

Ottawa Sands Herpetological Assessment

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Prepared for
Ottawa County Parks and Recreation Commission
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Financial assistance for this project was provided, in part, by the Coastal Management Program, Water Resources Division, Michigan Department of Environment, Great Lakes, and Energy, under the National Coastal Zone Management program, through a grant from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.



Executive Summary

In 2020 Herpetological Resource and Management, LLC (HRM) was contracted by the Ottawa County Parks and Recreation Commission to conduct reptile and amphibian surveys within Ottawa Sands County Park. Financial assistance for this project was provided, in part, by the Coastal Management Program, Water Resources Division, Michigan Department of Environment, Great Lakes, and Energy, under the National Coastal Zone Management program, through a grant from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Primary objectives was to conduct baseline surveys of current species present and overall habitat quality within the park. In addition to assessing the initial status of herpetofauna populations within the assessment areas, results of these surveys are intended to guide future restoration actions as well as provide a metric to measure project success.

The major findings of this project include:

- One (1) ecologically significant species was documented, the Fowler's Toad (*Bufo [Anaxyrus] fowleri*), which is rare throughout most of the state and listed as a Species of Concern and protected by law in Michigan.
- Six (6) species of herpetofauna were observed in 2020 including 4 species of amphibians and 2 species of reptiles.

Habitat assessments revealed that Ottawa Sands County Park have a high potential to support diverse herpetofaunal populations including at least 17 species not observed during 2020 surveys. Notable species include Eastern Box Turtle (*Terrapene carolina carolina*), Blanchard's Cricket Frog (*Acris blanchardi*), Black (Gray) Rat Snake (*Pantherophis spiloides*), and Smooth Green Snake (*Opheodrys vernalis*)

Ottawa Sands contains a mosaic of different natural communities capable of supporting diverse and viable populations of herpetofauna. This park is located within a well populated area and/or support high volumes of park patrons seeking to enjoy the counties natural resources. As such, there is potential for this high quality system to experience habitat degradation due to human impacts as well as invasive species. As part of this project several recommendations were provided to the county with the purpose of aiding future management and restoration of their natural community with major focus on invasive species management and restoration of critical herpetofauna habitat.

Based on HRM's assessments during the 2020 field season, Ottawa Sands has the potential to support a rich assemblage of herpetofauna and overall efforts to further protect and to restore the functionality of natural habitat within Ottawa County will likely increase the current densities of local herpetofauna and encourage the establishment of additional species as well.

The statements, findings, conclusions, and recommendations in this report are those of the Ottawa County Parks & Recreation Commission and Herpetological Resource and Management and do not necessarily reflect the views of the Michigan Department of Environment, Great Lakes, and Energy or the National Oceanic and Atmospheric Administration.

Introduction

In 2020 Herpetological Resource and Management, LLC (HRM) was contracted by the Ottawa County Parks and Recreation Commission (OCPRC) to conduct a herpetological survey in Ottawa Sands County Park. The survey conducted by HRM has established a baseline of observed species present 2020 which were used in conjunction with a review of historic amphibian and reptile observations including HRM's previous work within Ottawa County (Herpetological Resource and Management 2015) to develop a comprehensive list of known and potential species to help guide management recommendations that are described in this report.

Amphibians and reptiles (herpetofauna) are ecologically important as they fulfill an essential mid-level position in many food webs as both predators and as a prey base for other animals (Lagler 1943; Rowe 1992; Harding 1997; Walls and Williams 2001). Herpetofauna are recognized as key bioindicators, or gauges of environmental health as they are highly sensitive to environmental pollutants and habitat disturbance. The presence, age class structure, spatial distribution, and relative abundance of herpetofauna communities can be used to assess overall ecosystem quality, as well as to identify the need for and measure the success of habitat restoration (Cooperrider et al. 1986; Shear et al. 2003; Guilfoyle 2010). Herpetological studies that have been conducted in Michigan indicate significant population declines for over 60% of species, and anecdotal evidence suggests that even many formally common amphibian and reptile species have become less abundant (Clark-Eagle, 2005 Harding and Mifsud, 2017).

Among the most serious causes of herpetofauna population declines are habitat loss, degradation, and fragmentation, which can lead to the extinction of local populations (extirpation) (Knutson et al. 1999; Dodd et al. 2003; Marchand and Litvaitis 2004). These threats cause a loss of connectivity between natural communities, which can be particularly detrimental to herpetofauna as many species seasonally require access to a variety of habitat types. Additionally, the loss of connectivity decreases the ability of individuals from outside of a population to join and small isolated populations have the potential to lose genetic diversity through inbreeding depression, negatively affecting the long-term viability of a population (Hilty et al. 2006).

This project was funded by the Department of Environment, Great Lakes, and Energy (EGLE) Coastal Zone Management Program (CZM), which promotes the conservation of healthy and productive coastal systems and the natural resources they support. The Laurentian Great Lakes region supports a range of rare and sensitive ecosystems and west Michigan is home to the largest freshwater dune system in the world. Ottawa County supports expansive areas of these sensitive dune habitats. Additionally, the Grand River, which is the longest River system in Michigan, transects through the county and supports numerous smaller streams and tributaries. These natural communities, which include a variety of habitat types associated with the coastal zone are declining and degraded from a variety of factors including urban development and invasive species. A number of amphibians and reptiles including several rare and sensitive species are reliant on these ecosystems and the loss of connectivity among them is harmful to long-term population viability. For this reason, it is critical to conserve areas that contain continuous high quality habitat and restore the connectivity of those that are degraded. The results of HRM's 2020 survey and provided recommendations are intended to aid in identifying and implementing habitat restoration projects and conserving the long-term viability of herpetofauna in critical Ottawa County coastal areas.

Site Location and Description

Ottawa Sands County Park is 345 acres in size and is located just off the shore of Lake Michigan in the cities of Ferrysburg and Grand Haven, Michigan. Ottawa Sands was a historic sand mining operation and contains a large excavated lake. The system is primarily absent of aquatic vegetation and is largely oligotrophic in nature. Dunes are a defining characteristic of this park with a large complex surrounding the central lake. A backwater area lies along the eastern edge of the lake. The site contains high quality deciduous woodlands with oak and maple canopy, and a sparse sub canopy layer with abundant leaf litter throughout. Several vernal pools are scattered throughout this forested upland area. Sandy dune blowouts are present throughout and a large open meadow habitat extends throughout the park. A residential complex borders the eastern edge of the park in addition to single family other homes that run along the shoreline of Lake Michigan. Additional surrounding land use includes several other county and state managed parks as well as the Grand River and associated marinas.

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

The herpetofauna survey was conducted during July of 2020 during appropriate weather conditions by a team of three biologists trained in the identification of herpetofauna. The survey was conducted utilizing visual encounter and aural techniques to investigate aquatic and terrestrial habitats for evidence of reptiles and amphibians. Strategies for detection included inspection of potential basking and nesting areas, as well as turning over natural and artificial cover objects (logs, boards, debris, etc.). No voucher samples 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 Tier II spatial accuracy standards. Juno SB GPS Units were used during HRM's surveys and observations were mapped using ArcMap® software.

Results

Ongoing research into the genetics, physiology, behavior, and fossil history of amphibians and reptiles has led to debates about their proper classification. Some biologists have proposed the splitting of established genera like *Rana* (“typical frogs”) and *Bufo* (“true toads”) into the newer genera *Lithobates* and *Anaxyrus*, respectively (Harding and Holman 1999). Some suggestions have included using the newly proposed groupings as subgenera, allowing recognition of the new divisions while maintaining name stability. For the purposes of this report this system will be followed for the genus of toad *Bufo* (*Anaxyrus*). The genus of “typical frogs” will not include subgenera based on a recent publication which supports the placement of all North American ranid frogs in the genus *Rana* (Yuan, Zhou et al. 2016). These classifications are also recognized by Harding and Mifsud (2017).

The Ottawa Sands herpetofaunal survey resulted in the documentation of four (4) species of amphibians and two (2) species of reptiles for a total of six (6) observed species. These species include Eastern American Toad (*Anaxyrus americanus*), Fowler's Toad (*Bufo* [*Anaxyrus*] *fowleri*), Green Frog (*Rana clamitans*) (Photo 1), Northern Leopard Frog (*Rana pipiens*), Eastern Snapping Turtle (*Chelydra serpentina*), and Northern Brown Snake (*Storeria dekayi*) (Photo 2). One (1) of the species detected by HRM staff, Fowler's Toad (Photo 3), is listed as Special Concern and is protected in Michigan. Additionally, the Michigan Department of Natural Resources (MDNR) identified the Northern Leopard Frog (Photo 4) as a Species of Greatest Conservation Need.

Based on available habitat, this site has the potential to support 17 additional species that HRM staff did not detect during the 2020 survey. These species include Red-backed Salamander (*Plethodon cinereus*), Wood Frog (*Rana sylvaticus*), Eastern Newt (*Notophthalmus viridescens*), Bullfrog (*Rana catesbeianus*), Gray Treefrog (*Hyla versicolor* and *H. chrysoscelis*), Blanchard's Cricket Frog (*Acris blanchardi*), Midland Painted Turtle (*Chrysemys picta marginata*), Eastern Box Turtle (*Terrapene carolina carolina*), Eastern Spiny Softshell Turtle (*Apalone spinifer*), Northern Water Snake (*Nerodia sipedon*), Blue Racer (*Coluber constrictor foxii*), Eastern Hognose Snake (*Heterodon platirhinos*), Northern Ribbon Snake (*Thamnophis sauritus*), Eastern Garter Snake (*Thamnophis sirtalis sirtalis*), Smooth Green Snake (*Ophedrys vernalis*), Ring-neck Snake (*Diadophis punctatus*), and Black (Gray) Rat Snake (*Pantherophis spiloides*). Of these 17 species, four (4) are State protected including Michigan Special Concern Eastern Box Turtle, Smooth Green Snake, Black (Gray) Rat Snake, and Michigan Threatened Blanchard's Cricket Frog.

Discussion

During HRM's assessment of Ottawa Sands, one (1) species of Special Concern amphibian, the Fowler's Toad was documented. Within Michigan, this species' range is limited to the western half of the state due to colder temperatures in other areas of Michigan (Harding and Mifsud 2017). In these areas, intensive recreational use of dune habitats, specifically off-road driving, has been detrimental to this species along with habitat loss and fragmentation. HRM staff documented over 400 Fowler's Toads of varying age classes comprised largely of metamorphs and juveniles throughout the park (Photo 5). Given the number of

individuals present, Ottawa Sands serves as an important breeding ground and critical refugia for this declining species. The Northern Leopard Frog was also detected in large numbers. This species is a Species of Greatest Conservation Need (Clark-Eagle, A., E. M et al, 2005). In addition to these species observed, this park supports habitat features that can support an additional three (3) Special Concern species, the Black (Gray) Rat Snake, Eastern Box Turtle, and Eastern Smooth Green Snake and one (1) State Threatened species, Blanchard's Cricket Frog.

While overall habitat quality at Ottawa Sands was high and the site appears to support significant populations of Fowler's Toads and Northern Leopard Frogs, Several invasive species, including Common Reed (*Phragmites australis*) were present. Of perhaps even more importance is the presence of the federally protected Pitcher's Thistle (*Cirsium pitcher*) (Photo 6). This rare species was observed in multiple locations throughout the park in several life stages. A significant number of this plant species is present in the northern section of the dune complex.

Although signage is present to prevent the public from entering the water and off trail area, there was still evidence of individuals disturbing the habitat through the presence of trash, pet waste, and indicators of woody debris being moved. During the survey period, HRM staff witnessed park patrons walking dogs off leash and dogs swimming in the lake.

Recommendations

Many of the following recommendations have been developed utilizing the Michigan Amphibian and Reptile Best Management Practices manual, a Michigan-focused guide that provides specific recommendations for protecting, preserving, and restoring the herpetofauna of Michigan (Mifsud 2014). Incorporating Best Management Practices (BMPs) during the continued management and activities conducted by the Parks and Recreation Commission can help support and maintain local herpetofauna. Based on HRM's knowledge of Ottawa County's herpetofauna and experience in design and creation of reptile and amphibian habitat, as well as using sound data and peer reviewed scientific literature the following recommendations are provided to improve or retain desirable habitat features for reptiles and amphibians. Many of these recommendations can be implemented for additional parks not surveyed by HRM crews within Ottawa County as well.

Restoration and management activities within the park should seek to provide amphibians and reptiles with habitat features that are essential for healthy and viable populations of herpetofauna (Figure 1). Amphibians and reptiles are ectothermic (regulation of body temperature depends on external sources) and require access to basking sites where they can warm themselves to regulate their body temperature. These locations can include on/under sun-exposed rocks and logs or in gaps in the vegetation canopy where the sun shines. Turtles often prefer to bask on structures placed in the water where it is difficult for predators to access and they can quickly dive into the water for cover. Snakes typically use rocks or wood structures to warm themselves as the gaps between stones and logs are important for providing a place where animals can quickly hide. Some species will also deposit eggs under or in woody debris. It is important that structurally diverse areas of vegetation and substrates that provide shade or cooler temperatures are also adjacent to basking areas. Felling trees on site, using existing logs, or bringing in logs can provide turtle basking habitat while basking sites for other species can be achieved by placing rocky structures in open areas or clearing vegetation from existing rocky outcroppings to create sunlight exposure.

The addition of nesting areas to the landscape would also encourage species colonization and persistence in the park. Many reptiles lay shelled eggs and typically require well-drained, moist soils on a

south-facing slope for their nests. Turtles are known to use a variety of habitats for nesting but preferred nesting areas include sandy or loose, friable soils and are typically on south-facing slopes to warm the nest to an appropriate temperature for incubation. One strategy for nest creation would be near shore targeted bank grading. The bank slope in multiple areas of the park is steep and nearly impossible for turtles and other wildlife to traverse (Photo 7). A lesser gradient would improve the maneuverability of the landscape and allow for further dispersal of herpetofauna throughout the park. Snake nesting sites should also be incorporated and can include mulch piles, leaf litter or other warm decomposing organic materials where the animals can burrow and deposit eggs.

The presence of dense subsidized predator populations that prey on unattended nests is a significant threat for amphibians, reptiles, and other wildlife including ground nesting birds. Predators such as raccoons can have a disproportionate effect on herpetofauna populations when the predators population exceeds natural levels. Indirect mitigation measures include the use of predator excluder devices, which can be designed to protect both single nests as well as entire nesting areas. Refuse receptacles that are designed to prevent wildlife from scavenging and signage discouraging people from littering or feeding wildlife is also beneficial.

Including hibernacula in upland areas of Ottawa Sands is also recommended. During winter months, reptiles and other wildlife seek out protected locations for hibernation. This may include holes, burrows, crevices and other forms of sufficient cover. Larger structures known as hibernacula are often used simultaneously by numerous snakes and other wildlife species. Hibernating habitat for aquatic turtles include silt, mud, and detritus at the bottom of water bodies or in submerged banks. Ensuring these habitats are present can be accomplished through restoration and preservation of wetlands. The Eastern Box Turtle, Michigan's only terrestrial turtle species and a potential species for the park, hibernates in burrows in sandy or friable soils in forested areas.

As previously discussed, reptiles and amphibians require a variety of habitat types to be present on a landscape to fulfill necessary life stages (Figure 2). Many species are seasonally dependent and rely on uplands directly adjacent to these wetlands during the remainder of their annual cycle. Ottawa Sands has a range of these habitats including multiple wetland types that offer both permanent and seasonal sources of water (Photo 8), upland forests with open understories and ample leaf litter, as well as open fields and sandy blowout areas (Photo 9). Constructing shallow swales and interdunal pools would create additional habitat types allowing for further herpetofauna diversity. Historically, this habitat type has been a signature of the Great Lakes region and supported many species of Michigan's rare herpetofauna including Spotted Turtles, Blanding's Turtles, Fowler's Toads, and Eastern Newts. These areas provide unique breeding and nursery habitat for a variety of reptile and amphibian species. Ottawa County is a documented strong hold for the State protected Fowler's Toad, so maintaining areas on Ottawa Sands' landscape that promote reproductive success is essential to maintaining this promising population. It is critical to ensure that these different habitat types are accessible for herpetofauna to move between freely. Routine maintenance can ensure that these diverse habitats do not become established with invasive species and continue to offer refugia for herpetofauna within the park system.

Ottawa County Parks and Recreation has been very proactive in managing invasive species which is evident by a lack of well-established populations currently in their parks. This proactive approach is critical to maintaining long-term ecosystem as several invasive species currently present within Michigan represent significant threats to the health of coastal communities. Many of these species, most notably *Phragmites*, grow in dense monocultures that do not provide necessary habitat components herpetofauna rely on. Dense stands can also create physical barriers which compound the difficulty of wildlife dispersal on a landscape

that is dominated by roadways. A combination of treatment methods can be utilized to restore ecosystem function; however timing and specific procedures should be evaluated for ways to reduce potentially harmful effects to herpetofauna. Additionally, invasive species should be replaced with common native plants to promote the return of historic habitat. Planting near shore aquatic emergent and submergent plants would not only aid in keeping invasives at bay, but also provide a food source, refuge, and nursery for herpetofauna. Long-term habitat restoration through control of invasives and aquatic vegetative planting will significantly improve overall habitat quality, function and spatial distribution of herpetofauna (Mifsud 2014).

Keeping herpetofauna in mind when developing construction plans can have a significant impact when trying to improve population sizes (Figure 3). Creating wildlife corridors with various road crossing structures that utilize designs targeting small animals can be an effective tool for preventing road related mortalities and conserving herpetofauna across the landscape. The best opportunity for most amphibians and reptiles to cross a road is typically through culverts or under bridges (Figure 4). A majority of culvert systems are designed with the primary objective of allowing water passage while preventing scour that might degrade the road or crossing structure and the resulting designs are usually inadequate for allowing wildlife passage (Andrews et al. 2015). To ensure the effectiveness of wildlife corridors, several key aspects must be considered including structure type, size, and ability to attract wildlife. Bridges typically provide the most direct opportunity for animal dispersal across a landscape, although open bottom arch culverts also provide suitable conditions. When constructing culverts, the structure should be oversized to allow more natural light and to ensure that the structure does not reach capacity during times of high water flow. Animals are more likely to utilize crossing structures that closely match natural habitat conditions. As such, structures should contain natural substrate as well as sources of cover which herpetofauna rely on heavily for protection from the elements and predation. Additional features that promote wildlife usage of crossing structures include barrier fences which can prevent animals from entering the roadway while simultaneously guiding them into nearby structures (Figure 5). Another measure that has been shown to reduce road mortality is the installation of wildlife friendly curbs and storm drains (Figure 6). Once within the roadway, vertical curbs can prevent herpetofauna from successfully crossing. Incorporating designs with either a rolled curb or no curb is an effective way to prevent road related mortalities (Figure 7). All of these strategies should be considered during roadway expansion at key proposed roads.

The use of synthetic erosion control mesh during construction activities is strongly discouraged as it can fatally entangle herpetofauna and other wildlife (Harding and Mifsud 2017). Photodegradable varieties do not degrade when shaded by newly sprouted vegetation and must also be avoided. Several natural products are available and should be used as the standard for erosion control.

Due to parks and natural areas typically being surrounded by suburban and urban land uses human impacts tend to be higher. Limiting the negative impacts after and during restoration that come from this are highly recommended and include action such as reaching out to neighborhoods that surround parks and asking for citizens to not discard refuse on county lands, only participate in approved activities, and maintain proper pet care when within the parks. The primary tools to be used to do this is through the use of public outreach and signage along trails. Pet waste receptacles should also be placed in various locations along trails to encourage patrons to clean up after their pets. These waste stations would also provide fishermen with a place to dispose of used fishing line and other garbage which would minimize the amount of litter left on the landscape. Fishermen are a specifically important group of patrons to reach with signage due to the threat that fishing line and hooks pose to herpetofauna and other wildlife. Hooks can become lodged in the mouths of turtles and cause significant damage. Fishing line can pose a similar threat, and if ingested, it could tangle the intestines causing death. Small snakes and frogs may also get tangled in fishing line making

them more susceptible to predation and other hazards. Signs educating patrons on the rare native herpetofauna that Ottawa Sands supports should also be implemented.

Herpetofauna populations are known to fluctuate between years and due to the cryptic nature of many species, it is difficult to properly assess their true status. Due to the potential for herpetofauna within Ottawa Sands to be so diverse as well as the numerous sensitive species found within the parks, continued monitoring of their populations is highly recommended. This action is particularly important after any restoration efforts or construction projects are undertaken within the parks. It is essential during times when disturbances are being made to monitor their impacts on local wildlife and see how the populations respond once the disturbance is over.

Conclusion

Ottawa Sands supports a wealth of herpetofauna and is ecologically significant with large number of ecologically sensitive species of herpetofauna observed and the significantly high probability of supporting several more. Among the species observed by HRM in 2020, two (2) have a conservation status given by the state of Michigan including one (1) Special Concern species, Fowler's Toad. Based on current habitat quality and availability, an additional 17 species of herpetofauna likely occur within the park. Several of the potential species have been historically observed within the County and are most likely still present, some being documented in the area as recently as 2015. Habitat contained within the park is high quality and suitable for supporting the diverse assemblage of herpetofauna known to occur within Ottawa County and the Lake Michigan basin. In addition to ongoing early detection and rapid response of invasive species, habitat restoration targeting herpetofauna, creation of wildlife corridors, and adoption of BMPs is recommended to further benefit local amphibian and reptile populations and ensure their long-term viability. Continued monitoring and assessment of the amphibians and reptiles within the county is also recommended to better determine the current status and distribution of these species and understand current population trends.

Tables

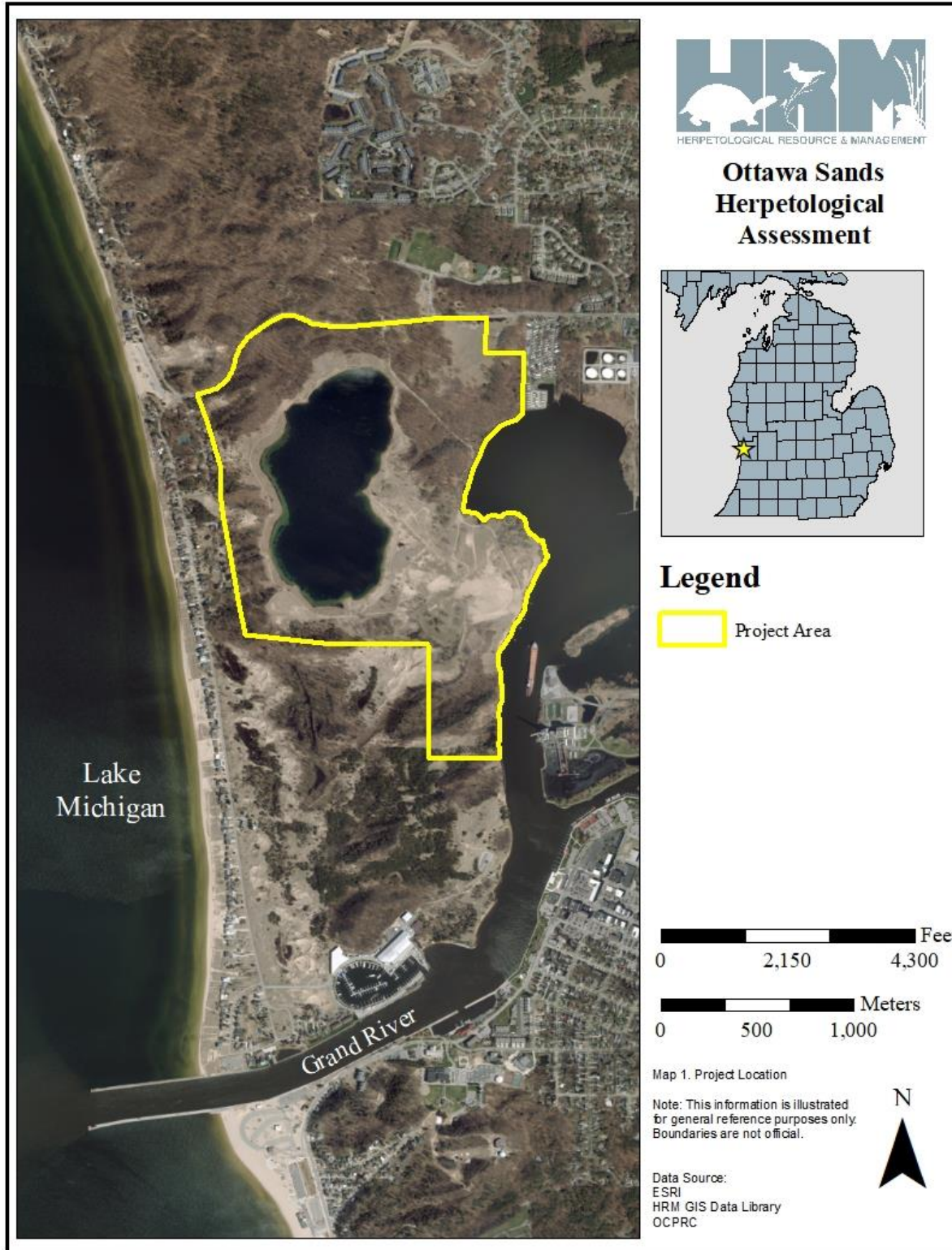
Ottawa Sands Herpetofauna Richness				
Common Name	Species Name	Observed Species	Potential Species	State Status
Black (Gray) Rat Snake	<i>Pantherophis obsoletus</i>		X	Special Concern
Blue Racer	<i>Coluber constrictor foxii</i>		X	SGCN
Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>		X	
Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>		X	SGCN
Northern Brown Snake	<i>Storeria dekayi dekayi</i>	X		
Northern Ribbon Snake	<i>Thamnophis sauritus septentrionalis</i>		X	
Northern Water Snake	<i>Nerodia sipedon sipedon</i>			
Northern Ring-necked Snake	<i>Diadophis punctatus edwardsii</i>		X	SGCN
Eastern Smooth Green Snake	<i>Opheodrys vernalis</i>		X	SGCN
Eastern Snapping Turtle	<i>Chelydra serpentina</i>	X		
Midland Painted Turtle	<i>Chrysemys picta</i>		X	
Eastern Box Turtle	<i>Terrapene carolina carolina</i>		X	Special Concern
Eastern Spiny Softshell Turtle	<i>Plethodon cinereus</i>		X	
Eastern American Toad	<i>Anaxyrus americanus</i>	X		
Fowler's Toad	<i>Anaxyrus fowleri</i>	X		Special Concern
Green Frog	<i>Rana clamitans</i>	X		
Northern Leopard Frog	<i>Rana pipiens</i>	X		SGCN
Wood Frog	<i>Rana sylvaticus</i>		X	
Bull Frog	<i>Rana catesbeianus</i>		X	
Gray Treefrog	<i>Hyla versicolor</i>		X	
Blanchard's Cricket Frog	<i>Acris blanchardi</i>		X	Threatened
Red-backed Salamander	<i>Plethodon cinereus</i>		X	
Eastern Newt	<i>Notophthalmus viridescens</i>		X	

Table 1. Observed and potential reptile species at Ottawa Sands County Park.

Ottawa Sands Initial Habitat Improvement Recommendations	
Action	Target
Remove invasive species with emphasis on <i>Phragmites</i>	Increase ecological integrity of the site and provide opportunities for increased spatial distribution and reduce habitat fragmentation
Provide basking logs	Aid in thermoregulation of reptiles
Place small multi-branched limbs in open water	Provide adherence points for amphibian eggs and cover for a variety of wildlife
Create terrestrial nesting areas	Increase recruitment and population viability of turtle and snake populations
Place flat basking structures	Aid in thermoregulation of reptiles
Grade near shore banks	Improve accessibility of upland habitat to herpetofauna
Plant aquatic emergent and submergent vegetation	Provide refuge and a food source for wildlife and combat invasive species
Create hibernacula	Offer overwintering habitat for snakes to encourage species persistence
Use wildlife friendly erosion control post construction	Reduce herpetofauna fatalities from getting caught in erosion netting
Create shallow swales and interdunal pools	Provide breeding and nursery habitat for coastal species
Add large woody debris to upland areas	Provide cover and basking opportunities as well as nesting locations for certain species
Integrate wildlife crossing signage and structures at key proposed roads	Proactively decrease the number of transportation related herpetofauna fatalities
Add educational signage about native herpetofauna	Educate park patrons on the natural landscape around them and the value of preserving it
Provide waste receptacles along trails	Mitigate the amount of fishing materials and pet waste left behind by park patrons

Table 2. Habitat restoration recommendations generated based on the preliminary 2020 site assessment.

Maps



Map 1. Ottawa Sands County Park project location.

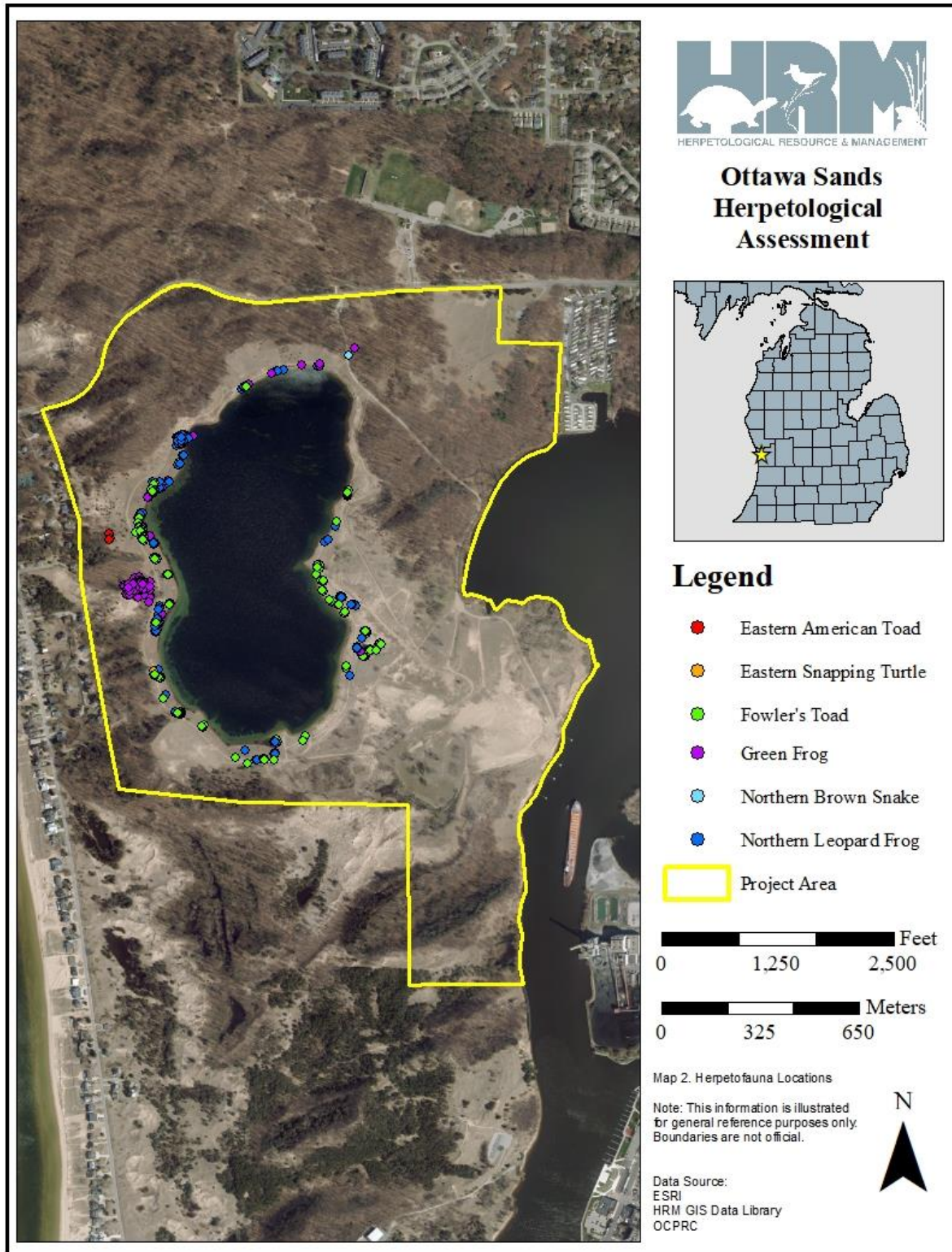


Figure 2. Amphibian and reptile diversity of Ottawa Sands in 2020.

Figures



Figure 1. Maintaining landscape heterogeneity that includes basking logs, sandy turtle nesting areas, mulch piles for snakes to nest, upland woody debris as refugia, and submerged logs for amphibian nurseries is essential to preserving and re-establishing local herpetofauna populations. Graphic used with permission (Mifsud, D. 2014).

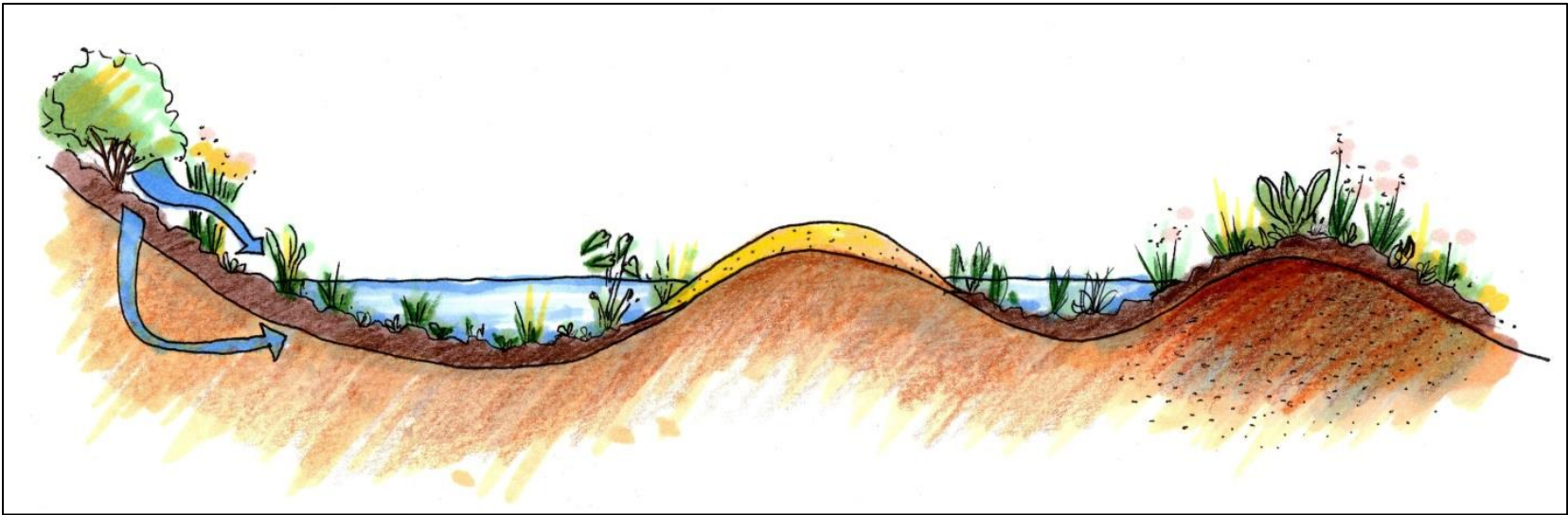


Figure 2a. Herpetofauna rely on a variety of wetland types including those with variable topography as depicted above. Graphic used with permission (Mifsud, D. 2014).

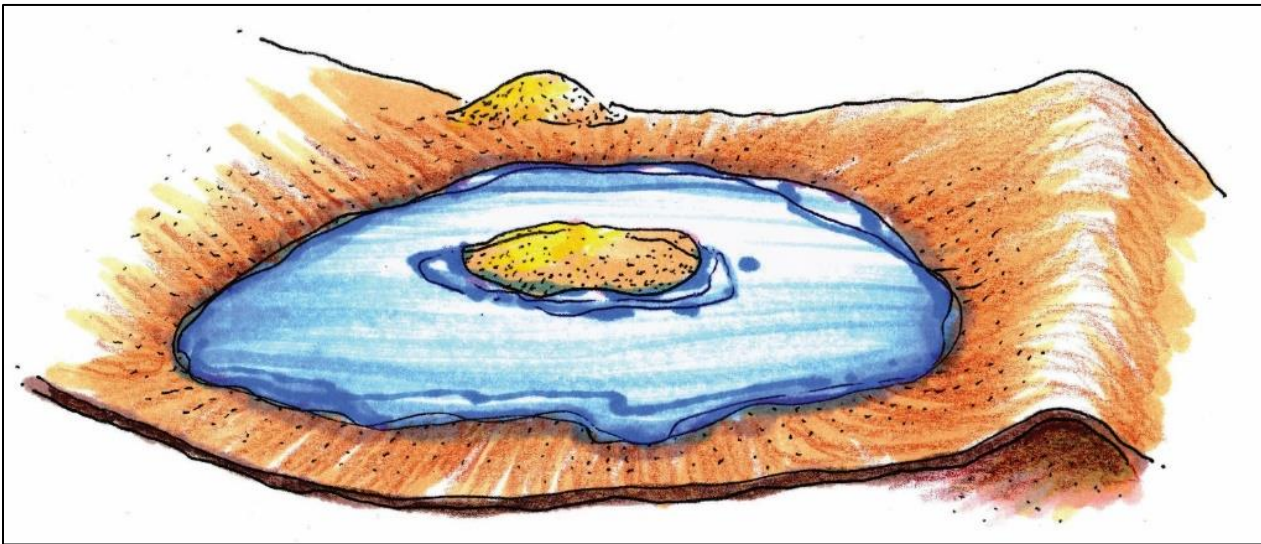


Figure 2b. Top view of heterogeneous wetland depicted in Figure 2a. Graphic used with permission (Mifsud, D. 2014)

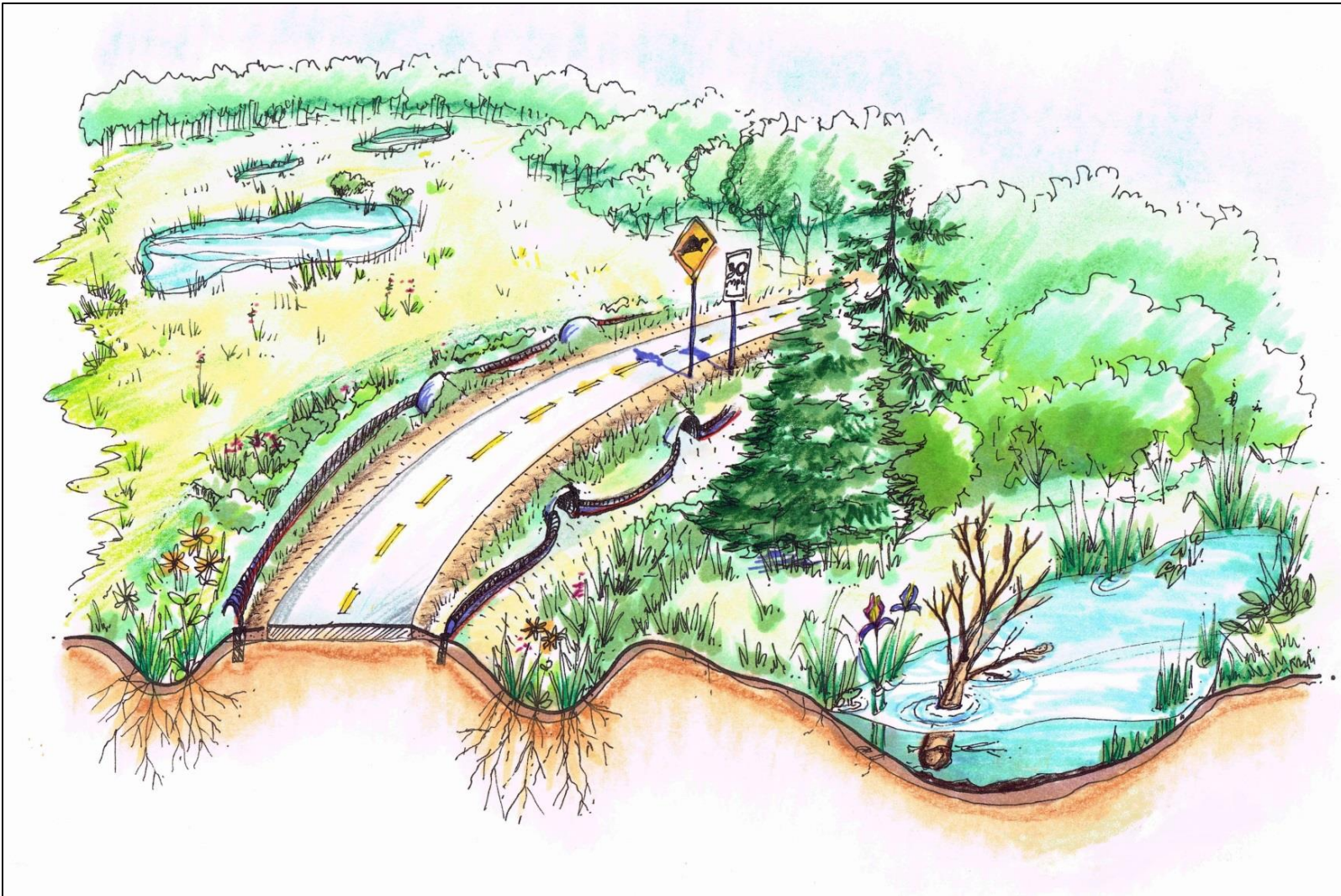


Figure 3. Conceptual drawing depicting a landscape modified to incorporate wildlife needs including, low or non-existent curbs, crossing structures and associated barrier fencing, no mow and vegetative buffer zones, and wildlife crossing signs. Graphic used with permission (Mifsud, D. 2014).

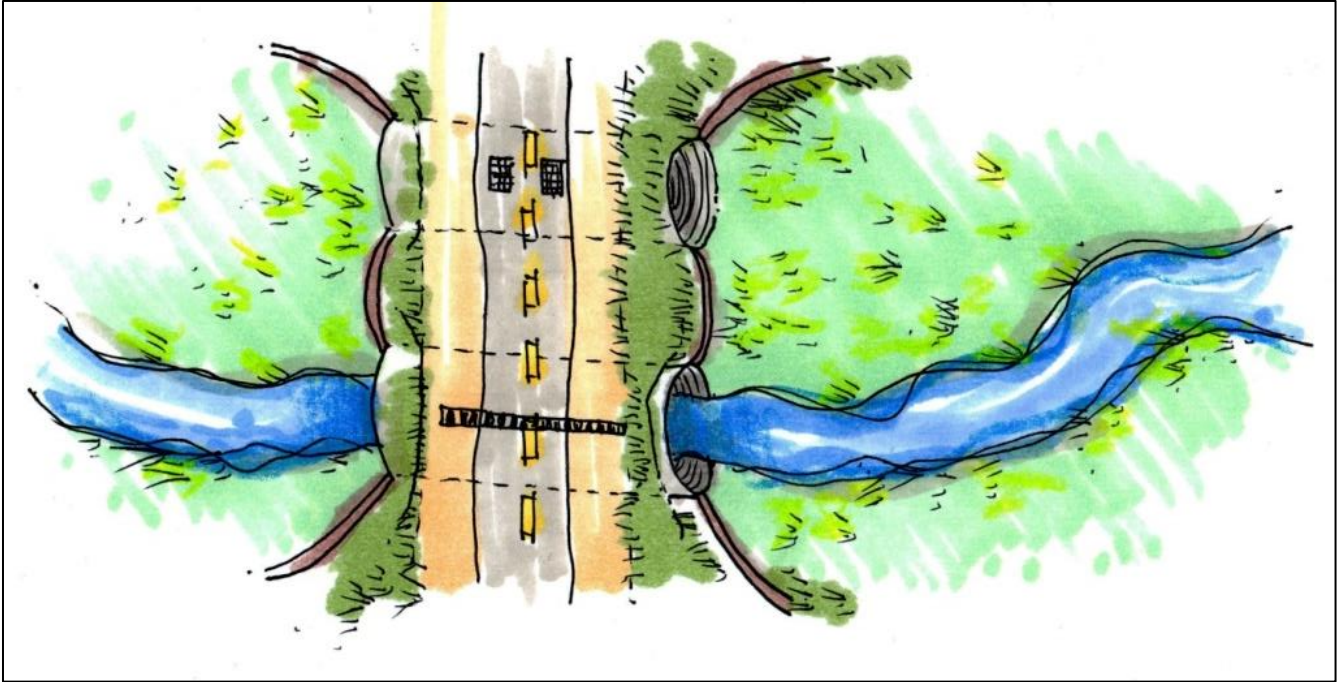


Figure 4. Wildlife culvert systems can have a large impact on reducing road mortalities. Graphic used with permission (Mifsud, D. 2014).



Figure 5. Wildlife barriers which are anchored into the ground prevent amphibians and reptiles from burrowing under or crawling over into roadways or other hazardous areas. Graphic used with permission (Mifsud, D. 2014).



Figure 6. Storm drain grates with smaller openings and grating along the curb prevent amphibians and reptiles from falling through. Graphic used with permission (Mifsud, D. 2014).

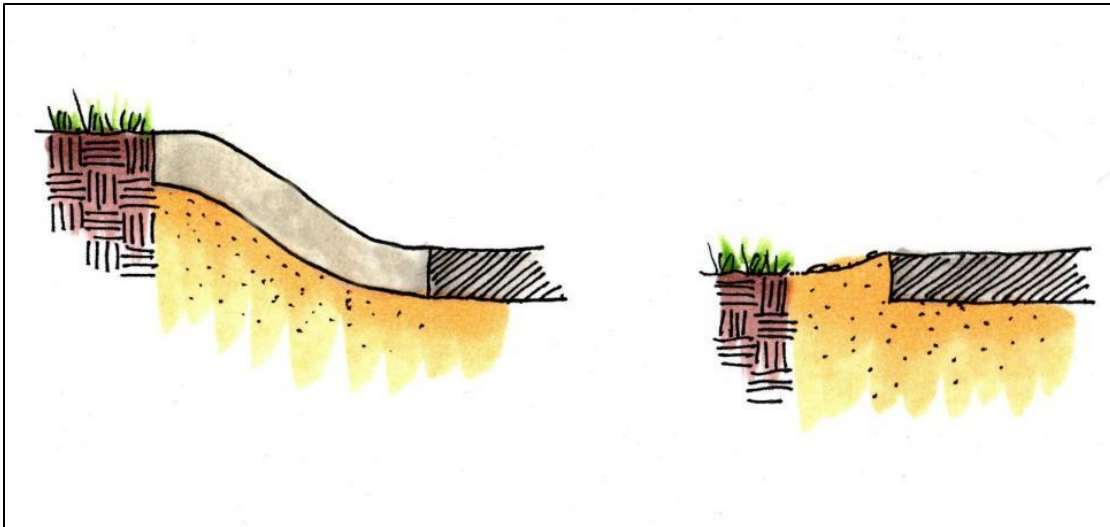


Figure 7. Eliminating curbs or installing those with gentle slopes can reduce rates of road mortality. Graphic used with permission (Mifsud, D. 2014).

Photos



Photo 1. Green Frog detected by HRM staff.



Photo 2. Northern Brown Snake observed by HRM staff.



Photo 3. Fowler's Toad observed by HRM Staff.



Photo 4. Northern Leopard Frog detected by HRM Staff.



Photo 5. Multiple age classes of Fowler's Toads were observed throughout the park.



Photo 6. Pitcher's Thistle observed by HRM staff.



Photo 7. Steep banks along lake shore should be graded to improve accessibility of upland to herpetofauna.



Photo 8. Forested vernal pool in Ottawa Sands County Park.



Photo 9. Grassy upland adjacent to lake in Ottawa Sands County Park.



Photo 10. Backwater area of Ottawa Sands that likely supports amphibian breeding in spring.

Species Profiles

Fowler's Toad (*Bufo fowleri*)



Fowler's Toad is listed as a Species of Special Concern by the Michigan Department of Natural Resources' Wildlife Action Plan. This species closely resembles the Eastern American Toad being tan or brown with a light strip down the back. Most individuals have dark blotches spread randomly around their body and limbs. This species is found within open woodlands, sand prairies, meadows and beaches but can also be found in suburban and agricultural areas. Sandy soil is usually a common factor between all of the location that Fowler's Toads are found. The diet of Fowler's Toads are terrestrial invertebrates such as insects but may not be quite as varied as the diet of the Eastern American Toad. Breeding occurs in the spring with males making nasally low pitched bleats a couple of seconds long. This species most commonly is active during the day and can withstand higher temperatures than American Toads but become less active as temperatures lower. Hibernation Particular care should be taking preserving known breeding sites of this species. However, overall habitats should also be sought to be protected in order to protect this declining species as it is likely that its habitats have been degraded through human activities (Harding and Mifsud 2017).

Northern Leopard Frog (*Rana pipiens*)



The Northern Leopard Frog is listed as a Species of Greatest Conservation Need in Michigan. Once fairly common, populations of this frog suffered serious declines in the 60's and 70's and now can be uncommon in much of its range. The Northern Leopard Frog prefers habitats that are open and may consist of marshes, bogs, edges of water bodies, fields, meadows and even lawns. Northern Leopard Frogs feed primarily on invertebrates but full grown adults are known to eat small frogs such as Spring Peepers. A large variety of predators including humans feed upon all life stages of Leopard Frogs. During the spring, these frogs transition to shallow water for breeding but then disperse to dry land for the remainder of the summer. As with other amphibians, pollutants in the water have a negative effect on this species but the leopard frog tends to be particularly sensitive. The leopard frog is also sensitive to changes in the pH of water and generally does not do well in acidified waters. This frog also faces pressure from human collection for science and bait. Overall, it is believed though that the Northern Leopard Frog has the potential to recover from its reduced populations if the proper habitat is available (Harding and Mifsud 2017).

Blanchard's Cricket Frog (*Acris crepitans blanchardi*)



Photo credit Jim Harding

Once common, the Blanchard's Cricket Frog has undergone dramatic population declines within Michigan and is currently listed as State Threatened. This small warty frog can be brown, tan, olive, or grey, sometimes with green, black, or red blotches on its body. These frogs are found along the edges of open bodies of water and will spend time on floating aquatic vegetation if available. The Blanchard's Cricket Frog will hibernate through the winter buried into the shoreline or nearby soil. Predators for this species include birds, snakes, and larger frogs. Breeding occurs in early spring with males calling throughout the day and night along the edges of water bodies. The call of this species sounds like a series of metallic clicks, which can vary in tempo. Solitary tadpoles are usually observed in benthic littoral habitats in late spring and early summer, and tend to metamorphose in late summer and early fall. Drivers of the declining status of Blanchard's Cricket Frog populations across the Midwest are so far poorly understood. However, human activities are suspected to be the primary cause, including habitat degradation through pollution and development (Harding and Mifsud 2017).

Black (Gray) Rat Snake (*Pantherophis obsoletus obsoletus*)



A Species of Special Concern in Michigan protected under the MDNR Fisheries Order 224.13, Black Rat Snake populations have been declining in recent years particularly in southeastern Michigan. The largest snake species in the State, adults range from 40 to 101 inches with hatchlings starting out over 10 inches long. As their name suggests, this species is black with white coloration on its throat. Black Rat Snakes are primarily found in woodlands or open areas next to them such as fields, pastures, bogs or marshes. Common prey items include small mammals, birds, which they hunt using arboreal behavior and occasionally amphibians and other reptiles. Their diet also makes them useful to farmers in that they are excellent pest control. Black Rat Snakes establish home ranges of about 2,000 ft. in diameter and have interactions with others of their species to establish dominance. Due to their size there are relatively few predators that threaten them, the primary being humans. Similar to several other species of snakes, Black Rat Snakes hibernate communally and will commonly share hibernacula with other species of snake as well. Mating occurs mostly in the spring and eggs are usually laid around late June or July in loose soil, rotted stumps, or under cover like rocks. Long lived, this species has been known to live almost 23 years in captivity but are particularly vulnerable in the wild to road mortalities and human activities (Harding and Mifsud 2017).

Blue Racer (*Coluber constrictor foxi*)



A Species of Greatest Conservation Need under the Michigan Wildlife Action Plan, Blue Racers prefer areas that are dry and sunny with access to cover, including shrubby fence lines, old fields, hedgerows, thickets, open forest, and woodland edges. This species also inhabits moist areas, including grassy lake edges and marshes. Coloration of Blue Racer varies between individuals from gray to blue to brown above, and light blue or cream on the belly. Hatchlings are 7-14", and adults can reach over 6' in length. These snakes eat a varied diet, including insects, spiders, frogs, salamanders, small turtles, lizards, snakes, birds, bird eggs, mice and other small rodents. Blue Racers are non-venomous, and will often escape when danger is detected. However, if cornered these snakes will coil and strike as well as release a foul-smelling musk. Females nest in June and July, and eggs hatch in August or early September. Hibernation for this species during the winter months occurs in various small mammal burrows, crayfish chimneys, and other natural and artificial sources of cover such as crevices or building foundations. Due to their large size and habitat needs these snakes face multiple threats from humans including development and direct aggression towards the snakes. An important pest and rodent consumer these snakes are important components of their ecosystem (Harding and Mifsud 2017; Holman 2012).

Eastern Hog-nosed Snake (*Heterodon platirhinos*)



Ranging in color patterns with some individuals displaying blotches down the back with others demonstrating a plain gray or brown coloration the Eastern Hog-nosed Snake is listed as a Species of Greatest Conservation Need. Adults of this species typically range from 1.5 feet to over 3 feet in length. This species will be found in multiple forms of terrestrial habitat to various forest types, old fields, and meadows. The major habitat feature indicator for this species tends to be soils that are sandy and well drained. These snakes prey upon small reptiles, amphibians, mammals, birds but are commonly observed preying upon toads. Eastern Hog-nosed Snakes demonstrate several interesting reaction to their own predation. The snakes will flatten their head giving them a distinct almost cobra like appearance and produce loud hissing noises. They also display the ability to play dead in order to trick predators into not eating them. These snakes will hibernate in burrows or in rotten stumps. Eastern Hog-nosed snakes reach maturity in their second or third year and females will lay clutches of eggs ranging in size from 4-61 individuals. While capable of being locally abundant in some location this snake's population has declined with loss of habitat and persecution by people being leading causes of this snakes plight (Harding and Mifsud 2017; Holman 2012).

Eastern Smooth Green Snake (*Opheodrys vernalis*)



Smooth Green Snakes also known as Eastern Smooth Green Snakes range from about a foot long to just over two feet long and are listed as Species of Greatest Conservation Need by Michigan's Wildlife Action Plan. As the name implies this snake is entirely bright green with a cream colored underside. This snake prefers to inhabit moist grassy places like marshes, meadows, and lake edges. These snakes are commonly found under cover objects including logs, flat rocks, and debris such as boards and tar paper. Smooth Green Snake's diet is primarily insects and they tend to specialize on grasshoppers and crickets. This snake will lay 3-13 eggs that have ranging incubation times and in some cases may be born alive. Hibernation for Smooth Green Snakes occurs in hibernacula with other species of small snakes. Unfortunately these snakes are decreasing in numbers and in some cases have faced extirpation in the Great Lakes Basin. The largest threat to the Smooth Green Snake is agriculture as it not only destroys habitat used by the Smooth Green Snake but it also employs the use of pesticides which kill off the main source of food. Interestingly this species is one of the few species of snakes that generally does not face persecution and aggression from people because of their unique coloring (Harding and Mifsud 2017).

Northern Ring-necked Snake (*Diadophis punctatus edwardsii*)



The Northern Ring-necked Snake is a small species that will rarely exceed a foot and a half in length. This species is listed as a Species of Greatest Conservation need by the Michigan Wildlife Action Plan. Darkly colored these snakes are distinguishable by their bright orange or yellow ring around its necks. Ring-necks prefer moist shaded woodlands but can also be found in fringe habitat between woodlands and other community types. This snake is commonly found below or inside rotting logs which can make assessing local populations challenging. Because of this preferred habitat as well predation from natural sources is usually a small concern for maintaining these populations as only when individuals leave the protection of their hide could they possibly be taken. These snakes feed on an assortment of small snakes, lizards, frogs, salamanders, earthworms, slugs, and insect larvae. This species hibernates underground, in burrows or crevices which are either naturally occurring or made by other animals. In many areas this species has undergone dramatic declines. Northern Ring-necked Snakes typically are found in colonies and entire populations can be heavily affected even by small disturbances to their preferred habitat. As such development and habitat fragmentation are serious threats to this species (Harding and Mifsud 2017; Holman 2012).

Eastern Box Turtle (*Terrapene carolina carolina*)



The Eastern Box Turtle is listed in Michigan as a Species of Special Concern and protected under the MDNR Fisheries Order 224.13. It is currently proposed for elevation to Threatened (Herpetological Resource and Management 2014). These turtles are primarily terrestrial, favoring wooded areas consisting of deciduous or mixed trees with sandy soils but can also be found utilizing nearby open habitats such as fields and marshes. They require some form of access to water, including streams, ponds, or bogs, and spend most of the summer buried in leaf litter or, when temperatures are high, near their source of water. This species is diurnal and peak periods of activity are typically in the morning or after a rainstorm. During the winter box turtles hibernate by burrowing into the ground ranging from shallow to much deeper burrows. These turtles have relatively small ranges and have an omnivorous diet consisting of plants, berries, invertebrates, and some small vertebrates. Major predators include raccoons, skunks, foxes and other mid-sized carnivores however, roadside mortalities of these animals is an even larger threat. These long lived animals (40-50 years in the wild but some can live to over 100) can take up to 10 years to reach sexual maturity and because of the high mortality rates of young box turtles it can take some time for adults to replace themselves in the population. The largest threats facing the Eastern Box Turtle come from humans, ranging from habitat destruction and road mortality to collection for the pet trade (Harding and Mifsud 2017).

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