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# Celeron Island Amphibian and Reptile Inventory Report

August 2020



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## Executive Summary

In 2014, Herpetological Resource and Management, LLC (HRM) was contracted by Environmental Consulting and Technology (ECT) to conduct baseline studies and assist in habitat restoration targeting amphibians and reptiles on Celeron Island. In the summer of 2020, HRM returned to Celeron Island to assess the success of restoration efforts. Work was funded through the National Oceanic and Atmospheric Administration (NOAA). Pre-restoration monitoring was conducted in 2014 and 2017 to establish baseline data of species richness, abundance and distribution. The results of these surveys were used to help evaluate restoration success and wildlife response. Due to Covid-19 and State mandated restrictions put in place for travel, early and mid-season sampling was not conducted. Significant findings from the post restoration 2020 assessment included:

- A total of seven (7) species of herpetofauna including four (4) amphibians and three (3) reptiles were documented within the project area.
- Two species, Gray Treefrog and Eastern Spiny Softshell turtle were officially documented for the first time on the Island.
- Based on current conditions and historic records, an additional eight (8) species may occur on Celeron Island including the Eastern Fox Snake, Mudpuppy, and Butler's Garter Snake.

## Introduction

The Detroit River is an important international channel that links Lake St. Clair and the Upper Great Lakes to Lake Erie. Over 100 years of development have degraded the river by eliminating areas of suitable fish and wildlife habitat and introducing various sources of pollution which have contributed to high levels of bacteria, PCBs, and other contaminants in the system. As a result, the Detroit River is one of 43 contaminated sites designated as an Area of Concern (AOC) under the 1987 Great Lakes Water Quality Agreement. Listed among the multiple Beneficial Use Impairments (BUIs) is the loss of fish and wildlife habitat. The river historically supported extensive areas of coastal marsh with shorelines covered by beds of emergent and submergent aquatic vegetation. Urbanization in the watershed resulted in the loss of more than 90% of the river's coastal wetlands (United States Environmental Protection Agency 1996). A majority of the remaining wetland habitat is found on the river's islands, which support a considerable amount of suitable habitat for resident and migratory fish and wildlife. Recently, several groups and agencies from both United States and Canada have spearheaded efforts to conduct restoration that will contribute to the removal of BUIs on the Detroit River and aid in the overall delisting as an AOC.

Celeron Island, located in the lower Detroit River, was selected for restoration. Work began in 2013 to explore habitat improvement options for the island. The natural habitat on the island has become degraded over the last twenty years due to erosion as well as invasive, nonnative vegetation. Restoring this unique Great Lakes ecosystem was identified as a high priority (United States Environmental Protection Agency 1996). In 2014, Herpetological Resource and Management (HRM) was contracted by Environmental Consulting and Technology (ECT) as part of a grant from the Friends of the Detroit River with funding provided by the National Oceanic and Atmospheric

Administration (NOAA) to evaluate Celeron Island for restoration opportunities targeting amphibians and reptiles. An initial site visit and rapid habitat assessment was conducted in May 2014 and recommendations were provided to assist in guiding restoration actions to be taken on the island (Mifsud 2014). These recommendations were incorporated into a larger scale restoration project, proposed to begin in 2018. Through additional funding provided by NOAA, comprehensive pre-restoration monitoring was conducted by HRM in summer 2017. Surveys focused on documenting amphibian and reptile community composition, represented age classes, spatial distribution, and relative abundance.

In 2020, HRM conducted post restoration monitoring of Celeron Island to determine the success of the restoration project. Emphasis was placed on habitat aspects that were focused on during restoration including erosion control, nesting sites, basking structures for snakes and turtles, Mudpuppy structures, and protective shoals along southern end of the island.

## **Site Description**

Celeron Island is an uninhabited 68-acre island located in the Lower Detroit River at the mouth of Lake Erie in the township of Grosse Ile. The island is now a State Game Area, but historically a summer cottage was located on the north end of the island and a perimeter road existed until the early 1970's. The island has since reverted back to a more natural state. The island is separated into two portions by a large enclosed bay in the center of the island with a single entrance on the western side. High water levels in recent decades coupled with erosion from river current and wave action has left much of the island shoreline washed away as well as a large portion of the central wetland (Photo 1). The interior portion supports coastal marsh, deciduous forest, and

forested wetland habitats.

## **Herpetofauna Regulations**

Michigan Threatened and Endangered species are afforded protection against collection or take through the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, administered by the Michigan Department of Natural Resources (MDNR) Wildlife Division. The law requires permits when listed species might be harmed, handled, or disturbed, even if proposed work includes conservation activities that are likely to benefit the species long-term (Michigan Department of Natural Resources 1994). Most Special Concern species in Michigan are not afforded protection under this legislation; however, Special Concern reptiles and amphibians are protected from take in accordance with MDNR Fisheries Division Order (224.16). The order states that take from the wild or possession of any such species is prohibited except as authorized under a scientific collectors permit. The Eastern Massasauga Rattlesnake is also listed as Federally Threatened. The Federal Endangered Species Act of 1973 protects threatened and endangered species by prohibiting take including harassing, harming, hunting, shooting, wounding, killing, trapping, capturing, or collecting individuals (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1973).

## **Methods**

During the summer of 2020 HRM conducted a rapid site assessment targeting herpetofauna habitat on Celeron Island and associated shoals. Surveys on Shoal G were used as a representative sample of what herpetofauna may occur on the protective islands. Time constrained ground searches were utilized to assess both aquatic and terrestrial habitat, and assess the relative

abundance, richness, and spatial distribution of herpetofauna present. Emphasis was placed on potential nesting, foraging, basking, and overwintering sites.

Methods to detect herpetofauna included visual encounter surveys and random meander transects which included the investigation of potential basking and nesting areas, as well as turning over natural and artificial cover (logs, boards, debris, etc.).

Site conditions were recorded for each survey event using a Kestrel 3000 pocket weather meter. During all of HRM's surveys on Celeron Island, no voucher specimens were collected, but photographs were taken when possible. All survey activities were in accordance with HRM's Scientific Collector's and Threatened and Endangered Species permits issued by the State of Michigan.

Each positively identified amphibian and reptile was recorded in the database. The following data were collected for each record: (1) species, (2) sex of each individual (when possible), (3) behavior of each individual, and (4) reproductive condition of each individual (if it can be determined). Observation locations were recorded using Trimble® Juno SB GPS Units, which record the location to U.S. Environmental Protection Agency (EPA) Tier II National Geospatial Data Spatial Standards, and were mapped using ArcMap® software. Control points were obtained during every survey to confirm spatial accuracy and equipment functionality.

## Results

Based on data from previous assessments, 10 species of amphibian and reptile are known to historically occur on or near Celeron Island. These species include Bullfrog (*Rana catesbeiana*), Eastern American Toad (*Bufo americanus americanus*), Green Frog (*Rana clamitans*), Mudpuppy (*Necturus maculosus maculosus*), Eastern Fox Snake (*Pantherophis gloydi*), Eastern Garter Snake (*Thamnophis sirtalis*

*sirtalis*), Northern Brown Snake (*Storeria dekayi dekayi*), Northern Water Snake (*Nerodia sipedon sipedon*), Eastern Snapping Turtle (*Chelydra serpentina serpentina*), Midland Painted Turtle (*Chrysemys picta marginata*), and Northern Map Turtle (*Graptemys geographica*) (Table 1). Three (3) of these species were observed during the rapid habitat assessment in 2014 including Eastern Garter Snake, Northern Map Turtle, and Eastern American Toad.

During the 2020 survey season, HRM documented seven (7) species on the Island including Bullfrog, Gray Treefrog (*Hyla chrysoscelis/H. versicolor*), Eastern American Toad (Photo 2), Eastern Spiny Softshell Turtle (*Apalone spinifera spinifera*), Green Frog, Midland Painted Turtle, and Northern Map Turtle (Photo 3). Two (2) of these species, Gray Treefrog and Eastern Spiny Softshell Turtle were documented for the first time on Celeron Island in 2020. HRM did not observe any amphibians or reptiles while assessing the shoals and associated habitat structures during 2020 surveys.

Based on pre-restoration and post-restoration assessments, the study site has potential to support four (4) additional species of herpetofauna not observed historically or during recent surveys including Northern Spring Peeper (*Pseudacris crucifer crucifer*), Wood Frog (*Rana sylvatica*), Butler's Garter Snake (*Thamnophis butleri*), and Musk Turtle (*Sternotherus odoratus*) (Table 1). The 2020 surveys identified newly developed landscape features that make Celeron Island suitable habitat for the State protected Blanding's Turtle (*Emydoidea blandingii*) as well.

## **Discussion and Recommendations**

Amphibians and reptiles are recognized as key bioindicators (gauges of environmental health), due in part to their high sensitivity to environmental pollutants and habitat disturbance. Their presence, richness, and distribution are important metrics for determining the health of natural



communities (Cooperrider et al. 1986; Welsh and Droege 2001; Guilfoyle 2010). Documenting the herpetofaunal diversity and habitat usage on Celeron Island is an effective way to assess the overall ecosystem health of the site and will likely serve as a valuable tool for evaluating the success of proposed restoration efforts.

Pre-restoration field work conducted by HRM on Celeron Island in 2014 and 2017 focused on assessing habitat conditions and restoration opportunities. Objectives of the post-restoration monitoring in 2020 were focused on determining the response of amphibian and reptile populations to restoration and habitat enhancement measures taken on Celeron Island and associated shoals. Detection rate as well as species diversity and distribution may have been affected by the atypically high water levels that have been observed in the Detroit River in recent years as well as overall low precipitation during HRM's sampling period. Results were also likely impacted by delayed sampling due to Covid-19 and travel restrictions with surveys limited to summer months between June and September. Vegetation during this time was denser and taller than in the spring likely reducing detection of herpetofauna.

Ideally, comprehensive amphibian and reptile assessments should occur at different times of the active season to capture seasonal trends in activity, habitat use, and presence of multiple age classes. For example, Mudpuppies have been identified as potentially present offshore of Celeron Island based on historical records and available habitat; however due to the timing of surveys targeted trapping was not conducted as it is outside of the active season. Capture efforts for this species should be conducted in early spring when the species is still active in nearshore habitats and submerged traps do not pose the risk of capturing turtles that may drown. Conducting surveys through multiple seasons would provide greater opportunity for more accurate depiction of the

species community compositions and spatial distribution on the Celeron Island.

Among the seven (7) species of amphibian and reptile observed on Celeron Island, two species, Gray Treefrog and Eastern Spiny Softshell Turtle, were not documented on the island prior to 2020. Gray Treefrogs are relatively common throughout the Great Lakes Basin and are known to persist through disturbances to their habitat. However, like many amphibian species, Gray Treefrogs are limited by nursery habitat such as inland ponds and vernal pools lacking fish predators (Harding and Mifsud 2017). The colonization of this species on the island indicates increased opportunities for amphibian reproduction and growth. Eastern Spiny Softshell Turtles are a more ecologically sensitive species. Due to their use of cloacal and cutaneous respiration, this species has little tolerance to aquatic pollution and requires high dissolved oxygen levels in water. The presence of the Eastern Spiny Softshell Turtles is an indication of the efficacy of the restoration efforts and help demonstrate the overall project success in improving overall water quality. Additionally, documenting these new species shows there is potential for additional species to disperse to Celeron Island to continue to establish new populations.

Although zero (0) species of herpetofauna were detected on the North Island Shoal or Shoals A – G, it is the professional opinion of HRM that several species of reptiles and amphibians utilize these areas as refugia. Shoal G had the largest diversity of habitat including basking logs, nesting areas, meadow vegetation, and Mudpuppy structures. It is highly likely that turtles, such as the Northern Map Turtle, Midland Painted Turtles, Spiny Soft-shell and the Eastern Snapping Turtle, are actively nesting on Shoal G. The absence of mesopredators like raccoons (*Procyon lotor*) on the shoals greatly improves the success of turtle nests, and buried nests are difficult to detect without disturbing the eggs. For most turtle species, it is very difficult to detect nests without direct observation of turtles nesting at the time of survey. With time, the basking logs will be used, and the

dense aquatic beds will provide ample habitat for several species of turtle and snake. Eastern Fox Snakes are well documented swimmers (Harding and Mifsud 2017) and can easily move from nearby island or mainland populations to Celeron Island or the shoals. The ample large limestone and crevasse are ideal habitat for Mudpuppies. Given other work HRM and others have conducted along the Detroit River and the corridor, it is believed this species is seasonally using the shoals (Stapleton et al. 2018).

Based on HRM's surveys of Celeron Island in 2020, the herpetofauna habitat on the island can be considered moderate and improving. Given the relatively small size of Celeron Island and its mostly isolated location, it is expected to have an overall lower diversity compared to communities in mainland habitats or larger islands nearby. The interior of the island contains abundant sources of woody debris, which provide critical cover and refugia for a number of species. Numerous individuals of some species including Eastern American Toad were found directly under debris. The interior portions of the island also support multiple vernal pools, which provide critical habitat for amphibian breeding and development as well as seasonal foraging grounds for a range of wildlife species. These pools often dry early in the season and future restoration efforts to improve interior habitats on the island are encouraged. Juvenile Eastern American Toads were observed throughout the 2020 assessments, indicating that amphibians are currently using these habitats to successfully reproduce. Large open water wetlands hydrologically connected to the river are present providing habitat for other amphibians including Green Frogs and Bull Frogs. A limiting factor for amphibians on Celeron island is the ability to breed in habitats that support fish, as many species of frogs require fishless habitats. This makes maintaining the vernal pools further inland on Celeron Island even more critical in herpetofauna persistence.

Several rare and sensitive amphibians and reptiles known to historically occur on or near

Celeron Island were not observed during HRM's 2020 assessments. The Eastern Fox Snake is a State Threatened species whose range lies entirely within the Great Lakes basin where it is found in coastal marshes and other near shore habitats. While no recent observations of this species have been recorded directly on Celeron Island, Fox Snakes are documented in the surrounding area as close as Lake Erie Metropark directly adjacent to Celeron Island to the west and Grosse Isle to the north. Their strong swimming ability and tendency to travel long distances over water indicate the species is capable of colonizing Celeron Island, if suitable habitat is present.

As previously discussed, Mudpuppies were not directly observed during HRM's 2020 assessments; however, they are known to occur in the Detroit River. This aquatic salamander, which is listed as Special Concern and protected in Michigan, should remain a major target for herpetofauna restoration and monitoring. Mudpuppies are the obligate host to the state Endangered Salamander Mussel (*Simposonais ambigua*), making it an integral component of this aquatic ecosystem. They are also known predators of the invasive Zebra Mussel (*Dreissena polymorpha*) and Round Goby (*Neogobius melanostomus*) (Stapleton et al. 2018). This species has been documented by HRM just upstream of Celeron Island as recently as early 2020. Mudpuppy trapping was not conducted during this project due to the lower probability of capture and increased risk of bycatch mortalities, particularly turtles. The aquatic habitat features designed for use by Mudpuppies for nesting, breeding, and refugia purposes that were implemented will increase the use of the area around Celeron Island and the associated shoals by this species. Future monitoring for Mudpuppies is recommended to understand how this species uses the habitat structures available.

Severe erosion has significantly degraded shoreline habitat on Celeron Island. Shorelines along the western and southern portion of the island where wave action appears to be more severe have become incredibly steep in some areas. The erosion has created conditions that make it difficult

or nearly impossible for some herpetofauna to move between the river and the island (Photo 4). The wave action and high water levels in recent years have also eliminated the protective beach that once connected the north and south islands. Increased water levels have also reduced the connectivity of habitat throughout the island. When the water level in the Detroit River lowers, herpetofauna populations will positively respond through greater dispersal and colonization on Celeron Island.

Between the steep shorelines and loss of sandy beach habitat, turtle nesting opportunities appear to be very limited on Celeron Island. The largest areas suitable for nesting are currently restricted to small sections of sandy shoreline on the eastern side of the island with some limited habitat also present on the western side (Photo 5). During HRM's 2020 assessments, limited evidence of turtle nesting activity was observed with only one predated Northern Map Turtle nest documented. Raccoons are known to be present on the island and are problematic nest predators of turtles and birds. Given the low number of predated nests it is likely that if significant turtle nesting activity was present, higher numbers of predated nests would be observed as well. The atypically high water levels have significantly reduced nesting areas along the perimeter of the island. The presence of the shoals and the created nesting areas are critical in times of high water to provide nesting areas. With time these areas will be used by more species of turtles. Placement of trail cams would be worthwhile to document various species use of the shoals and to better document nesting and basking use. A major contributing factor of the degradation of habitat on Celeron Island is the excessive presence of invasive vegetation. Problematic invasives observed during HRM's 2017 assessments included European frog's-bit (*Hydrocharis morsus-ranae*), Eurasian honeysuckle (*Lonicera* spp.), European Buckthorn (*Rhamnus cathartica*), Eurasian common reed (*Phragmites australis* ssp. *australis*), multiflora rose (*Rosa multiflora*), and White mulberry (*Morus alba*). Several of these species were again documented during 2020 surveys and can negatively impact herpetofauna populations

through habitat alteration, competition, and added predation pressure. Additionally, the shade from densely established plants can eliminate sunny basking areas for reptiles. Of these invasives observed on Celeron, *Phragmites* likely poses one of the largest threats. Large expanses dominate several plant communities and its presence threatens coastal marsh habitat throughout the Detroit River. Besides eliminating suitable habitat directly, this and other invasive species severely fragment amphibian and reptile habitat by creating physical barriers and preventing their dispersal through the landscape (Westbrooks 1998; Tulbure et al. 2007). Dense, mature stands of *Phragmites* surrounds nearly all of the outer shorelines and the inner bay as well (Photo 6). The barrier presented by *Phragmites* still prevents herpetofauna from moving between sunny and shaded areas needed for optimal thermoregulation and between land and open water. Additionally, the plant has been shown to shade out nesting habitat with the lower temperatures leading to reduced turtle hatching success (Bolton and Brooks 2010). Dense stands of this invasive plant coupled with the steep banks caused by erosion have severely fragmented access to Celeron Island from the Detroit River for herpetofauna and other wildlife. Efforts to restore connectivity between the island and Detroit River will provide increased opportunity for herpetofauna colonization on Celeron Island.

## **Conclusion**

The Detroit River Watershed supports a number of rare and sensitive species and restoration in the area is essential to the long-term viability of the region's ecological function. The natural communities of Celeron Island have improved but would benefit from further restoration measures. Available herpetofauna habitat is currently considered moderate in quality though improving. The island historically supported diverse communities of amphibians and reptiles and though several species are currently present, overall richness has decreased from historic levels and population size and spatial distribution is limited. The restoration measures that were implemented

have measurably improved the herpetofauna community and will likely continue to increase the reptile and amphibian populations as well as overall ecosystem function of the island. Lower water levels and improved connectivity between the northern and southern portions of the island will likely have a measurable positive impact on both herpetofauna richness, density, and distribution.

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## Tables

Table 1: Celeron Island herpetofauna species historically recorded, species observed during HRM's pre-restoration surveys, species observed during HRM's most recent survey, and herpetofauna that were not observed recently but may potentially occur on the island. \**Rana* (=Lithobates) \*\**Bufo* (=Anaxyrus)

Common Name	Species Name	Historically Observed	Observed Pre-Restoration	Observed 2020	Potential
Bullfrog	<i>Rana catesbeiana</i> *	X		X	
Eastern American Toad	<i>Bufo americanus americanus</i> **	X	X	X	
Green Frog	<i>Rana clamitans</i> *	X		X	
Gray Treefrog	<i>Hyla chrysoscelis/ versicolor</i>			X	
Northern Spring Peeper	<i>Pseudacris crucifer crucifer</i>				X
Wood Frog	<i>Rana sylvatica</i> *				X
Mudpuppy	<i>Necturus maculosus maculosus</i>	X			X
Butler's Garter Snake	<i>Thamnophis butleri</i>				X
Eastern Fox Snake	<i>Pantherophis gloydi</i>	X			X
Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>	X	X		
Northern Brown Snake	<i>Storeria dekayi dekayi</i>	X			X
Northern Water Snake	<i>Nerodia sipedon sipedon</i>	X			X
Eastern Spiny Softshell Turtle	<i>Apalone spinifera spinifera</i>			X	
Eastern Snapping Turtle	<i>Chelydra serpentina serpentina</i>	X			X
Midland Painted Turtle	<i>Chrysemys picta marginata</i>	X		X	X
Musk Turtle	<i>Sternotherus odoratus</i>				X
Northern Map Turtle	<i>Graptemys geographica</i>	X	X	X	

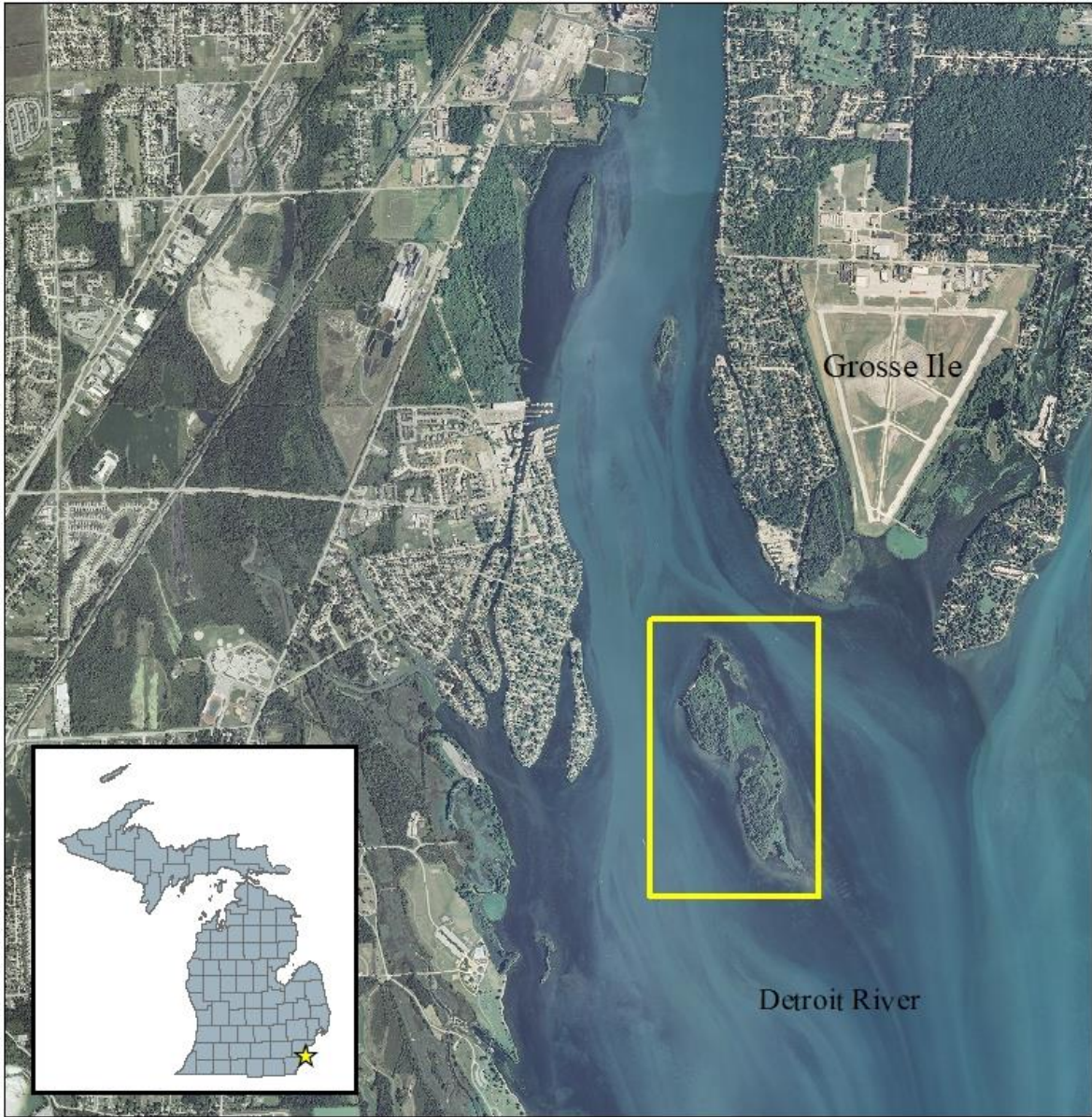


Maps



# Celeron Island Herpetofauna Assessment

Map 1. Project Location



**Legend**

 Project Area

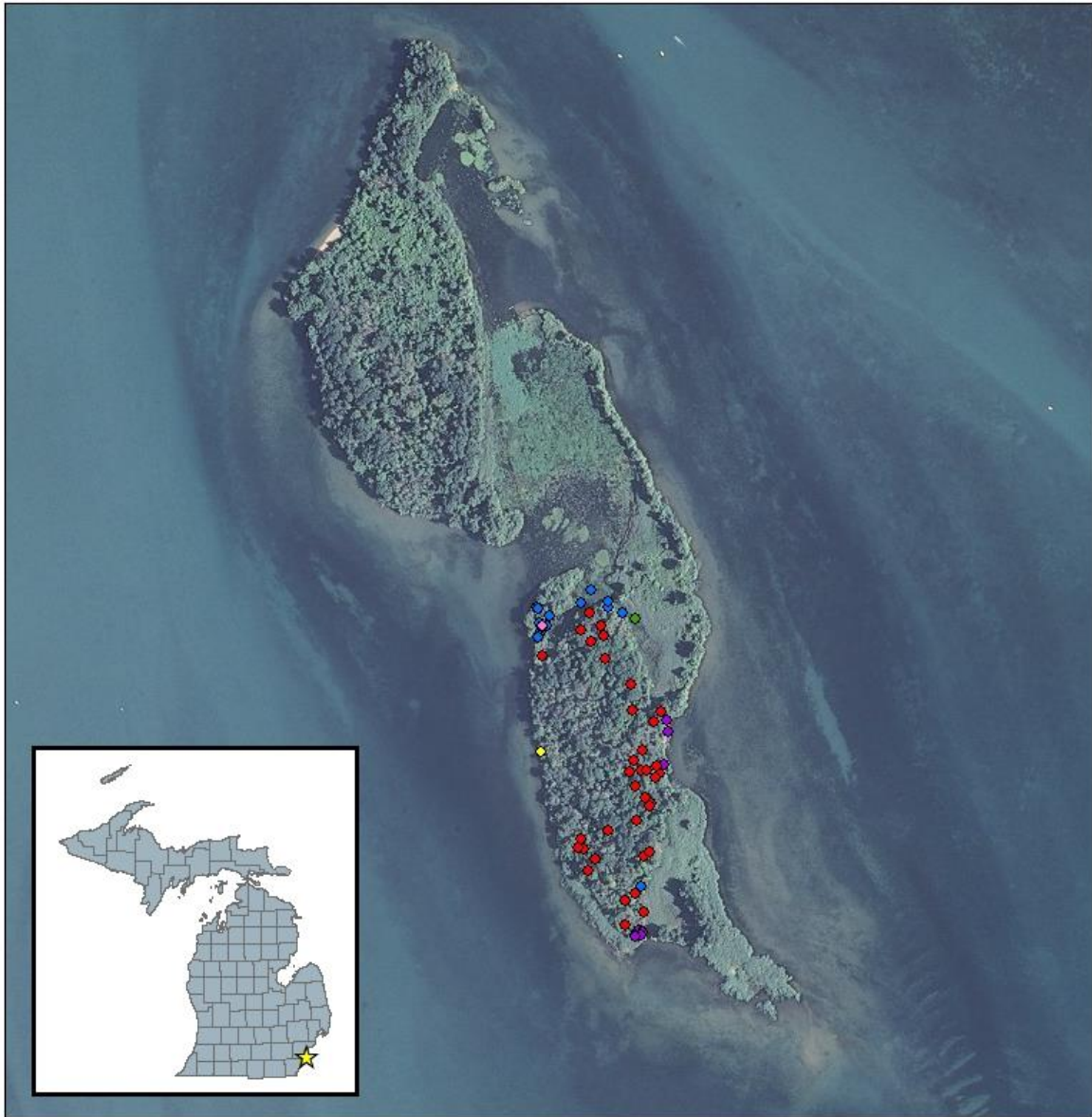


0 1,100 2,200 4,400 6,600 Feet

0 330 660 1,320 1,980 Meters

# Celeron Island Herpetofauna Assessment

Map 2. Herpetofauna Locations



**Legend**

- Bullfrog
- Green Frog
- Gray Treefrog
- Midland Painted Turtle
- Eastern American Toad
- Northern Map Turtle
- Eastern Spiny Softshell Turtle



0 262.5 525 1,050 1,575 Feet

0 75 150 300 450 Meters

## Photos



Photo 1. Erosion along shoreline of Celeron Island in the Detroit River observed during HRM's 2020 assessment.



Photo 2. Eastern American Toad observed during 2020 surveys.



Photo 3. Subadult Northern Map Turtle observed basking on east side of island near only nesting site during HRM's 2020 surveys.



Photo 4. Significant erosion has led to bank deterioration and tree fall creating beneficial basking sites, but limiting access for some species due to steep slopes.



Photo 5. Limited nesting habitat on the eastern shore of Celeron Island. During low water levels more open beach and nesting areas exists.



Photo 6. HRM staff surveying in the dense *Phragmites* stands on Celeron Island.



Photo 7. Protective shoals were constructed during restoration to combat erosion along southern end of Celeron Island.



Photo 8. Submerged areas of rocky shoals provide excellent Mudpuppy habitat.



Photo 9. Aquatic vegetation beds were observed off the shore of Shoal G likely acting as a food source for multiple species of turtles and encouraging these animals to utilize the constructed habitat.



Photo 10. HRM staff surveying Celeron Island during the 2020 field season.

## Species Profiles

### Mudpuppy (*Necturus maculosus maculosus*)



Mudpuppies are large entirely aquatic salamanders that are a Species of Special Concern in Michigan. They are easily recognized by their large size (up to 1.5 feet long) and large external gills just behind the head (Harding and Mifsud 2017). Small Mudpuppies might resemble the larvae of other salamanders, but have only four toes on each foot instead of five. In Michigan, this species is the only amphibian that normally inhabits the open water of large lakes and rivers, spending most of its time hiding under flat rocks. They are highly carnivorous and are often caught by fishermen, even in winter. Because of their unique appearance and unjustified reputation as predators of game fish, they are often killed when captured, even though they are harmless. Mudpuppies breed in fall, entering shallow water as the temperatures cool, but do not nest until the following spring. Females require moderately shallow water with plenty of large, flat rocks on the bottom beneath which they can deposit their eggs. Mudpuppies are the obligate host species for the larvae of the Salamander Mussel (*Simpsonia ambigua*), a state Endangered species (Eagle et al. 2005). This species is also potentially important in helping control invasive species. They have been recorded eating invasive round gobies (*Apollonia melanostomus*) and invasive mussels making them an important species in maintaining healthy aquatic habitats.



### Butler's Garter Snake (*Thamnophis butleri*)



In Michigan, the Butler's Garter Snake is listed as a Species of Special Concern, which affords it protection under MDNR Fisheries Order 224.13 (Herpetological Resource and Management 2014). In Canada, the species is listed as Endangered. Ranging from 15 to 29 inches these yellow/orange striped snakes are restricted to the eastern half of the state. The Butler's Garter Snake requires wet grassy habitat including meadows prairies, water body shores, old fields etc. and is commonly found under debris in these locations outside of their mating season, which occurs in early spring. Movements of this species tend to be restricted to the vicinity of water and patterns of movement parallel the margins of marsh habitat. Butler's Garter Snakes are rarely observed in woods and wooded areas likely act as a barrier. The primary prey source for these snakes are earthworms, which they typically hunt for in fairly small ranges of less than 1 ha. Being a relatively small snake the Butler's Garter Snake faces predation from an array of wildlife. The largest growing threat for this snake is the development of urban and suburban lands which can devastate communities of this snake that rely on the open fields in which buildings are being built and are often found basking on gravel roads and walking/bicycle trails (Harding and Mifsud 207; COSEWIC 2008)

## Eastern Fox Snake (*Pantherophis gloydi*)



Eastern Fox Snakes have a small range restricted to areas along and adjacent to the shores of Lake Huron and Lake Erie. They are a State Threatened species in Michigan, and are listed as Endangered in Canada. Fox Snakes require grassland habitat that is rarely mowed or burned, and often prefer to take shelter and overwinter in adjacent riprap or similar habitat. Although they spend much of their time in uplands feeding on small mammals, they are very strong swimmers, and it is not uncommon for them to use waterways to travel significant distances. Despite their size, these snakes are often preyed upon by large raptors and medium sized mammals. In the fall, Fox Snakes enter hibernacula, which sometimes include communal sites, and do not emerge until mid-April or May. Breeding occurs in spring, and eggs are laid in June or July, hatching about two months later. Fox Snakes are often senselessly killed because they are mistaken for Copperheads (*Agkistrodon contortrix*, a U.S. species not present in Michigan), because of the orange head, or rattlesnakes because they will vibrate their tail against dry vegetation when threatened, producing a loud buzz (Harding and Mifsud 2017). This species is also uniquely vulnerable to habitat loss because of its restriction to a thin strip of shoreline where it must compete with intense road development (COSEWIC 2008).

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