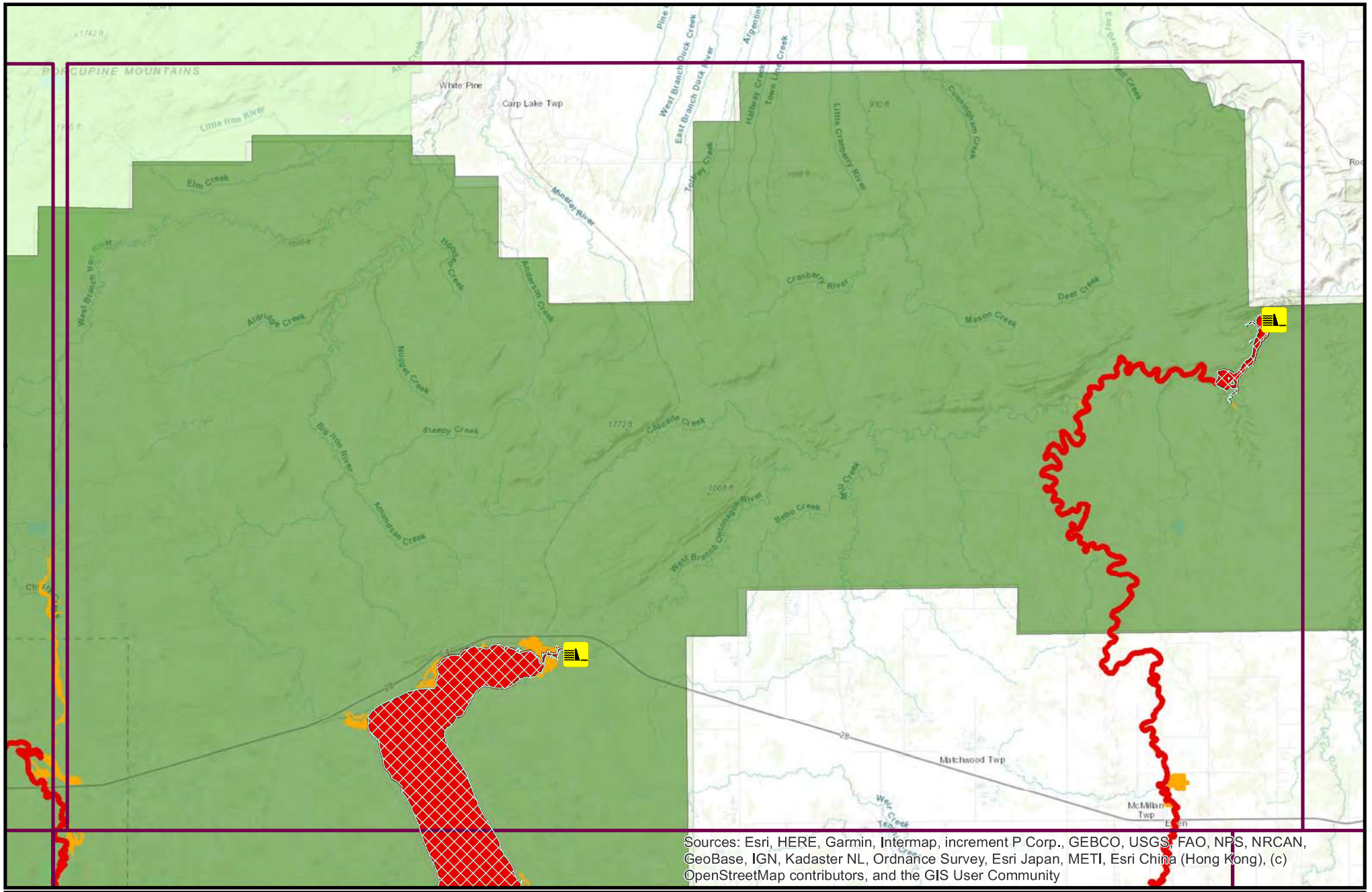

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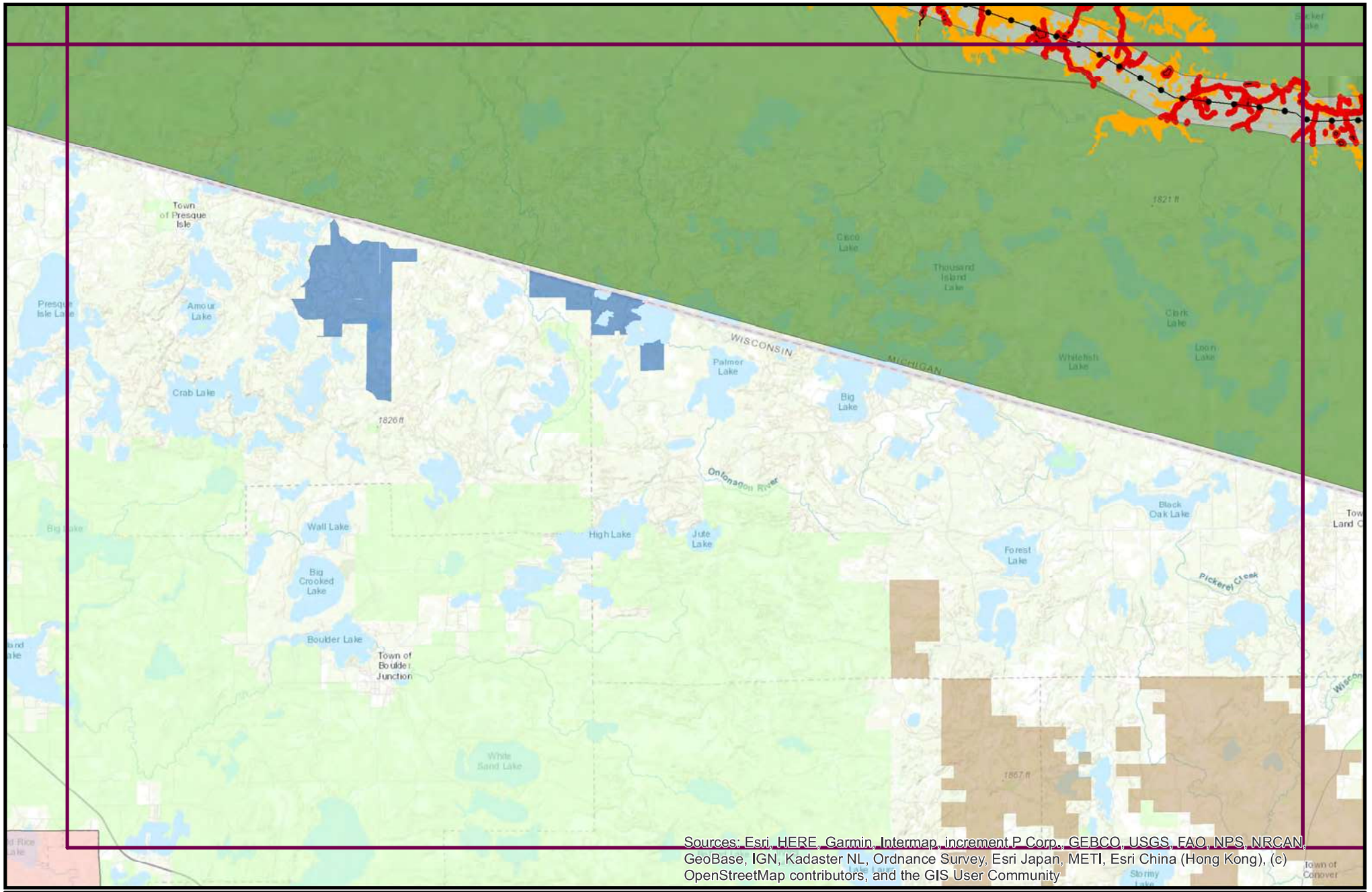

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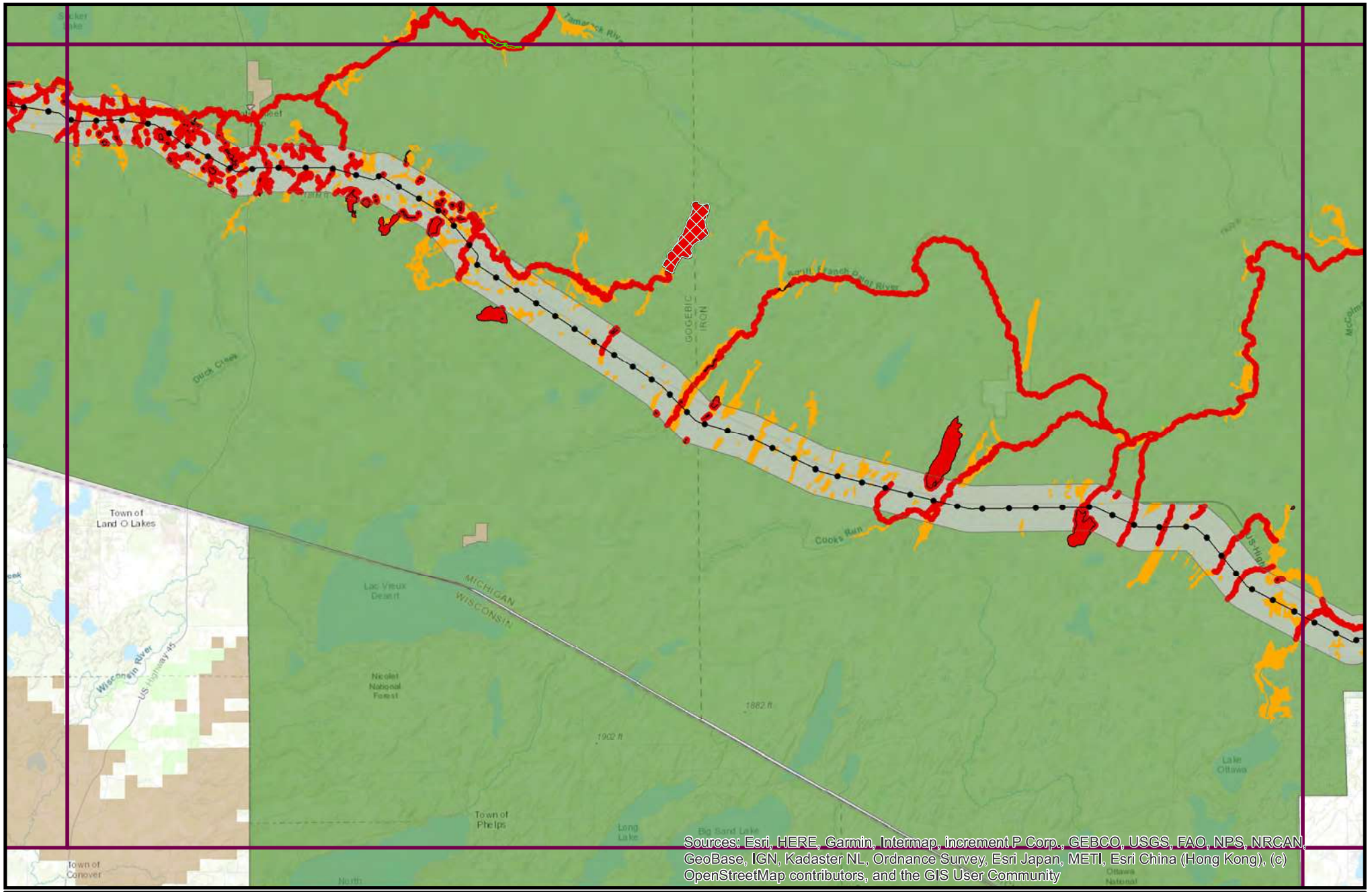

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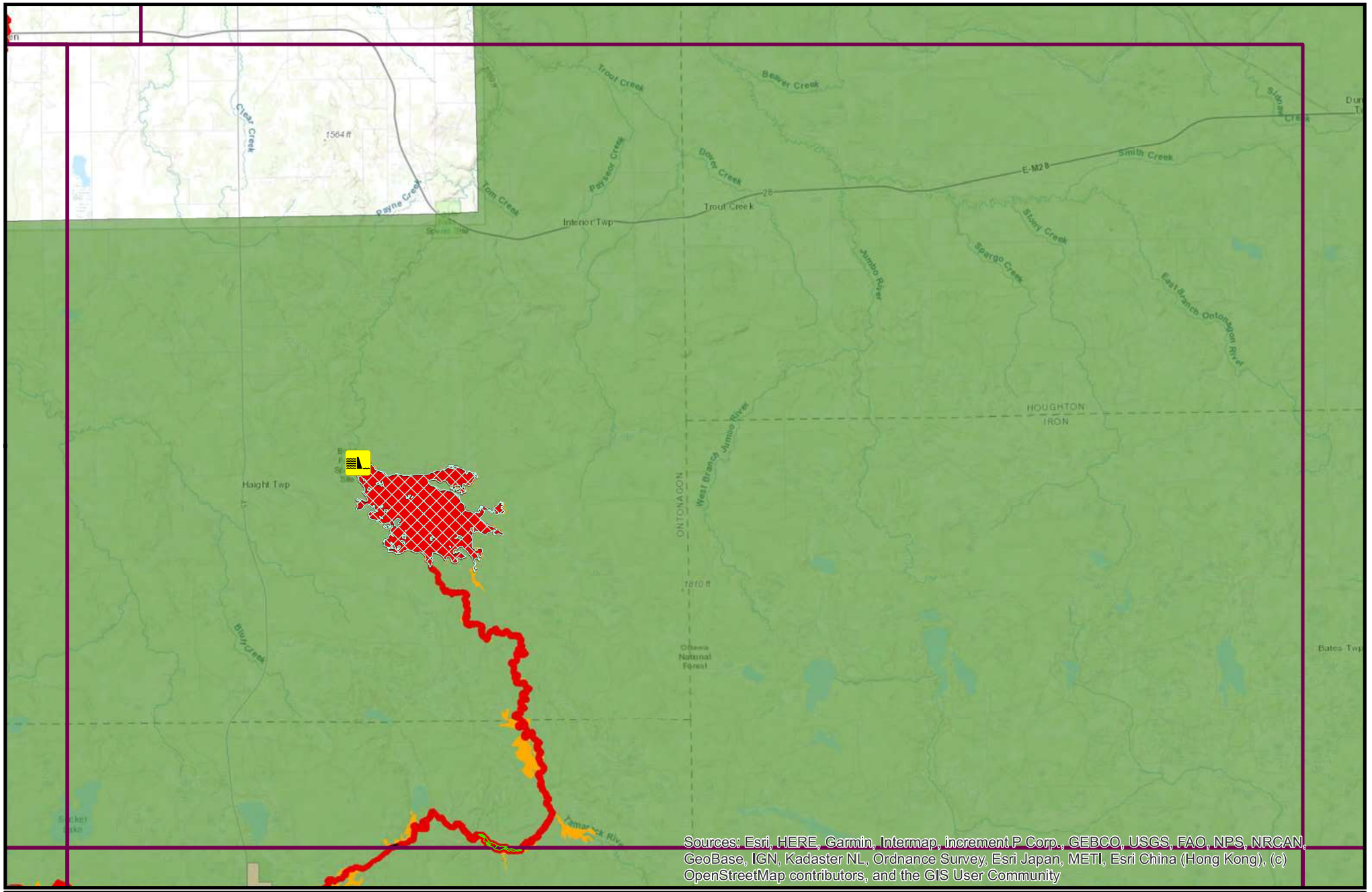
Trout Creek
Beaver Creek
Clear Creek
1564 ft
Payne Creek
Tom Creek
Paysaut Creek
Dover Creek
Trout Creek
Interior Twp
E-M28
Smith Creek
Stony Creek
Sparge Creek
Jumbo River
East Branch Ontonagon River
HOUGHTON
IRON
ONTONAGON
West Branch Jumbo River
Haight Twp
1810 ft
Ottawa National Forest
Bates Twp
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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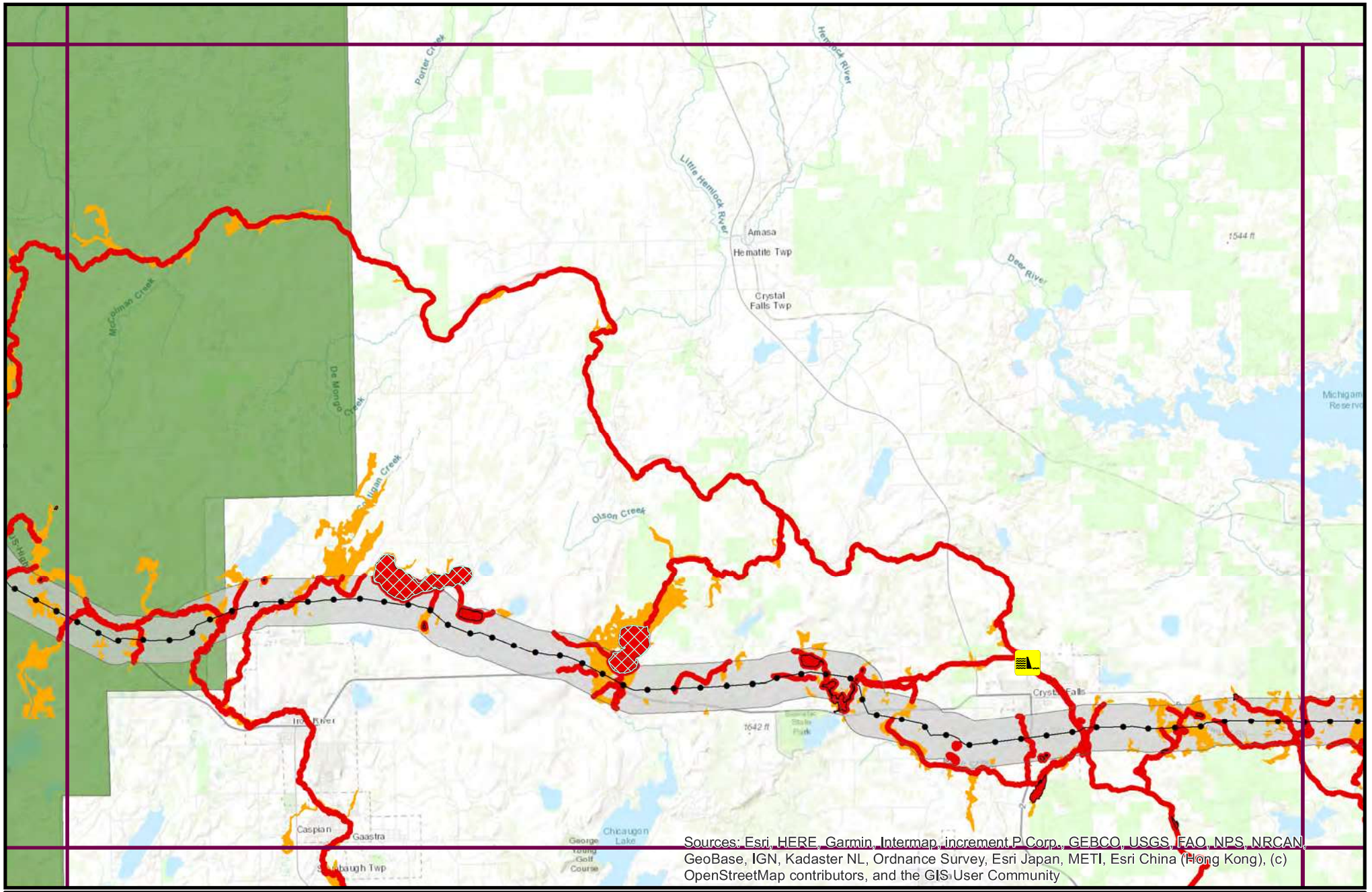

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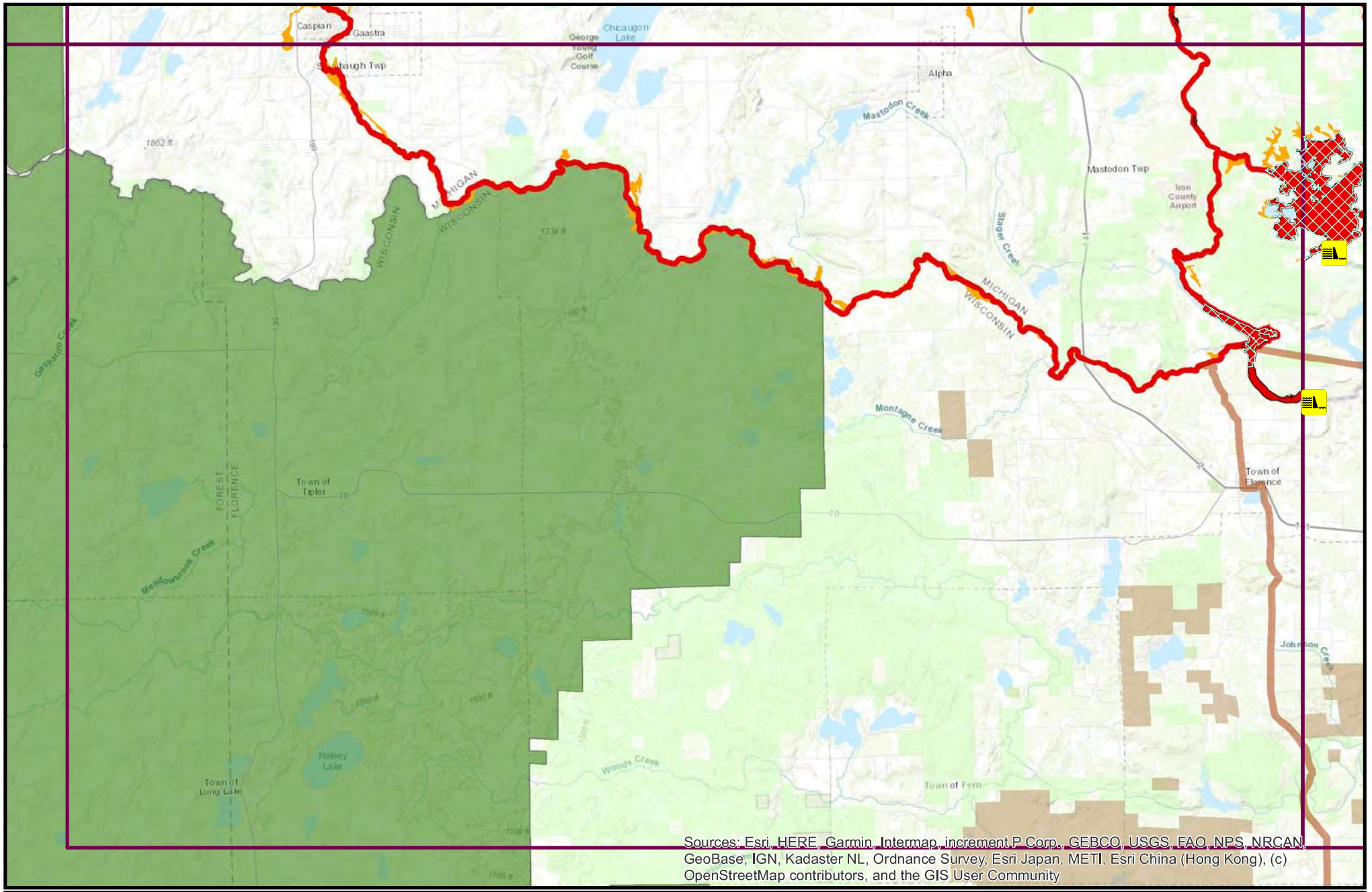

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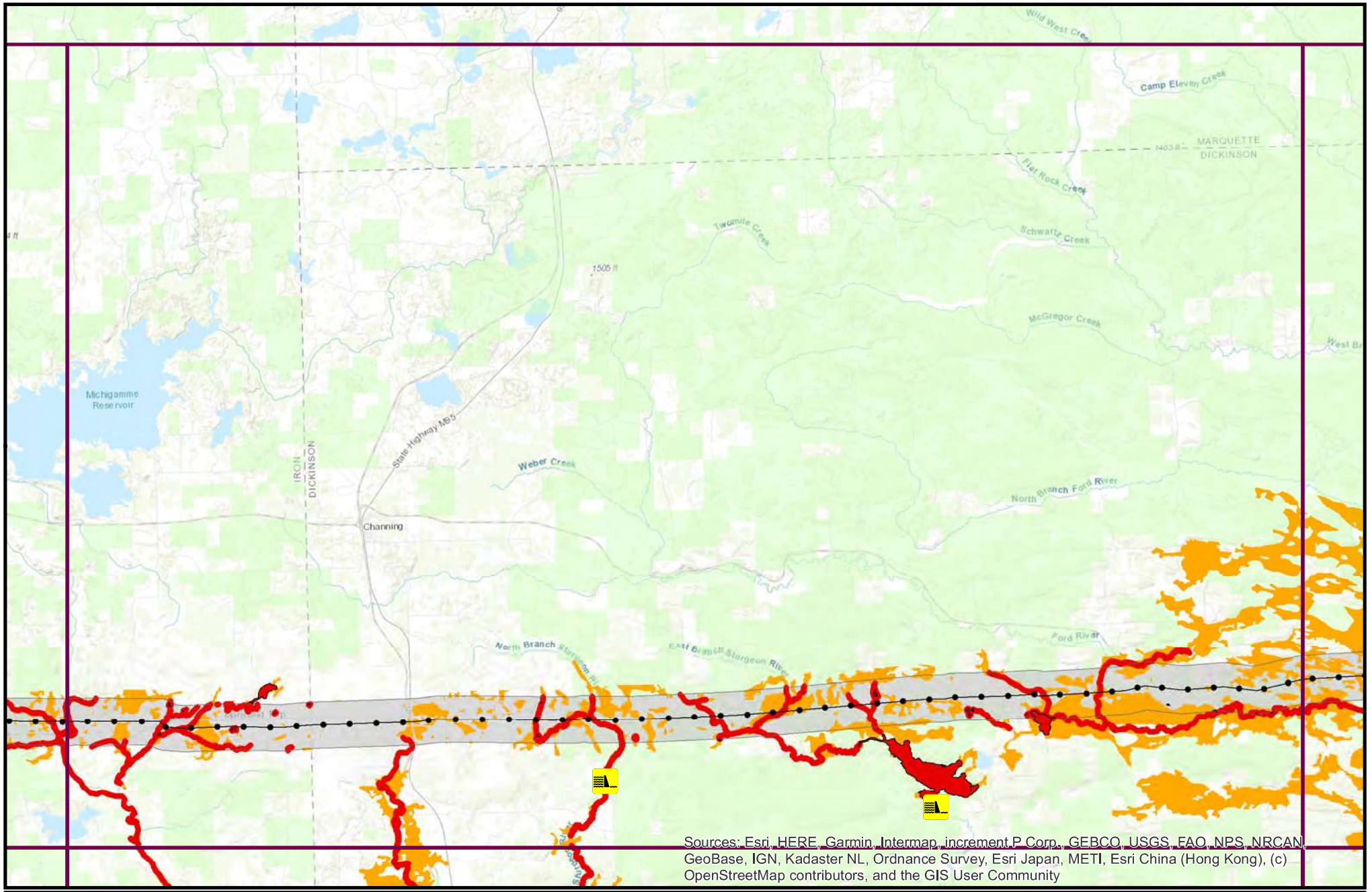

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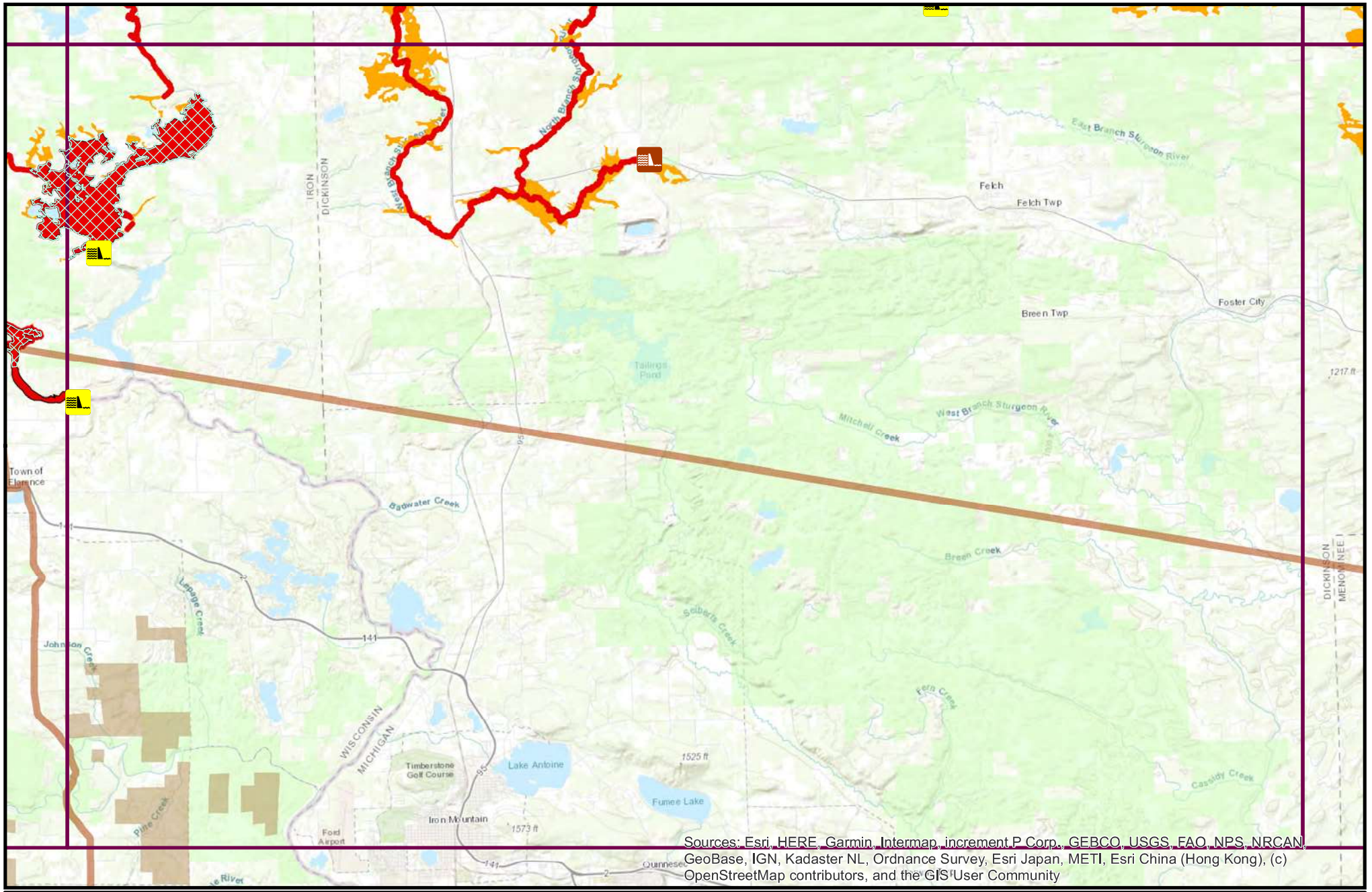

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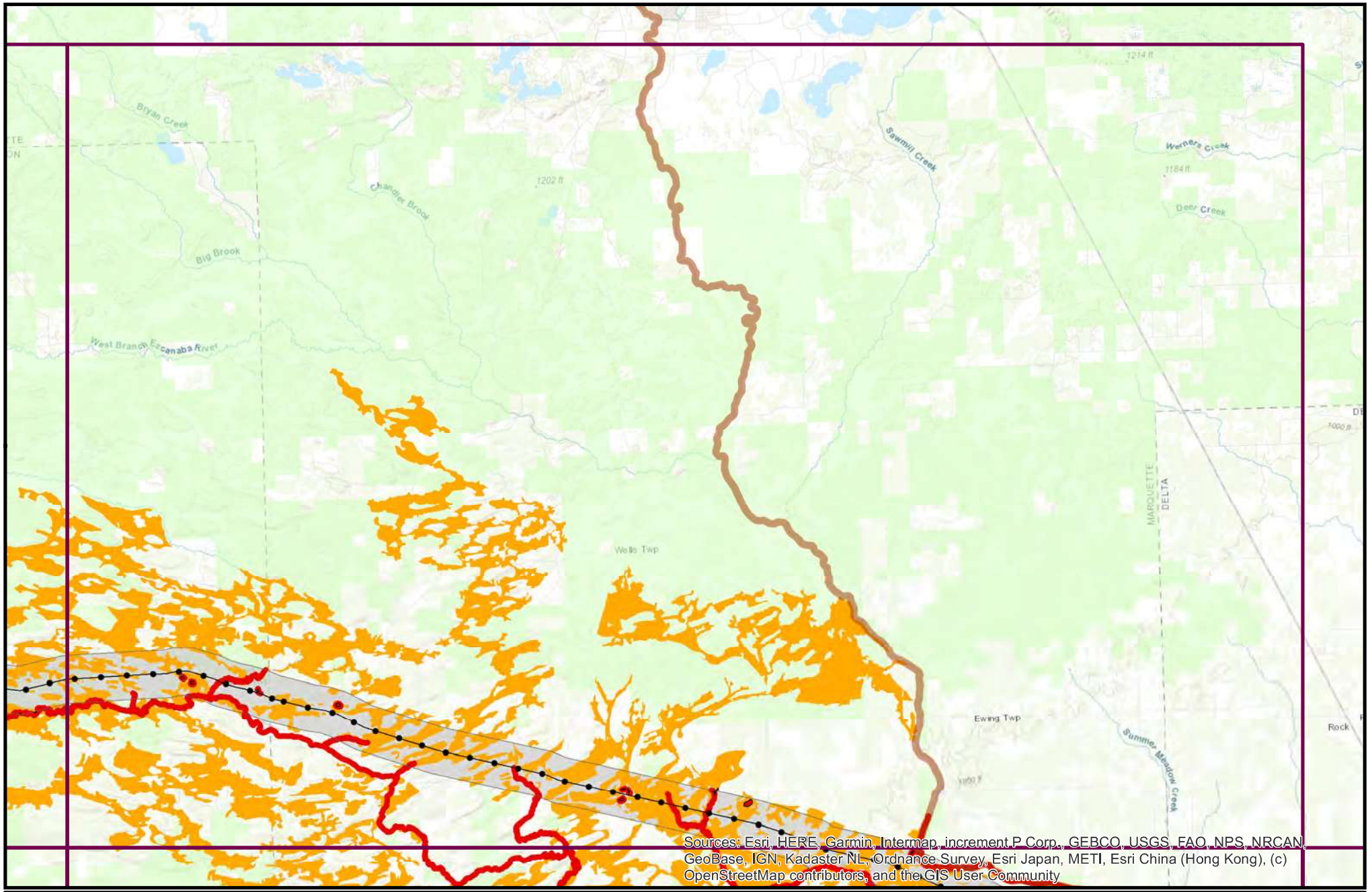

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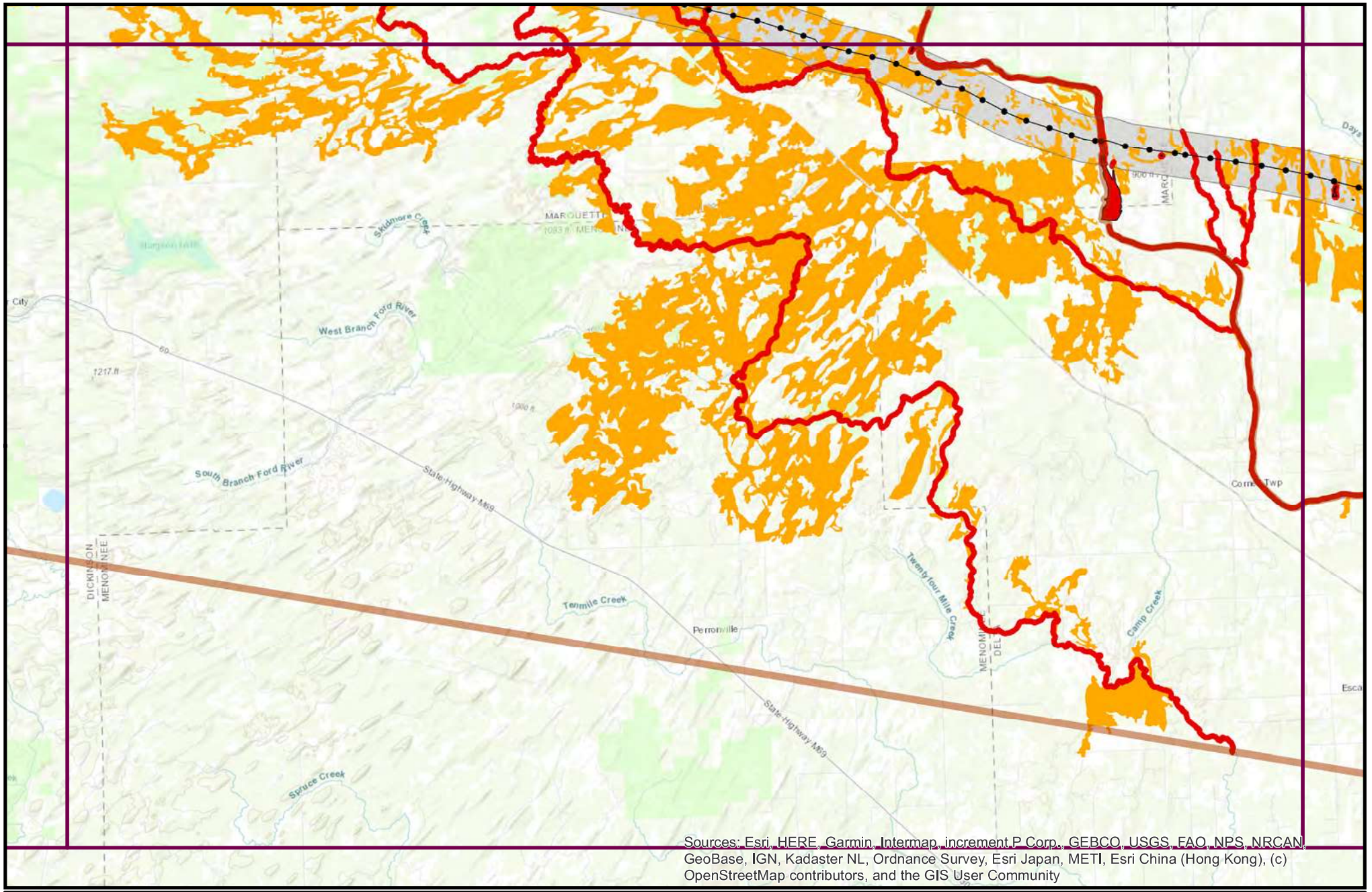

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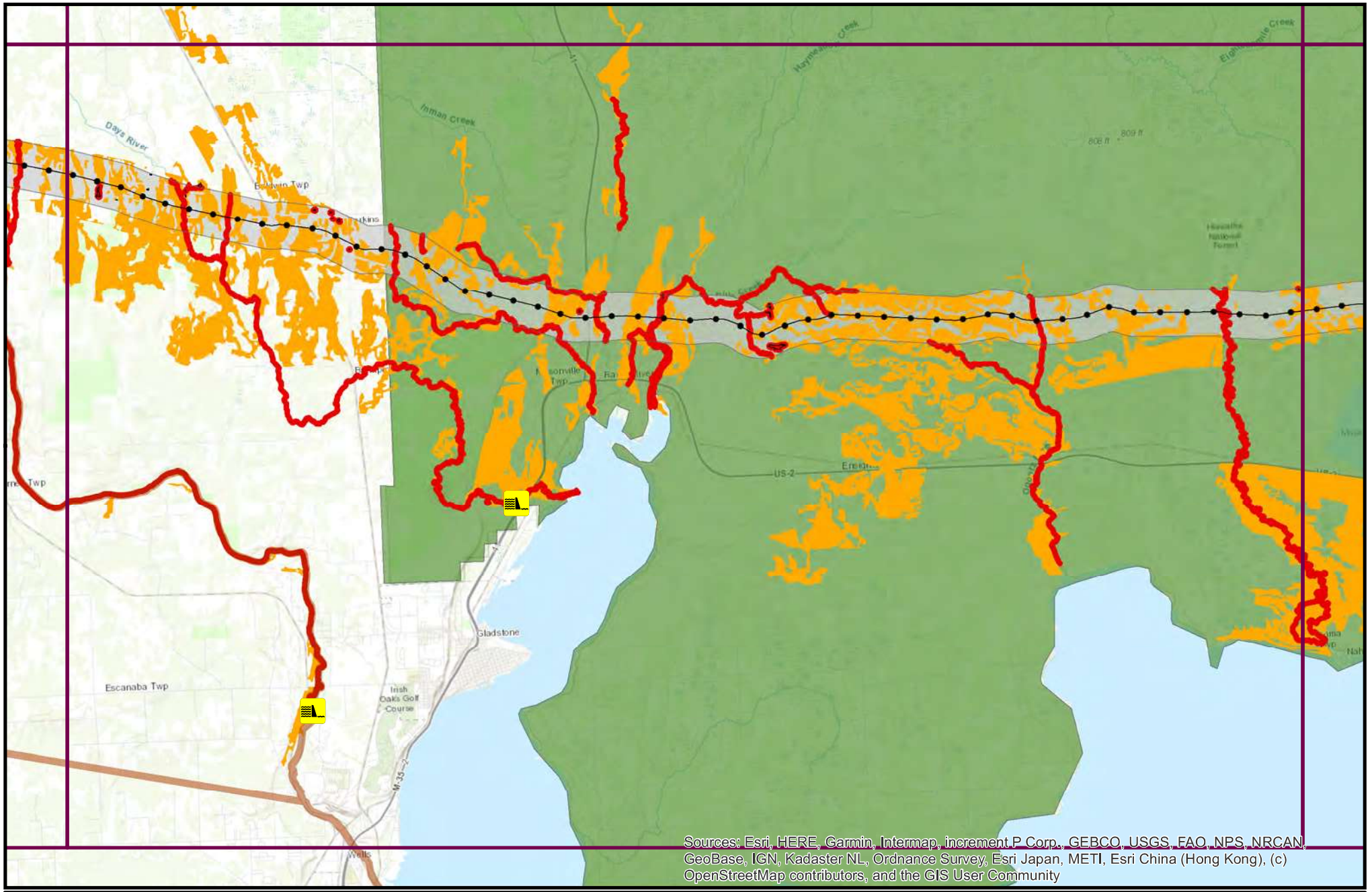

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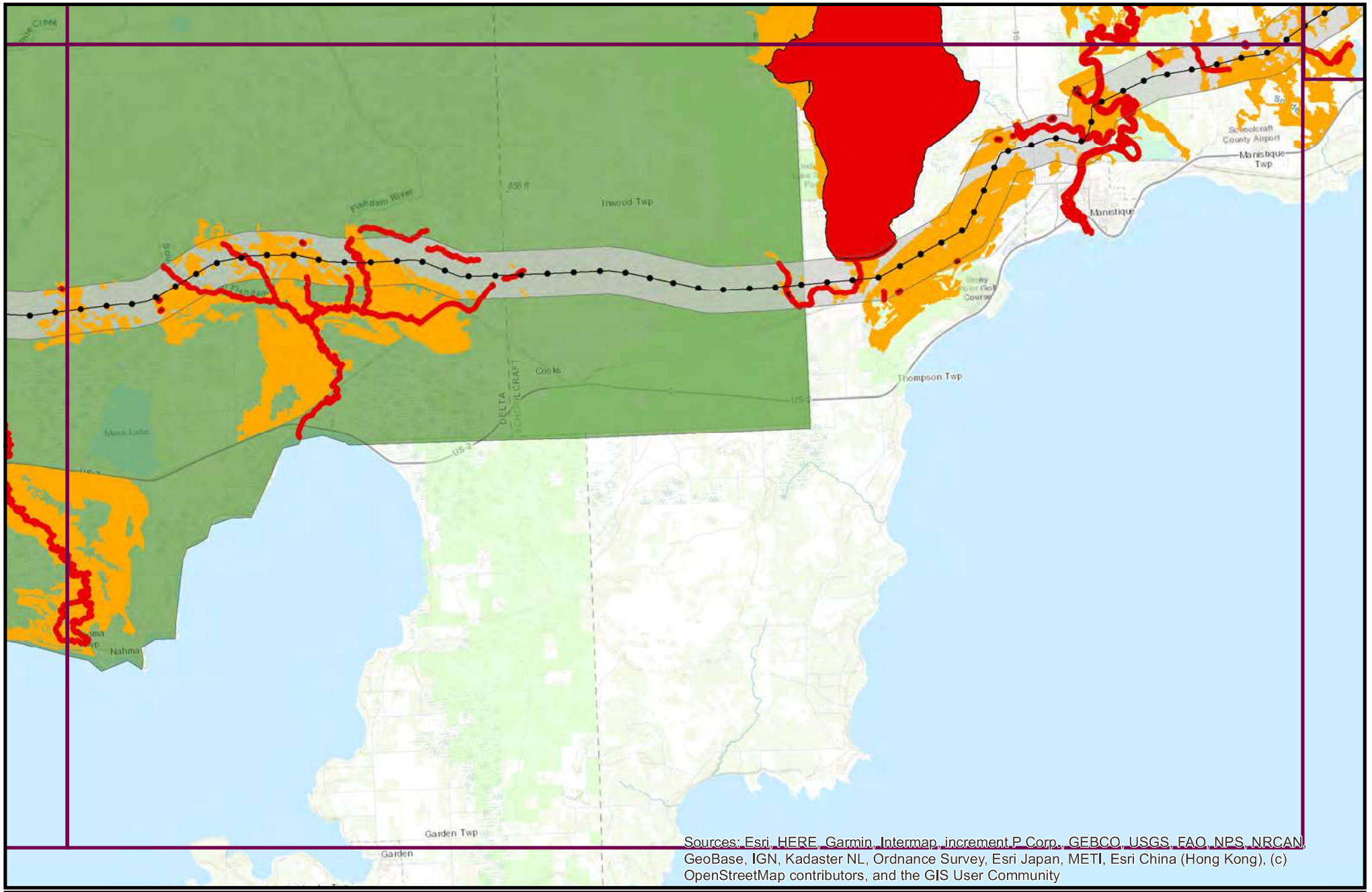

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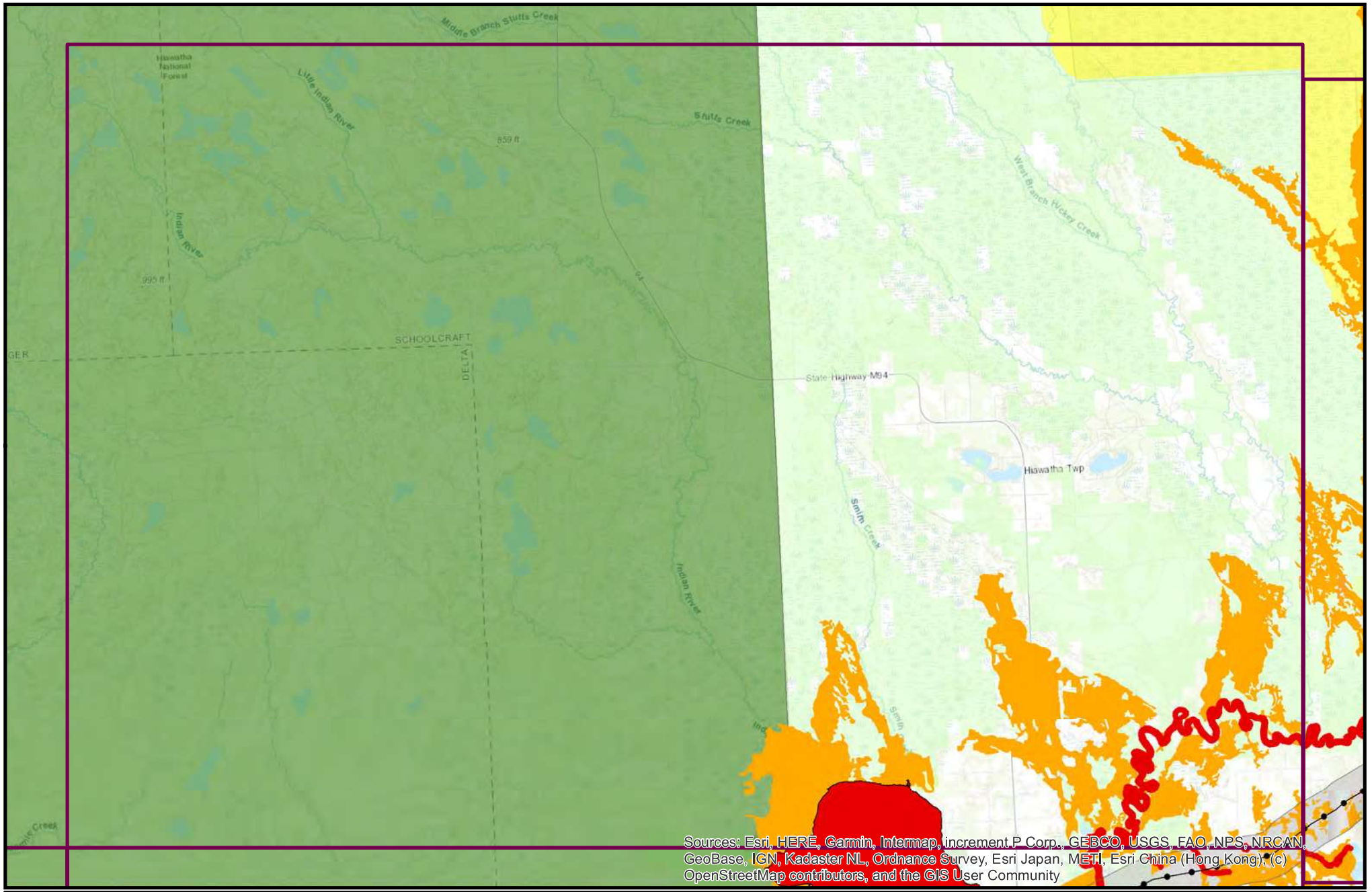

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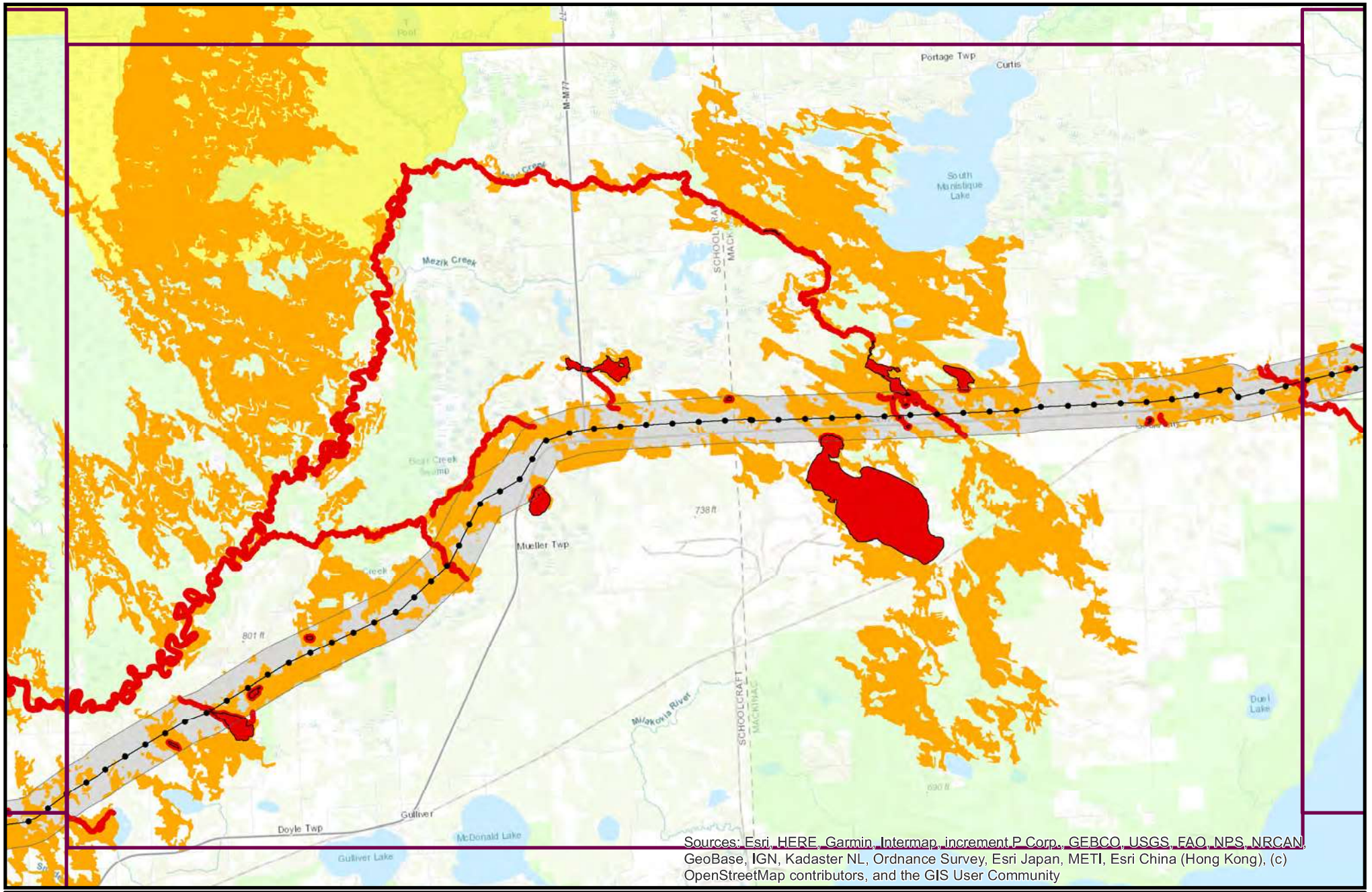

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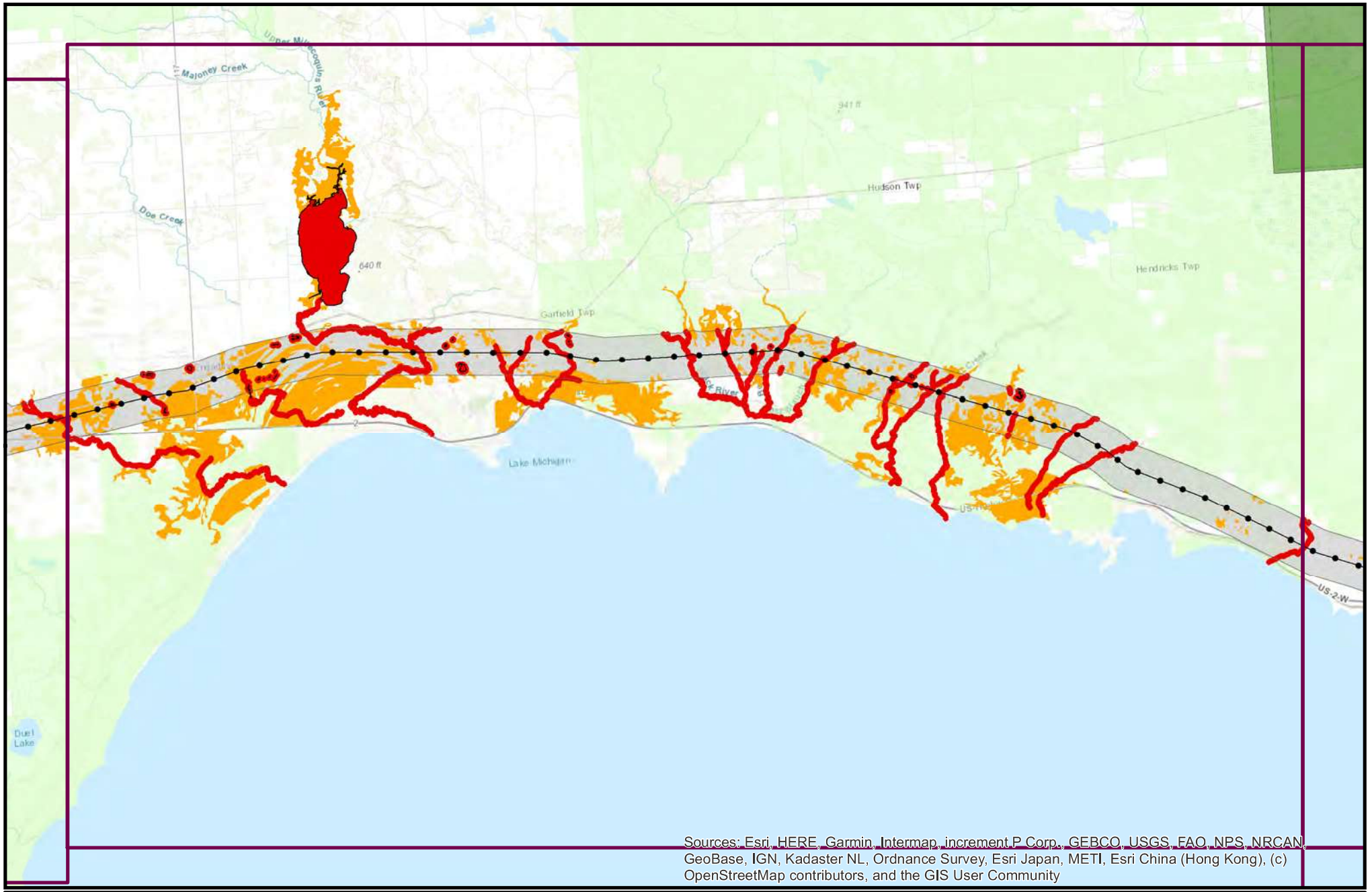

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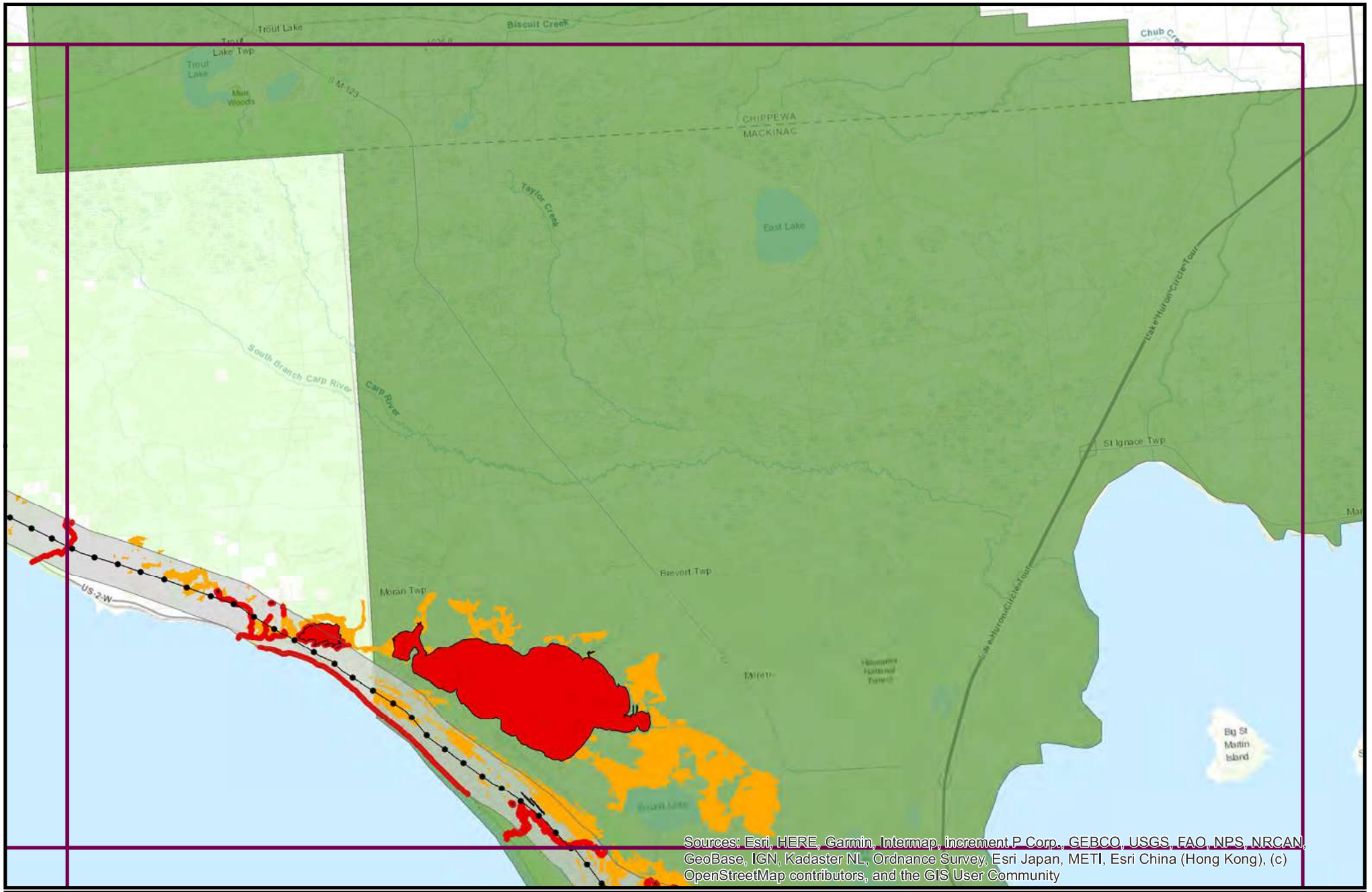

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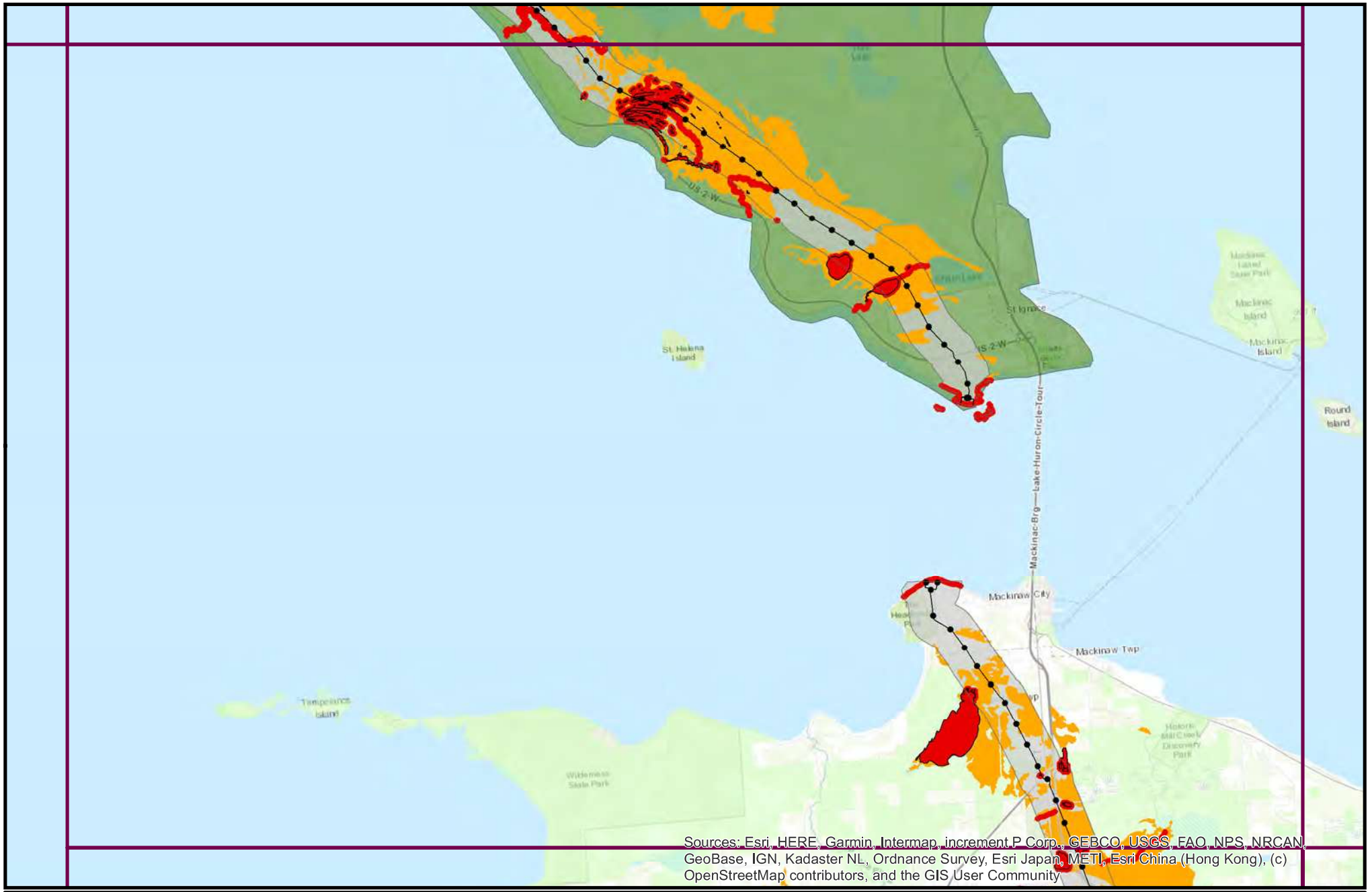

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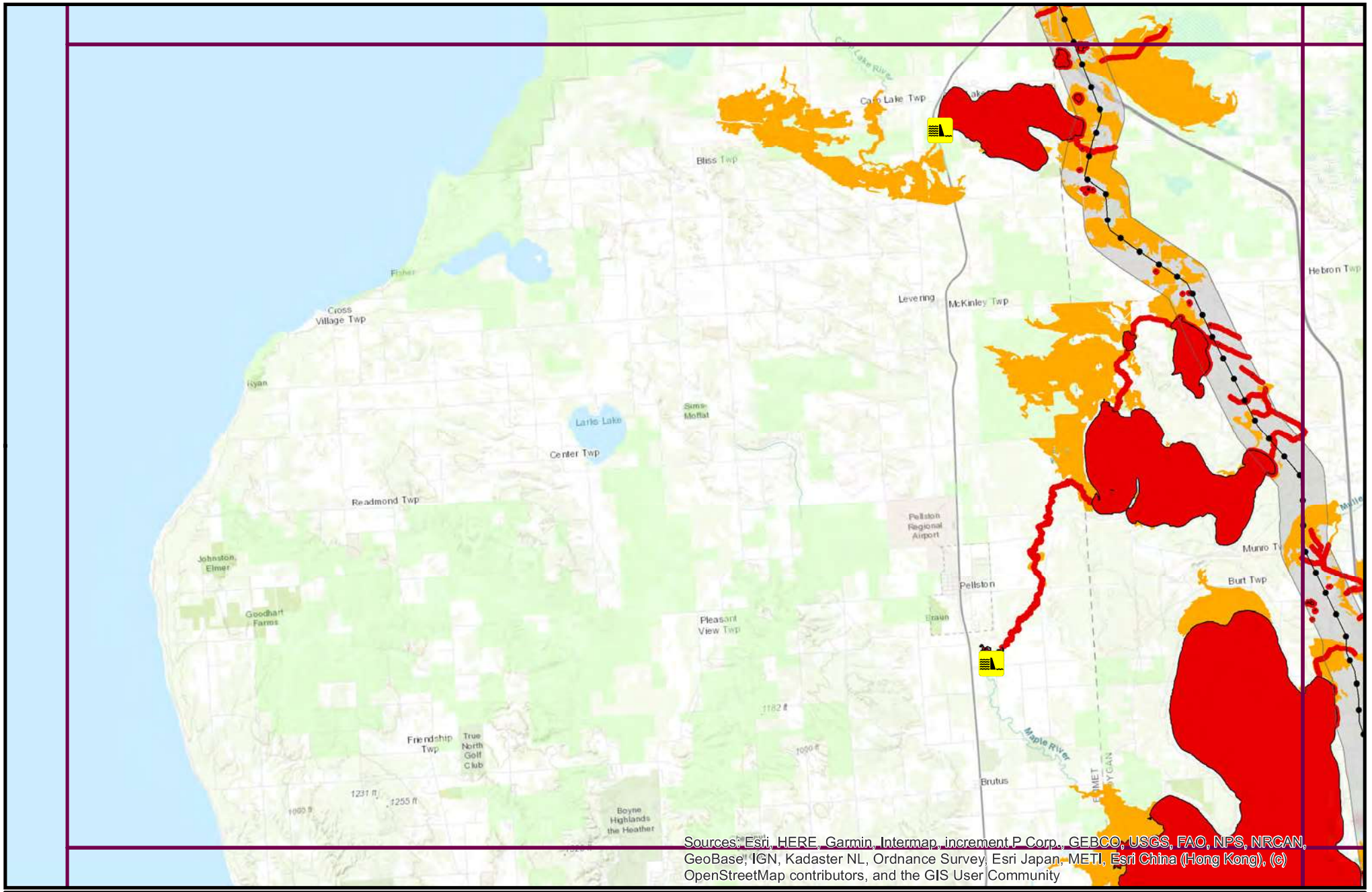

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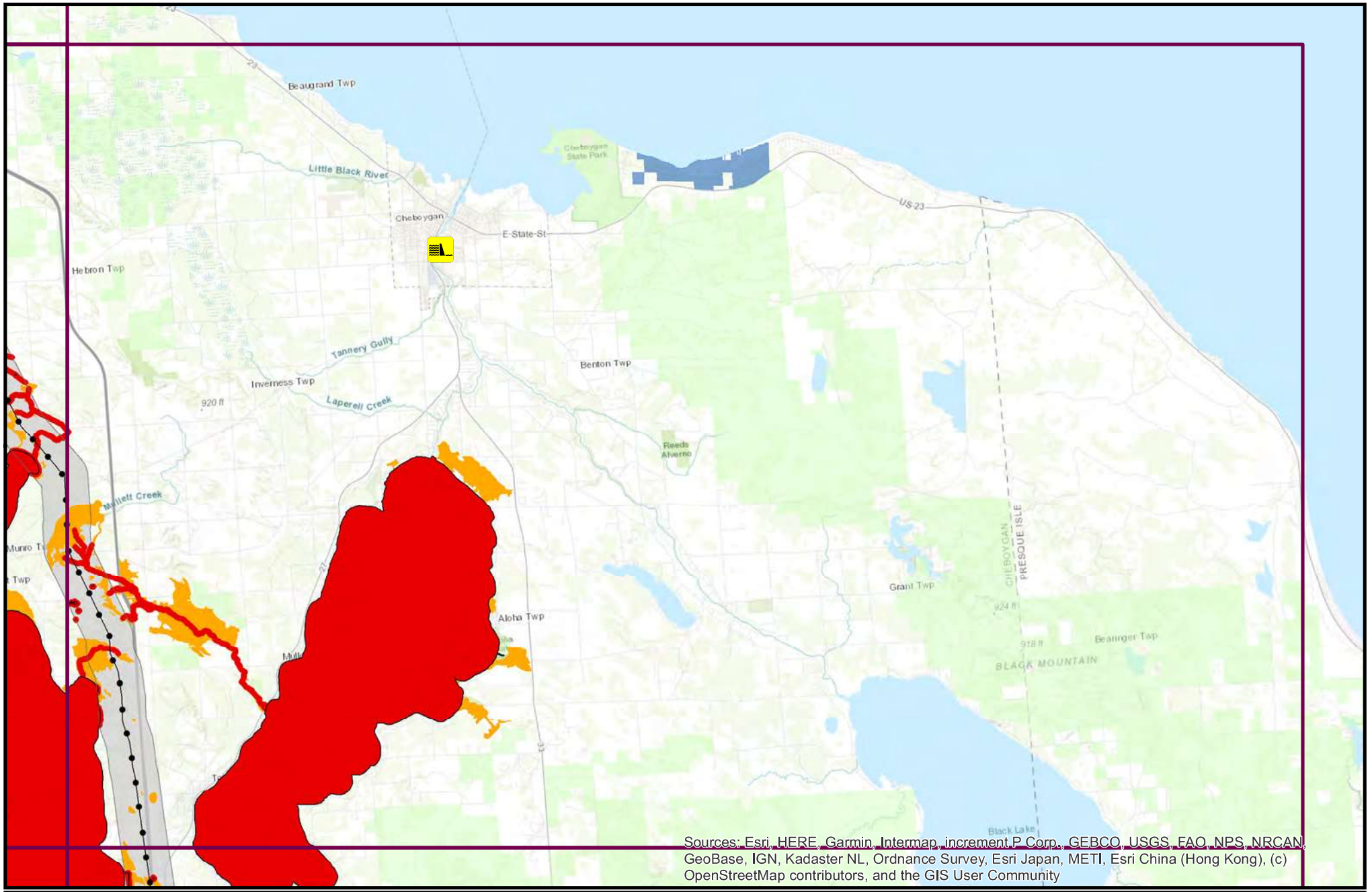

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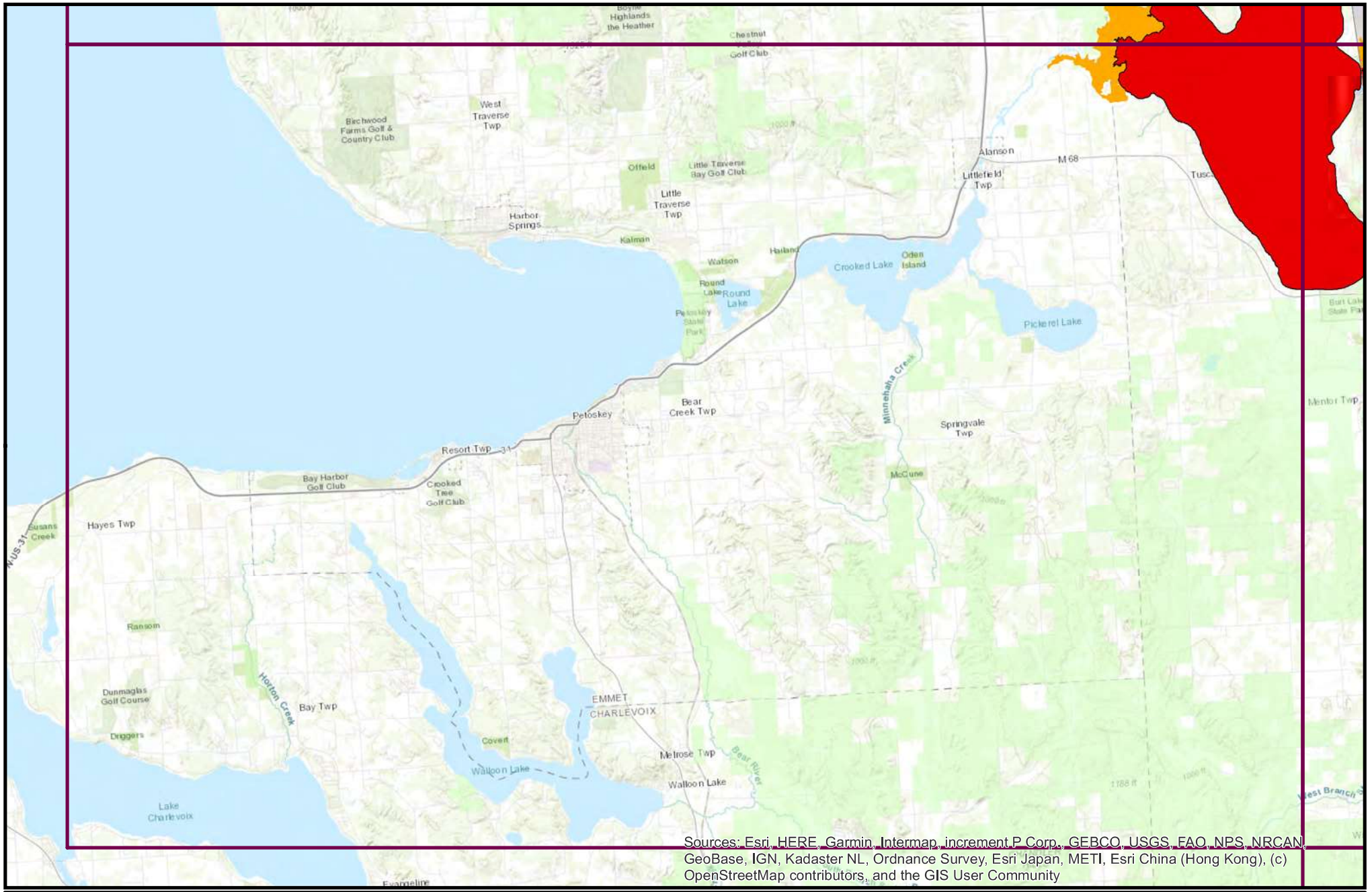

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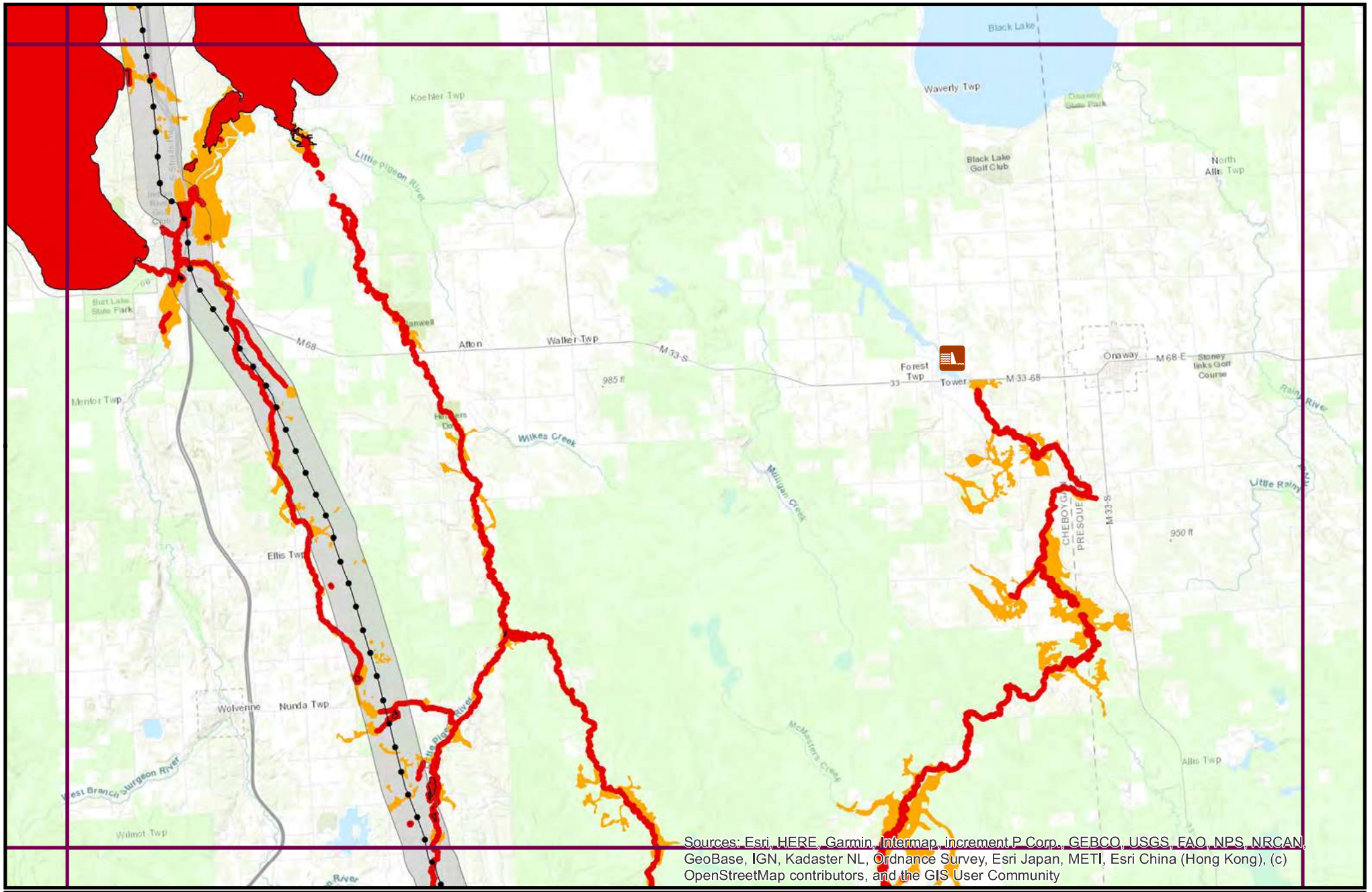

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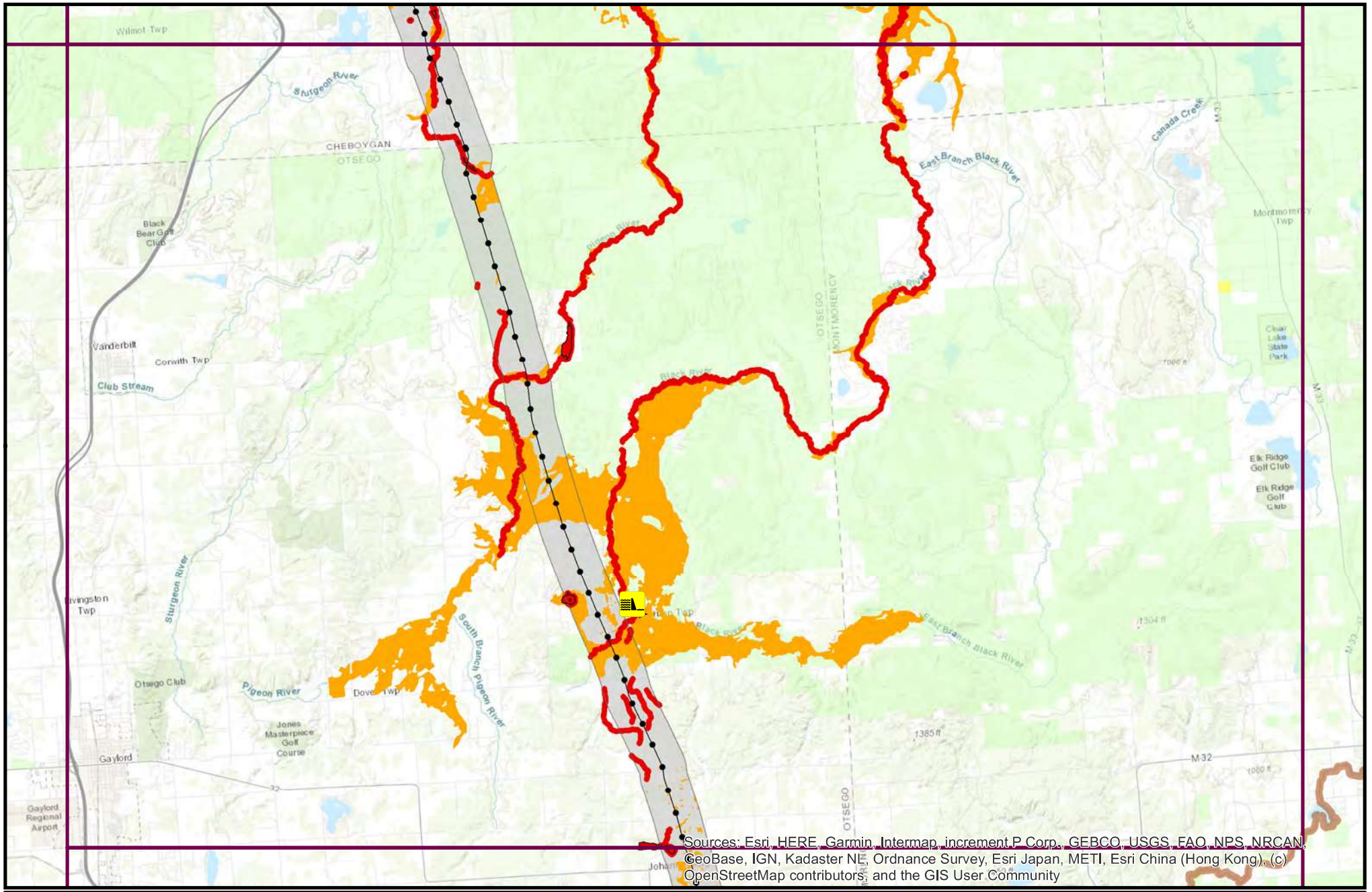

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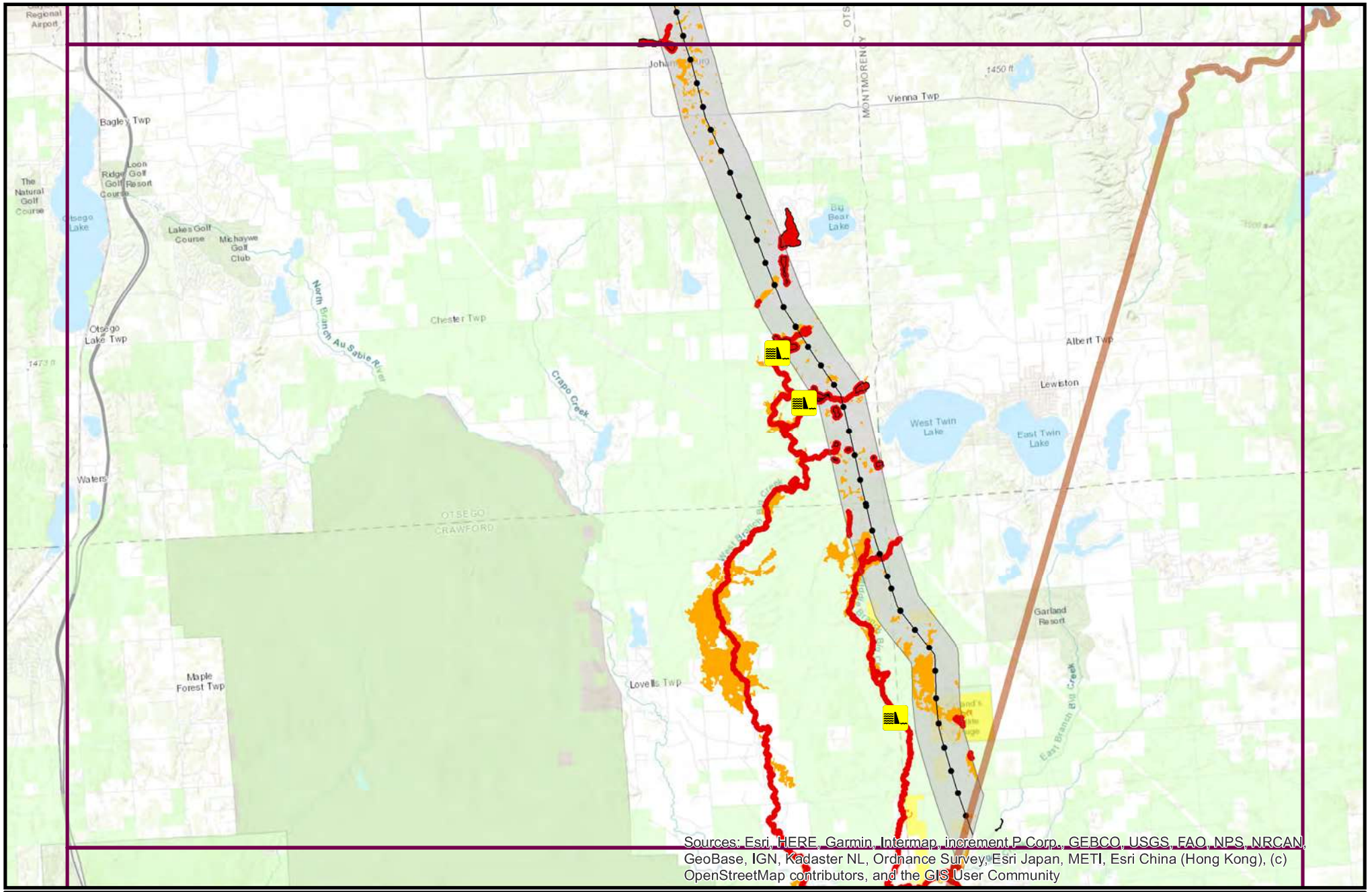

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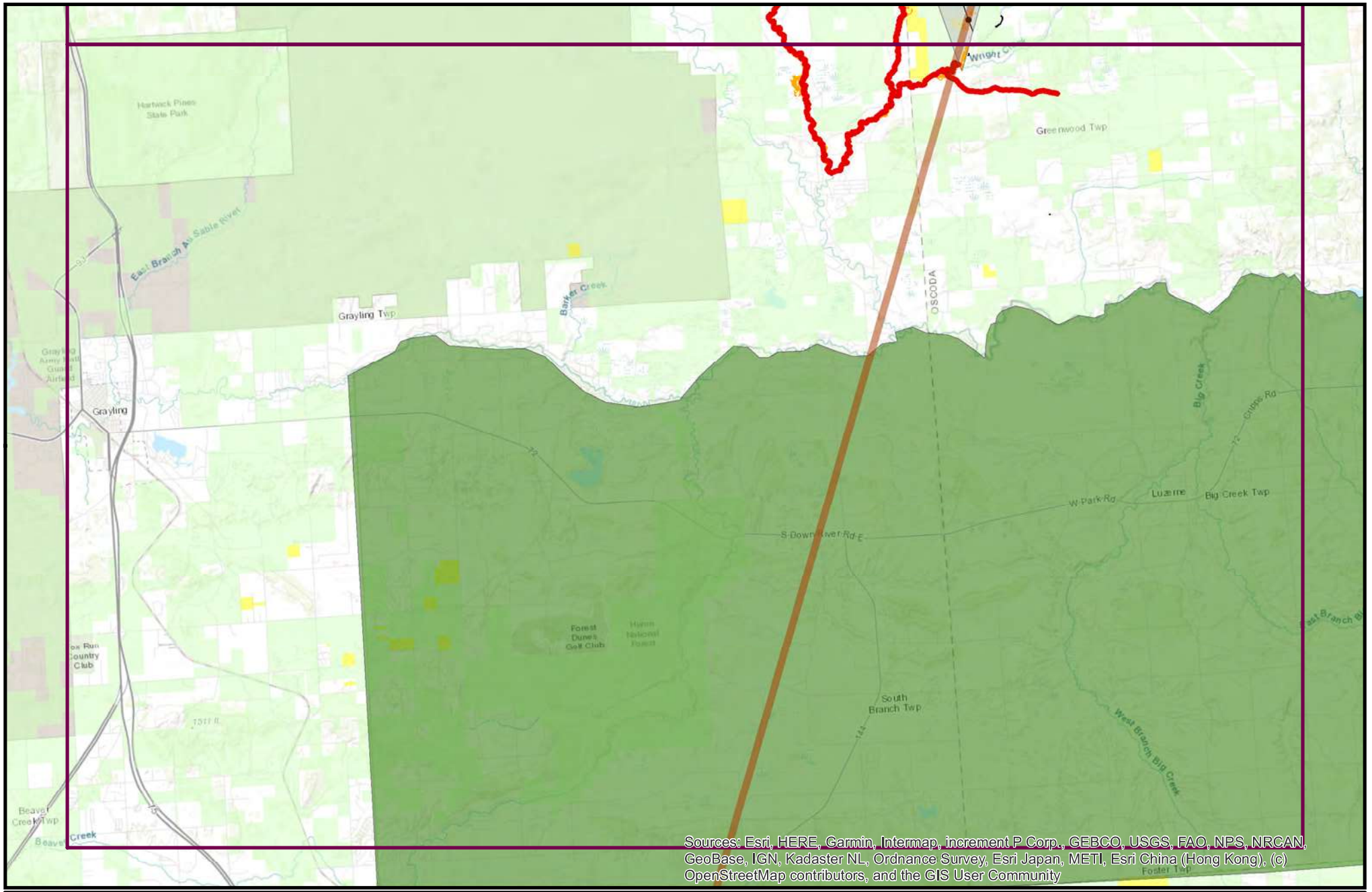

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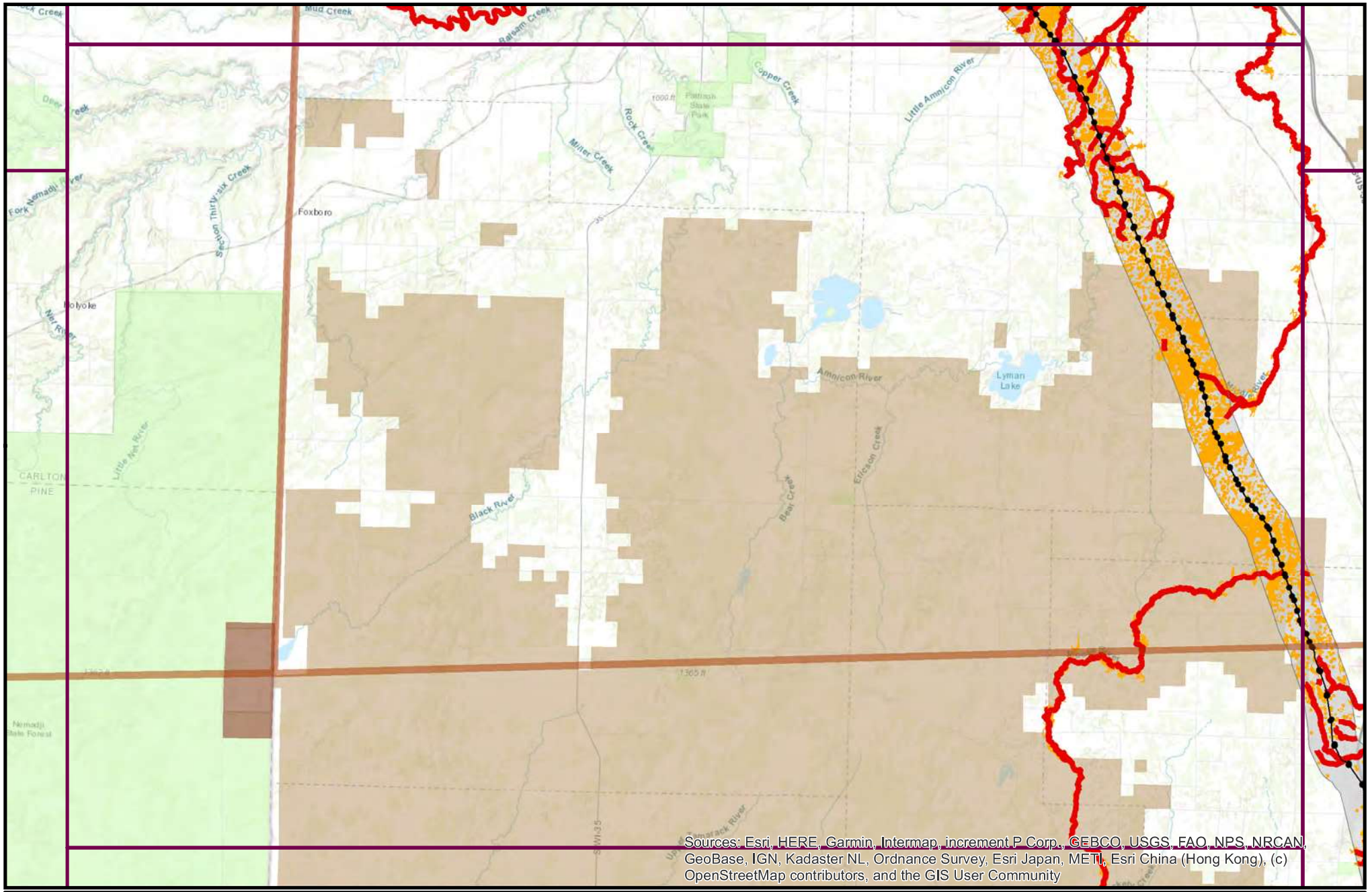

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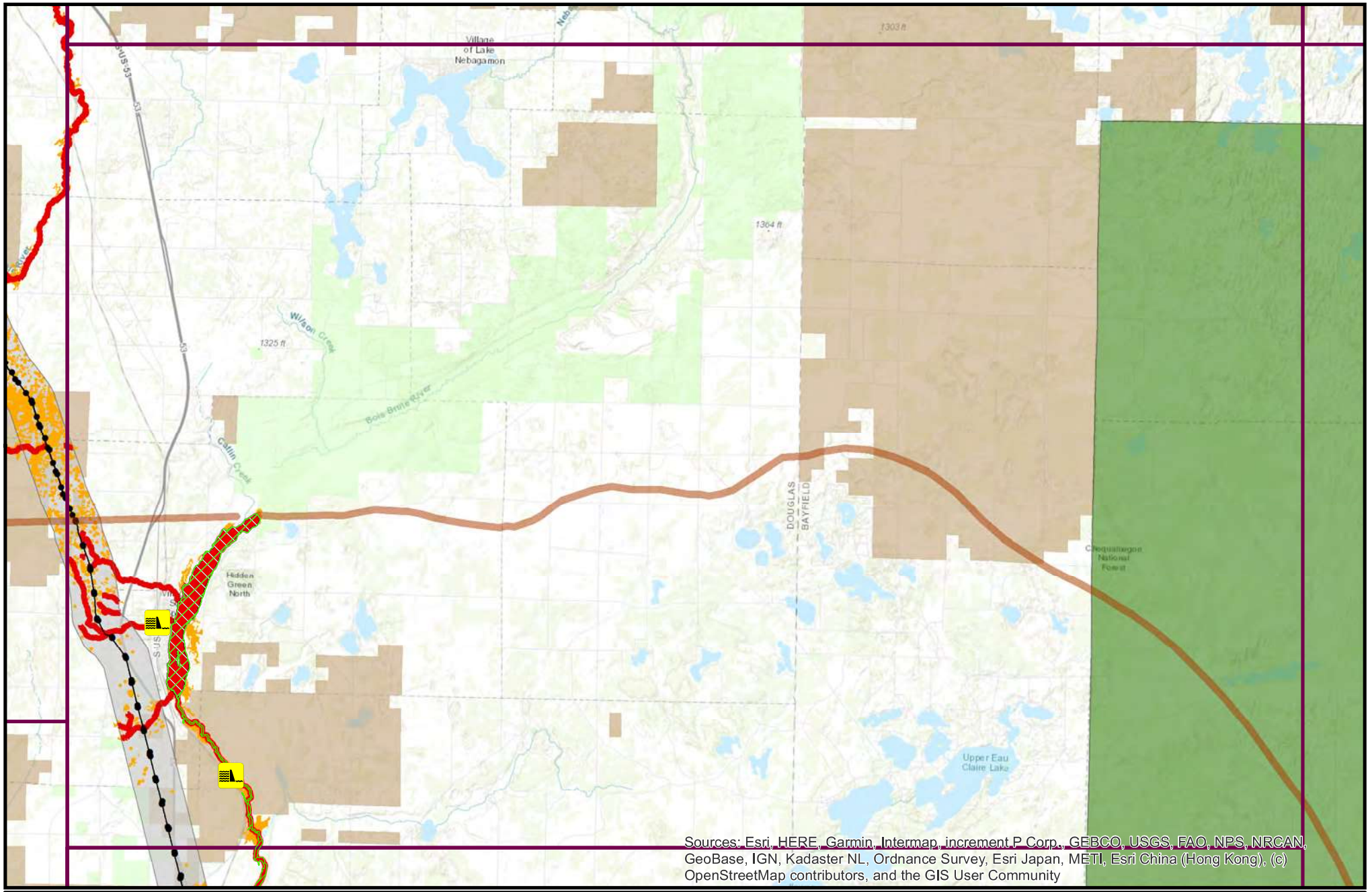

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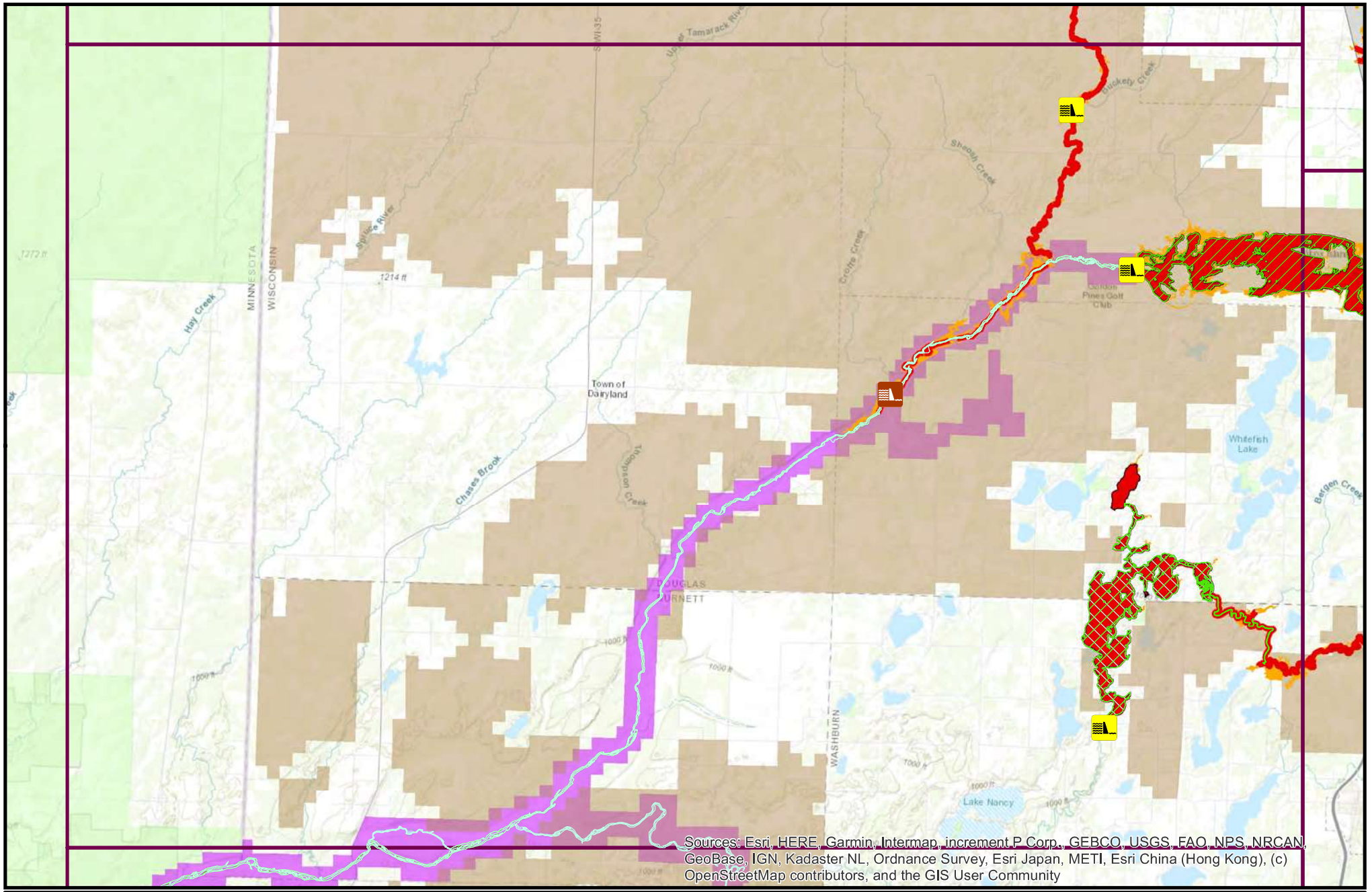

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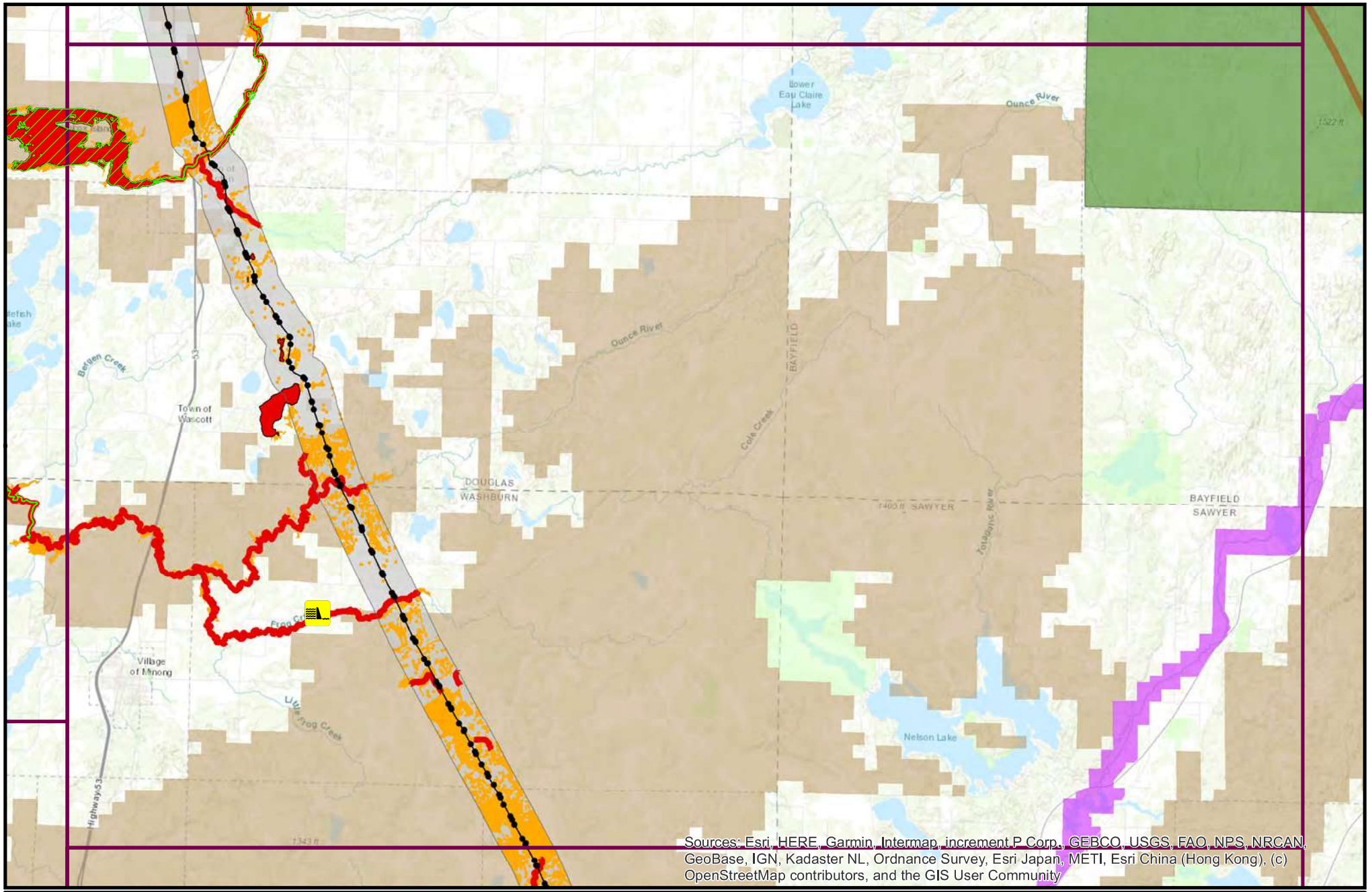

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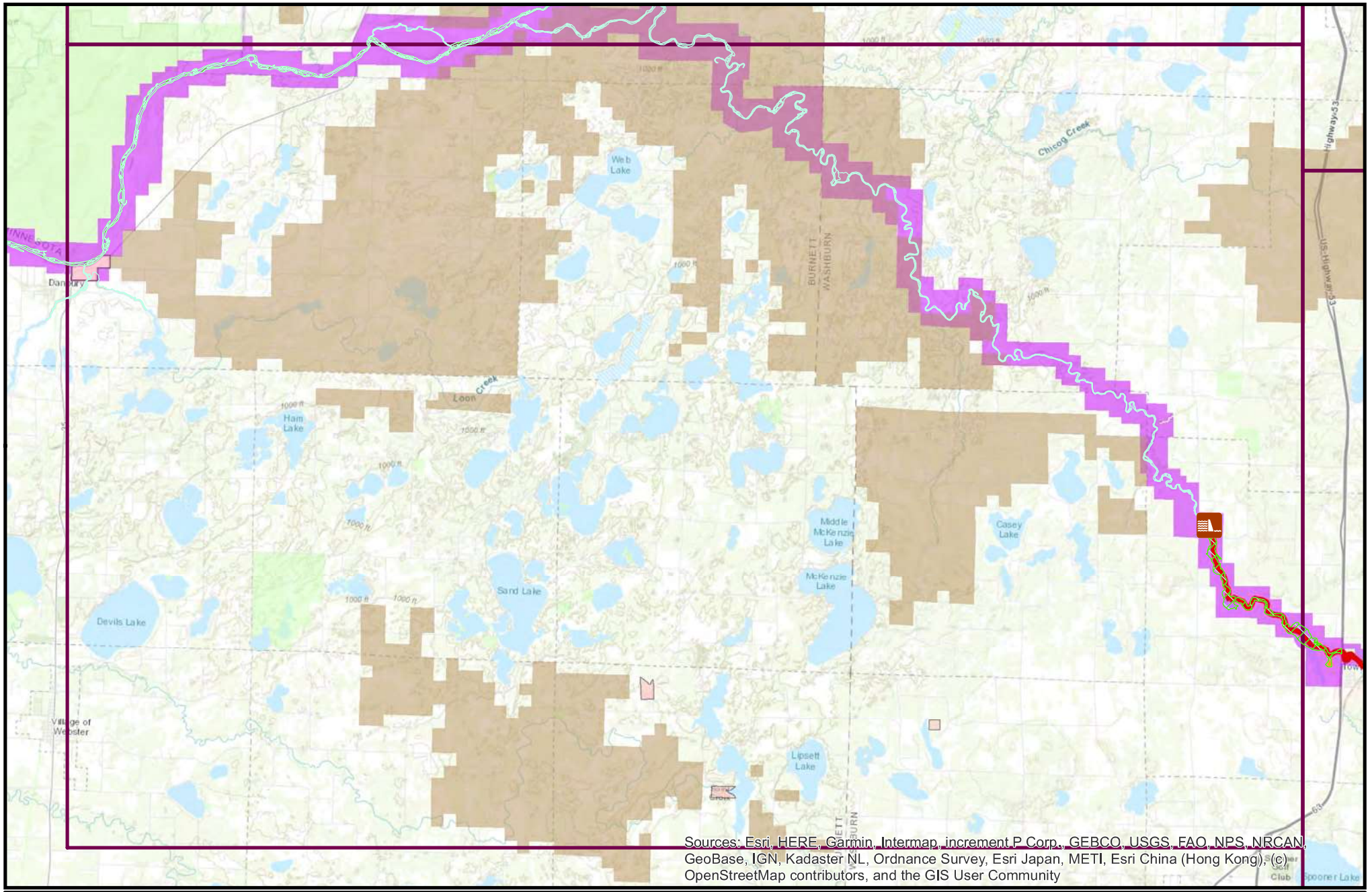

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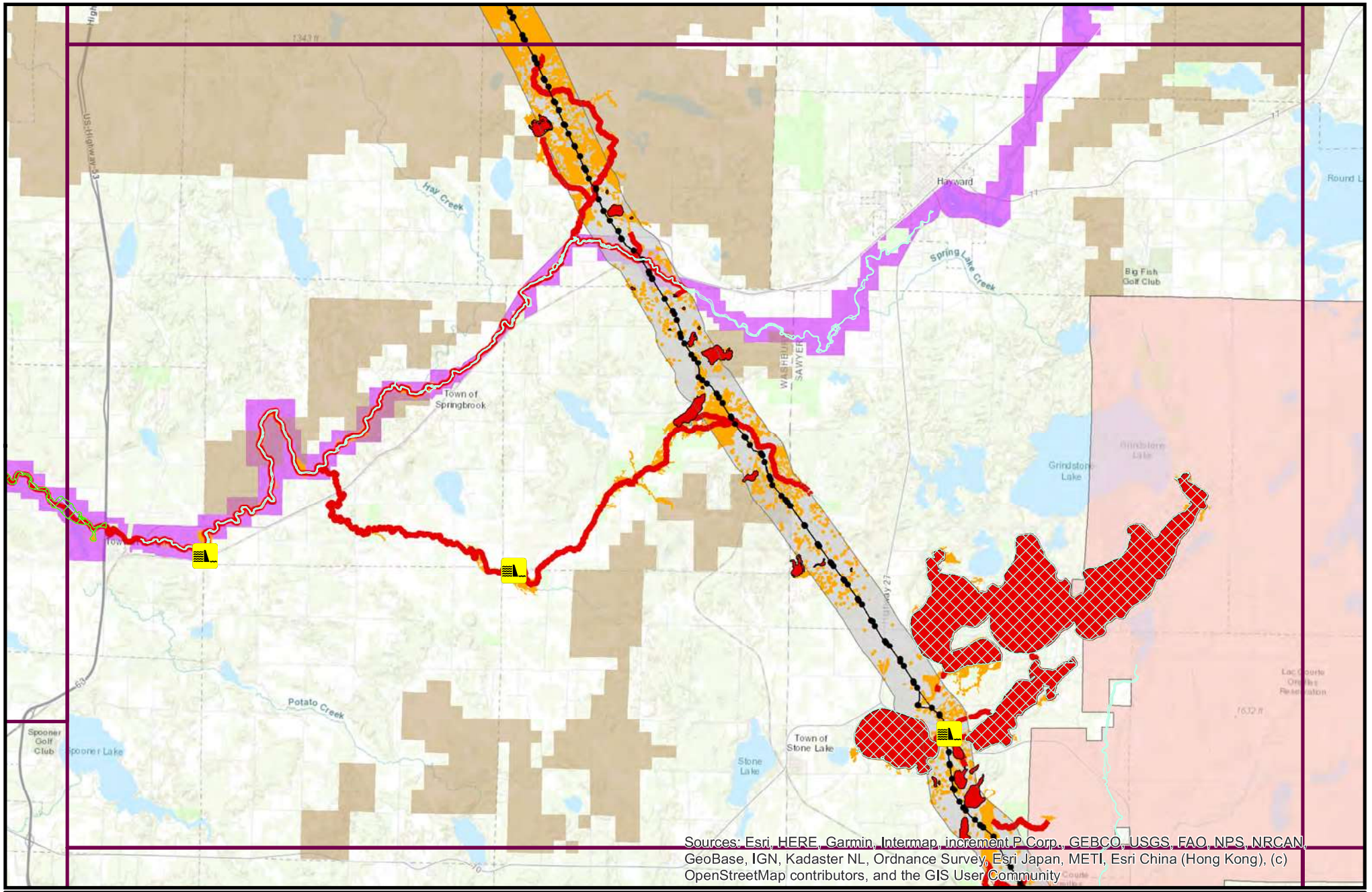

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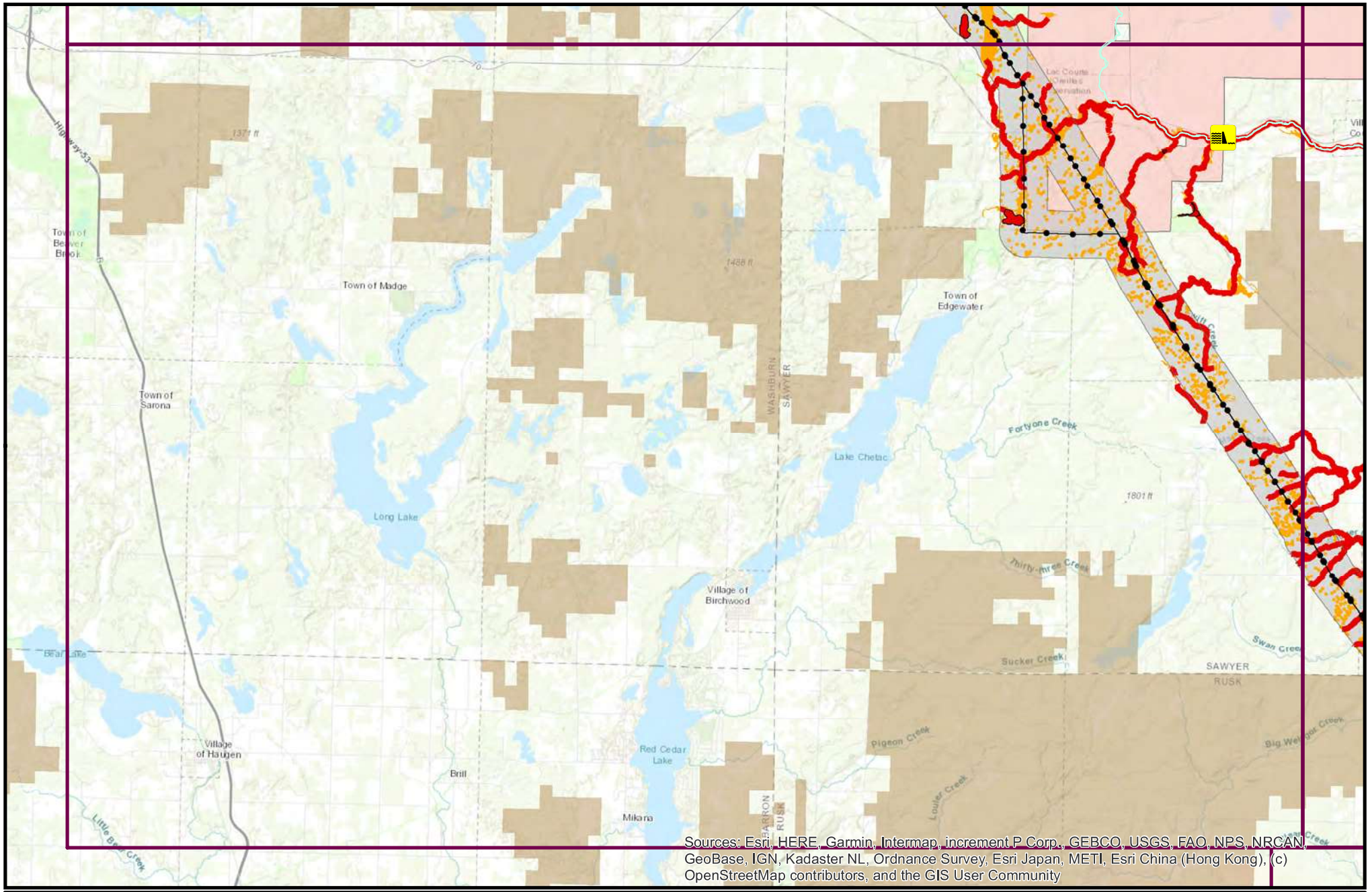

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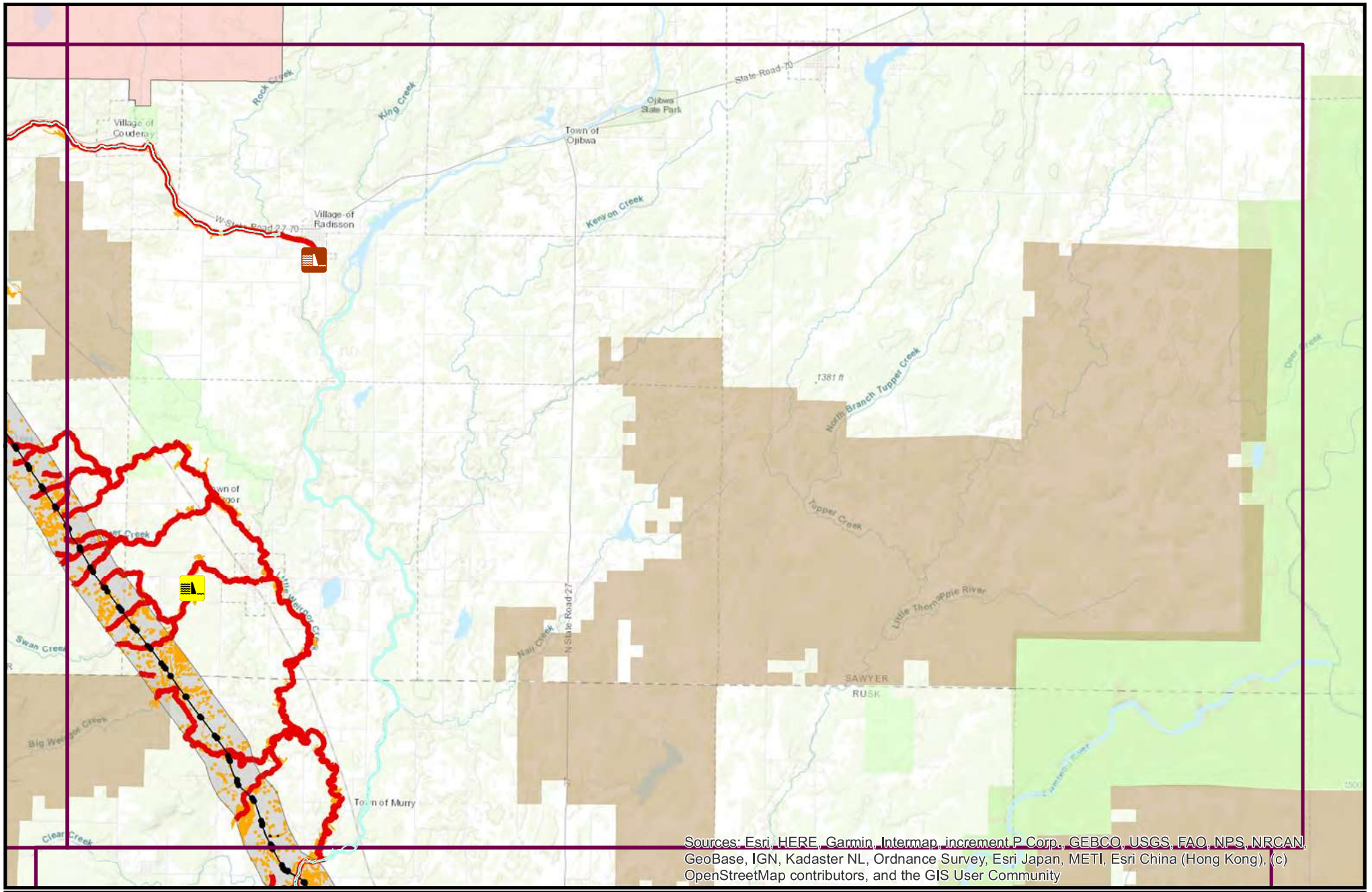

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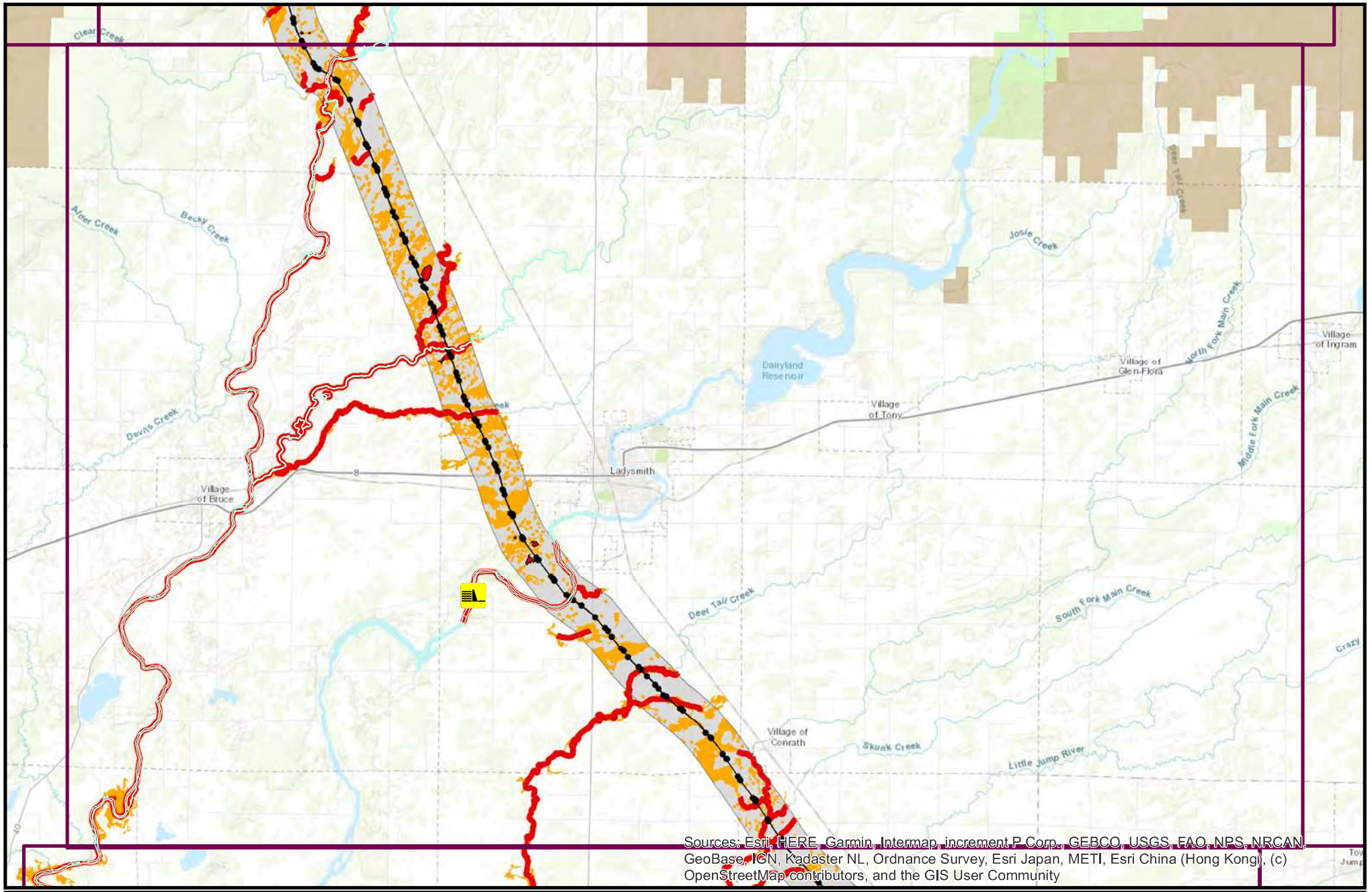

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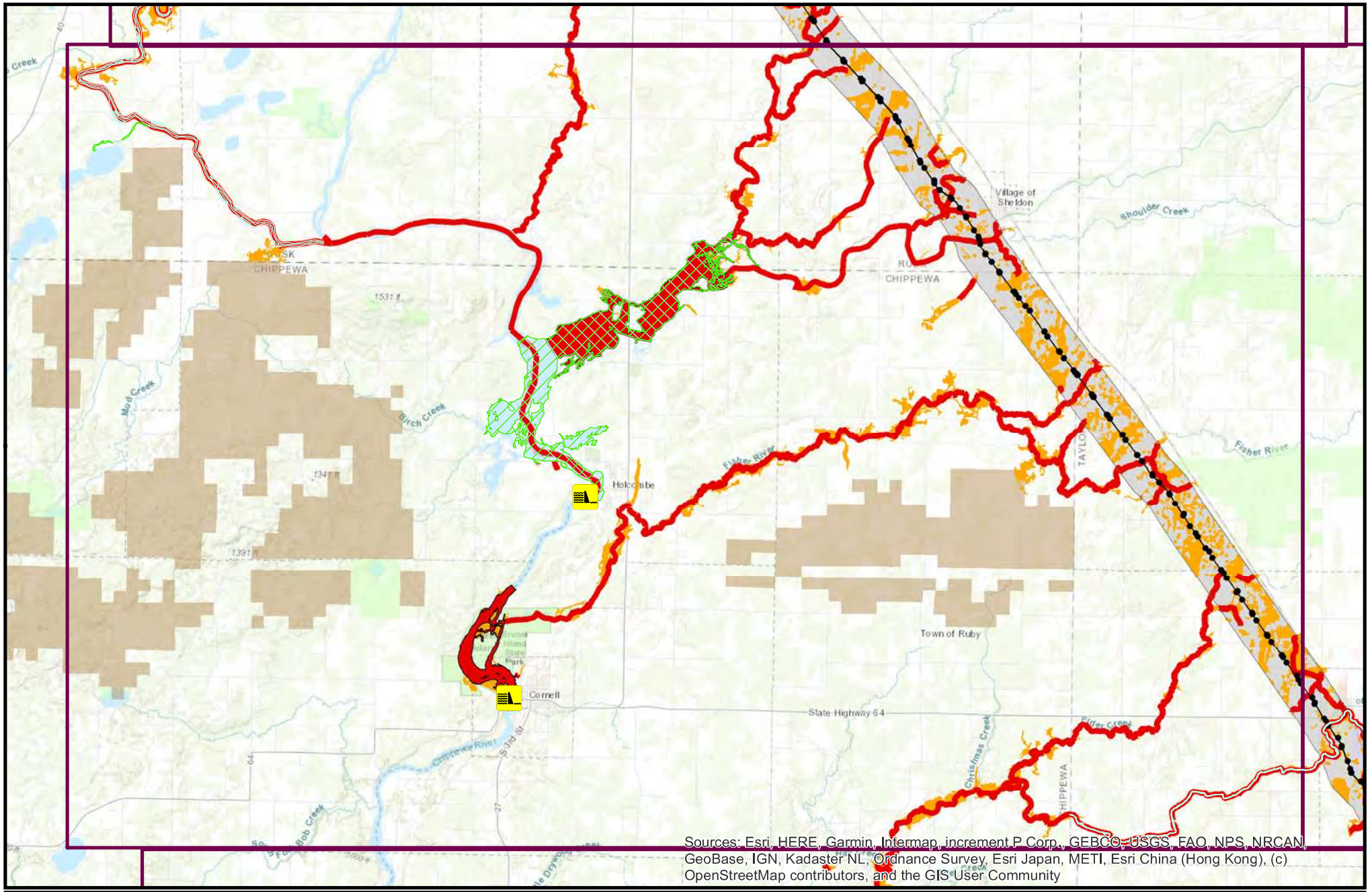

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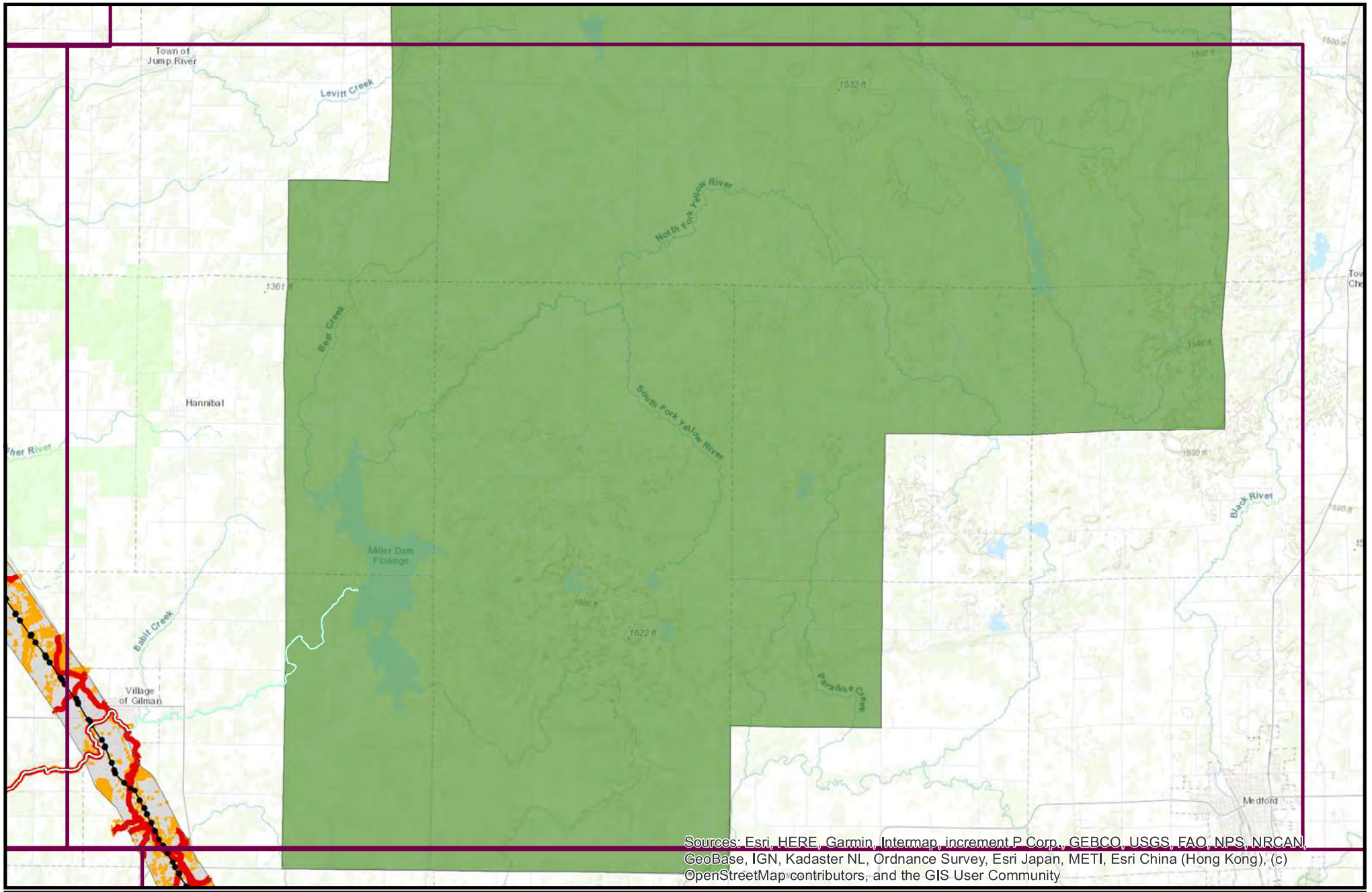

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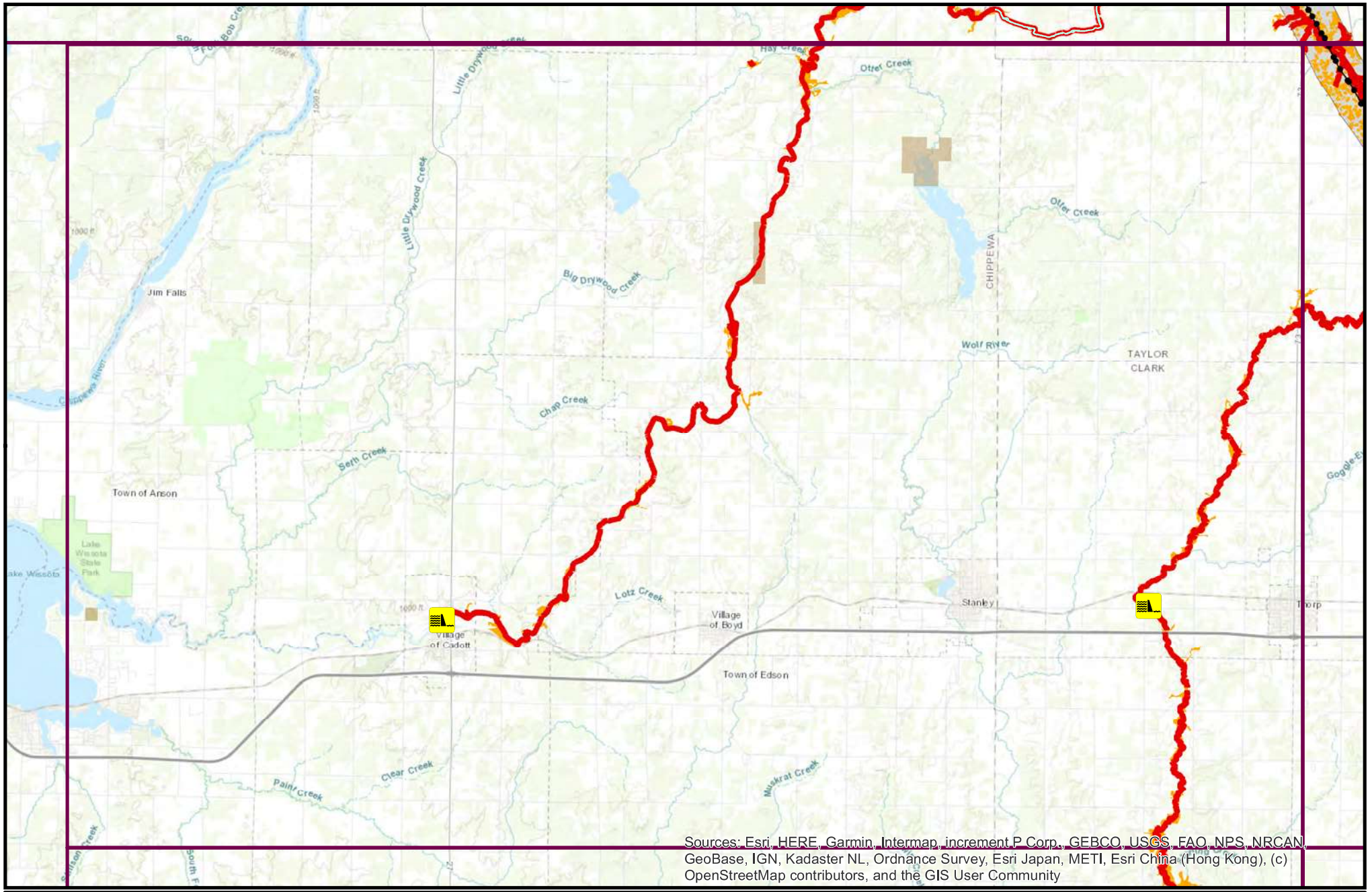

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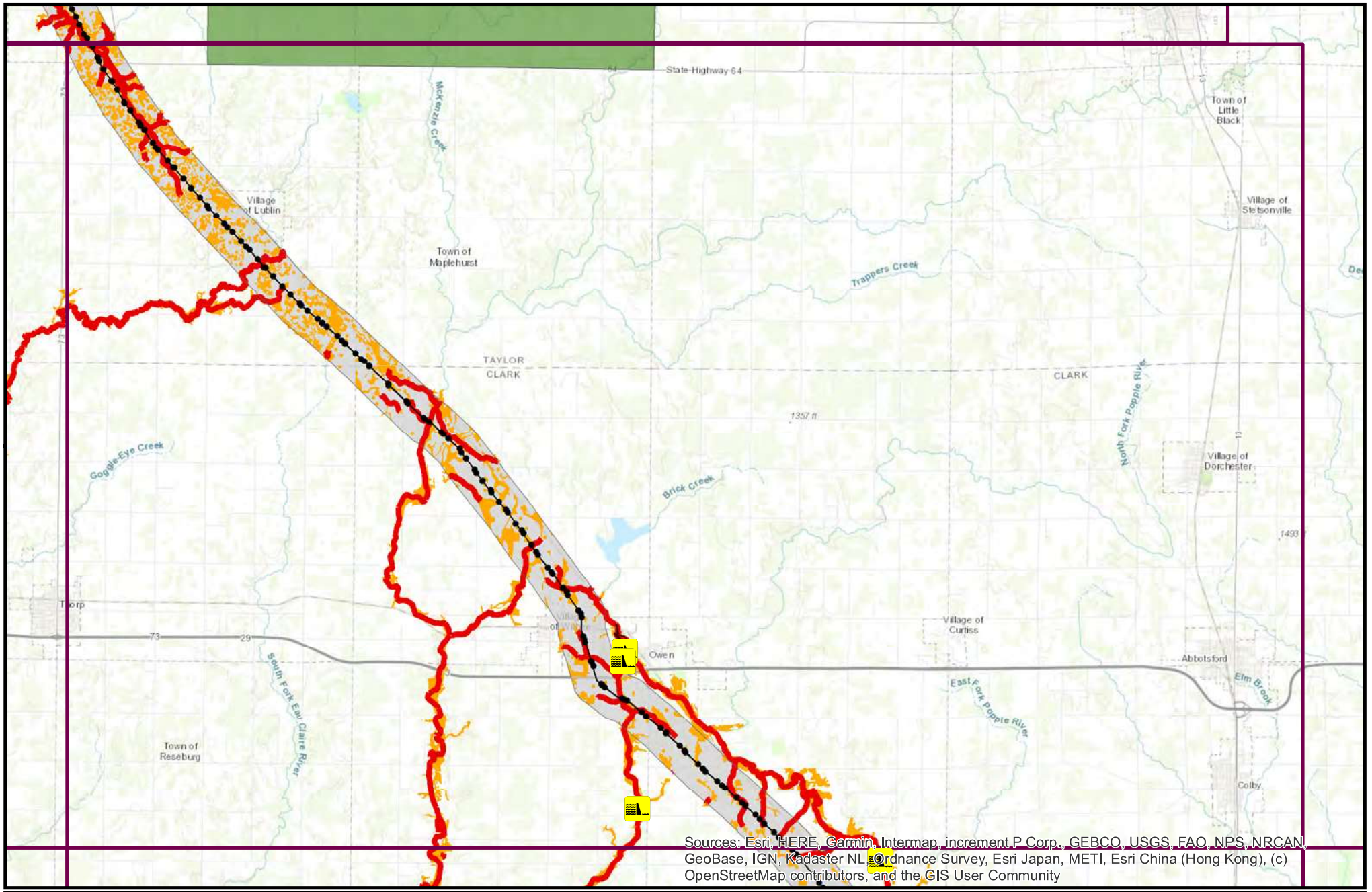

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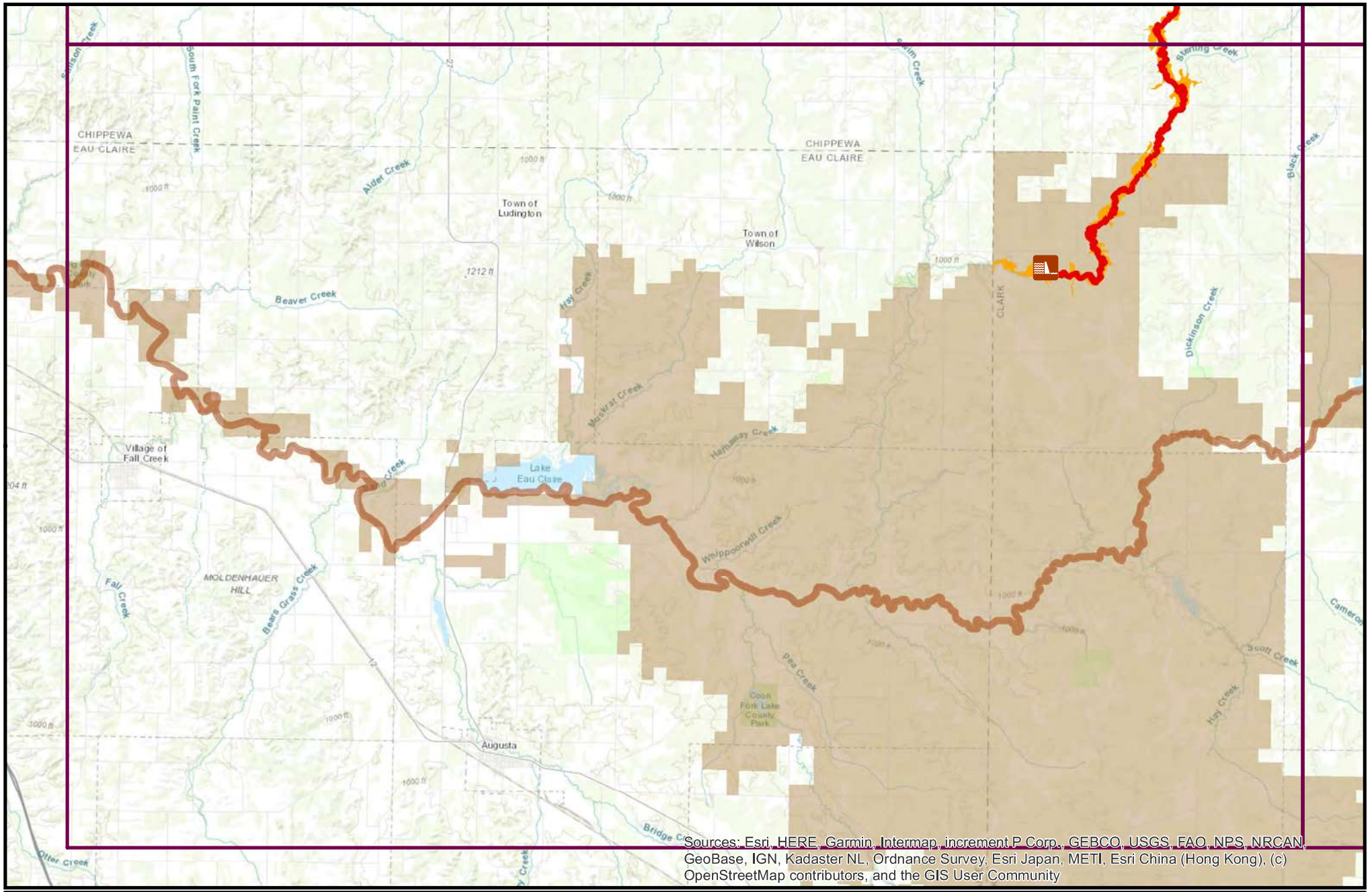

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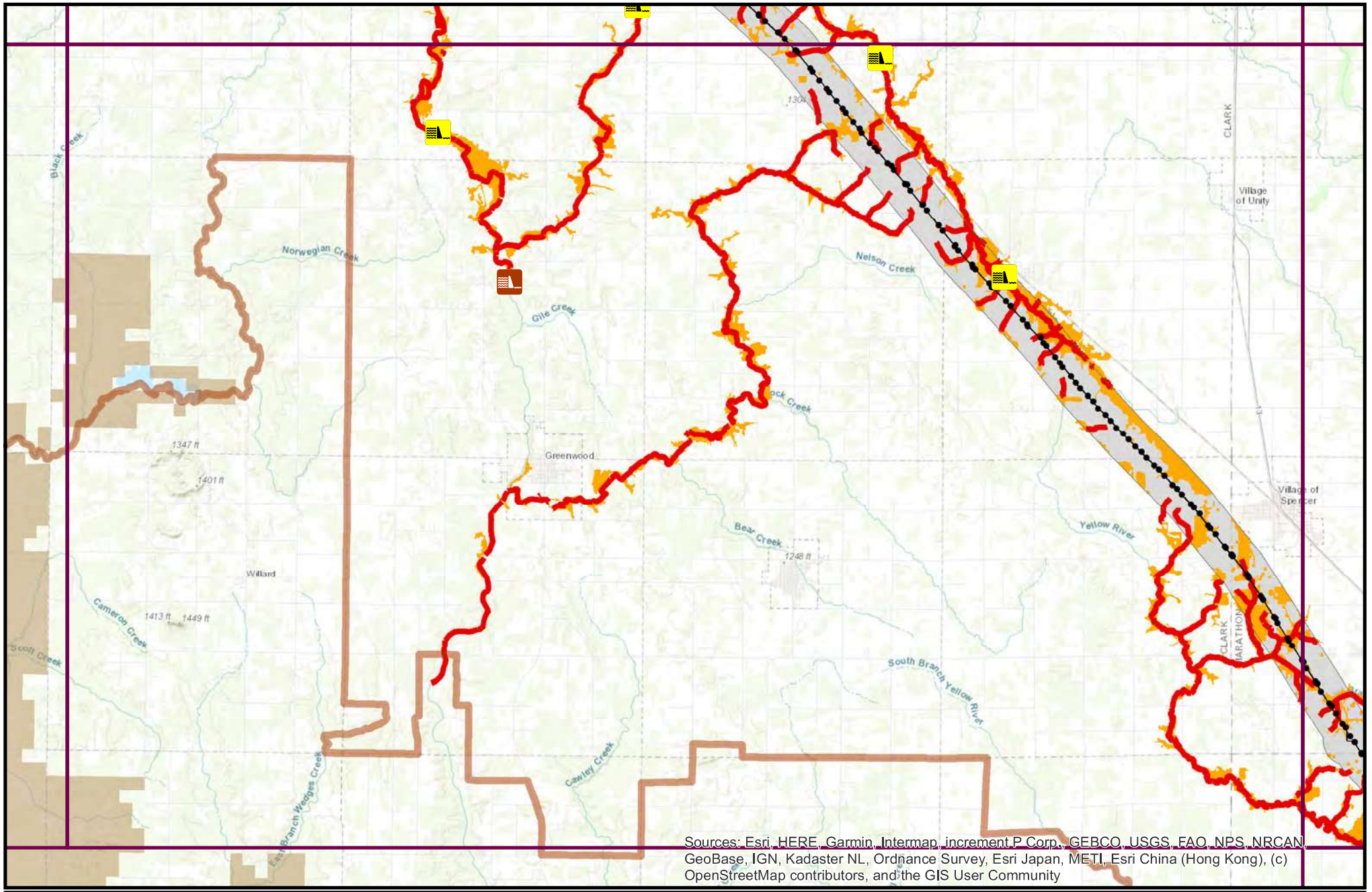

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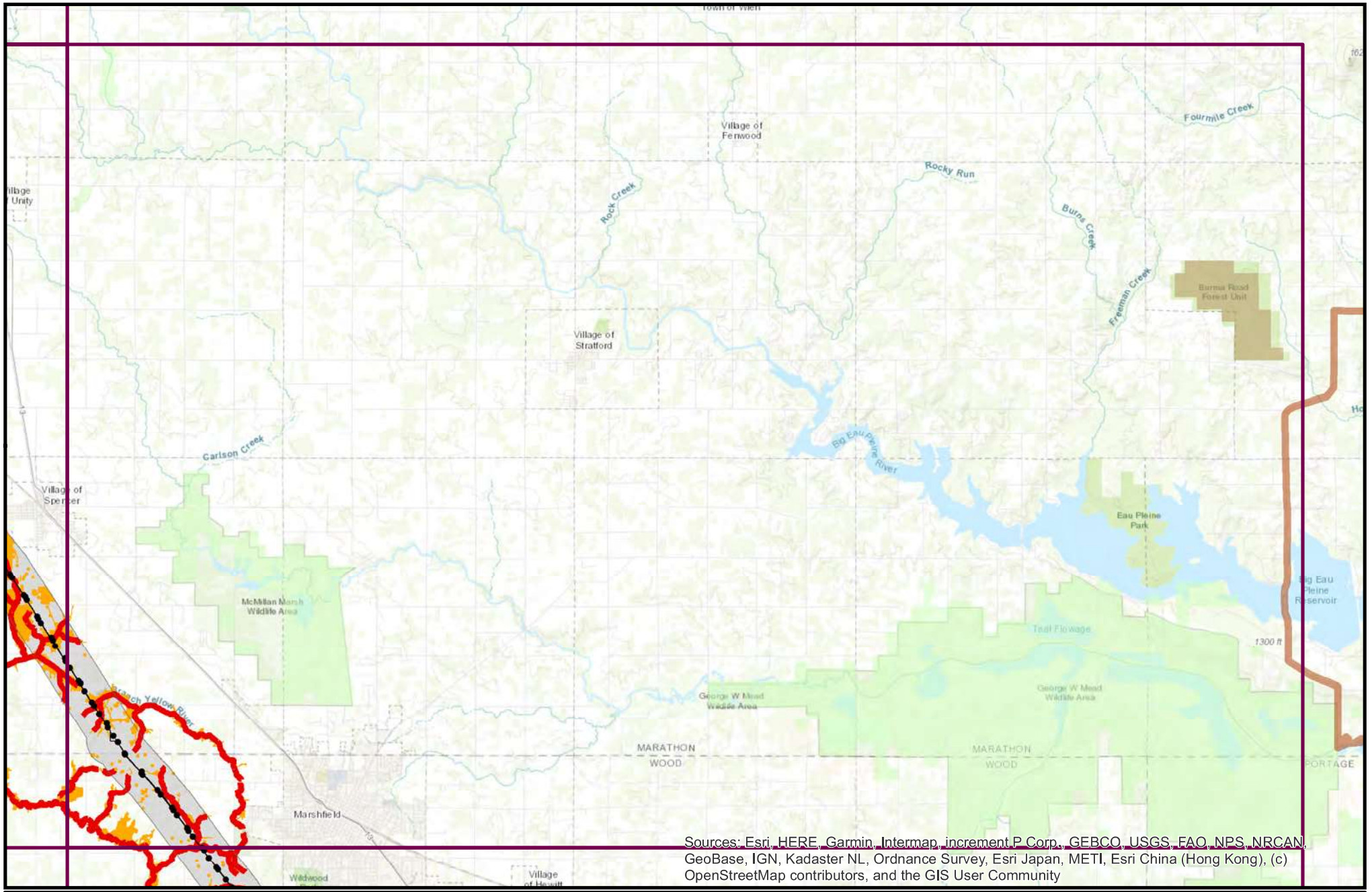

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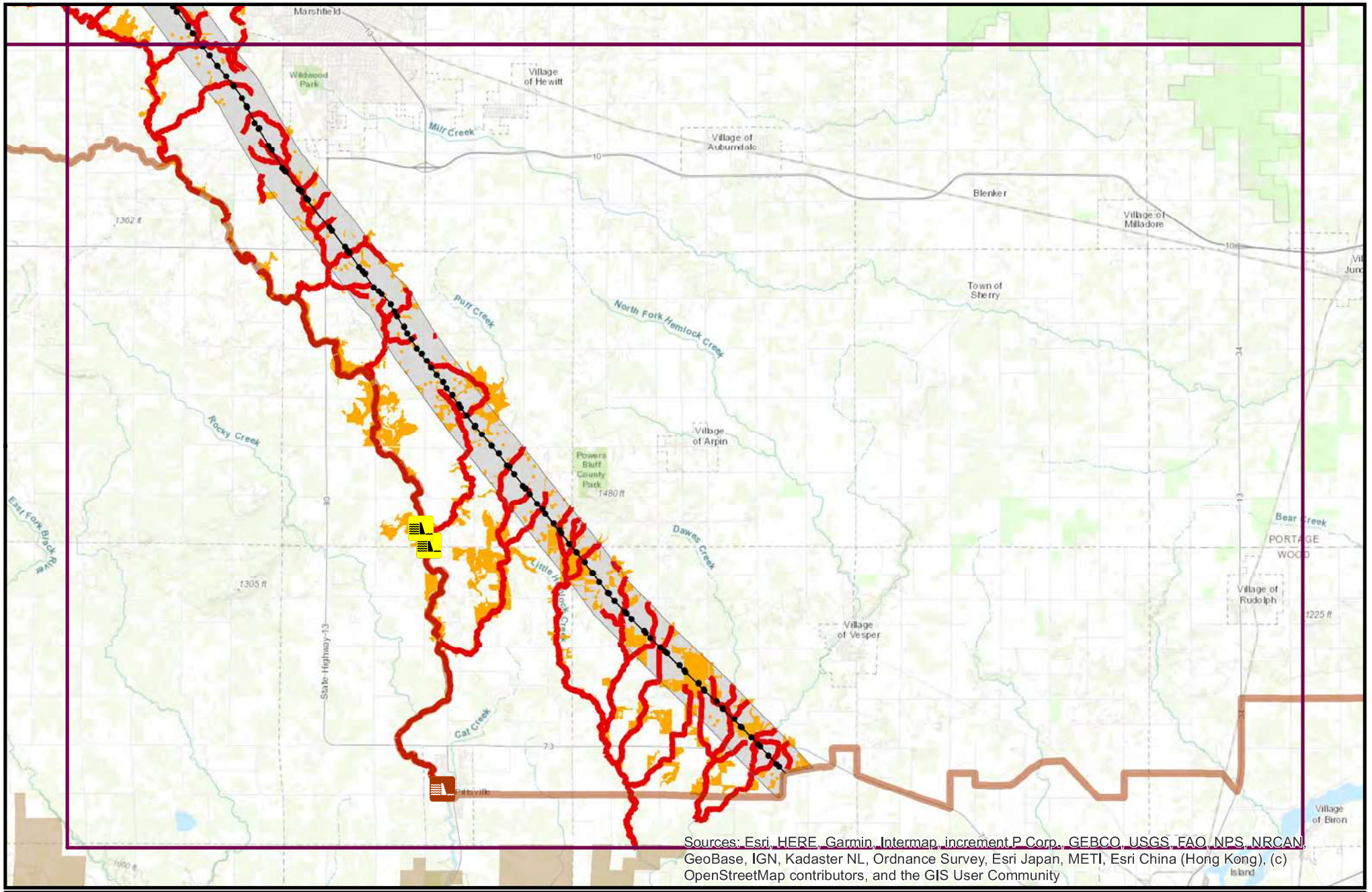

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MNRD THREATENED AND ENDANGERED SPECIES REPORT

ATTACHMENT 3

Section 3.1 - Assessment of Cumulative Environmental Risk for Crude Oil and Natural Gas Transmission Pipelines in the Ceded Territories

The network of pipelines that cross the ceded territories has not been assessed for combined environmental impacts. The purpose of this section is to provide information for GLIFWC's work of protecting habitats that are necessary for treaty protected natural resource harvests. The cumulative risk characterization is also important for the Forest Service's decision on the renewal of the special use authorization for the section of Line 5 that crosses the Chequamegon Nicolet National Forest because this permitting decision affects the broader pipeline network. Thus, potential cumulative risks should be considered. As described in the cumulative impact section, the construction and excavation of the right-of-way filled wetlands, altered vegetation, streambanks, soils and contributed to changes in land use. In addition to these impacts, the continued presence and operation of crude oil and natural gas pipelines means that the likelihood of spills and/or explosions at any point along a pipeline continues to exist.

Risk of a Pipeline Incident

The specific risk of a spill or explosion for any single pipeline is difficult to determine because that calculation depends on a large number of variables (e.g., subsurface stress, maintenance, chemical degradation). However, a general estimate of potential release risk may be made by considering the recent history of releases from crude oil pipelines within the United States. The following analysis was developed by the U.S. Forest Service (Appendix 3.1-A).

Information on crude oil pipelines operating within the Unites States from 2004 to 2017 was obtained from the Pipeline and Hazardous Materials Safety Administration (PHMSA) website (https://www.phmsa.dot.gov/). An average of 42,517 barrels of crude oil was released per year from all incidents with an average unrecovered volume of 11,820 barrels or 29%. This equates to a minimum average volume of 228 barrels released and 64 barrels unrecovered per incident. To better understand the risk in terms of the range of potential spills volumes and volumes recovered and not recovered additional available data on individual crude oil spill incidences was downloaded from the PHMSA website for the years 2010 to 2018. This information was narrowed down to attempt to identify those that represented actual onshore crude oil pipeline spills by restricting them to incidences involving onshore pipelines. It was further narrowed down by screening out causes identified as equipment failure (non-pipeline) or incorrect operation as these indicate spills that likely are not due to failure of the pipeline. The data does include valve sites as it did not allow differentiation between spills involving valves and the pipeline.

The average annual number of reported crude oil pipeline system incidents and the number of crude oil pipeline miles from 2007 to 2017 were used to estimate an upper end of potential release risk by assuming all incidents resulted in releases. It should also be noted that incidents include both pipelines and pipeline-associated facilities. This constitutes an annual average of one release incident per 318 miles of pipeline, or, alternatively, as much as 0.0032 incidents per mile of pipeline per year. Based on past crude oil pipeline incidents, the 1,277

miles of crude oil pipeline in the ceded territories can expect approximately 4 crude oil pipeline incidents every year. As explained in Appendix 3.1-A, this is considered an upper end estimate.

Because that pipeline spills and explosion incidents have occurred, it is reasonable to assume that they will occur again as long as the pipelines remain operational. The following analysis identifies natural resources that lie within the hazard zone of crude oil and natural gas transmission pipelines and provides an assessment of the cumulative risk of spills and explosions to those resources and to tribal use of those resources. In general, the analysis follows methods detailed in an Environmental Protection Agency guidance document titled "Applying Cumulative Impact Analysis Tools to Tribes and Tribal Lands" (Appendix 3.1-B). The analysis is based on spatial relationships of geographic features, meaning that any natural feature (e.g., lake, river, species) that intersects a pre-defined pipeline hazard zone is considered at risk of being impacted by a spill and/or explosion event.

Scale of Cumulative Environmental Risk Analysis

The scale may be the most important factor in an analysis of cumulative environmental risk. An analysis with a scale that is too small will potentially miss impacts that may be important to quantify when developing results or conclusions. Conversely, a scale that is too large will potentially provide information that is unrelated to the project under analysis. As detailed in Appendix 3.1-B, the following considerations were used to define the scale of the cumulative environmental risk analysis:

1. The ceded territories where Ojibwe Tribes have reserved usufructuary rights.
2. Resources that may be impacted. The areas are defined by the hazard zone, but it should be noted that different resources will have hazard zones of different sizes. For example, the hazard zone for rivers will be larger than the hazard zone for vegetation because oil can travel greater distances in water than over land.
3. The analysis is conducted from a cultural and natural resource point of view and is not defined or limited by the management or regulatory interests of any agency. Even though the Forest Service is only considering a permitting decision on approximately 11 miles of Line 5 that runs through the Chequamegon Nicolet National Forest, the oil and gas transmission network covers a greater area. The entire network presents a risk to the ceded territories that cannot be separated from the permit area in question.

An analysis of natural resources potentially affected by releases along oil and gas transmission lines is presented at three scales.

1. The 1836, 1837, 1842, and 1854 ceded territories. A comprehensive accounting of oil and natural gas pipeline related risks to treaty reserved resources in the ceded territories of GLIFWC's member tribes does not exist. This analysis scale is needed in order to understand the implications of permitting decisions to tribes.
2. National Forest Lands. The focus of this analysis is to provide information directly related to the decision about re-authorizing the easement for the section of Line 5 that crosses the Chequamegon Nicolet, Ottawa and Hiawatha National Forests.

3. The Line 5 crude oil pipeline. This pipeline is different from other pipelines when it comes to its environmental risk. Characterizing those differences is important given the permitting decision mentioned above.

Crude Oil Pipeline Hazard Zone

The hazard zone for spilled oil is a combination of land and aquatic hazard zones. The land hazard zone for spills at crude oil pipelines is defined as 2,500 feet from the pipeline for a total corridor width of 5,000 feet. This distance is based on spill and explosion hazards. For oil spills, the hazard zone is calculated by adding the distance that spilled oil would typically travel over flat ground (1,214 feet from the pipeline) with an additional distance of 1,050 feet for estimated migration in groundwater. The combined distance of 2,264 feet on either side of the center line is rounded to 2,500 feet. This method was chosen after a review of existing information, particularly the Final Environmental Impact Statement for the Line 3 Replacement Project in Minnesota (MDOC, 2018). The crude oil pipeline hazard zone in the ceded territories is 423,080 acres.

The aquatic hazard zone is added to the land hazard zone because crude oil can be highly mobile in water (Hollebone, 2017). For rivers that intersect the pipeline and the land hazard zone it is assumed that the entire stretch of river could be impacted by oil up to and including any lakes that the river flows into. The presence of two dams in a potentially impacted river are considered sufficient to stop downstream oil flow. The entire area of lakes that intersect the land hazard zone and potentially impacted rivers are considered potentially impacted. Finally, all sections of wetlands that intersect the land hazard zone and border potentially impacted rivers or lakes, are considered as potentially impacted by spilled oil.

The explosion hazard zone is derived from the evacuation distance for oil spill (300 meters or 984 feet) and fire (800 meters or 2,625 feet) listed in the Enbridge Energy Field Emergency Response Plan for the Lake Superior Region (Enbridge, 2017). A distance of 2,500 feet on either side of the center line was selected to match the land and aquatic hazard zones described above. It is important to note that the explosion hazard zone does not include areas potentially affected by air quality impacts from (e.g. smoke). The spatial extent of this type of impact is dependent on many site-specific factors and cannot be characterized in this analysis.

Natural Gas Pipeline Hazard Zone

The primary hazards associated with natural gas transmission pipelines are explosion and fire. The blast radius or evacuation zone is the distance from the pipeline that fire damage can be expected to occur. It is also the distance beyond which people would need to move in order to avoid burns or respiratory injuries in the event of a pipeline explosion. This distance is calculated based on the diameter of the pipe and the pressure at which natural gas is transported (Figure 3.1.1). In the ceded territories, PHMSA data indicates that diameters of natural gas pipelines range from 4 to 42 inches. Information on transportation pressure is not available. Given that operating pressures of pipelines can be increased by an operator and pipelines can be upgraded to increase capacity, a blast radius of 3,500 feet was used to represent the evacuation zone. This

distance would be an appropriate evacuation zone for the majority of natural gas pipeline incidents in the ceded territory (Figure 3.1.2).

Recommended Minimum Evacuation Distances
For
Natural Gas Pipeline Leaks and Ruptures
(Not applicable for Butane, Propane, or other Hazardous Liquids)

Pressure (psig) \ Pipeline Size (inches)	4	6	8	10	12	16	20	22	24	30	36	42
100	91	137	182	228	274	365	456	502	547	684	821	958
200	129	193	258	322	387	516	645	709	774	967	1161	1354
300	158	237	316	395	474	632	790	869	948	1185	1422	1659
400	182	274	365	456	547	730	912	1003	1094	1368	1642	1915
500	204	306	408	510	612	816	1020	1122	1224	1529	1835	2141
600	223	335	447	558	670	894	1117	1229	1340	1675	2011	2346
700	241	362	483	603	724	965	1206	1327	1448	1810	2172	2534
800	258	387	516	645	774	1032	1290	1419	1548	1935	2322	2709
900	274	410	547	684	821	1094	1368	1505	1642	2052	2462	2873
1000	288	433	577	721	865	1154	1442	1586	1730	2163	2596	3028
1100	302	454	605	756	907	1210	1512	1664	1815	2269	2722	3176
1200	316	474	632	790	948	1264	1580	1738	1896	2369	2843	3317
1300	329	493	658	822	986	1315	1644	1809	1973	2466	2959	3453
1400	341	512	682	853	1024	1365	1706	1877	2047	2559	3071	3583
1500	353	530	706	883	1060	1413	1766	1943	2119	2649	3179	3709
1600	365	547	730	912	1094	1459	1824	2006	2189	2736	3283	3830
1700	376	564	752	940	1128	1504	1880	2068	2256	2820	3384	3948
1800	387	580	774	967	1161	1548	1935	2128	2322	2902	3482	4063
1900	398	596	795	994	1193	1590	1988	2186	2385	2981	3578	4174
2000	408	612	816	1020	1224	1631	2039	2243	2447	3059	3671	4283
2100	418	627	836	1045	1254	1672	2090	2299	2508	3134	3761	4388
2200	428	642	856	1069	1283	1711	2139	2353	2567	3208	3850	4492

Figure 3.1.1 - Minimum evacuation distances for natural gas pipelines (NTSB, 2015)

Within the evacuation zone, the analysis also includes a high consequence zone. This is an area where damage from a natural gas pipeline explosion is expected to be catastrophic and there is a high risk of death to people and wildlife. Based on available model data (Figure 3.1.2), the high consequence area for this analysis is a radius of 1,100 feet on either side of a natural gas pipeline (Stevens, 2000).

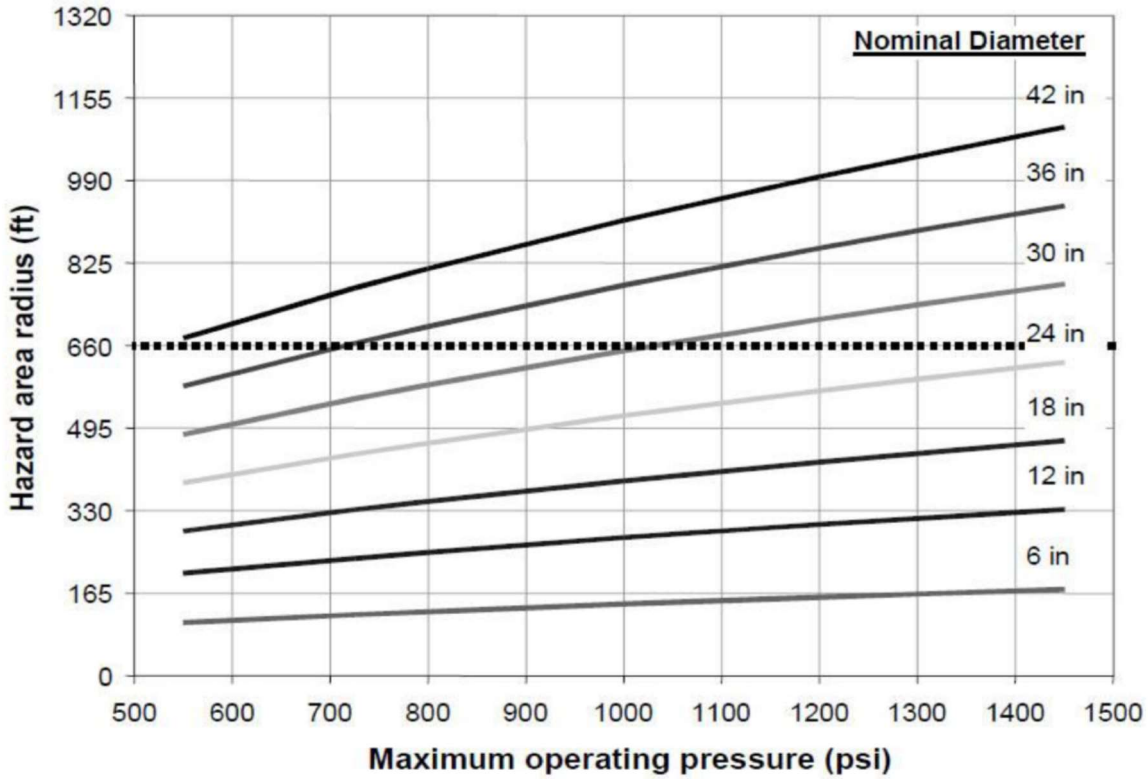

Figure 3.1.2 - Model curves for sizing high consequence areas (Stevens, 2000).

Risk to Human Health

Oil spills and explosions can affect human health through direct skin contact, inhalation, or ingestion of crude oil and gaseous byproducts. The Enbridge Line 6B spill in the area of Marshall, Michigan, involved public health responses to air quality, surface water and fish, and possible groundwater impacts (Michigan Department of Community Health, 2015). Public health was of concern because 40,000 people lived within a mile of the affected release area. Though no residents were located in the area with the highest impacts on air, nearby residences did relocate as a result of odors. An evacuation of the Notawaseppi Huron Band of the Potawatomi was ordered because of concerns of possible explosion. The resulting damage is still affecting the environment and the tribe almost 10 years later. Loss of life related to pipeline incidents can involve pipeline company employees and the general public (MDOC, 2018). Repair of an Enbridge pipeline near Clearbrook, Minnesota, resulted in the deaths of two pipeline workers in 2010 when leaking oil ignited (Duluth News Tribune, 2010). People are known to use the Line 5 pipeline right-of-way and tribal members engage in treaty harvest activities in the vicinity. The presence of the pipeline presents some level of risk in the spill and explosion impact areas.

Figure 3.1.3 - Explosion at an Enbridge natural gas pipeline that impacted the Lheidli T'enneh First Nation in British Columbia, Canada (https://globalnews.ca/news/4531677/prince-george-fire-evacuation/)

Risk at Ceded Territory and National Forest Scales

The Ceded Territory has 1,277 miles of crude oil pipelines and 6,460 miles of natural gas transmission pipelines. Oil pipelines are located in three right-of-way corridors that converge on the Enbridge Terminal in Superior Wisconsin. Natural gas transmission pipelines are widely distributed throughout the Ceded Territory (Figure 3.1.4).

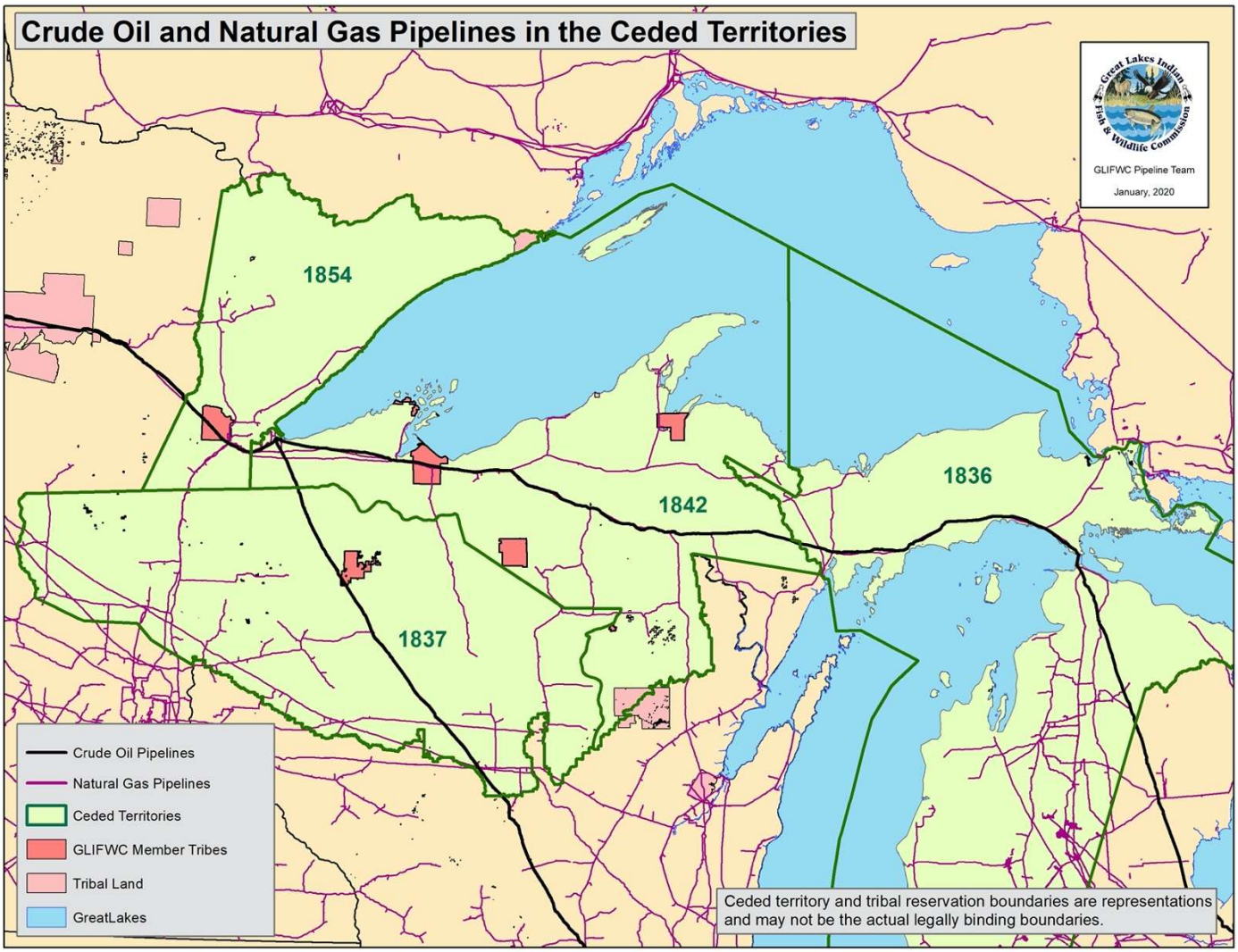

Figure 3.1.4. Crude oil and natural gas pipelines in the 1836, 1837, 1842, and 1854 ceded territories.

Crude Oil Spill Risk – Aquatic Environments

Oil released into aquatic environments is difficult to recover in large quantities because water surface and weather conditions must be sufficiently calm to permit recovery equipment to function well and for response personnel to safely operate the equipment (International Tanker Owners Pollution Federation Limited, 2016). Oil spilled into surface waterbodies generally floats initially and is transported by winds and currents depending on the waterbody type and

conditions during the spill. Spills tend to spread shorter distances in standing water such as lakes and ponds with minimal currents. However, wind can increase oil dispersal in those surface waters. Currents in streams and rivers transport oil downstream, and thus impacts are likely to occur over greater areas than in lakes or ponds. The Saskatchewan River spill of 2016 had oiling impacts up to 217 miles downstream of where oil entered the river. The distance that spilled oil travels in flowing water can be considerable (Hollebone, 2017) and the specific morphology and flow of a stream will determine downgradient oil impacts. In larger, fast-moving rivers and creeks, oil would be quickly dispersed downstream with the flow of the river, while in smaller flowing streams and backwater eddies an oil spill could have a more localized effect on the water column and surrounding habitat due to the lower relative volume and rate of water flow.

Figure 3.1.5 - Impacts to the river and riparian wetlands from the Kalamazoo oil spill (Photo courtesy of the USEPA Region 5).

Wetlands, including marshes, swamps, peat bogs, and fens, are particularly sensitive to oil spills. In wetlands, small areas of shallow water, finer sediments with high organic content, greater vegetation cover, and high biochemical oxygen demand (leading to anaerobic conditions) would affect the dispersion and weathering of spilled crude oil. Oil spilled into wetlands could be widely dispersed by wind or water movement and would typically become stranded on fine sediments or vegetation. In this case, oil would not likely travel as far as it would in open water. Transport out of a wetland may occur via small stream discharge points. If the spilled oil becomes entrained within anaerobic sediments, the rate of biodegradation may be significantly reduced (Boufadel et al. 2015).

The fate and transport of crude oil in groundwater is a complex process. The USGS has been conducting research into this topic at the site of a Enbridge pipeline crude oil spill in Bemidji, Minnesota. The spill occurred from a ruptured pipeline that released approximately 10,700 barrels of oil. After recovery efforts, including a pump and treat system, it is estimated that approximately 2,000 barrels remain underground. Continued research at the USGS Bemidji research lab has shown that when spilled oil enters the groundwater system, biological activity is minimal, and the oil can be expected to remain in the aquifer for decades. Furthermore, contaminants such as benzene, toluene, ethylbenzene, xylene (BTEX), and polycyclic aromatic hydrocarbons (PAHs) are commonly present in groundwater plumes from crude oil. (https://www.usgs.gov/mission-areas/environmental-health/science/us-geological-survey-identifies-crude-oil-metabolites?qt-science_center_objects=0#qt-science_center_objects). The behavior of the groundwater oil plume at the Bemidji, MN site has been relatively stable over time and biodegradation of oil is extremely slow. Revesz et al. (1995) calculated that the minimum life expectancy of the release was 110 years. However, they stated that this was an order of magnitude estimate due to expectations that calculated degradation rates used for the estimate would actually be slower in the future. It is unclear if the oil in groundwater will attenuate in the foreseeable future.

Freshwater fish are important components of aquatic ecosystems and food webs, as well as major economic resources in recreation and commercial fishing industries. Fish can be affected by oil releases through multiple exposure pathways and at multiple life stages, and the toxicity effects can be either acute, chronic, or indirectly related to contamination of habitat features (Enbridge 2016d). The Marshall, Michigan, spill resulted in 42 dead fish immediately after the spill, which was considered negligible (USFWS 2015). Though scientists and local officials debated the exact cause, roughly 100 dead fish were found following the crude oil release to Wabamun Lake (Birtwell 2008). The Pine River, Missouri spill resulted in 1,637 observed dead fish immediately following the spill. These fish tended to be larger, bottom-feeding fish, with a small proportion (<15 percent) being surface feeders. Fish mortality was noted up to 30 miles downstream of the release. Longer term effects of spills include habitat degradation and sublethal effects, including deformities. Longer term effects of the Marshall spill included declines in abundance and diversity of fish in Talmadge Creek in the year following the release. Recovery occurred shortly thereafter, but changes in fish community composition also occurred in response to habitat changes in the following three years (USFWS et al. 2015). Sublethal effects on fish were present for 27 miles downstream of the release site, as revealed by a fish health study two months following the spill (Papoulias et al. 2014). Fish consumption advisories were issued for two years as a result of crude oil exposure. In Wabamun Lake, important juvenile and spawning habitat for various species was significantly affected by oil contamination, and in the two years following the spill, increases in fish deformities were attributed to the spill.

The Pine River spill also impacted benthic organisms. Immediately following the spill event, benthic populations within the affected area were 0.1 percent of typical populations, with a complete loss of mayfly and stonefly species. By 9 months following the release, the mayfly and stonefly populations had recovered to levels observed in unaffected areas upstream of the spill (Crunkilton and Duchrow 1990). By 18 months, the mayfly and stonefly populations had recovered to levels observed in healthy Missouri streams. In a similar 18-month timeframe at a

separate Missouri pipeline spill (Gasconade River, 1988, intermediate weight sweet crude), macroinvertebrate communities had not fully recovered in their diversity and abundance due to residual hydrocarbon contamination, which was particularly concentrated in sloughs (Poulton et al. 1997). Greater recovery had occurred in riffle habitats where more frequent bed scour helped to flush oil contamination from sediments.

Numerous bird species spend their time near or within waterbodies and can be highly susceptible to oil spill impacts. The Marshall, Michigan, spill affected roughly 400 birds, 52 of which died shortly after the spill (USFWS et al. 2015). An additional 144 birds affected by released oil were captured and rehabilitated, and roughly 140 birds were observed with oil effects but were not captured. Affected birds were generally waterfowl, including Canada geese, mallard ducks, and great blue herons. For comparison, of the birds affected by the Rainbow Pipeline release, approximately one-third were waterfowl and two-thirds were shorebirds and songbirds. The explosion of the Husky refinery in Superior Wisconsin also impacted birds. EPA reports indicate that 3 grackles, 3 robins, 1 starling, 1 American bittern, 2 geese, 1 redwing blackbird, and 4 unidentified birds were killed as a result of oiling. In addition, 9 geese (5 adults and 4 goslings), 3 mallards, 3 killdeer (1 adult and 2 chicks), and 1 robin were cleaned and released back into the environment. Finally, 30 adult geese and 63 goslings had to be relocated from the impacted area. It should be noted that the wildlife survey occurred several days after the explosion so these numbers of impacted birds are likely a fraction of the total impact.

Figure 3.1.6 - Great Blue Heron oiled during the Enbridge pipeline spill in Marshall Michigan (Photo courtesy of the Michigan Department of Environment, Great Lakes, and Energy EGLE).

Reptiles and amphibians are particularly vulnerable to oil spills. In the event of an oil spill, an external oil coating of skin or scales in amphibians and reptiles can lead to reduced thermoregulatory capacity and suffocation in amphibians. Amphibians may absorb toxins from oil through their skin. Exposure to toxins that occurs during egg formation in reptiles and amphibians can lead to reduced productivity and teratogenic effects. Reptiles, such as turtles,

may be more susceptible to carcinogenic effects of PAHs compared to shorter-lived animals (Burns et al. 2014). The timing of a spill is important for impacts to reptiles and amphibians. Spills in winter over ice may cause fewer impacts to reptiles and amphibians. However, spills that occur in warm periods of the year are disastrous to these animals. The Marshall, Michigan spill occurred at a time of receding flood flows in the Kalamazoo River. As a result, oil was distributed into and trapped within floodplain depressions, resulting in a substantial effect on amphibians and reptiles. Over 100 reptiles died, and nearly 4,000 turtles and 73 amphibians were captured and treated for oil effects (USFWS et al. 2015).

Figure 3.1.7 - Painted turtle oiled during the Kalamazoo oil spill (photo courtesy of EGLE).

Semi-aquatic mammals are those specially adapted to live near water and inhabit aquatic environments. While most mammals are terrestrial, the semi-aquatic variety are generally most prone to impacts from oil spills (Enbridge 2016d). The Marshall, Michigan spill reportedly killed 40 mammals, and an additional 23 were captured and rehabilitated, though it was expected that additional mammals were affected but not observed during monitoring efforts (USFWS et al. 2015). Of the affected mammals, the primary species included muskrat (45 percent), raccoon (13 percent), and beaver (13 percent). Oil spilled as a result of the 2018 refinery explosion in Superior, Wisconsin is known to have impacted water voles in the vicinity of the explosion.

Rivers and Streams

There are 4,335 river miles at risk of oiling impacts from a crude oil pipeline spill in the ceded territory. Table 3.1.1 contains an additional breakdown of miles of river at risk within National Forests and tribal reservations. Rivers and streams at risk of impacts from crude oil pipeline spills are illustrated in figure 3.1.8 and in greater detail in the spill mapbook.

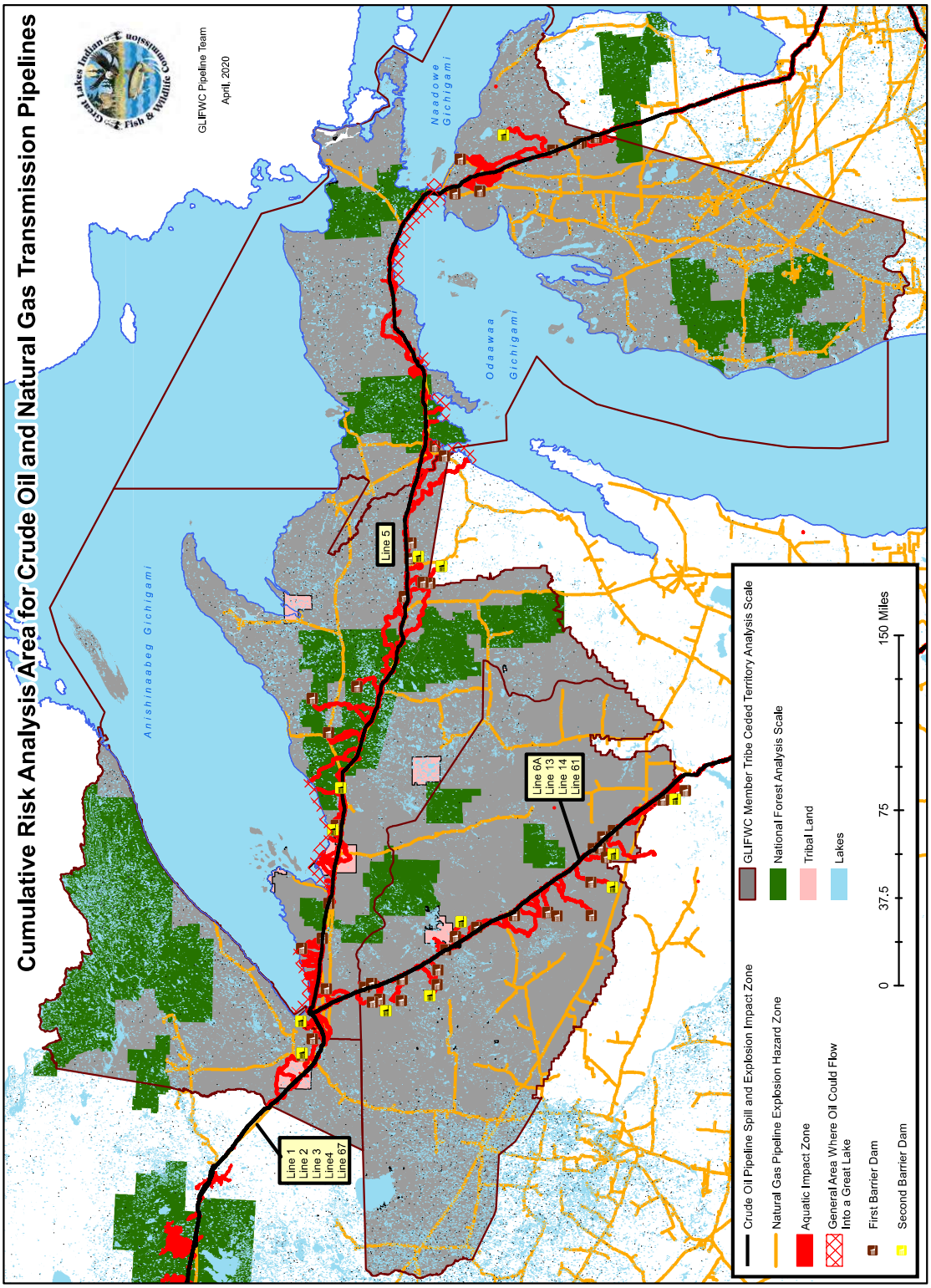

Figure 3.1.8 - Rivers and streams in the ceded territory at risk from crude oil pipeline spills.

Table 3.1.1 - Miles of rivers and streams at risk from crude oil pipeline spills

Rivers and Streams at Risk from Crude Oil Pipeline Spills		
		Miles
Ceded Territory		4,335
Fond Du Lac Reservation		74
Bad River Reservation		155
Lac Courte Oreilles Reservation		30
Chequamegon - Nicolet National Forest		37
Ottawa National Forest		444
Hiawatha National Forest		159

Seven river segments that are available for tribal spearing harvest are at risk from crude oil pipeline spills. These rivers are listed in table 3.1.2 and illustrated in the spill mapbook.

Table 3.1.2 River segments available for tribal spearing harvest at risk from crude oil pipeline spills.

County	**Lake/Slough**
Chippewa, Rusk	Holcombe Flowage
Ashland	Unnamed (Northeast) Slough
Ashland	Wood Creek Slough
Ashland	Bad River Sloughs
Ashland	Honest John Lake
Washburn	Trego Flowage
Douglas	St.Croix (Gordon) Flowage
Douglas, Washburn	Minong Flowage
Douglas	Upper Saint Croix Lake
Douglas	Allouez Bay
Gogebic	Slate River Slough

Eight rivers with known manoomin (wild rice) presence are at risk from crude oil pipeline spills. These rivers are listed in table 3.1.3 and illustrated in the spill mapbook.

Table 3.1.3 - Rivers with known manoomin presence at risk from crude oil pipeline spills.

County	River Name
Burnett, Douglas, Polk	St Croix River
Rusk	Rice Creek
Douglas	St. Louis River
Douglas, Washburn	Totogatic River
Ashland	Kakagon River
Ashland	Beartrap Creek
Douglas	Pokegama River/Bay
Gogebic	Ontonagon River

Lakes

There are 1,013 ceded territory lakes with 101,202 acres of open water that are at risk of oiling impacts due to a crude oil pipeline spill. Table 3.1.4 contains additional breakdown of acres of lakes at risk from crude oil pipeline spills within National Forests and Tribal Reservations. Lakes at risk of impacts from crude oil pipeline spills are illustrated in figure # and in greater detail in the spill mapbook.

Table 3.1.4 - Acres of open water lakes at risk of crude oil pipeline spills that are located within Tribal Reservations and the proclaimed boundaries of National Forests.

Lakes at Risk from Crude Oil Pipeline Spills			
		Lakes	Acres
Ceded Territory		553	97,262
Fond Du Lac Reservation		13	693
Bad River Reservation		8	287
Lac Courte Oreilles Reservation		1	5140
Chequamegon - Nicolet National Forest		6	108
Ottawa National Forest		120	16,424
Hiawatha National Forest		86	13,399

Crude oil spills originating from several oil pipelines, including Line 3 and Line 5, have the potential to impact the St. Louis River Estuary as well as the Lake Superior National Estuarine Research Reserve (NERR). This protected area is one of only two freshwater estuaries in the Great Lakes. The NERR includes the world's largest freshwater bay mouth sandbar and rare estuarine wetlands. It is also an area of great cultural significance to the Ojibwe tribes. The estuary itself encompasses 11,197 acres of open water and the NERR protects almost 17,000 acres of land. The risk of crude oil spills to the estuary and the NERR are depicted on page 3 of the spill mapbook.

Seventeen lakes that GLIFWC member tribes have declared for walleye fishing are at risk from crude oil pipeline spills. These lakes are listed in table 3.1.5 and illustrated in the spill mapbook.

Table 3.1.5 - Lakes declared for walleye spearing at risk from crude oil pipeline spills.

County	Lake
Chippewa	Holcombe Flowage
Rusk	Thornapple Flowage
Sawyer	Lac Courte Oreilles
Sawyer	Whitefish Lake
Sawyer	Sand Lake
Washburn	Minong Flowage
Gogebic	Lake Gogebic *
Washburn	Trego Lake
Douglas	Upper St. Croix Lake
Bayfield	Bladder Lake **
Iron	Peavy Pond
Iron	Sunset Lake
Iron	Emily Lake
Iron	Paint Pond
Iron	Tamarack Lake *
Ontonagon	Bond Falls Flowage *
Ontonagon	Victoria Pond *

Eleven lakes and sloughs with known wild rice presence are at risk from crude oil pipeline spills. These waters are listed in table 3.1.6 and illustrated in the spill mapbook.

Table 3.1.6 - Known manoomin waters at risk from crude oil pipeline spills.

County	Lake/Slough
Chippewa, Rusk	Holcombe Flowage
Ashland	Unnamed (Northeast) Slough
Ashland	Wood Creek Slough
Ashland	Bad River Sloughs
Ashland	Honest John Lake
Washburn	Trego Flowage
Douglas	St.Croix (Gordon) Flowage
Douglas, Washburn	Minong Flowage
Douglas	Upper Saint Croix Lake
Douglas	Allouez Bay
Gogebic	Slate River Slough

Wetlands

There are two categories of wetlands that are at risk of impacts from pipeline spills of crude oil in the ceded territories. First, there are 12,340 wetlands totaling 145,560 acres located inside the 5000-foot hazard zone surrounding the crude oil pipelines. Second, there are 5,743 riparian wetlands that are hydrologically connected to rivers and lakes within the aquatic hazard zone. These riverine and lacustrine wetlands total 270,526 acres in the ceded territory. Table 3.1.7 contains additional breakdowns of wetlands at risk from pipeline crude oil spills in the ceded territories.

Wisconsin's wetland inventory includes information on small wetlands that do not have acreage or delineation information. These are often small wetlands that despite their size, may have significant biological significance. There are 7,258 of these wetlands located within the 5,000-foot hazard zone. The size and ecosystems supported by these wetlands is largely unknown. Wetlands at risk of impacts from crude oil pipeline spills are illustrated in the spill mapbook.

Table 3.1.7 - Wetlands at risk from crude oil pipeline spills.

Wetlands at Risk from Crude Oil Pipeline Spills			
		Wetlands	Acres
Ceded Territory		12,340	145,560
Fond Du Lac Reservation		437	4,636
Bad River Reservation		394	2,431
Lac Courte Oreilles Reservation		54	252
Chequamegon - Nicolet National Forest		25	38
Ottawa National Forest		625	11,943
Hiawatha National Forest		282	19,324
		Riparian	Acres
Ceded Territory		5,743	270,526
Fond Du Lac Reservation		139	3,424
Bad River Reservation		318	3,535
Lac Courte Oreilles Reservation		70	388
Lac Vieux Desert		1	16
Chequamegon - Nicolet National Forest		1	2
Ottawa National Forest		349	23,254
Hiawatha National Forest		135	28,192
Total Wetlands at Risk		18,083	416,086

Groundwater

The United States Forest Service (USFS) developed a groundwater model for the Chequamegon-Nicolet National Forest (CNNF). Modeling results indicate that the water table largely mirrors surface topography with a groundwater mound located below the Bayfield highlands. Groundwater flow is dominated by gravity because there are no pumping sites within the National Forest boundary. Figure 3.1.9 illustrates the location of the groundwater mound and particle tracking points show the general direction of groundwater flow away from the mound.

Oil spilled along the section of Line 5 that is located within the CNNF would quickly infiltrate the sandy soils. Some oil would become bound with the sand but it is highly likely that oil would reach the water table. The groundwater model indicates that an oil plume would move away from the spill location along two general flow paths and flow along the pathways is expected to continue for hundreds of years and the model indicates that spilled oil could daylight at surface water bodies and existing water supply wells (Figure 3.1.9). It is important to note that even if the spilled oil never intersects a surface water body, the groundwater aquifer would remain contaminated for the foreseeable future. The full USFS modeling report is available in Appendix 3.1-A.

The USGS research site in Bemidji, Minnesota is the only location in the Great Lakes region that has information on ongoing effects of oil spills to groundwater. In addition, a groundwater model for the ceded territories is not available to identify areas at risk of impacts from spilled oil traveling through groundwater. Additional research would be needed to determine if past oil spills in the ceded territory have ongoing, unidentified groundwater impacts.

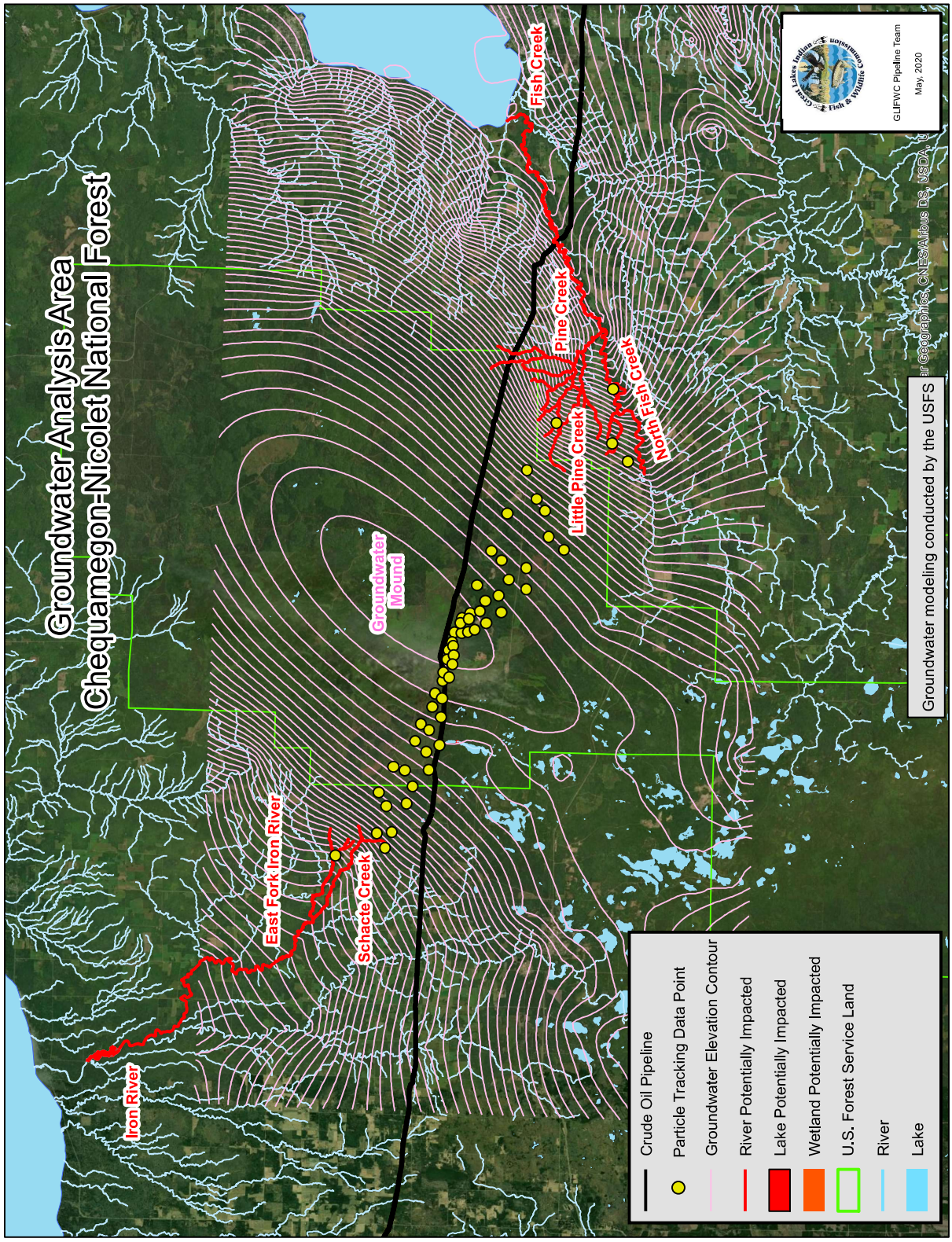

Figure 3.1.9 - Modeled crude oil spill from the section of Line 5 that crosses the proclaimed boundary of the Chequamegon-Nicolet National Forest.

Crude Oil Spill Risk – Terrestrial Environments

Crude oil releases to the ground surface can have harmful effects on soil and important resident microorganisms (Enbridge 2016). Remediation of spilled oil usually involves the removal of affected material from the area resulting in permanent impacts to soil structure. After a series of oil spills near Great Slave Lake in Alberta, Canada, soil tilling, burning, and fertilizer applications were used to remediate the soils. Twenty-five years later, oil concentrations within the first foot in soil depth were still high. More recently, bioremediation techniques have been developed where microbial communities are used to promote biodegradation. These techniques have had success over long periods of time (Hemmings et al, 2015).

Figure 3.1.10 - 2018 Keystone XL pipeline oil spill in South Dakota (https://www.argusleader.com/story/news/crime/2018/04/07/keystone-pipeline-spill-south-dakota-twice-big-first-thought/496613002/).

Oil-contaminated deciduous plants showed effects within hours of oil exposure and evergreen vegetation took weeks to show stress. Regrowth in oil-exposed plants was less robust than would typically occur. Plants in oil-saturated soil showed no regrowth. After a single growing season, recovery varied between 20 and 55 percent, depending on the oil treatment rate. A similar study in the Northwest Territories involving light-crude application revealed changes in species composition and diminished vegetation cover in the test area after 10 years (Robson et al. 2004). A test release of heavy crude in Caribou-Poker Creek Watershed of Alaska, in 1976 showed that mosses and lichens died shortly after the release, but some specific grass species persisted.

Oil spills affect terrestrial animal species through mortality or displacement. Impacts to specific species will be highly site and species specific and cannot be characterized in detail in this analysis with the available data.

The area of uplands potentially impacted by crude oil pipeline spills in the ceded territory was obtained by subtracting acres of wetland from the land terrestrial hazard zone acreage. Table 3.1.8 contains additional breakdowns of uplands at risk from pipeline crude oil spills in the ceded territories.

Table 3.1.8 - Acres of uplands in the crude oil pipeline land hazard zone.

Upland Areas at Risk from Crude Oil Pipeline Spills		
		Acres
Ceded Territory		277,520
Fond Du Lac Reservation		4,137
Bad River Reservation		5,025
Lac Courte Oreilles Reservation		2,450
Chequamegon - Nicolet National Forest		7,307
Ottawa National Forest		29,756
Hiawatha National Forest		11,027

There are crude oil pipeline hazard zones that are located on public or protected lands outside of National Forests. Table 3.1.9 lists those areas as well as the acres located within the hazard zone. Protected areas at risk of impacts from pipeline explosions are illustrated in the explosion mapbook. Additional information would be needed to characterize the environmental risk of crude oil spills to these areas and to determine if crude oil pipelines are compatible with local management goals.

Table 3.1.9 Acres of lands in the USGS Protected Areas Database (PADUS) that are potentially impacted by a crude oil pipeline spill.

Area Database (PADUS)	Acres
Atlanta State Forest Area	20
Bean Brook Fishery Area	90
Bennet Communication Tower	10
Benson Creek Fishery Area	4
Brule River State Forest	827
Bullock Ranch Flooding State Wildlife Management Area	860
Cisco Branch Ontonagon National Wild and Scenic River	744
Critical Dune Barrier dunes	1342
Critical Dune Exemplary dune associated plant comm	1397
Crystal Falls State Forest Area	7911
Cut River Bridge	36
Dingman Marsh Flooding State Wildlife Management Area	503
Douglas County Wildlife Area	309
Escanaba State Forest Area	1598
Flambeau River State Forest	145
French Farm Flooding State Wildlife Management Area	406
Gaylord State Forest Area	8087
Genes Pond Flooding State Wildlife Management Area	252
Grayling State Forest Area	3571
Gwinn State Forest Area	406
Jump River Fishery Area	8
Kirtlands Warbler Wildlife Management Area	621
Little Brevort Lake Scenic Site	437
Middle Branch Ontonagon River	786
North Country National Scenic Trail	8
Pershing Wildlife Area	7
Pigeon River Country State Forest Area	4171
Presque Isle River National Wild and Scenic River	288
REM-Namekagon River	84
REM-Weirgor River	122
Sand Lake Rearing Station	83
Sand Lake Tower Site	1
Sault Ste. Marie State Forest Area	10715
Shingleton State Forest Area	3153
South Branch Paint River National Wild and Scenic River	319
South Shore Lake Superior Fish and Wildlife Area	304
St. Croix National Scenic Riverway	504
St. Louis River Stream Bank Area	105
Statewide Habitat Area	11
Statewide Habitat Area	59
Statewide Non-point Easement Program	21
Statewide Public Access	22
Sturgeon River National Wild and Scenic River	386
Tuscobia State Trail	12
unnamed - private lands managed by DNR	33
Wagner Falls Scenic Site Park	260
Whitefish River National Wild and Scenic River	63
Wild Rivers State Trail	96
Wyman Nursery	95

Crude Oil and Natural Gas Pipeline Explosion Risk

Tribal, Public and Protected Lands

The land area at risk from an oil pipeline explosion totals 423,080 acres in the ceded territory. The land area at risk from a natural gas transmission pipeline explosion totals 3,331,762 acres. The combined explosion risk area for both pipeline types is 3,536,902 acres. Explosion hazard areas include portions of the Fond Du Lac, Lac Courte Oreilles, Keweenaw Bay Indian Community, and Bad River Reservations as well as portions of the Chequamegon-Nicolet, Ottawa, Hiawatha, Superior, and Huron-Manistee National Forests (Table 3.1.10). Figure 3.1.11 depicts land ownership in relation to the explosion hazard area with greater detail in the explosion mapbook. The combined area of the protected lands database at risk of being impacted by an explosion from crude oil and natural gas pipelines is 373,593 acres.

Table 3.1.10 - Acres at risk of impacts from a crude oil or natural gas pipeline explosion.

Combined Crude Oil and Natural Gas Pipeline Explosion Hazard Areas		
		Acres
Ceded Territory		3,563,902
Fond Du Lac Reservation		21,413
Bad River Reservation		20,795
Lac Courte Oreilles Reservation		2,702
Keweenaw Bay Indian Community		6,128
St. Croix Reservation		408
Chequamegon - Nicolet National Forest		55,368
Ottawa National Forest		122,184
Hiawatha National Forest		100,201
Huron - Manistee National Forest		89,265
Superior National Forest		6,297

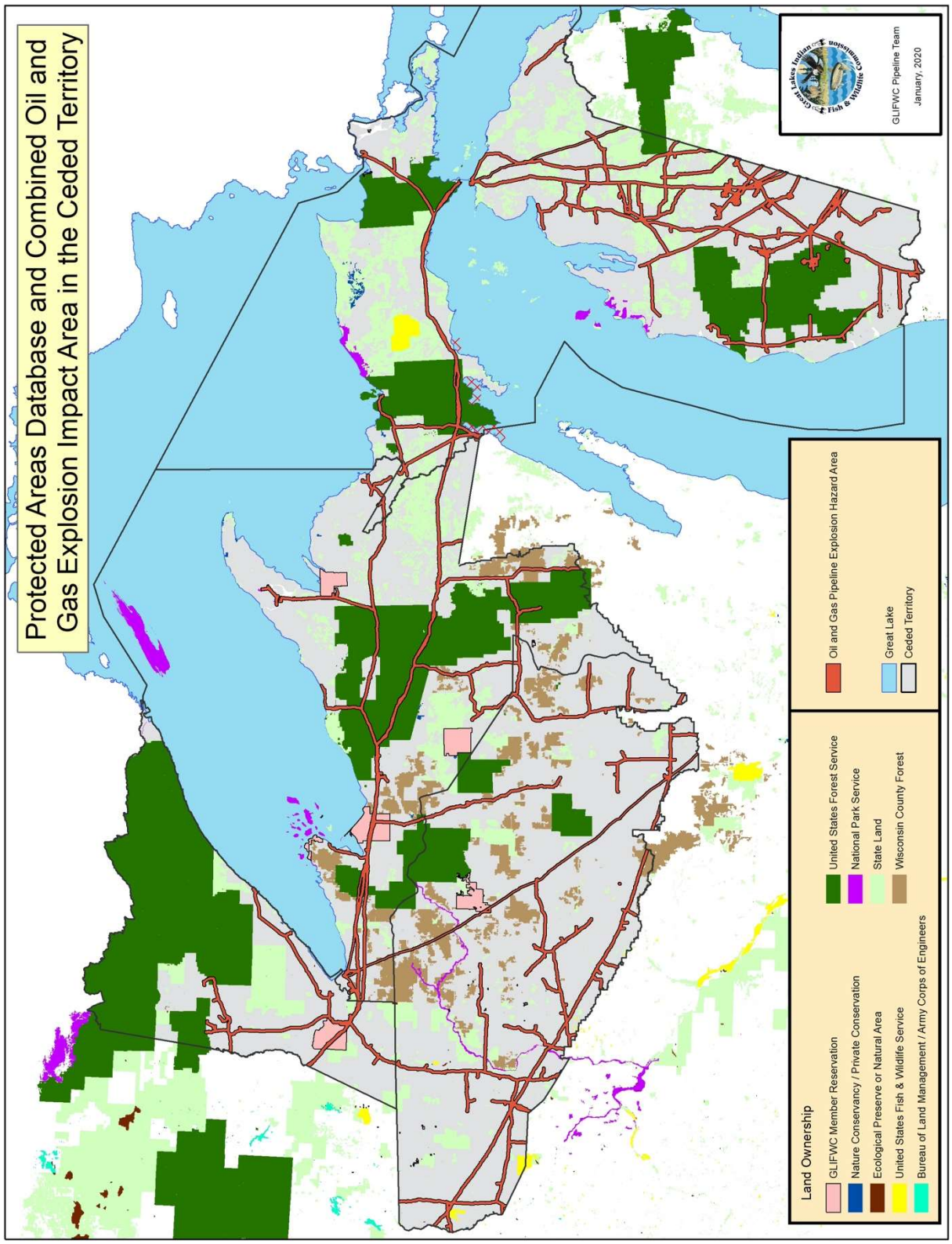

Figure 3.1.11 - Explosion hazard area for crude oil and natural gas pipelines in the 1836, 1837, 1842, and 1854 ceded territories.

Rivers and Streams

The Ceded Territory has 2,003 miles of rivers and streams that are at risk of impacts from a crude oil pipeline explosion. There are 7,492 miles of rivers and streams within the evacuation zone of natural gas pipelines and 2,273 of those miles are in the high consequence zone. The combined crude oil and natural gas explosion impact area (evacuation and high consequence) for the Ceded Territory contains 8,762 miles of rivers and streams. Table 3.1.11 contains additional breakdown of miles of rivers and streams at risk from pipeline explosions within National Forests and Tribal Reservations. Rivers and streams at risk of impacts from pipeline explosions are illustrated in the explosion mapbook.

Table 3.1.11 - Miles of rivers and streams that are located within the explosion hazard areas of crude oil and natural gas pipelines.

Miles of Rivers and Streams At Risk from Pipeline Explosions				
	Crude Oil	**Natural Gas**		**Combined Risk Zones**
		Evacuation Zone	**High Consequence Zone**	
Ceded Territory	2,003	7,492	2,273	8,762
Fond Du Lac Reservation	9	17	6	22
Bad River Reservation	47	82	30	97
Lac Courte Oreilles Reservation	13	0	0	13
Keweenaw Bay Indian Community	0	28	9	28
Chequamegon - Nicolet National Forest	3	46	11	47
Ottawa National Forest	164	401	119	426
Hiawatha National Forest	76	232	72	279
Huron - Manistee National Forest	0	210	54	210
Superior National Forest	0	8	3	8

Lakes

There are 491 lakes with 47,785 acres of open water at risk of impacts from an oil pipeline explosion. There are 6,016 lakes with 223,564 acres of open water that are located within the evacuation zone for natural gas pipelines and of those, 2,127 lakes with 77,345 acres of open water are located in the high consequence area. Combined crude oil and natural gas explosion impact area for the Ceded Territory contains 6,202 lakes with 237,075 acres of open water. Table 3.1.12 contains additional breakdown of acres of lakes at risk from pipeline explosions within National Forests and Tribal Reservations. Lakes at risk of impacts from pipeline explosions are illustrated in the explosion mapbook.

Table 3.1.12 - Number of lakes and acres of open water that are located within the explosion hazard areas of crude oil and natural gas pipelines.

Lakes At Risk from Pipeline Explosions								
	Crude Oil		Natural Gas Evacuation Zone		High Consequence Zone		Combined Risk Zones	
	Lakes	Acres	Lakes	Acres	Lakes	Acres	Lakes	Acres
Ceded Territory	491	47,785	6,016	223,564	2,127	77,345	6,202	237,075
Fond Du Lac Reservation	11	553	30	143	16	48	32	660
Bad River Reservation	6	17	7	18	6	16	7	18
St. Croix Reservation	0	0	2	2,772	2	2,772	2	2,772
Keweenaw Bay Indian Community	0	0	21	27	6	4	21	27
Chequamegon - Nicolet National Forest	5	23	69	2,601	30	1,874	69	2,601
Ottawa National Forest	93	811	232	14,850	85	628	241	14,959
Hiawatha National Forest	85	9,070	157	16,179	61	1,060	201	16,278
Huron - Manistee National Forest	0	0	136	1,304	41	462	136	1,304
Superior National Forest	0	0	22	1,988	10	1,452	22	1988

Of the lakes listed above, 39 are known to support manoomin (wild rice) (Table 3.1.13) and 57 are lakes that Tribes have declared for walleye spearing (Table 3.1.14). An explosion at one of the pipelines could impact tribal members as they harvest these important resources as well as damage the resources themselves. These lakes are depicted in the explosion mapbook.

Table 3.1.13 - Wild Rice waters at risk of crude oil and natural gas pipeline explosion.

County	Lake		County	Lake
Burnett, Douglas, Polk	St Croix River		Douglas	Fasteland Road Ponds
Douglas	St. Louis River		Lincoln	Wisconsin River
Vilas	Mud Creek		Burnett, Washburn	Yellow River
Barron	Rice Creek		Forest	Rat River (GLIFWC long term study)
Douglas	Pokegama River/Bay		Chisago	Mud Lake
Lincoln, Oneida	Wisconsin River (above Lake Alice)		Isanti	Grass
Vilas	Wisconsin River		Isanti	North Stanchfield
Forest	Little Rice Lake		Morrison	Pelkey
Burnett	Clam Lake, Lower		Isanti	Rice
Burnett	Big Sand Lake		Sherburne	Long Pond
Burnett	Memory Lake		Pine	Stanton
Burnett	Mud Hen Lake		Crow Wing	Unnamed
Oneida	Spur Lake		Chisago	North Sunrise Pool
Polk	Little Butternut Lake		Pine	Fox
Oneida	Cuenin Lake		Morrison	Popple
Forest	Scattered Rice Lake		Morrison	Coon
Polk	Balsam Lake		Kanabec	Twin
Polk	Unnamed Pond			Mississippi River
Lincoln	Alice Lake			Mississippi River
Burnett	Clam Lake, Upper		Pine	Snake River

Table 3.1.14 - Walleye waters at risk of crude oil and natural gas pipeline explosion.

County	Lake		County	Lake
BENTON	MAYHEW L		POLK	BALSAM L
CHISAGO	SOUTH LINDSTROM L		BURNETT	DUNHAM L
CHISAGO	NORTH CENTER L		BURNETT	UPPER CLAM L
CHISAGO	LITTLE L		BURNETT	BIG SAND L
CHISAGO	NORTH LINDSTROM L		GOGEBIC	SUNDAY L
CHISAGO	GREEN L		GOGEBIC	ALLEN L
CHISAGO	LITTLE COMFORT L		GOGEBIC	L GOGEBIC
TAYLOR	RIB L		BAYFIELD	BLADDER L
ONEIDA	MINOCQUA L		BAYFIELD	LONG L
ONEIDA	TOMAHAWK L CHAIN		ISANTI	SKOGMAN L
LINCOLN	L ALICE		ISANTI	FLORENCE L
ONEIDA	GEORGE L		ISANTI	FANNIE L
ONEIDA	HASBROOK L		ISANTI	NORTH STANCHFIELD L
ONEIDA	GILMORE L		HOUGHTON	TORCH L
ONEIDA	SWEENEY L		HOUGHTON	PORTAGE L
ONEIDA	PICKEREL L		IRON	SUNSET L
ONEIDA	RAINBOW FL		IRON	EMILY L
VILAS	LITTLE ST GERMAIN L		IRON	IRON L
ONEIDA	PLANTING GROUND L		FOREST	TRUMP L
ONEIDA	TOWNLINE L		MORRISON	PIERZ FISH L
DUNN	TAINTER L		MORRISON	PELKEY L
BARRON	BIG MOON L		MARQUETTE	GREENWOOD RES
BARRON	LOWER TURTLE L		FOREST	SILVER L
BARRON	UPPER TURTLE L		PINE	STANTON L
BARRON	BEAVER DAM L		PINE	CROSS L
BARRON	BEAVER DAM L		BARAGA	BEAUFORT L
BARRON	LOWER VERMILLION L		BARAGA	KING L
PRICE	DUROY L		ONEIDA	CLEAR L
ST CROIX	CEDAR L		ONEIDA	L JULIA (RHINELANDER)

Wetlands

Wetlands at risk from an oil pipeline explosion total 145,457 acres in the Ceded Territory. Wetlands at risk from a natural gas transmission line explosion total 630,265 acres in the Ceded Territory and of those, 187,029 acres are within the high consequence hazard zone. Combined crude oil and natural gas impact area for the ceded territory contains 92,297 individual wetlands covering 675,047 acres. In the Wisconsin portion of the ceded territories, there are 7,258 small wetlands within the crude oil explosion hazard zone and 27,584 small wetlands within the natural gas explosion hazard zone. Wetlands at risk of impacts due to explosion are summarized in Table 3.1.15 and in the explosion mapbook. These small wetlands do not have acreage information in the Wisconsin Wetland Inventory. Table 3.1.15 also contains additional breakdown of acres of wetlands at risk from pipeline explosions within National Forests and Tribal Reservations.

Table 3.1.15 - Number of wetlands that are located within the explosion hazard areas of crude oil and natural gas pipelines.

Wetlands At Risk from Pipeline Explosions								
	Crude Oil		Natural Gas Evacuation Zone		High Consequence Zone		Combined Risk Zones	
	Wetlands	Acres	Wetlands	Acres	Wetlands	Acres	Wetlands	Acres
Ceded Territory	12,340	145,457	85,076	630,265	33,474	187,029	92,297	675,047
Fond Du Lac Reservation	442	4,725	923	8,366	379	2,409	973	9,004
Bad River Reservation	395	2,434	817	4,695	385	1,804	862	4,822
St. Croix Reservation	0	0	17	91	3	24	17	91
Keweenaw Bay Indian Community	0	0	27	312	14	124	27	312
Lac Courte Oreilles Reservation	61	279	0	0	0	0	61	279
Chequamegon - Nicolet National Forest	25	38	1,168	8,403	423	2,287	1,191	8,438
Ottawa National Forest	629	12,012	1,472	23,875	550	6,821	1,558	24,505
Hiawatha National Forest	287	129,648	723	37,937	357	10,056	827	39,679
Huron - Manistee National Forest	0	0	1,758	9,412	701	2,586	1,758	9,412
Superior National Forest	0	0	156	1,016	60	207	156	1,024

Risk Associated with the Enbridge Line 5 Crude Oil Pipeline

This section describes the environmental risks of Line 5. This analysis scale is appropriate given the unique geographic setting of this pipeline compared to the other pipelines in the ceded territories. This focus is also necessary because of the need to evaluate risk of this line as part of the special use authorization re-issuance application being considered by the U.S. Forest Service.

The 454 miles of Line 5 account for 36% of all crude oil pipeline miles in the ceded territories. It is also the only pipeline that does not share the right-of-way with other crude oil pipelines. Line 5's isolation means that it is solely responsible for a large percentage of the risk to natural resources from future oil spills. These include:

- 65% of all ceded territory acres that are at risk of oiling and explosion impacts.
- 82% of all ceded territory inland lakes that are at risk of oiling and explosion impacts.
- 52% of all ceded territory river miles that are at risk of oiling and explosion impacts.
- 70% of all ceded territory wetland acres that are at risk of oiling and explosion impacts.

Another way of describing this risk is to say that if Line 5 was to be decommissioned, the environmental risk to the ceded territories from crude oil pipeline spills and explosions would be reduced by the percentages listed above. Natural resources at risk are detailed in table.

Line 5 also has risks that are almost completely absent for the other pipelines in the ceded territory. Line 5 is the only crude oil pipeline in the ceded territories that crosses National Forest lands. If Line 5 was to be decommissioned, there would no longer be any risk of oiling or explosion to the lands and waters located within the Chequamegon-Nicolet, Ottawa, and Hiawatha National Forests. Line 5 is also the pipeline that presents the greatest risk to the Great Lakes. Line 5 is located entirely within the Great Lakes watershed and there are areas where oil spilled from this pipeline could flow into Lake Superior, Lake Michigan and/or Lake Huron through tributaries that have no flow interruptions such as lakes or dams (figures 3.1.12 and 3.1.13). A report from the Great Lakes Commission characterizes the risk of crude oil spills from Line 5 to shorelines of Lake Superior (Marty and Nicol, 2017). The project developed an environmental sensitivity index which combines data on physical, biological and human environments. This index is then spatially overlayed with oil transportation infrastructure in a GIS. The results are maps of environmental sensitivity to oil spilled from the different conveyance methods, including the Line 5 pipeline. Data from this study are also mapped in figures 3.1.12 and 3.1.13.

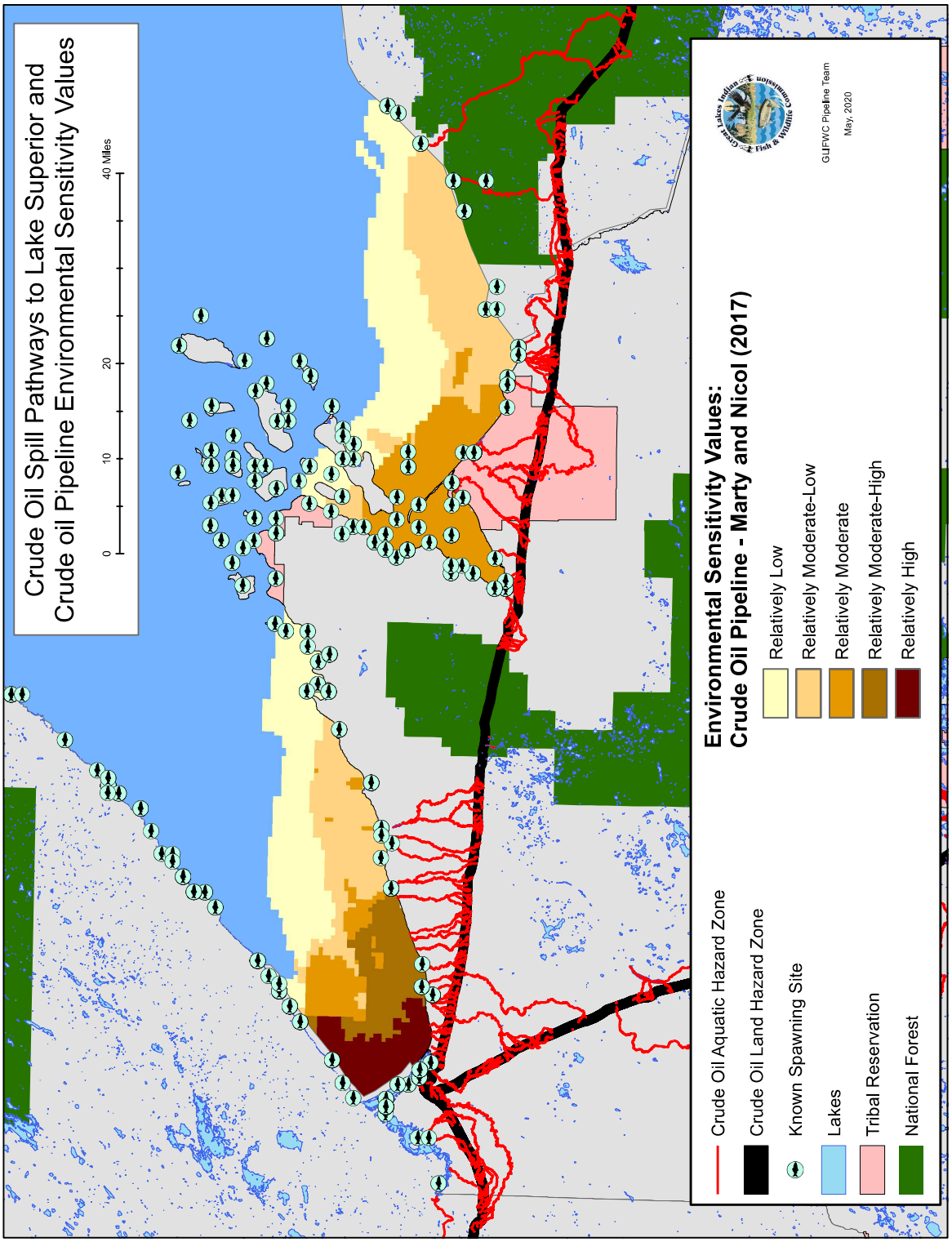

Figure 3.1.12 - Crude oil spill pathways from Line 5 to Lake Superior.

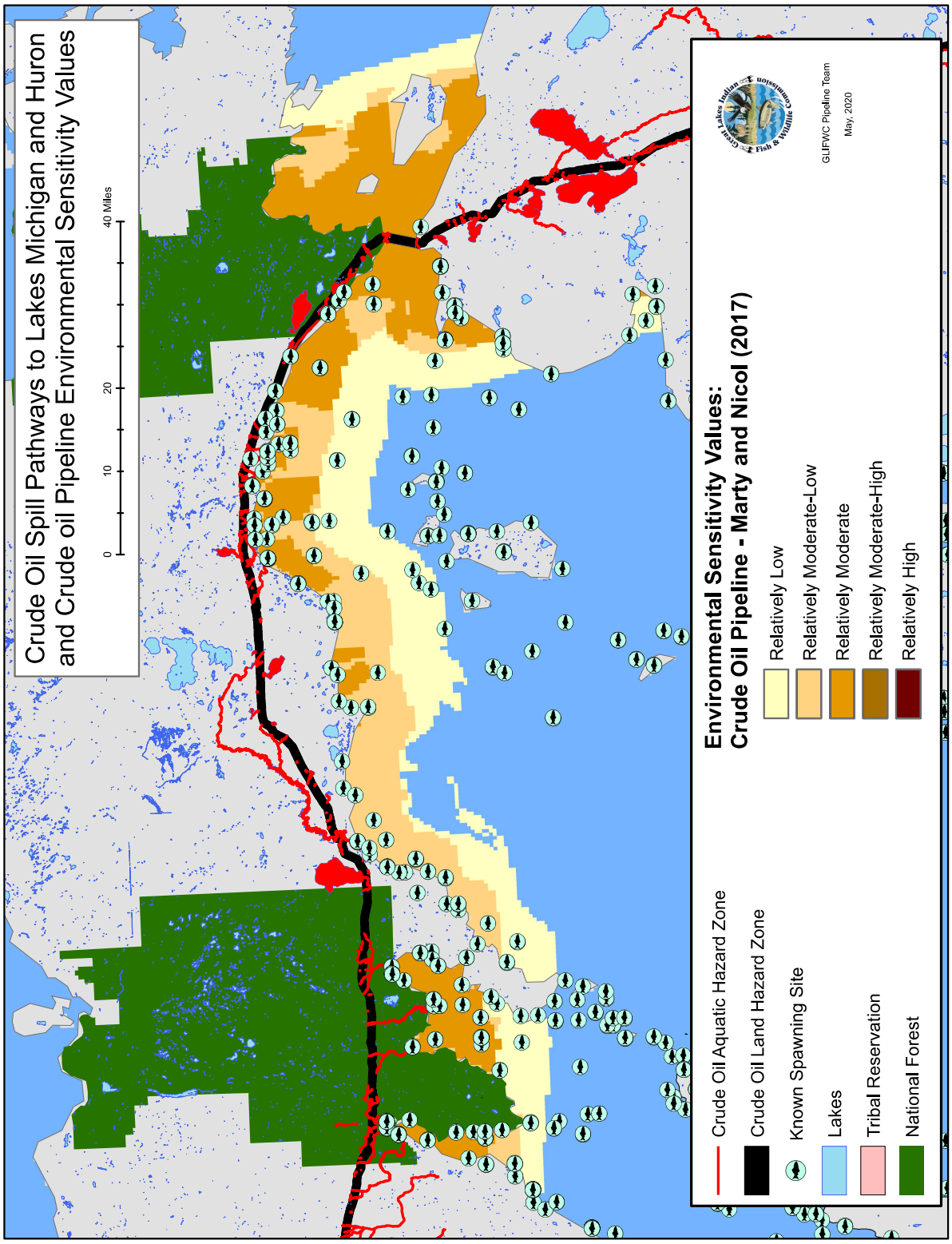

Figure 3.1.13 - Crude oil spill pathways from Line 5 to Lakes Michigan and Huron.

The analysis conducted by Marty and Nicol indicates that some of the most environmentally sensitive areas of the south shore of Lake Superior are also some of the most vulnerable to pipeline oil spills. This includes Chequamegon Bay which could be impacted by a spill occurring within the administrative boundaries of the Chequamegon Nicolet National Forest. The entire report is available in Appendix 3.1-C.

Of all the areas at risk of oiling from a Line 5 spill, the potential impacts of an oil spill at the Straits of Mackinac is the only area that has been well studied. Modeling done at the University of Michigan Water Science center indicates that over 700 miles of Great Lakes shoreline could be impacted by a Line 5 spill with devastating effects to tribal, commercial and recreational fishing, as well as long term damage to tourism in the area (Figure 3.1.14)(Schwab, 2016). Modeling of oil spill impacts is not available for other areas at risk in Lakes Superior and Michigan.

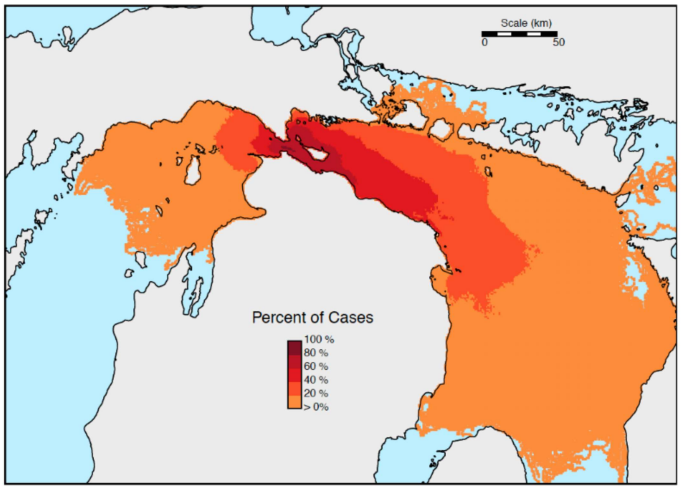

Figure 12. Percent of cases in which oil is present at *any* time after initial release.

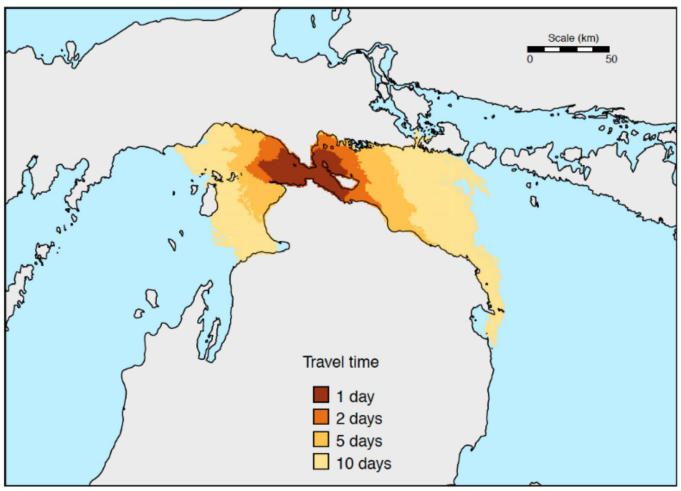

Figure 13. Minimum travel time (up to 10 days) to a location from *any* case.

Figure 3.1.14 - Modeled extent of oiling from a spill at the Straights of Mackinac section of Line 5 (Schwab, 2016).

In addition to ecological impacts to Lake Superior, an oil spill in the sensitive areas identified above could be catastrophic to the tribal commercial fishery. This treaty guaranteed fishing activity is not only central to the cultural identity of tribes but also a critical economic activity and source of income for the Great Lakes area in general. Figures 3.1.15 - 3.1.19 show the tribal harvest data for areas of the Great Lakes in the ceded territories that could be impacted by a Line 5 oil spill. The data clearly indicate a substantial risk to tribal fishing. Additional work would be needed to fully account for the economic consequences of a spill to tribes as well as losses to the regional economy.

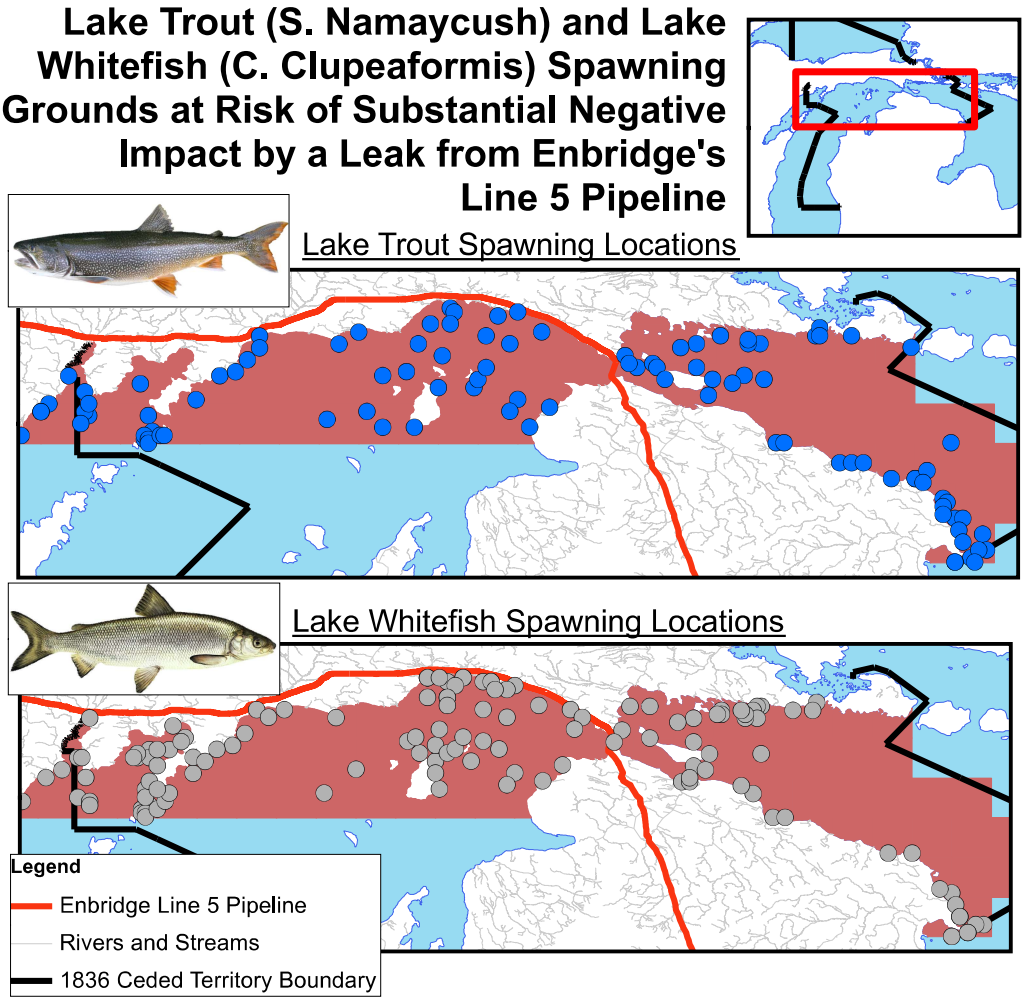

Figure 3.1.15 - Known spawning locations for lake trout and whitefish potentially impacted by a Line 5 crude oil spill at the Straights of Mackinac (Kevin Donner, Little Traverse Band of Odawa Indians, Personal Communication).

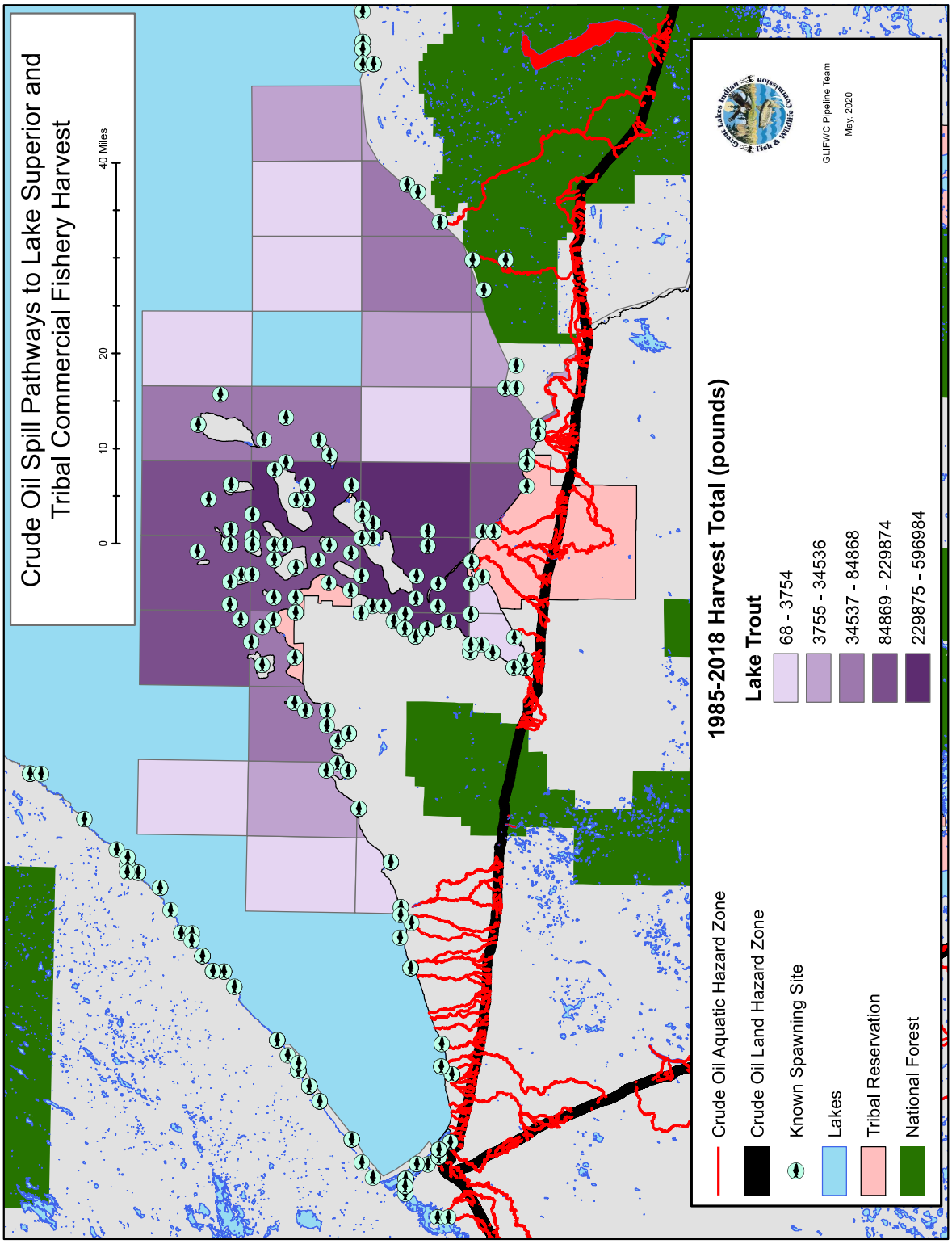

Figure 3.1.16 - Crude oil spill pathways from Line 5 to Lake Superior and potential impacts to known spawning sites and tribal commercial fishing for lake trout.

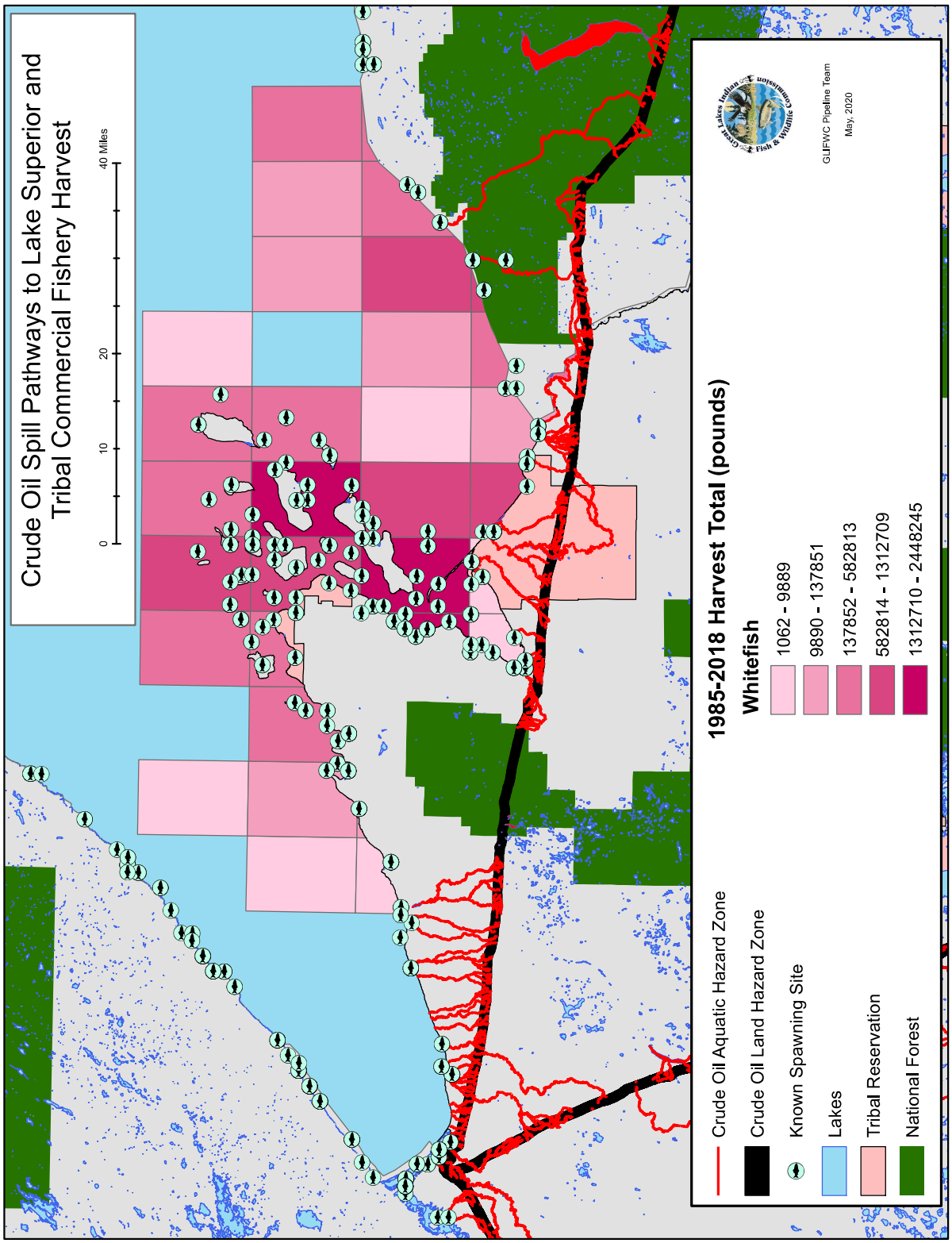

Figure 3.1.17 - Crude oil spill pathways from Line 5 to Lake Superior and potential impacts to known spawning sites and tribal commercial fishing for whitefish.

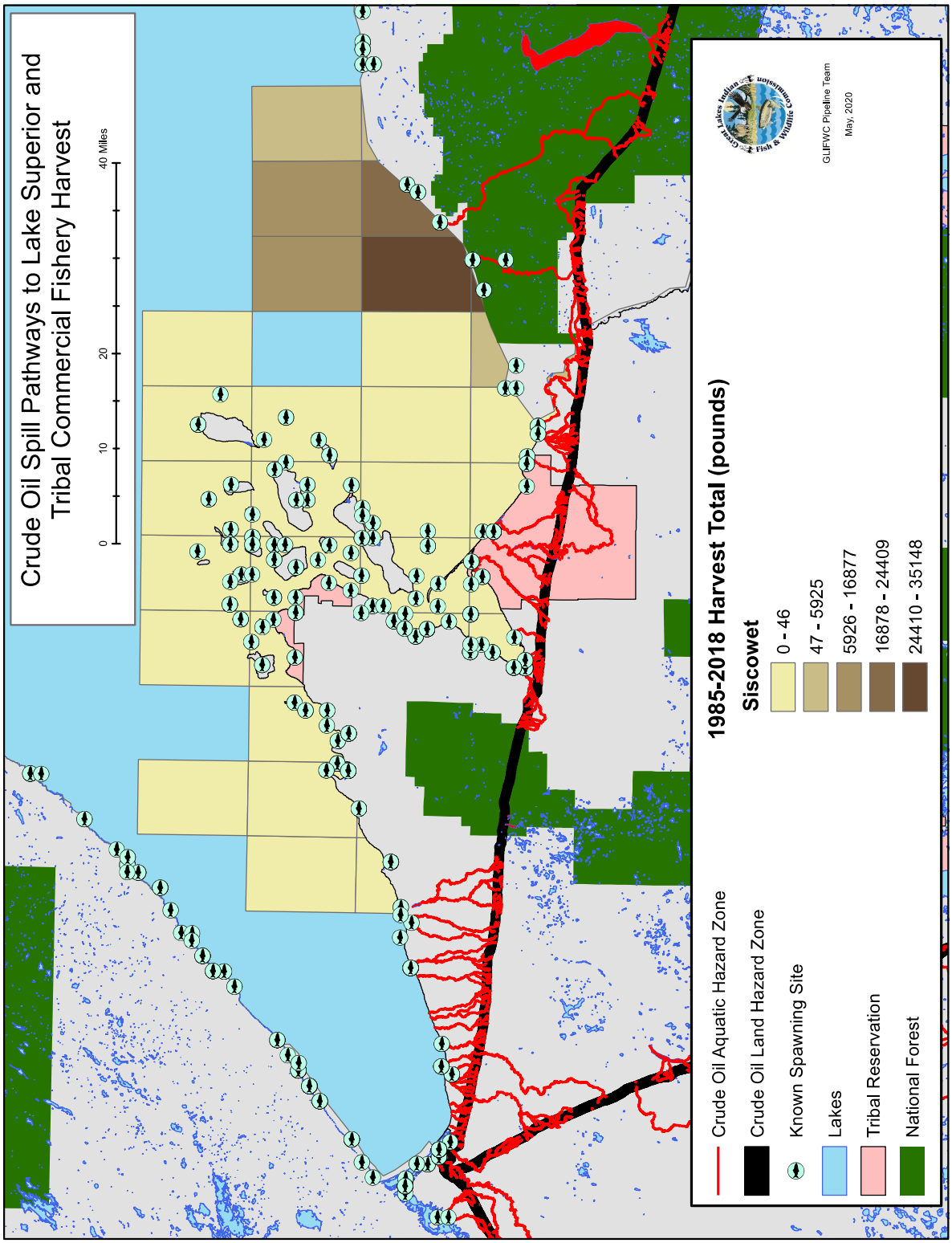

Figure 3.1.18 - Crude oil spill pathways from Line 5 to Lake Superior and potential impacts to known spawning sites and tribal commercial fishing for siscowet.

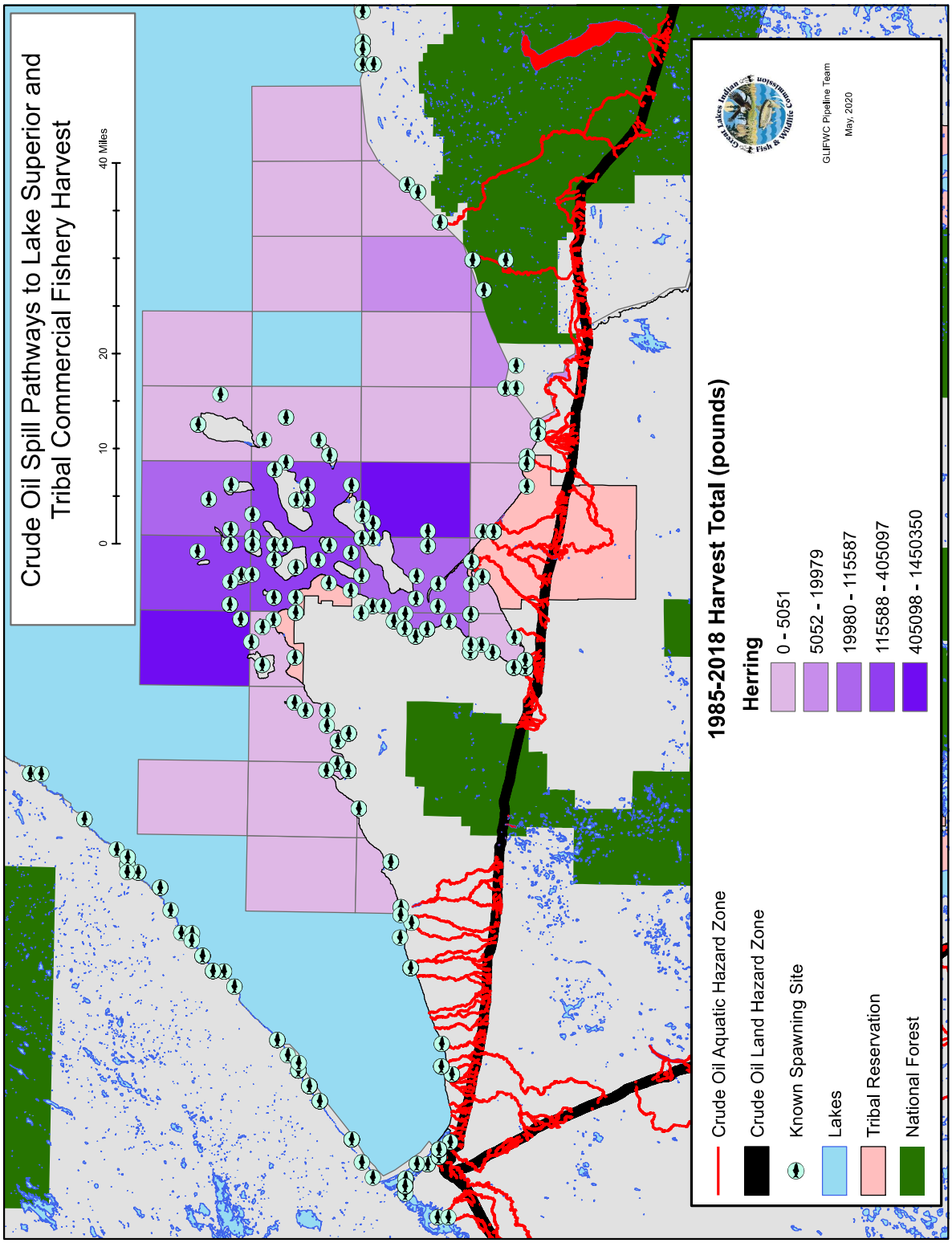

Figure 3.1.19 - Crude oil spill pathways from Line 5 to Lake Superior and potential impacts to known spawning sites and tribal commercial fishing for herring.

Conclusion

This section presents a step towards understanding the risk of crude oil and natural gas pipelines to the ecological integrity of the ceded territories. The analysis is based on accepted published methods and defines hazard zones, areas in the ceded territories that could be impacted by crude oil spills and explosions. Further characterization is made by identifying areas of known tribal natural resource harvest activity and areas of known environmental importance. Mapbooks provide a visualization of potential areas of impact shown overlain with identified areas of resource harvest and/or of particular ecological significance.

The identification of these important resources provides context to the risk of a pipeline failure and is critical to GLIFWC's role of protecting habitats that are necessary for treaty protected natural resource harvests. This information is also important for the Forest Service's decision on the renewal of the special use authorization for the section of Line 5 that crosses the Chequamegon Nicolet National Forest. Line 5 does not exist in a vacuum; it is part of a larger pipeline network just as the National Forest is part of a larger ceded territory. What happens to one has consequences to the broader whole, including two Great Lakes, hundreds of lakes, hundreds of miles of rivers and streams, and thousands of acres of wetlands.

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