

6 July 2012  
Reference: 0161978

Travis Beakley  
Mustang Engineering, Inc.  
16001 Park 10 Place  
Houston, Texas 77084

Re: Rare Species Assessment  
Project Mariner West Pipeline  
St. Clair Meter Station

3352 128<sup>th</sup> Avenue  
Holland, MI 49424-9263  
(616) 399-3500  
(616) 399-3777 (fax)  
<http://www.erm.com>



Dear Mr. Beakley:

Environmental Resources Management, Inc. (ERM) is pleased to provide you with this Rare Species Assessment Report for the St. Clair Meter Station location of the Sunoco Logistics Project Mariner West Pipeline (the Project) located in Marysville, Michigan. This assessment was conducted to determine if any threatened or endangered species were likely to occur or do occur on the Project site. For the purpose of this report, the survey area that was evaluated is referred to as the Project Area.

The Rare Species Assessment consisted of an environmental desktop review and a field survey and assessment. Methods and results of the assessment, along with a description of the project area and the regulatory process, are described below.

### ***PROJECT AREA DESCRIPTION***

The Project Area is located along the St. Clair River, approximately six miles south of Port Huron in the City of Marysville in Port Huron Township, St. Clair County in the eastern portion of the Lower Peninsula of Michigan, as indicated in Figure 1, Site Location Map. The Project Area boundary encompasses approximately 3.8 acres and is indicated in Figure 2, which also includes the site wetland locations and types.

The majority of the Project Area is currently developed for pipeline right-of-way (ROW), with undeveloped forested woodlots between two pipeline ROWs. The existing infrastructure located within the Project Area includes a valve station owned by a third party company within the north ROW (Figure 2) and pipelines running east and west along the north and south ROWs. The proposed Project

would consist of the construction of added pipeline infrastructure and development of a meter/custody station and access road.

The topography of the Project Area is relatively flat with depressional features noted within the forested woodlot. The elevation of the Project Area is approximately 594 feet above mean sea level (AMSL).

### ***REGULATORY AUTHORITY AND PROCESS***

In Michigan, threatened and endangered species are protected on both public and private lands. Part 365 of the Michigan Natural Resource and Environmental Protection Act (NREPA, 1994 PA 451 as amended) states an individual may not harm or take state-listed threatened or endangered species. In addition, the federal Endangered Species Act of 1973 (ESA, 16 U.S.C. 1531-1544, 87 Stat. 884, as amended) provides similar protections for federally-listed threatened and endangered species.

For new developments on private or public lands, an endangered species review must be completed to determine if the proposed project could have impacts to endangered or threatened species. Reviews are requested through the Michigan Natural Features Inventory (MNFI), which searches the Michigan Natural Heritage database to determine whether or not there are known occurrences of state or federal threatened, endangered, or species of special concern within 1.5 miles of a project site.

If no threatened or endangered species occur or have the potential to occur within the project scope, a written response is sent to the requestor indicating as such. If a threatened or endangered species is known to occur or has the potential to occur within the project scope, further evaluations are conducted to determine if the species will be affected by the proposed project. Habitat requirements, species rarity, scope of the project, and the potential impacts are all used to determine if a species will be impacted by the project activities. In some cases a biological survey is done to assess for the presence or absence of a protected species. If a state listed threatened or endangered species will be taken or harmed, an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR) is needed, or in the event of a federally listed species an Incidental Take Permit from the US Fish and Wildlife Service is required.

## ENVIRONMENTAL DESKTOP REVIEW

In April 2012 ERM submitted an Endangered Species Environmental Review request to MNFI. The review, conducted by MNFI staff, included conducting a MNFI Natural Heritage database search where the location of the proposed Project Area was checked against localities of known rare species and unique natural features. This review process included searching for occurrences of rare species within a 1.5 mile radius of the Project Area.

Results of the environmental review for threatened and endangered species are summarized in Table 1, as adopted from the response provided in Attachment 1. The state threatened or endangered species identified included one fish species and seven plant species. The most recent observation of any species was Sauger (*Sander Canadensis*) in 1983 with the remaining species not observed since 1915 or earlier.

No federally listed species were identified during the review.

**Table 1**      ***Known Occurrences of Legally Protected Species Within 1.5 Miles of the Project Area***

<b>Species</b>	<b>Common Name</b>	<b>First Observation</b>	<b>Last Observation</b>	<b>Federal Status</b>	<b>State Status</b>	<b>Category</b>
<i>Sander canadensis</i>	Sauger	1937-05-30	1983-11	NL	T	Fish
<i>Draba reptans</i>	Creeping whitlow grass	1913	1913-05-08	NL	T	Plant
<i>Gentiana flavida</i>	White gentian		1900-PRE	NL	E	Plant
<i>Gymnocarpium robertianum</i>	Limestone oak fern	1888	1888-06-10	NL	T	Plant
<i>Vitis vulpina</i>	Frost grape	1896	1899-07-29	NL	T	Plant
<i>Ranunculus rhomboideus</i>	Prairie buttercup	1894	1915-05-29	NL	T	Plant
<i>Plantago cordata</i>	Heart-leaved plantain	1838	1897-05-31	NL	E	Plant
<i>Galearis spectabilis</i>	Showy orchis	1892	1892-05-27	NL	T	Plant

Note: Adopted from Attachment 1; T=threatened, E=endangered, NL=not listed

Table 2 lists three species of special concern with known occurrences within 1.5 miles of the Project Area. Species of special concern are not afforded legal protection through any state or federal statutes.

**Table 2**      *Special Concern Species Within 1.5 Miles of Project Area*

<b>Species</b>	<b>Common Name</b>	<b>First Observation</b>	<b>Last Observation</b>	<b>Federal Status</b>	<b>State Status</b>	<b>Category</b>
<i>Polygala incarnata</i>	Pink milkwort	1896-08-16	1896-08-16	NL	SC	Plant
<i>Dalea purpurea</i>	Purple prairie clover	1915	1915-08-31	NL	SC	Plant
<i>Cerastium velutinum</i>	Field Chickweed	1832-06	1832-06	NL	SC	Plant

Note: Adopted from Attachment 1; SC=species of special concern, NL=not listed

Upon receipt of the results from the Endangered Species Environmental Review, ERM conducted a desktop review of MNFI abstracts, provided by the MNFI website, for each species to determine appropriate survey methods and habitat requirements for each species. Results of this review were used to determine the probability of each species being located within the Project Area.

### *Species Review*

Table 3 provides a summary of species-specific habitat requirements, associated plants, survey methodologies, and survey windows. The single fish species, sauger, is not discussed as the Project Area does not include any open water habitats, and no project impacts are anticipated to the St. Clair River where these species potentially occur.

**Table 3** *Preferred Habitat and Survey Periods for the state Listed Plant Species Identified in the Endangered Species Review Results*

<b>Common Name</b>	<b>Preferred Habitat</b>	<b>Associated Plants</b>	<b>Survey Technique</b>	<b>Survey Time Period</b>
Creeping whitlow grass	Oak savanna remnants on steep hillsides	Little bluestem, red cedar, kitten-tails, side oats grama grass, prairie buttercup, black oak, white oak, Pennsylvania sedge, small skullcap, bastard toadflax, and black eyed susan	Random meander search	Fourth week of April – fourth week of May
White gentian	Dry or moist prairies and oak woodlands	Big bluestem, little bluestem, cordgrass, prairie coreopsis, wild geranium, pale-leaved sunflower, false boneset, smooth sumac, rosin weed, yellow-pimpernel, hoary vervain, prairie violet, golden alexanders, black oak, white oak, pin oak, hickory, sassafras, service berry, New Jersey tea, beaked hazelnut	Random meander search	Fourth week of August – third week of September
Limestone oak fern	Northern white cedar-dominated swamps in northern Lower Michigan	Sphagnum moss, northern white cedar, white spruce, balsam fir, goldthread, fly honeysuckle, lady fern, oak fern, yellow lady-slipper, and showy lady-slipper	Random meander search	Third week of June – third week of September
Frost grape	Rich mesic forests in Southwest Michigan	Sugar maple, basswood, butternut, red oak, and northern white cedar	Random meander search	First week of June – fourth week of August
Prairie buttercup	Located in sandy, dry prairie remnants on steep hillsides near lakes and streams	Black oak, white oak, little bluestem, ground juniper, red cedar, flowering spurge, Pennsylvania sedge, bush-clover, tick-trefoil, ohio spider wort, new jersey tea, and bracken fern	Random meander search	Fourth week of April – fourth week of May
Heart-leaved plantain	Large river floodplains and along small, mucky streams	Silver maple, green ash, red maple, black walnut, hackberry, black maple, Ohio buckeye, box elder, black ash, black willow, cottonwood, swamp white oak, sycamore, spice bush, redbud, paw paw, Kentucky coffee tree, red mulberry, wahoo, Virginia blue-bells, common trillium, red trillium, stinging nettle, poison ivy, moneywort, Canada moonseed, wild ginger, skunk cabbage, honewort, kidney-leaved buttercup, false mermaid, rough bedstraw, mayapple, blue eyed Mary, and Canada goldenrod	Random Meandar search	First week of May - fourth week of June

<b>Common Name</b>	<b>Preferred Habitat</b>	<b>Associated Plants</b>	<b>Survey Technique</b>	<b>Survey Time Period</b>
Showy orchis	Rich deciduous woods, often near temporary spring ponds in sandy clay or rich loam soils, or in shady, rich microhabitats alongside common spring ephemerals. Vigorous colonies can spread into more open habitat	Blue-beech, water leaf, sedge, bottle brush grass, large flowered trillium, spring beauty, hepatica, sugar maple, Eastern hemlock, beech, yellow birch, basswood, white pine, red oak, white cedar, white birch, ironwood, American elm, balsam fir, white baneberry, red baneberry, wild leek, wild sarsaparilla, jack-in-the-pulpit, blue cohosh, enchanter's nightshade, bunchberry, blue-bead lily, Canada mayflower, Solomon's seal, false spikenard, twisted stalk, bellwort, star flower, nodding trillium, common trillium, maiden hair fern, lady fern, rattlesnake fern, spinulose woodfern, stiff clubmoss, shining clubmoss, ground pine, striped maple, leatherwood, fly honeysuckle, and maple-leaf viburnum.	Random Meandar search	Third week of May - fourth week of June

*Note: Adopted from Attachment 2 (species abstracts)*

### **FIELD SURVEY AND ASSESSMENT**

ERM performed a random meander search within the Project Area on 30 April 2012 to search for any of the species listed in Table 3. During the meander search, a plant list was documented to compare plants found within the Project Area with the associated plants for each rare plant species in Table 3. Plants and associated habitats observed within the Project Area were compared to the preferred habitats described in Table 3 for each rare plant species.

Tables 4 -6, below, list the plants documented during the survey and their associated habitats and strata.

**Table 4** *Plant List for the Project Area as Documented During the 30 April 2012 Meander Survey - Manicured Right-of-Way (ROW)*

Species Name	Common Name	Stratum	Associated Habitat
<i>Carex</i> sp./Sedge Species*	Sedge species	Herbaceous	Manicured wetland in pipeline ROW
<i>Festuca</i> sp.	Fescue grass species	Herbaceous	Manicured pipeline ROW
<i>Phalaris arundinacea</i>	Reed canary grass	Herbaceous	Manicured wetland in pipeline ROW
<i>Phragmites australis</i>	Common reed	Herbaceous	Manicured wetland in pipeline ROW
<i>Toraxacum officinale</i>	Common dandelion	Herbaceous	Manicured pipeline ROW
<i>Trifolium pratense</i>	Red clover	herbaceous	Manicured pipeline ROW

\* Several carex species were noted; however, most species did not exhibit developed inflouescens for positive identification to the species level.

**Table 5** *Plant List for the Project Area as Documented During the 30 April 2012 Meandering Survey - Forested Wetland*

<i>Acer rubrum</i>	Red maple	Tree	Forested wetland
<i>Populus deltoides</i>	Eastern cottonwood	Tree	Forested wetland
<i>Quercus macrocarpa</i>	Burr oak	Tree	Forested wetland
<i>Cornus sericea</i>	Red osier dogwood	Shrub	Forested wetland
<i>Frangula alnus</i>	Glossy buckthorn	Shrub	Forested wetland
<i>Viburnum</i> sp.	Viburnum species	Shrub	Forested wetland
<i>Aster</i> sp.	Aster species	Herbaceous	Forested wetland
<i>Carex</i> sp./Sedge Species*	Sedge species	Herbaceous	Forested wetland
<i>Exquisetum</i> sp.	Horse tail species	Herbaceous	Forested wetland
<i>Onoclea sensibilis</i>	Sensitive fern	Herbaceous	Forested wetland
<i>Phalaris arundinacea</i>	Reed canary grass	Herbaceous	Forested wetland
<i>Ranunculus septentrionalis</i>	Swamp buttercup	Herbaceous	Forested wetland
<i>Rosa multiflora</i>	Multiflora rose	Herbaceous	Forested wetland
<i>Rosa palustris</i>	Swamp rose	Herbaceous	Forested wetland
<i>Viola</i> sp.	Violet species	Herbaceous	Forested wetland

\* Several carex species were noted; however, most species did not exhibit developed inflouescens for positive identification to the species level.

**Table 6** *Plant List for the Project Area as Documented During the 30 April 2012 Meandering Survey - Forested Upland*

<i>Acer rubrum</i>	Red maple	Tree	Forested upland
<i>Carpinus caroliniana</i>	Blue beech	Tree	Forested upland
<i>Fagus grandifolia</i>	American beech	Tree	Forested upland
<i>Ostrya virginiana</i>	Hop-hornbeam	Tree	Forested upland
<i>Tilia Americana</i>	American basswood	Tree	Forested upland
<i>Quercus rubra</i>	Red oak	Tree	Forested upland
<i>Viburnum sp.</i>	Viburnum species	Shrub	Forested upland
<i>Carex pennsylvanica</i>	Pennsylvania sedge	Herbaceous	Forested upland
<i>Erythronium americanum</i>	Trout lilly	Herbaceous	Forested upland
<i>Geranium maculatum</i>	Wild geranium	Herbaceous	Forested upland
<i>Podophyllum peltatum</i>	May apple	Herbaceous	Forested upland
<i>Toxicodendron radicans</i>	Poison ivy	Herbaceous	Forested upland
<i>Trillium grandiflorum</i>	Large white trillium	Herbaceous	Forested upland
<i>Viola sp.</i>	Violet species	Herbaceous	Forested upland

*\* Several carex species were noted; however, most species did not exhibit developed inflourescens for positive identification to the species level.*

## **DISCUSSION**

No rare plants were identified during the threatened and endangered botanical field survey. Some of the plants identified within the Project Area were included in the list of plants associated with the rare species listed in Tables 1 or 3.

No recent observations have been made for any of the listed plant species as all plants documented within 1.5 miles of the Project Area were observed in the early 1900s or earlier. Habitat likely has been disturbed for many of these plants within the 1.5 mile review area. None of the listed species historically observed in the vicinity are likely to exist within the Project Area.

Mr. Travis Beakley  
07/06/12  
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ERM appreciates the opportunity to be of service to Mustang Engineering and Sunoco Logistics. Should you have any questions regarding this information, please feel free to contact Jeff Williams at (616) 738-7370.

Sincerely,

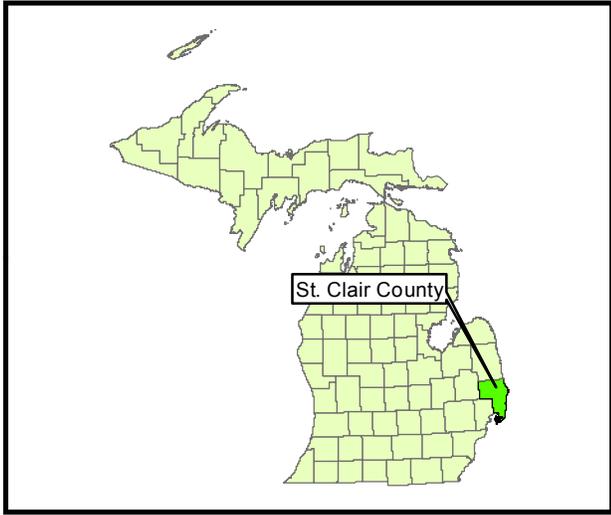


Jeff Williams  
*Project Scientist*

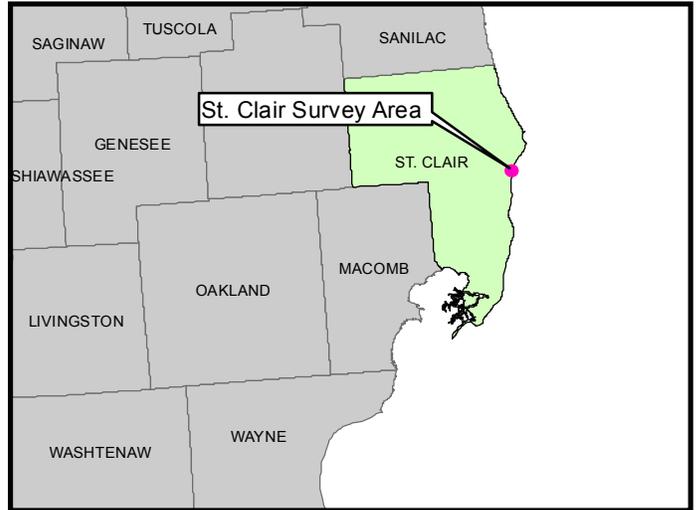
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## *Figures*

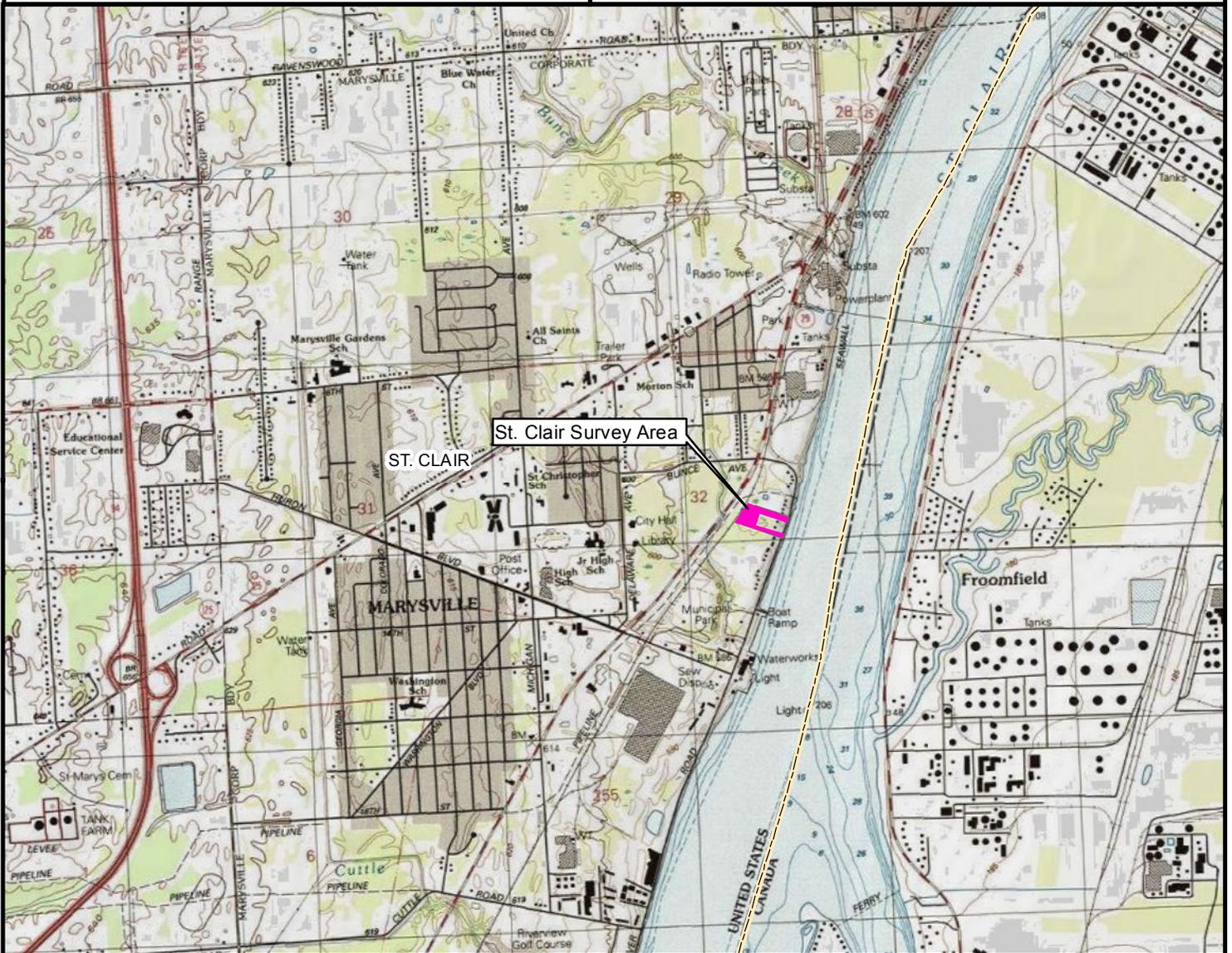
- *Figure 1. Site Location Map*
- *Figure 2. St. Clair Area  
Wetland Map*



State of Michigan

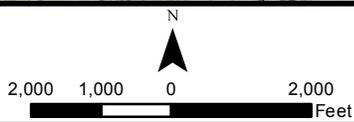


St. Clair County

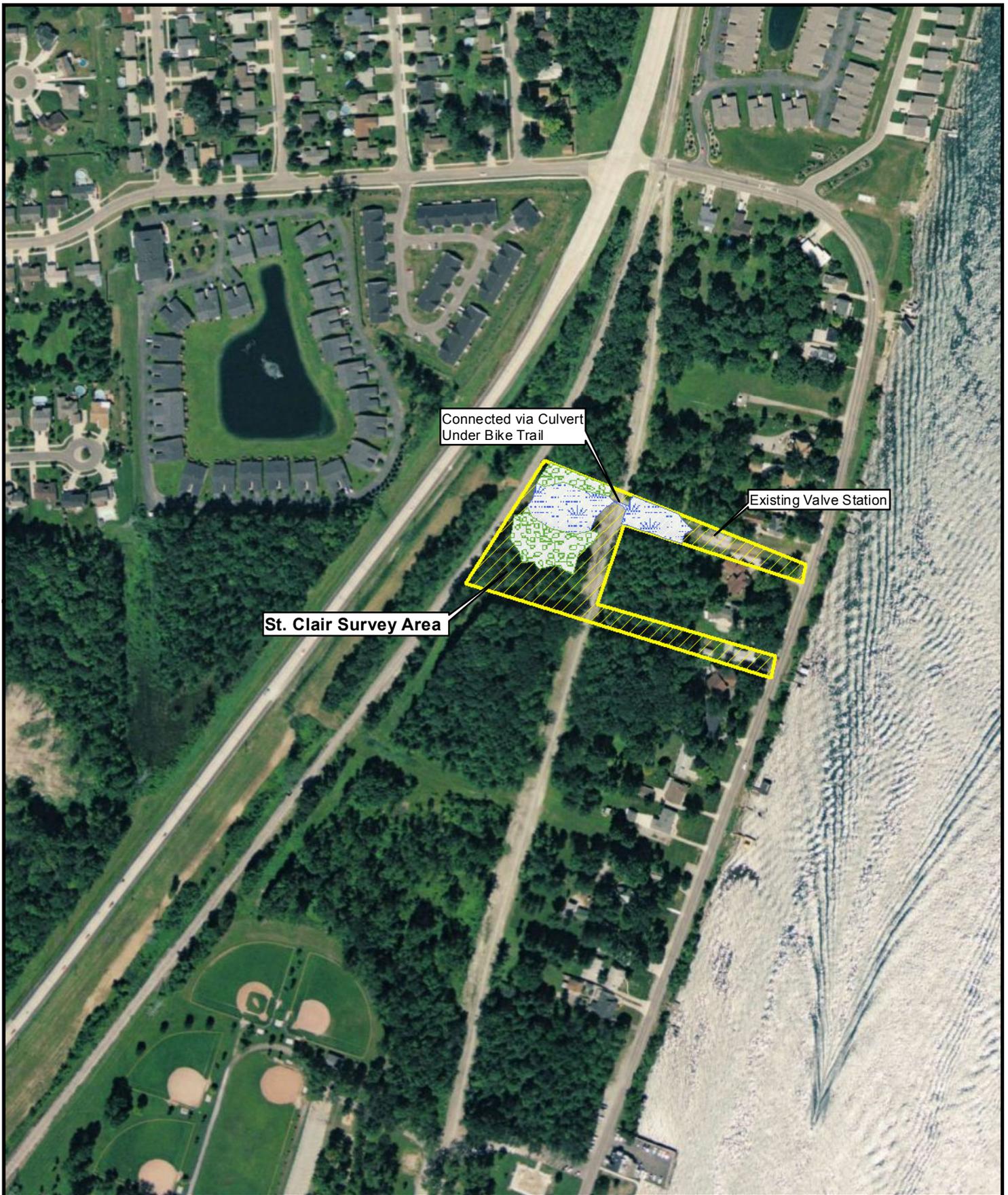


Section 32  
T.6N./R.17E.  
City of Marysville  
St. Clair County, Michigan

USGS TOPO Quad: Port Huron, 1991



**Figure 1**  
**St. Clair Survey Area**  
**Site Location Map**  
Mustang Engineering  
St. Clair County  
Michigan  
May 2012



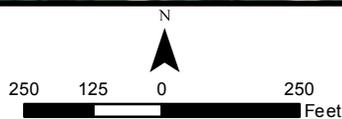
St. Clair Survey Area

Connected via Culvert  
Under Bike Trail

Existing Valve Station

**Field Delineated Wetland**

-  Forested Wetland
-  Emergent (herbaceous) Wetland



**Figure 2**  
**St. Clair Valve Station**  
**Area Wetland Map**

**Mustang Engineering**  
**St. Clair County, Michigan**  
**May 2012**

*Attachment 1*  
*MNFI Rare Species Review Results*

MICHIGAN STATE  
UNIVERSITY  
EXTENSION

Jeff Williams  
Project Scientist  
Environmental Resources Management  
3352 128<sup>th</sup> Avenue  
Holland, MI 49424

April 13, 2012

**Subj: Rare Species Review #1074 – Natural Gas Pipeline Improvements, St. Clair Survey Area, St. Clair County, MI, T6N R17E Section 32.**

Mr. Williams,

The location of the proposed pipeline improvements was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a particular site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, “a person shall not take, possess, transport, ... fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened,” unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.



Michigan Natural  
Features Inventory

P.O. Box 30444  
Lansing, MI  
48909-7944  
(517) 373-1552  
FAX: (517) 373-9566

According to the natural heritage database, listed species **may be** negatively impacted by the proposed pipeline improvements. However, MNFI cannot fully assess potential impacts without conducting an on-site survey. Keep in mind that MNFI is not a regulatory agency. MDNR Wildlife is responsible for issuing permits and enforcement relative to the take of endangered and threatened species. These data can be submitted to MDNR Wildlife should it be determined that this project requires an endangered species permit. Their contact person is Lori Sargent, MDNR Wildlife Division, P.O. Box 30180, Lansing, MI 48909. Phone: 517.373.1263, email: [SargentL@michigan.gov](mailto:SargentL@michigan.gov). Should MDNR Wildlife require more information regarding your project, MNFI offers more detailed reviews including field surveys, which I would be happy to discuss with you.

V/r,

Mike Sanders  
Environmental Review Specialist/Zoologist  
Michigan Natural Features Inventory

*Michigan State University  
Extension programs and materials  
are open to all without regard to  
race, color, national origin, gender,  
religion, age, disability, political  
beliefs, sexual orientation, marital  
status, or family status.*

*MSU is an affirmative-action,  
equal-opportunity employer.*

**Table 1: Legally protected species within 1.5 miles of #1074.**

SNAME	SCOMNAME	FIRSTOBS	LASTOBS	USESA	SPROT	GRANK	SRANK	ELCAT
<i>Sander canadensis</i>	Sauger	1937-05-30	1983-11		T	G5	S1	Animal
<i>Draba reptans</i>	Creeping whitlow grass	1913	1913-05-08		T	G5	S1	Plant
<i>Sander canadensis</i>	Sauger	1937-05-30	1937-05-30		T	G5	S1	Animal
<i>Gentiana flavida</i>	White gentian		1900-PRE		E	G4	S1	Plant
<i>Gymnocarpium robertianum</i>	Limestone oak fern	1888	1888-06-10		T	G5	S2	Plant
<i>Vitis vulpina</i>	Frost grape	1896	1899-07-29		T	G5	S1S2	Plant
<i>Ranunculus rhomboideus</i>	Prairie buttercup	1894	1915-05-29		T	G5	S2	Plant
<i>Plantago cordata</i>	Heart-leaved plantain	1838	1897-05-31		E	G4	S1	Plant
<i>Galearis spectabilis</i>	Showy orchis	1892	1892-05-27		T	G5	S2	Plant

**Comments #1074** – The state threatened sauger (*Sander canadensis*) has been known to occur in the St. Clair River adjacent to the project site. Saugers prefer large, turbid rivers and lakes. It occurs in large, deep waters of low gradients, except during spawning, when it may occur in the tailwaters of dams over rubble substrates. Spawning occurs in streams and lakes from late April through May. Sauger spawn in coarse sand, gravel, or cobble at depths from 2 to 10 feet. The sauger is host to the glochidial stages of a large number of mollusk species.

**Table 2: Special concern\* species or other features within 1.5 miles of #1074.**

SNAME	SCOMNAME	FIRSTOBS	LASTOBS	USESA	SPROT	GRANK	SRANK	ELCAT
<i>Polygala incarnata</i>	Pink milkwort	1896-08-16	1896-08-16		X	G5	SX	Plant
<i>Dalea purpurea</i>	Purple prairie clover	1915	1915-08-31		X	G5	SX	Plant
<i>Cerastium velutinum</i>	Field Chickweed	1832-06	1832-06		X	G5T4?	SX	Plant

\* Special concern species and natural communities are not protected under endangered species legislation but efforts should be taken to minimize any or all impacts.

**Codes to accompany Tables 1 & 2:**

**State Protection Status Code Definitions (SPROT)**

- E: Endangered
- T: Threatened
- SC: Special concern

**Global Heritage Status Rank Definitions (GRANK)**

The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Q: Taxonomy uncertain

**State Heritage Status Rank Definitions (SRANK)**

The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.

S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).

*Attachment 2*  
*MNFI Rare Species Abstracts*

## Rare Species Explorer

### Vitis vulpina

#### Frost grape

#### Key Characteristics

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High climbing vine of rich woods; climbing by tendrils located opposite the leaves; leaves mostly unlobed to weakly lobed (tips pointing outward), green to yellowish-green beneath with at best sparse hairs, bluntly (not acutely) toothed on the margin; fruits purple-black and not glaucous.

#### Status and Rank

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**State Status:** T - Threatened (legally protected)

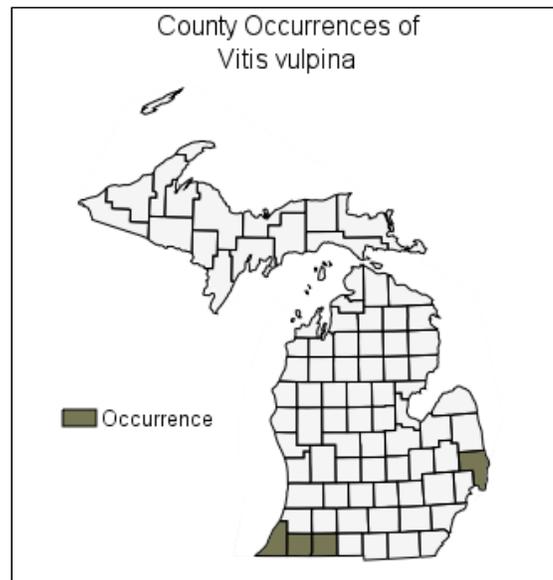
**State Rank:** S1S2 - Rank is uncertain, ranging from critically imperiled to imperiled

**Global Rank:** G5 - Secure

#### Occurrences

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County Name	Number of Occurrences	Year Last Observed
Berrien	2	2005
Cass	1	1905
St. Clair	1	1899
St. Joseph	1	1976



Updated 03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences. Data may not reflect true distribution since much of the state has not been thoroughly surveyed.

#### Habitat

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Little habitat data are available for this species, which is known from rich mesic forests in southwest Michigan.

#### Natural Community Types

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Mesic southern forest

#### Associated Plants

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Sugar maple, basswood, butternut, red oak, and northern white cedar.

## Management

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The primary need for this species is a status survey. It is likely to occur in same habitats as other native grape species and should not be sought only in mesic forests.

## General Survey Guidelines

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Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgement of the investigator.

## Survey Methods

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### Meander search

Survey Period: From first week of June to fourth week of August

## Page Citation

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Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer> [Accessed Apr 20, 2012]

## References

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### Survey References

- Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. The Nature Conservancy and Bureau of Land Management, Denver. BLM Technical Reference 1730-1. 477pp.
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Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region, 4th ed. Indiana Academy of Science, Indianapolis. 921pp.

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## Rare Species Explorer

### Plantago cordata

#### Heart-leaved plantain



Photo by MNFI Staff

#### Key Characteristics

Large leafy forb of swamps; leaves broadly heart-shaped, up to 20 cm wide, forming a basal rosette, with the lateral veins of the leaf branching off the primary midvein as opposed the arching from the base of the petiole; flowers minute, densely borne on a long erect or arching stalk.

#### Status and Rank

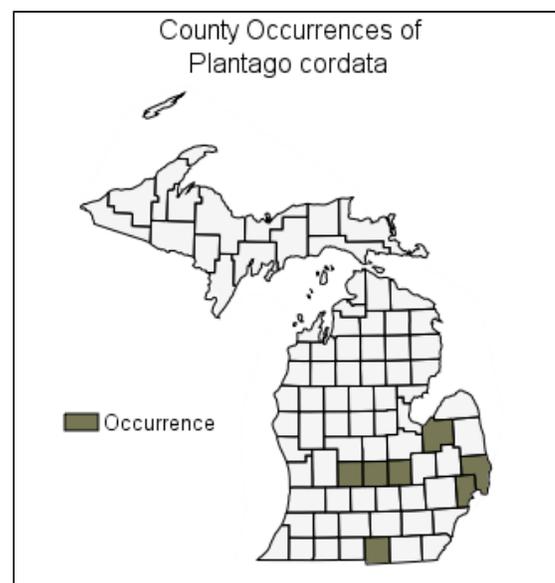
**State Status:** E - Endangered (legally protected)

**State Rank:** S1 - Critically imperiled

**Global Rank:** G4 - Apparently secure

#### Occurrences

County Name	Number of Occurrences	Year Last Observed
Clinton	1	1873
Hillsdale	1	1992
Ionia	2	2006
Macomb	1	1843
Shiawassee	1	1889
St. Clair	3	2011
Tuscola	1	2003



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Updated 03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences. Data may not reflect true distribution since much of the state has not been thoroughly surveyed.

## Habitat

---

Heart-leaved plantain occurs in large river floodplains and along small, mucky streams.

## Natural Community Types

---

Southern hardwood swamp

Floodplain forest

## Associated Plants

---

Silver maple, green ash, red maple, black walnut, hackberry, black maple, Ohio buckeye, box elder, black ash, black willow, cottonwood, swamp white oak, sycamore, spice bush, redbud, paw paw, Kentucky coffee tree, red mulberry, wahoo, Virginia blue-bells, common trillium, red trillium, stinging nettle, poison ivy, moneywort, Canada moonseed, wild ginger, skunk cabbage, honewort, kidney-leaved buttercup, false mermaid, rough bedstraw, mayapple, blue eyed Mary, and Canada goldenrod.

## Management

---

To protect this species, conserve the hydrology of river systems and corresponding cyclical floodplain regimes. Maintain healthy intact, mature floodplain forest and minimize forest fragmentation. When possible, leave large tracts of unharvested forests and allow natural processes to operate unhindered.

## General Survey Guidelines

---

Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgment of the investigator.

## Survey Methods

---

### Meander search

Survey Period: From first week of May to fourth week of June

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## Page Citation

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Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer>  
[Accessed Apr 20, 2012]

## More Information

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[See MNFI Species Abstract](#)

## References

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- Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. The Nature Conservancy and Bureau of Land Management, Denver. BLM Technical Reference 1730-1. 477pp.
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- Voss, E.G. 1996. Michigan Flora. Part III. Dicots (Pyrolaceae-Compositae). Bulletin of the Cranbrook Institute of Science and University of Michigan Herbarium. 622pp.

orientation, marital status or family status.

## Rare Species Explorer

### Gymnocarpium robertianum

#### Limestone oak fern



Photo by Michael R. Penskar

[More Images](#)

#### Key Characteristics

---

Small fern (10-50 cm) of dense cedar swamps; leaf broadly triangular, twice-divided, pinnae straight, perpendicular to rachis; underside of leaf and rachis densely covered by short, glandular hairs.

#### Status and Rank

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**State Status:** T - Threatened (legally protected)

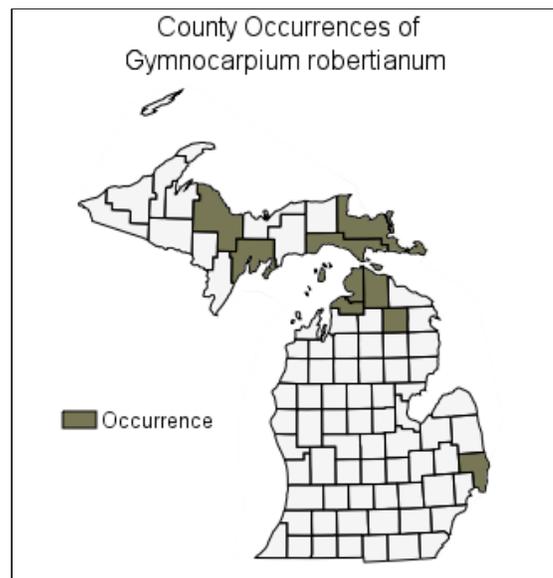
**State Rank:** S2 - Imperiled

**Global Rank:** G5 - Secure

#### Occurrences

---

County Name	Number of Occurrences	Year Last Observed
Alger	1	1989
Charlevoix	1	2001
Cheboygan	1	1948
Chippewa	3	2007
Delta	3	1989
Emmet	1	2002
Mackinac	3	2010
Marquette	1	1906
Montmorency	2	1998
St. Clair	1	1888



Updated 03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences. Data may not reflect true distribution since much of the state has not been thoroughly surveyed.

## Habitat

---

This species is found primarily in northern white cedar-dominated swamps in northern Lower Michigan and the Upper Peninsula, but can also occur in shaded, cedar-dominated limestone glades and shaded limestone cliffs.

## Natural Community Types

---

Rich conifer swamp  
Limestone bedrock glade  
Limestone lakeshore cliff

## Associated Plants

---

Sphagnum moss, northern white cedar, white spruce, balsam fir, goldthread, fly honeysuckle, lady fern, oak fern, yellow lady-slipper, and showy lady-slipper.

## Management

---

This species requires the maintenance of hydrology in conifer swamps and protection of groundwater sources. Maintenance of the forest canopy is also likely important to provide continued shade and a cool, moist microclimate.

## General Survey Guidelines

---

Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgement of the investigator.

## Survey Methods

---

### Meander search

Survey Period: From third week of June to third week of September

## Page Citation

---

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Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer>  
[Accessed Apr 20, 2012]

## More Information

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[See MNFI Species Abstract](#)

## References

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- Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. The Nature Conservancy and Bureau of Land Management, Denver. BLM Technical Reference 1730-1. 477pp.
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## Rare Species Explorer

### Ranunculus rhomboideus

#### Prairie buttercup



Photo by Susan R. Crispin

#### Key Characteristics

Small perennial forb (20 cm) of open oak forests and rocky outcrops; basal leaves forming a rosette with hairy, undivided blades; upright stems with smaller deeply lobed leaves; flowers yellow with 5 petals, longer than the sepals.

#### Status and Rank

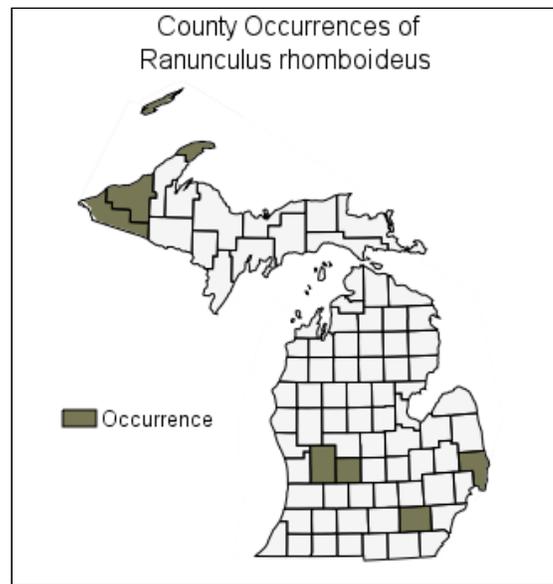
**State Status:** T - Threatened (legally protected)

**State Rank:** S2 - Imperiled

**Global Rank:** G5 - Secure

#### Occurrences

County Name	Number of Occurrences	Year Last Observed
Gogebic	1	1993
Ionia	2	2005
Kent	5	2001
Keweenaw	18	1994
Ontonagon	2	2004
St. Clair	2	1915
Washtenaw	1	1924



Updated 03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences.

Data may not reflect true distribution since much of the state has not been thoroughly surveyed.

## Habitat

---

In southern Michigan, prairie buttercup is known from prairie remnants on steep hillsides near lakes and rivers, in dry, sandy prairie remnants. On Isle Royale in the Upper Peninsula, it is found on rocky, south-facing ridges.

## Natural Community Types

---

Volcanic bedrock glade

Oak openings

Hillside prairie

## Associated Plants

---

In southern Lower Michigan, associates may include black oak, white oak, little bluestem, ground juniper, red cedar, flowering spurge, Pennsylvania sedge, bush-clover, tick-trefoil, Ohio spiderwort, New Jersey tea, rockrose, and bracken fern. On Isle Royale, it may be found with more northern species such as northern white cedar, bunchberry, bluejoint, violet, ticklegrass, yarrow, bearberry, marsh bellflower, pale Indian paintbrush, hair grass, spike-rush, butterwort, ninebark, silverweed, dwarf Canadian primrose, and wild rose.

## Management

---

This species requires open habitats. In southern Michigan, it would benefit from maintenance of the prairie and savanna community through activities like brush removal and prescribed burns. Due to its tendency to occur on steep hillsides and rocky openings, trampling and damage from erosion are also management concerns.

## General Survey Guidelines

---

Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgment of the investigator.

## Survey Methods

---

Meander search

Survey Period: From fourth week of April to fourth week of May

## Page Citation

---

Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer>  
[Accessed Apr 20, 2012]

## More Information

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[See MNFI Species Abstract](#)

## References

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### Survey References

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## Rare Species Explorer

### **Galearis spectabilis**

#### **Showy orchis**



Photo by Steve Grund

[More Images](#)

#### **Key Characteristics**

---

Small orchid (10-20 cm) of rich woods; two ovate basal leaves; flower stalk short and stubby, bearing several small two-parted flowers, each with a rounded pink hood and pale lower lip.

#### **Status and Rank**

---

**State Status:** T - Threatened (legally protected)

**State Rank:** S2 - Imperiled

**Global Rank:** G5 - Secure

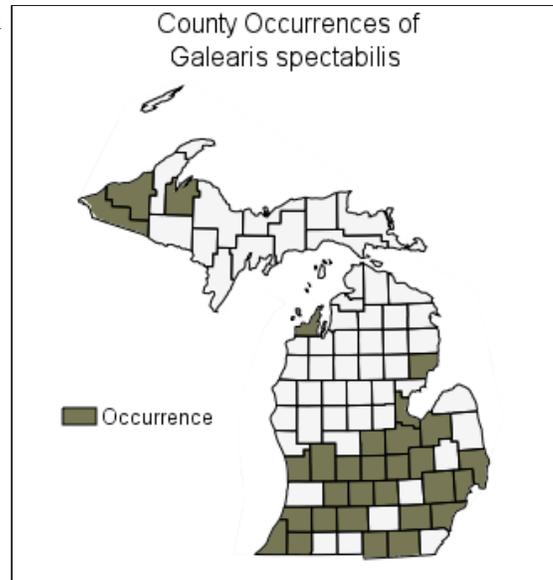
#### **Occurrences**

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County Name	Number of Occurrences	Year Last Observed
Baraga	1	1888
Barry	2	2006
Bay	1	1893
Berrien	10	2006
Calhoun	1	2006
Cass	2	2007
Clinton	4	1963
Eaton	4	1962

Genesee	1	1962
Gogebic	1	2010
Gratiot	2	1893
Hillsdale	2	2004
Ingham	3	1917
Ionia	1	1878
Iosco	1	2010
Kalamazoo	5	2008
Kent	2	1894
Leelanau	1	1998
Lenawee	3	1952
Macomb	3	1919
Oakland	11	1958
Ontonagon	3	2005
Ottawa	1	1894
Saginaw	1	1893
Shiawassee	1	1890
St. Clair	2	1952
Tuscola	1	1893
Van Buren	1	1906
Washtenaw	4	1963
Wayne	6	1933

Updated



03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences. Data may not reflect true distribution since much of the state has not been thoroughly surveyed.

## Habitat

Found in rich deciduous woods, often near temporary spring ponds in sandy clay or rich loam soils, or in shady, rich microhabitats alongside common spring ephemerals. Vigorous colonies can spread into more open habitat.

## Natural Community Types

Southern hardwood swamp  
 Mesic southern forest  
 Mesic northern forest

## Associated Plants

Blue-beech, water leaf, sedge, bottle brush grass, large flowered trillium, spring beauty, hepatica, sugar maple, Eastern hemlock, beech, yellow birch, basswood, white pine, red oak, white cedar, white birch, ironwood, American elm, balsam fir, white baneberry, red baneberry, wild leek, wild sarsaparilla, jack-in-the-pulpit, blue cohosh, enchanter's nightshade, bunchberry, blue-bead lily, Canada mayflower, Solomon's seal, false spikenard, twisted stalk, bellwort, star flower, nodding trillium, common trillium, maiden hair fern, lady fern, rattlesnake fern, spinulose woodfern, stiff clubmoss, shining clubmoss, ground pine, striped maple, leatherwood, fly honeysuckle, and maple-leaf viburnum.

## Management

This species benefits from conservation of rich forest habitat, and avoidance of excessive logging and change in hydrology. Minimize development and fragmentation. When possible, leave large tracts of unharvested forests and allow natural processes to operate unhindered. Reportedly also very susceptible to herbivory from slugs.

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## General Survey Guidelines

---

Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgement of the investigator.

## Survey Methods

---

### Meander search

Survey Period: From **third week of May to fourth week of June**

## Page Citation

---

Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer>  
[Accessed Apr 20, 2012]

## More Information

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[See MNFI Species Abstract](#)

## References

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Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. The Nature Conservancy and Bureau of Land Management, Denver. BLM Technical Reference 1730-1. 477pp.

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## Rare Species Explorer

### Gentiana flvida

#### White gentian



Photo by Brad Slaughter

#### Key Characteristics

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Stout forb (50-90 cm) of mesic prairies; leaves greenish-yellow, opposite, widest near the base; flowers creamy-white.

#### Status and Rank

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**State Status:** E - Endangered (legally protected)

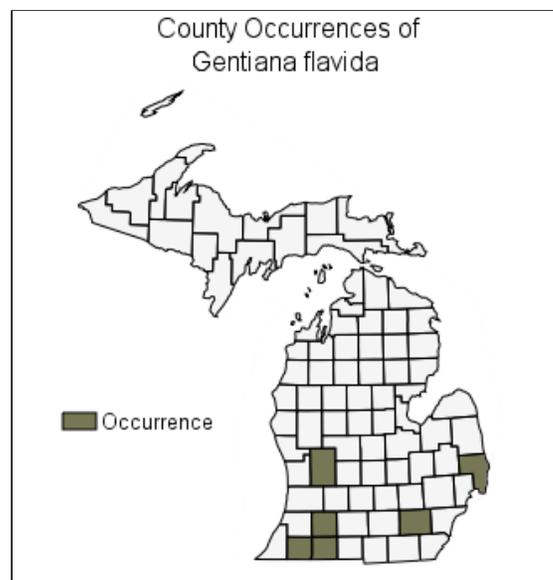
**State Rank:** S1 - Critically imperiled

**Global Rank:** G4 - Apparently secure

#### Occurrences

---

County Name	Number of Occurrences	Year Last Observed
Cass	2	1999
Kalamazoo	2	1939
Kent	1	1901
St. Clair	1	1900
St. Joseph	1	1838
Washtenaw	5	1981



Updated 03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences. Data may not reflect true distribution since much of the state has not been thoroughly surveyed.

## Habitat

---

Found in dry or moist prairies and oak woodlands.

## Natural Community Types

---

Dry-mesic prairie  
Oak barrens  
Mesic prairie

## Associated Plants

---

Big bluestem, little bluestem, cordgrass, prairie coreopsis, wild geranium, pale-leaved sunflower, false boneset, smooth sumac, rosin weed, yellow-pimpernel, hoary vervain, prairie violet, golden alexanders, black oak, white oak, pin oak, hickory, sassafras, service berry, New Jersey tea, beaked hazelnut.

## Management

---

Protect habitat and hydrological and natural disturbance regimes. This species likely requires natural disturbances associated with prairie habitat such as prescribed fire or brush removal to prevent woody plant succession. Significant increases in vegetative and reproductive vigor have been observed following early spring and late fall burns. Much of this habitat type has been lost or severely degraded. Many prairie remnants are vulnerable to common right-of-way maintenance activities such as mowing, herbiciding, and bulldozing.

## General Survey Guidelines

---

Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgment of the investigator.

## Survey Methods

---

### Meander search

Survey Period: From fourth week of August to third week of September

Survey Comments: oak barrens and prairie remnants

## Page Citation

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Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer>  
[Accessed Apr 20, 2012]

## References

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### Survey References

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## Rare Species Explorer

### Draba reptans

#### Creeping whitlow grass



Photo by Arthur Meeks

#### Key Characteristics

---

Small annual forb (20 cm) of sandy fields and remnant dry prairies and savannas; basal rosette of small leaves; stem leaves mostly absent; flowers white, with four small (3 mm) petals, borne in a crowded cluster; fruits elongated, flattened.

#### Status and Rank

---

**State Status:** T - Threatened (legally protected)

**State Rank:** S1 - Critically imperiled

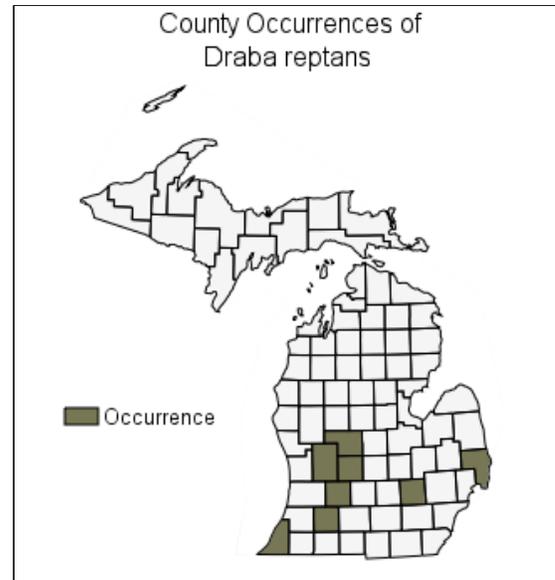
**Global Rank:** G5 - Secure

#### Occurrences

---

County Name	Number of Occurrences	Year Last Observed
Barry	1	1991
Berrien	1	1931
Ionia	2	1924
Kalamazoo	1	1937
Kent	3	1901
Livingston	1	1935
Montcalm	1	1890
St. Clair	1	1913

Updated 03/15/2012. Information is summarized from MNFI's database of rare species and community occurrences. Data may not reflect true distribution since much of the state has not been thoroughly surveyed.



## Habitat

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Found in oak savanna remnants on steep hillsides (black oak-white oak), especially those adjacent to large rivers and lakes in southern Lower Michigan. Most examples of these sites are small and becoming degraded through further landscape fragmentation and lack of management.

## Natural Community Types

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Hillside prairie  
Dry sand prairie  
Dry-mesic prairie  
Lakeplain oak openings  
Oak barrens  
Oak openings

## Associated Plants

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Little bluestem, red cedar, kitten-tails, side-oats grama grass, prairie buttercup, black oak, white oak, Pennsylvania sedge, small skullcap, bastard toadflax, and black-eyed Susan.

## Management

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This species requires the maintenance of grassland/savanna community through activities like brush removal and prescribed burns. Sites tend to heavily brush in without natural disturbance regime.

## General Survey Guidelines

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Random meander search covers areas that appear likely to have rare taxa, based on habitat and the judgment of the investigator.

## Survey Methods

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Meander search

Survey Period: From fourth week of April to fourth week of May

## Page Citation

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Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at <http://mnfi.anr.msu.edu/explorer>  
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