

Michigan Monkey-flower
(Mimulus michiganensis)

5-Year Review:
Summary and Evaluation



U.S. Fish and Wildlife Service, Midwest Region
East Lansing Field Office
East Lansing, Michigan

5-YEAR REVIEW

Species reviewed: Michigan monkey-flower (*Mimulus michiganensis*)

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Cover photograph

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5-YEAR REVIEW
Michigan monkey-flower (*Mimulus michiganensis*)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office: Region 3 (Midwest)
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Scott Hicks, Field Supervisor
Barbara Hosler, Biologist
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1.2 Methodology used to complete the review

The U.S. Fish and Wildlife Service (Service) conducts status reviews of species on the List of Endangered and Threatened Wildlife and Plants (50 CFR 17.11 and 17.12) as required by section 4(c)(2)(A) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*). The Service provided notice of this status review for the Michigan monkey-flower (*Mimulus michiganensis*) via the *Federal Register* (74 FR 11600) and requested new scientific or commercial data and information that may have a bearing on the Michigan monkey-flower's classification as endangered.

The East Lansing Field Office (ELFO), in coordination with Midwest Regional Office Ecological Services staff, conducted this review. We reviewed past and recent literature, public comments, the final listing rule (55 FR 25596), the Michigan Monkey-flower (*Mimulus glabratus* var. *michiganensis*) Recovery Plan (USFWS 1997), and the Michigan Natural Features Inventory (MNFI) database to prepare this 5-year review. The Service's 2006 Interim 5-Year Review Guidance does not require peer review if a 5-year review results in a recommendation to leave the status unchanged because there was no new information, or all new information has undergone prior peer review.

1.3 Background

1.3.1 *Federal Register* notice citation announcing initiation of this review:
74 FR 11600, Wednesday, March 18, 2009

1.3.2 Listing history

<u>Original Listing</u>	
<i>Federal Register</i> notice:	55 FR 25596
Date listed:	June 21, 1990
Entity listed:	Subspecies
Classification:	Endangered

1.3.3 Associated rulemakings:

75 FR 55686–55689 (September 14, 2010) - Technical Corrections for Three Midwest Region Plant Species. Direct final rule (revised the scientific name from *Mimulus glabratus* var. *michiganensis* to *Mimulus michiganensis*) effective December 13, 2010.

1.3.4 Review History: The Service initiated a cursory 5-year review of all species listed before January 1, 1991, which included Michigan monkey-flower (56 FR 56882). This review resulted in no change to the Michigan monkey-flower listing classification of endangered.

1.3.5 Species' Recovery Priority Number at start of 5-year review: 9C. A “9” indicates a moderate degree of threat and high recovery potential. The “C” means this subspecies is in conflict with construction or other development projects or other forms of economic activity.

1.3.6 Recovery Plan:

Name of plan: Michigan Monkey-flower (*Mimulus glabratus* var. *michiganensis*) Recovery Plan
Date issued: September 17, 1997
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate? *No*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria? *Yes*

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat? *Yes*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)? *Yes*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

The recovery plan states the following:

The fundamental recovery objective for *M. glabratus* var. *michiganensis* is to secure long-term protection for all of its 15 known occurrences as well as viable or restorable occurrences discovered subsequent to the preparation of the recovery plan, or newly identified extant colonies in historical sites.

M. glabratus var. *michiganensis* will be considered for reclassification from endangered to threatened status when protection is secured for all eight occurrences ranked “A” or “B” (“Excellent Occurrence” and “Good Occurrence”, respectively, see Appendix A). When all known occurrences are sufficiently protected, delisting can be considered.

Summary of Table 1:

- 19 total Michigan monkey-flower element occurrence records (EORs), including two historical occurrences.
- Eight EORs were previously ranked “A” or “B” upon issuance of the recovery plan (refer to RP [recovery plan] rank in table). Of these, six EORs have retained their ranks, one EOR rank was elevated, and one EOR rank was downgraded.
- Nine EORs are currently ranked “A” or “B” and six of these are located partially or fully on State, Federal, University or land conservancy properties.
- The historical Burt Lake West EOR crosses county lines, but is one occurrence.

When the recovery plan was issued, a total of 17 Michigan monkey-flower (MMF) EORs were documented, but only 15 were referenced as needing protection. The two historical EORs (#2 and #4, Burt Lake West and Mullet Lake, respectively) had no MMF observed and were not included in the referenced 15 EORs.

The MNFI (2009) has recorded four new EORs since issuance of the recovery plan. However, the historical occurrences are possibly extirpated—Mullet Lake was last observed in 1925 and Burt Lake West in 1933. According to MNFI records (2010a), the last search for both occurrences was in 1989, but no MMF were found. Development and agriculture run-off has altered much of the habitat in both locations, but pockets of potential habitat remain. Further exploration is needed.

Restoration and recovery activities have occurred at McFarlane Woods (EOR # 15) and Burdickville and Settler’s Park (EOR #7) (USFWS 2006; Jody Marquis, Mama Bear Restorations, pers. comm. 2010). Both occurrences are on or near Glen Lake, Emmet County. Within the past five years, the National Park Service (NPS) restored and continues to monitor three colonies at McFarlane Woods that were removed from an artificial drainage system and transplanted to a location adjacent to a nearby existing patch of MMF (Amanda Brushaber, NPS, pers. comm. 2010; Jenna Scheub, NPS, pers. comm. 2011). Relocating the plants was part of restoring the hydrological functions on this newly acquired NPS property. According to the NPS’s annual monitoring reports, the transplanting has been successful and the plants continue to thrive (Brushaber, pers. comm. 2010; Scheub, pers. comm. 2011).

In 2001, a group of property owners on Glen Lake (EOR #7) began a MMF habitat restoration and recovery project along the east side of the lake (Marquis, pers. comm. 2010). Invasive species were removed and the hydrology was restored which allowed MMF colonies to spread

(Marquis, pers. comm. 2010). The colonies now cover approximately 600 feet of contiguous shoreline, spanning five private properties and a county park (Marquis, pers. comm. 2010). Restoration is ongoing with plans for the landowners to “spearhead” a Michigan monkey-flower initiative (Marquis pers. comm. 2010).

Table 1. Location and ranks of Michigan monkey-flower element occurrence records (EORs) as of 2010.

EOR#	Site	County	Current rank	RP rank	Landowner
1	Carp Ck - Reese's Swamp	Cheboygan	A	A	University of Michigan Biological Station (UMBS)
2	Burt Lake West	Cheboygan/ Emmet	H	H	unknown
3	Reese's Swamp	Cheboygan	A	A	UMBS; multiple private
4	Mullet Lk - West Shore	Cheboygan	H	H	unknown
5	Maple River Dam	Emmet	B	B	Private
6	Mullet Lk SE - Parrot Pt	Cheboygan	D	D	Private
7	Burdickville & Settler's Pk	Leelanau	BC	BC	multiple private
8	St. James Harbor – Beaver Island	Charlevoix	D	B	Private
9	Epoufette Bay	Mackinac	B	BC	Michigan Nature Assoc.
10	Platte River - North Branch	Benzie	BC	BC	multiple private
11	Manitou Payment Highbanks	Mackinac	BC	BC	Sand Products Corp.
12	Brevort	Mackinac	B	B	Private
13	Little Sandy Bay – Beaver Island	Charlevoix	B	B	Little Traverse Conservancy
14	Cut River West	Mackinac	A	B?	State of Michigan
15	McFarlane Woods	Leelanau	A	A	National Park Service, Sleeping Bear Dunes
16	Harbor Springs	Emmet	C	BC	Idylwilde Association
17	Burt Lake Southeast	Cheboygan	C	C	State of Michigan; multiple private
18	Cut River East	Mackinac	C	Not in RP	State of Michigan
19	Hatlem's Ck	Leelanau	B	Not in RP	Private

Table derived from USFWS (1997) and MNFI (2009; 2010a).

The University of Michigan Biological Station (UMBS) has two EORs (#1 and #3) in aquatic habitats in Reese’s Swamp specifically for research use only, and as such very little manipulation is allowed (Bob Vande Kopple, UMBS, pers. comm. 2010). Vande Kopple (pers. comm. 2010), reported that monitoring does not occur, but noted that the habitat has not been altered. Additionally, UMBS protects the entire Reese’s Swamp watershed where their cedar swamps (MMF habitat) occur.

The Sand Products Corporation has been monitoring their MMF colonies (EOR #11) since

2002, in response to a permit request to the U.S. Army Corps of Engineers (USCOE). It is currently the subject of an ongoing section 7 consultation with the USCOE for this permit. For the past several years, the company has submitted its monitoring reports to the Michigan Department of Natural Resources and Environment (MDNRE) (Mike Penskar, MNFI, pers. comm. 2010; Tom Graf, MDNRE, pers. comm. 2010). Unfortunately, this population is in decline.

Protection is secured for four occurrences ranked “A” or “B”. More long-term protection is needed as well as comprehensive systematic surveys, monitoring, mapping, and working with private landowners. The recovery criteria to reclassify MMF from endangered to threatened status have not been met.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species’ biology and life history:

The following brief description of biology and habitat is derived from the recovery plan. Michigan monkey-flower is an aquatic to semi-aquatic Michigan endemic perennial characterized by its mat-forming, clonal growth habitat. It is restricted to cold, alkaline spring seepages and streams, usually in association with northern white cedar (*Thuja occidentalis*) swamps formed in drainages found at the base of relatively steep, morainic slopes and bluff. Within its habitat, it generally flourishes best in tree canopy openings, along forest edges, or along streams adjacent to open, meadow-like areas and flowers abundantly when growing in full sunlight. However, it mostly persists as sterile colonies when growing under heavy tree canopy cover. Michigan monkey-flower habitat requirements and population biology are not definitely known, owing in part, to a lack of long-term monitoring.

In a reproductive study of MMF, Bliss (1986) estimated and examined its pollen viability and fruit set using the differential malachite green/acid fuchsin stain technique (Alexander 1969). She found that compared to typical plant species, MMF’s pollen viability was low—less than one percent. More recent studies conducted by Posto and Prather (2000), using a different pollen staining technique as an estimate of pollen viability, confirmed this, but they also included the Reese’s Swamp population in Cheboygan County, Michigan, which had never been tested. They found that pollen stainability of all individuals in populations other than Maple River was not just low, but was zero percent, and it varied considerably within the Maple River population. Posto and Prather’s (2000) results further verified that viable pollen occurs only in the Maple River population in Emmet County, Michigan. The other populations are basically sterile and totally dependent on vegetative propagation via rhizomes (Bliss 1983; Bliss 1986).

Individuals from the Maple River population were capable of self-pollination, regularly set selfed-fruits in the greenhouse, and had 27–52% pollen viability (mean of 41%) (Posto and Prather 2000; Posto 2001). During the greenhouse experiments, Posto and Prather (2000) also noted the amount of self-pollination in the controlled setting was higher than that in the field and proposed that limited fruit set in nature may be limited

by resource competition. When Posto (2001) conducted interpopulational crosses between pollen-sterile individuals from other sites and Maple River individuals (the pollen donors), all the flowers survived to fruiting and all set fruit. In this cross-pollination experiment, fruit set was indicated by observations of a swollen ovary and calyx, which was suggestive of viable ovules and that seed will set. However, Roberts (1964) found during studies of synthesized F₁ hybrids of other *Mimulus* species that self-pollinated, semi-sterile plants exhibited enlargement of the capsule and calyx, but did not set seed. This was also observed in backcross experiments with a greater degree of enlargement. Roberts (1964) suggested that hormone action following pollination may be responsible for this effect. Therefore, Posto (2001) concluded that it is unclear whether fruit set in the interpopulational crosses between Maple River and pollen-sterile plants is due to seed development or hormone action.

Posto (2001) also conducted seed germination experiments and found that MMF seeds germinate best in light at approximately 23°C. This is noteworthy because MMF sites are considerably cooler than 25°C and mostly shaded, which suggests that seed germination is probably highest along the water margins in the sun, rather than under water (Posto 2001).

Posto and Prather (2000) and Posto (2001) concluded that MMF is self-compatible and plants from the Maple River population are capable of self-pollination. The taxon is also highly unlikely to produce seed asexually (Posto and Prather 2000). This is in contrast to the results of Bliss' (1986) study where she concluded that it was self-incompatible.

2.3.1.2 Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Michigan monkey-flower was one of the 578 U.S. species included in a 5-year review of species listed before January 1, 1991. At the time of this review, MMF occurred in only 12 sites in the counties of Benzie, Cheboygan, Emmet, Leelanau, and Mackinac (55 FR 25596). Eight sites contained less than 10 individual plants (55 FR 25596). Upon issuance of the recovery plan in 1997, 15 EORs were later documented, with the majority of occurrences clustered in the Mackinac Straits region.

Currently, there are 19 element occurrences, including two historical occurrences (MNFI 2010b). The newest colony was discovered in 2008 (MNFI 2010b). Overall, the entire population is stable, although MMF colonies at a few sites are in decline (MNFI 2010b). However, this information was obtained from records in which most have not been updated in more than 10 years (MNFI 2010b). A systematic survey would provide a more accurate description of MMF abundance and population trends.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Michigan monkey-flower is a rare species endemic to Michigan and is found within the Mackinac Straits and Grand Traverse regions (Figure 1). Because of its rarity, there are questions surrounding its origin and taxonomic rank that were raised in the recovery

plan. In order to address these questions, Posto and Prather (2003) conducted a genetics investigation, using random amplified polymorphic DNA (RAPD) to better understand the genetic relationships between MMF and two related species implicated in its origin: James' monkey-flower (JMF; *M. glabratus* var. *jamesii*) and Common monkey-flower (CMF; *M. guttatus*).

Detailed studies have already shown that MMF is morphologically distinct from JMF (Bliss 1986; Minc 1989; Posto and Prather 2003), reproductively isolated from all diploid varieties of *M. glabratus* (Vickery 1990; Posto and Prather 2003), and genetically distinct from all other members of the *M. glabratus* complex (Vickery 1990; Posto and Prather 2003). Posto and Prather's (2000) studies focused on the following research topics in the recovery plan: (1) population biology and genetic variability and (2) comparative biosystematic research to determine the most appropriate taxonomic classification.

Results from their population genetic study indicated that among their samples, 91% of the genotypes were unique to one individual. In other words, nearly every individual MMF is genetically distinct and possesses unique genetic markers not found in any other taxa in the analysis (Posto and Prather 2000; Posto 2001). The Beaver Island population harbored about half of the unique genetic markers. The Maple River population harbored 10% of the unique alleles and is the only population documented with fertile pollen. Posto and Prather (2000) suggested that although clonal growth is responsible for reproduction in most populations, a number of genetic individuals are present despite the small size of most occurrences.

Additionally, their biosystematic research has revealed that MMF is more closely related to JMF than to CMF (Posto 2001; Posto and Prather 2003). Michigan monkey-flower also does not appear to be of recent origin because it shares genetic markers with western populations of JMF and CMF that it does not share with more local, Michigan populations of JMF and CMF (Posto 2001). Posto and Prather's (2003) crossing studies have also demonstrated that MMF is not interfertile with any other member of the *M. glabratus* complex. Even in locations where MMF is sympatric with other *M. glabratus*, MMF has maintained its morphological distinctiveness, and there have been no reports of hybridization or of morphologically intermediate individuals (Posto and Prather 2003). Other studies by Posto and Prather (2003) have shown that although MMF shares more genetic markers with JMF than other taxa studied, its unique genetic markers group separately from all others in the Unweighted Pair Group Method with Arithmetic Mean (UPGMA) phenogram, indicating that it is genetically distinct from JMF and other *M. glabratus*.

2.3.1.4 Taxonomic classification or changes in nomenclature:

Posto's and Prather (2003) genetic investigation of Michigan monkey-flower concluded that the genetic distinctiveness of MMF, as indicated above in 2.3.1.3, supports recognition of the taxon at the specific rank to *Mimulus michiganensis*. The Service published a direct final rule (USFWS 2010) that revised the species' scientific name in the List of Endangered and Threatened Plants upon the rule's effective date of December 13, 2010.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Occurrences of Michigan monkey-flower are often very localized, sometimes consisting of small but dense patches restricted to small seeps, springs, and depressions, whereas others are comprised of numerous patches of plants widely dispersed along small streams and spring-fed seeps within northern white cedar swamps (Penskar and Higman 2001). Large to moderately-sized populations include occurrences on Glen Lake, Burt Lake, and portions of the Mackinac County shoreline within the Manitou Payment Highbanks formation in the Brevort to Epoufette region (Penskar and Higman 2001). Although new occurrences are documented, the distribution of MMF has not changed.

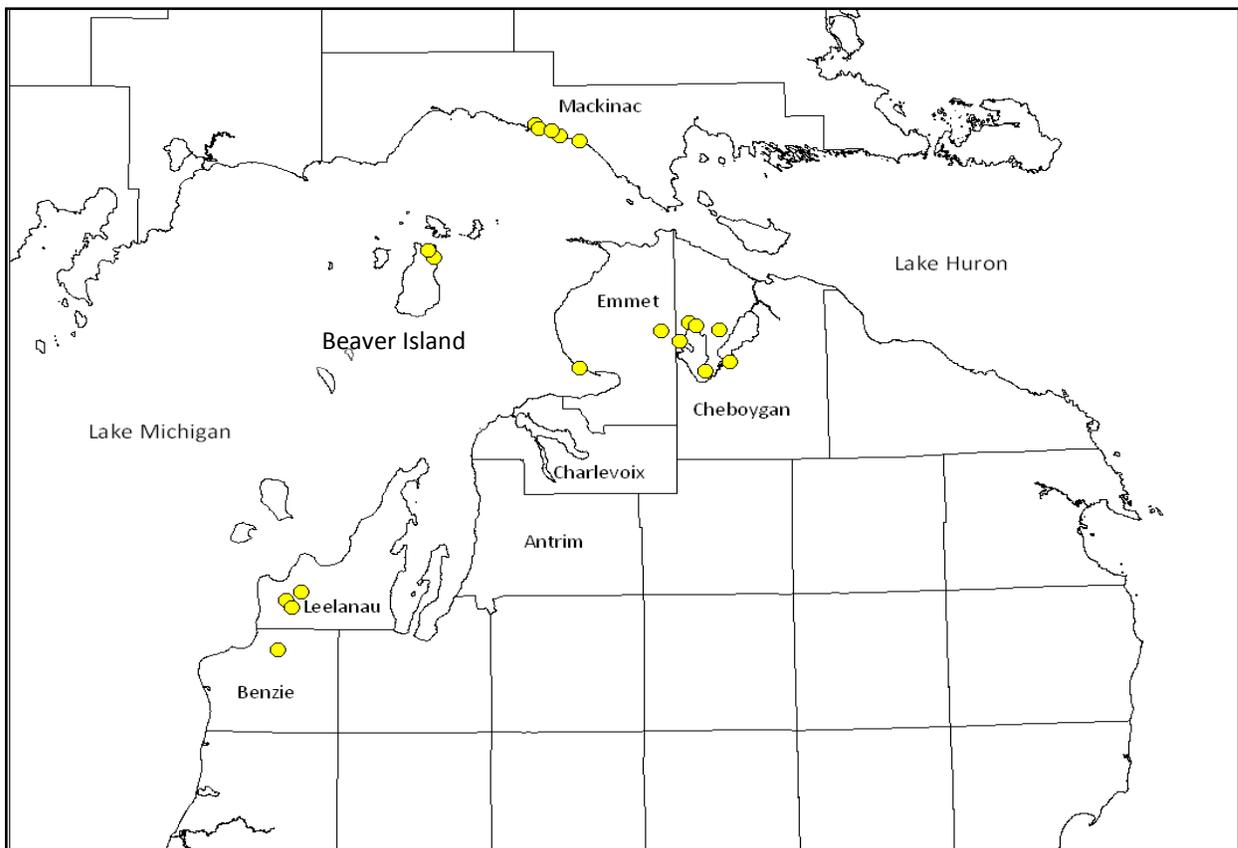


Figure 1. Distribution of Michigan monkey-flower.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Habitat suitability has changed at some sites. Habitat and hydrological disruptions and alterations have negatively impacted several occurrences (Andy Bacon, Michigan Nature Association [MNA], pers. comm. 2010; MNFI 2010b). Additionally, non-native invasive species are threatening some high ranking colonies.

2.3.1.7 Other: N/A

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

The recovery plan (USFWS 1997) provides a detailed analysis of these factors.

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

As discussed in the recovery plan, Michigan monkey-flower is threatened by direct destruction and modification of its habitat. Its habitat has been developed for recreational and residential purposes, which has led to extirpation and severe impacts to some historical populations. Hydrological disruptions constitute the next most serious threat as water diversion, warming of water sources, and other groundwater alterations lead to less than optimal habitat conditions. Consequently, this species may be inadvertently impacted by offsite activities.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

No known current demand exists for MMF plants for commercial, residential or educational purposes.

2.3.2.3 Disease or predation: *None*

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Michigan monkey-flower is listed as endangered both federally and by the State of Michigan. The Act provides little protection for listed plants on private property except where Federal agency actions occur. Michigan's Natural Resources and Environmental Protection Act (NREPA), Part 365, prohibits taking of endangered species on both public and private lands without a permit (USFWS 1997).

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Populations of MMF are particularly vulnerable to extirpation due to low numbers and limited capability for sexual reproduction. Additionally, periodic high water levels of the Great Lakes and strong winter storms impact MMF habitat that occurs near the Great Lakes shoreline by redirecting seepage streams and opening the overstory by felling cedars. However, opening of the overstory could benefit MMF by allowing for colonization.

Invasive species represent an additional threat. More specifically, Jody Marquis (pers. comm. 2010) recently reported that coltsfoot (*Tussilago farfara*) (Figure 2), an aggressive invasive plant, is growing within several MMF patches in the Glen Lake area. This invasive plant is known to spread rapidly via vegetative reproduction by

rhizomes and windborne distribution of dandelion-like seed heads (Marquis, pers. comm. 2010). The Glen Lake area provides habitat to several high ranking MMF colonies and without intervention and control of coltsfoot, localized extirpations are likely.

Approximately 80% of MMF sites are located on private property. Upon issuance of the recovery plan in 1997, many landowners became aware of MMF's presence and its significance (Penskar, pers. comm. 2010). However, changes in ownership since then may not have been updated in the EORs. Because the majority of occurrences are in private ownership, notifying and educating the landowners are the best tools for preventing attrition.

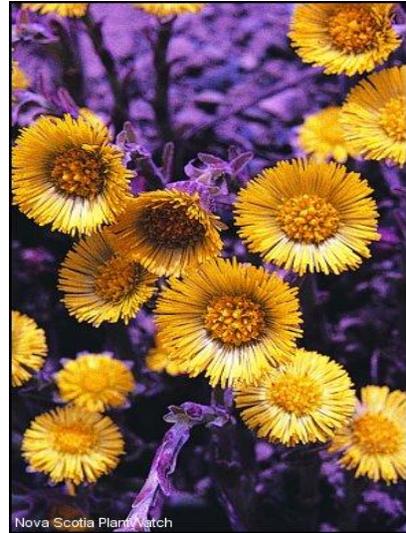


Figure 2. Coltsfoot (Naturewatch 2010)

Climate Change

Climate change models predict the climate of the Great Lakes region will grow warmer and drier over the next century, with precipitation increasing in winter and decreasing in summer (AMEC 2006; Anton Reznicek, University of Michigan, pers. comm. 2004; Kling et al. 2003). Although AMEC (2006) and Kling et al. (2003) predict increased precipitation, the warmer temperatures will likely lead to increased evaporation and transpiration, offsetting any increases in precipitation and contributing to significant reductions in Great Lakes, river, and stream water levels.

A warmer climate will also likely cause an increase in water temperatures that may facilitate the invasion of warm water-adapted species or exotic species (MacIsaac et al. 2002; AMEC 2006). Increased water temperatures will also result in decreased ice cover and, combined with an expected intensity of winter storms, will leave coastal areas more vulnerable to the effects of winter storms and flooding (Fang and Stefan 2000; AMEC 2006). Additionally, AMEC (2006) predicts that increased precipitation will increase the flow rates of some rivers and streams, resulting in increased scouring, deposition of sediment, nutrients, and pesticides, bank erosion, channel widening, and siltation of gravel beds and estuaries. Thus, climate change could significantly alter the natural stream morphology and likely make the habitat unsuitable for this Michigan endemic.

2.4 Synthesis

Michigan monkey-flower is a rare Michigan endemic with very specific habitat requirements within a restricted range. When the recovery plan was issued, there were 17 EORs (15 extant occurrences and 2 historical populations). Since then, the MNFI has discovered four new EORs, bringing the total amount of EORs to 19. Monitoring reports for two EORs indicate that both are declining. However, successful restoration activities have occurred at two sites. According to the remaining MMF EORs, the population is stable, although most of the records

have not been updated in more than 10 years. A systematic survey would provide a more accurate description of MMF habitat, population numbers, and trends.

New information is available regarding the species' biology and taxonomy. In 2000 and 2003, Posto and Prather found that the entire population, with the exception of one, is pollen sterile. They further suggested that the reduced fertility could be a byproduct of inbreeding depression, caused by reduced population size. If these populations remain isolated and continue to decrease in size, many colonies may find it difficult or may not be able to respond to a changing climate and environment, leading to extirpation of colonies or extinction of the species. Additionally, their genetic studies revealed that MMF is morphologically distinct and reproductively isolated from all other members of its taxa. This genetic distinctiveness supported its recognition of elevation from variety to species status: *Mimulus michiganensis*. The Service published a direct final rule (USFWS 2010) revising the species scientific name in the List of Endangered and Threatened Plants that became effective December 13, 2010.

Michigan monkey-flower continues to be threatened by loss and alteration of habitat and hydrological disruptions. Invasive species encroachment is an additional threat. Populations are also vulnerable to extirpation due to low numbers and limited capability for sexual reproduction. However, recovery and restoration activities conducted by the NPS and a group of private landowners have occurred and are ongoing at some sites, with MMF responding positively to these actions. Because the majority of occurrences are located on private land, continued notification, education, and outreach are the best tools to inform landowners of MMF's existence and significance.

The Great Lakes region is expected to grow warmer and drier, possibly leading to increased evaporation and transpiration due to climate change. A warmer climate will facilitate encroachment of more invasive and non-native species, while increased precipitation could increase the flow rates of rivers and streams. For the MMF, the increased flow rates could alter the natural stream morphology of its habitat. These events, combined with low population numbers, fragmented populations, and reduced fertility makes MMF even more susceptible to stochastic events that could result in extinction.

Known threats have not diminished, and climate change and invasive species represent new threats. There are currently 19 element occurrences, including two historical occurrences which are likely extirpated. The population is stable, although some sites are declining and two sites have increased their populations due to restoration activities. However, most of this information was obtained from records in which many have not been updated in more than 10 years. A systematic survey would provide a more accurate description of MMF habitat and population trends. No new information is available to suggest the status has changed since listing or its last status review. Therefore, the listing classification should remain as endangered under the Act.

3.0 RESULTS

3.1 Recommended Classification:

_____	Downlist to Threatened
_____	Uplist to Endangered
_____	Delist
<u> X </u>	No change is needed

3.2 New Recovery Priority Number: 8C

Brief Rationale: Although the population appears to be stable, previously known and new threats could affect the existence of this rare Michigan endemic. Additionally, information for this review came from records in which population data for many EORs have not been updated in over 10 years. Comprehensive surveys and inventories are needed to determine MMF's actual population status and habitat conditions.

The direct final rule revising the scientific name to *Mimulus michiganensis* became effective on December 13, 2010 (USFWS 2010). The recovery priority number should change to 8C, indicating a moderate degree of threat and high recovery potential for the species.

3.3 Listing and Reclassification Priority Number:

N/A

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Plan and implement regular surveys and monitor occurrences at all known extant and historical Michigan monkey-flower locations. Continue exploration for new occurrences and provide detailed mapping of all occurrences. Document habitat and status conditions and populations trends during these surveys. *Recovery plan action numbers: 21, 22, 23, 45*
- Report survey results and habitat and population conditions to the Michigan Natural Features Inventory and the East Lansing Field Office and update element occurrence records. *Recovery plan action number: N/A*
- Work with public and private landowners, site managers, and other stakeholders to protect the species and its stream/seep habitat upstream, if possible. Acquire land containing occupied or suitable Michigan monkey-flower habitat. *Recovery plan action numbers: 13, 15*
- Provide education and outreach to stakeholders and the public. *Recovery plan action number: 121*
- Monitor approach of non-native species and control as appropriate. *Recovery plan action number: N/A*

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Michigan monkey-flower (*Mimulus michiganensis*)

Current Classification: Endangered

Recommendation resulting from the 5 - Year Review

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Recovery Priority Number: 8C

Review Conducted By: Tameka N. Dandridge

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve: Scott Hicks Date: 5-10-2011
Scott Hicks

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, Ecological Services, Fish and Wildlife Service, Midwest Region

Approve: Lynn M. Lewis Date: 5/18/2011

6.0 Appendix A

The MNFI element occurrence ranking criteria (USFWS 1997) for Michigan monkey-flower.

Rank	Explanation
A	<p>Excellent Occurrence. Protection of A-ranked occurrences is essential to conservation of the maximum diversity and viability of an element in the state. A-ranked communities are essentially undisturbed by humans or have nearly recovered from early human disturbance. Species composition shows little departure from original structure and composition (except in seral or disturbance-dependent communities). A-ranked populations of a sensitive species are large in number of individuals, stable or growing, show good reproduction, and exist in a natural, sustainable habitat.</p>
B	<p>Good Occurrence. Protection of these occurrences is important to the survival of an element in the state, especially if very few or no A-ranked occurrences exist or in natural regions of the state where there are few or no A-ranked occurrences. A B-ranked community is still recovering from early disturbance or recent light disturbance but eventually will reach a B-rank. Presence of exotic species (if only localized and/or a minor component of the flora), a recoverable departure from original structure and composition for the site (except in seral and disturbance-dependent communities), result in a B-rank. B-ranked populations of a sensitive species are at least stable, occur in minimally disturbed habitat, and are of moderate population size.</p>
C	<p>Fair Occurrence. Protection of these occurrences helps conserve the biotic diversity on a regional or local level and is important to statewide conservation only if no higher-ranked occurrences exist. A C-ranked community is in an early stage of recovery from disturbance or its structure and composition have been altered such that the original vegetation of the site will never rejuvenate, yet with management and time, partial restoration of the community is possible. C-ranked populations of sensitive species are in clearly disturbed habitats, small in size and/or number, and possibly declining.</p>
D	<p>Poor Occurrence. Protection of these occurrences is seldom worthwhile except for historical reasons or only if no better occurrences exist. D-ranked communities are severely disturbed, their structure and composition have been greatly altered, and recovery to original conditions, despite management and time, essentially will not take place. D-ranked populations of sensitive species are very small with a high likelihood of dying out or being destroyed and exist in highly disturbed and vulnerable habitats.</p>