

Phase II Status Assessment of Herpetofauna in the Saginaw Bay Watershed

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The statements, findings, conclusions, and recommendations in this report are those of the Saginaw Basin Land Conservancy and do not necessarily reflect the views of the DEQ and the NOAA.

Executive Summary

In 2011 Herpetological Resource and Management, LLC (HRM) was contracted by Saginaw Basin Land Conservancy (SBLC) to conduct surveys for amphibians and reptiles in the Saginaw Bay Watershed in Michigan. In 2012, HRM began Phase II of the project. Funding for this project was provided through grants by the Michigan Department of Environmental Quality Coastal Management Program, and through funds provided by the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The primary objective of this study was to provide a comprehensive assessment of amphibian and reptile diversity within the study area. The results are a combination of both Phase I and Phase II grants and are intended to help establish baseline data for the current condition of herpetofauna within the coastal zone of the Saginaw Bay, guide future restoration efforts, and provide better management based on inclusion of these sensitive species in the decision making process.

Properties surveyed as part of this assessment include those owned by SBLC, as well as township, county, state and federal land. Portions of 123 Public Land Survey square-mile sections were surveyed, and incidental observations were made in five additional square-mile sections in 2011, 2012, and 2013. Through these efforts, 27 species of reptiles and amphibians were observed, including the Blanding's Turtle (*Emydoidea blandingii*), a State listed Species of Special Concern. To date, no other herpetological survey effort has covered

the extent of area along the Saginaw Bay or any part of the Great Lakes coastal wetland system in Michigan. This work has also resulted in a significant range expansion of Northern Map Turtle (*Graptemys geographica*) and Four-toed Salamander (*Hemidactylium scutatum*) in Michigan, a species identified by the Michigan Department of Natural Resources (MDNR) as a Species of Greatest Conservation Need (Harding 1997; Eagle, Hay-Chmielewski et al. 2005; Holman 2012). In addition, this work identified higher densities and number of species of herpetofauna in areas where *Phragmites australis* (here after referred to as *Phragmites*) was mowed or absent. This spatial correlation between herpetofauna communities and *Phragmites* demonstrates that control and eradication of *Phragmites* from the Saginaw Bay Watershed can improve ecosystem function and may be critical for long-term amphibian and reptile species viability.

The following objectives were accomplished as part of this project:

- Create an inventory plan that includes research of existing information to avoid sampling overlap and a study design that results in statistically reliable data.
- Create a comprehensive report summarized by park, refuge, management unit, island, or other natural unit.
- Document distribution for all detected herpetofaunal species by property.
- Map the distribution for all detected herpetofaunal species within the study area.
- Calculate observed species richness for all observed herpetofaunal communities.
- Provide a species summary for observed and potential rare species.
- Provide detailed management recommendations

Introduction

In 2011, Saginaw Basin Land Conservancy (SBLC) and Herpetological Resource and Management, LLC (HRM) began a much needed endeavor to document the diversity and distribution of amphibians and reptiles within the Saginaw Bay coastal wetland. It has been more than 100 years since data have been collected in this region, and what data existed was limited to only a few localities along the Bay.

Amphibians and reptiles are recognized as bioindicators: gauges of environmental health, due in part to their high sensitivity to environmental pollutants and habitat disturbance. Consequently, assessment of herpetofaunal abundance and species richness within an area can reveal much about the health of the ecosystem, and can point to habitat quality concerns that may not be detected by water quality or floristic assessments (Cooperrider, Boyd et al. 1986; Welsh and Droege 2001; Guilfoyle 2010). In recent years, populations of herpetofauna have declined in Michigan and throughout the world (Harding 1997; Graeter, Buhlmann et al. 2008; Holman 2012). There are many factors implicated in population declines including climate change, disease, water contamination, illegal collection, road mortality, and habitat loss. The most significant drivers of amphibian and reptile population declines in Michigan are likely habitat loss, fragmentation, and degradation.

Based on historic observations and historic range maps for amphibian and reptiles, over 40 species of amphibians and reptiles may be present in the Saginaw Bay coastal areas, making this a critical region for herpetofauna conservation in Michigan. Of these species, three turtles, six snakes, five salamanders, and four frogs are listed as Species of Greatest Conservation Need (SGCN) by the State of Michigan (Eagle, Hay-Chmielewski et al. 2005).

Four species, the Blanding's Turtle (*Emydoidea blandingii*), Wood Turtle (*Glyptemys insculpta*), Queen Snake (*Regina septemvittata*), and Eastern Massasauga (*Sistrurus catenatus catenatus*, a Federal Candidate Species) are all listed as Species of Special Concern in Michigan (Michigan Natural Feature Inventory 2010). In addition, three State Threatened Species, Six-lined Racerunner (*Cnemidophorus sexlineatus*), Spotted Turtle (*Clemmys guttata*), and Eastern Fox Snake (*Pantherophis gloydi*), may occur within the assessment area. Due to the lack of available information on the current status and overall health of herpetofauna within the study area, data gathered during this study will be valuable for use in future local, regional, state, and federal decision making regarding conservation and management.

The herpetofaunal species richness and distribution in the Saginaw Bay can be used as a tool to help assess the health of coastal communities. Areas of high quality habitat surveyed by HRM can serve as reference sites for future habitat restoration and to help set target goals for desired nongame wildlife. The data collected within the study area can be used to 1) assess habitat quality (i.e., high quality, degraded, impaired), 2) assess herpetofaunal community structure and composition, 3) identify priority areas for protection and restoration, and 4) provide sample targets for measurable results of habitat restoration.

Project partners and regional stakeholders can use data collected from this study to implement management strategies that benefit sensitive and imperiled species and their habitats. Data collected as part of this study can be incorporated into land use, master planning, habitat restoration, ecosystem management, and other land conservation and management plans.

Site Locations and Descriptions

The project area consisted of multiple segments of coastal habitat within the Saginaw Bay Watershed in the Michigan Counties of Arenac, Bay, Huron, and Tuscola within 123 square-mile sections as described by the Public Land Survey System (National Atlas of the United States 2012). Property owners include the Saginaw Basin Land Conservancy, Michigan Nature Association, Hampton Charter Township, Bay County, Michigan Department of Natural Resources (MDNR), and U.S. Fish and Wildlife Service. Incidental observations that occurred outside the assessment area were also documented. The following sites were surveyed and are described below.

1) Au Gres Delta Nature Preserve

Au Gres Delta Nature Preserve, maintained by the SBLC, is located within the city of Au Gres in Arenac County, Michigan. Portions of three square-mile sections were included in this assessment area (Table 1). This site is approximately 68 acres in area. It is bordered by Lake Huron to the east and the Au Gres River to the north and consists primarily of *Phragmites* dominated coastal marsh. The north half of the site is wooded, with wetlands and small streams interspersed throughout.

2) Pinconning Nature Preserve

The SBLC owned Pinconning Nature Preserve is located in Pinconning Township, Bay County, Michigan. This site occupies a portion of one square-mile section (Table 1). This site is approximately 38 acres, and is located on East Pinconning Road between Maloney Road and Two Mile Road, 0.25 miles west of Pinconning County Park and within

0.25 mile of Lake Huron. A 1.1 mile trail system leads through the preserve and to the river. This site is bound by East Pinconning Road to the north, North Two Mile Road to the east and the Pinconning River to the south. This site was formerly a farmstead, and the vegetation currently consists of Great Lakes coastal marsh and wet meadow species, dense *Phragmites* thicket, shrubs, and lowland deciduous forest.

3) Pressprich Nature Preserve

The SBLC Pressprich Nature Preserve is located in Sims Township, Arenac County, near Au Gres, Michigan. This site occupies a portion of one square-mile section (Table 1). This site is approximately 49 acres, and is composed of forested wetland, patchy shrub thicket, upland woods, wet meadow, and prairie grassland habitat. Invasive plants (e.g., *Phragmites*, common reed; *Lonicera sp.*, honeysuckle; *Elaeagnus sp.*, autumn olive) have colonized limited areas.

4) Saganing Nature Preserve

Saganing Nature Preserve is owned by the SBLC and is located in Standish Township, Arenac County, Michigan. This site occupies a portion of one square-mile section (Table 1). This site is approximately 51 acres and is composed of forested wetland and emergent marsh and coastal wetland. The preserve is partially colonized by *Phragmites* with portions of cattail stands. Portions of the forested wetland were made up of ash tree swamps. The Pine River borders the site to the north.

5) Sand Point Nature Preserve

The SBLC Sand Point Nature Preserve is located in Caseville Township, Huron County, Michigan. This site occupies a portion of one square-mile section (Table 1). This site is approximately 180 acres and is a mosaic of forest, sandy dune areas, inter-dune vernal pools, a small inland lake (Mud Lake), and coastal marsh. The coastal marsh area is dominated by *Phragmites*, with evidence of historic fill and dumping along the southern property boundary.

6) Sillman Tract

The Sillman Tract is owned by and located within Hampton Charter Township, Bay County, Michigan. This site is approximately 14 acres in a portion of one square-mile section (Table 1). This site has been disturbed in the recent past and is dominated by a second growth forest of invasive and aggressive native tree species and an understory of quick growing pioneering native shrubs and herbaceous plants. The forest area transitions into a disturbed coastal wetland dominated by *Phragmites*.

7) Standish Nature Preserve

Standish Nature Preserve, managed by the SBLC, is located in Standish Township, Arenac County, Michigan. This site is approximately 19 acres in a portion of one square-mile section (Table 1). This site is composed of an old field/disturbed remnant lake-plain prairie, a constructed channel bordered by woods, and a shrub thicket.

8) Wah-Sash-Kah-Moqua Nature Preserve

Just north of Pinconning, Michigan, the SBLC property of Wah-Sash-Kah-Moqua Nature Preserve is split between Bay and Arenac Counties. This site occupies portions of two square-mile sections (Table 1). This site is composed of three-parcels covering approximately 127 acres that were historically used for agriculture. All three parcels are mainly wet prairie, and the centers of the two southern parcels are seceding to mesic forest.

9) Finn Road Park

Finn Road Park in Hampton Charter Township, Bay County, Michigan, is owned by Hampton Charter Township. A portion of one square-mile section was included in this assessment area (Table 1). It is bordered by Lake Huron to the north and Finn Road to the south, and is adjacent to the Quanicassee State Wildlife Area. This site is approximately 80 acres, and is characterized by an area of upland forest that transitions to a disturbed coastal wetland dominated by *Phragmites*.

10) Michigan Islands National Wildlife Refuge (Charity Islands)

Charity Island is owned primarily by the U.S. Fish and Wildlife Service and is located near the mouth of Saginaw Bay in Lake Huron, Michigan. This site covers approximately 247 acres in portions of three square-mile sections (Table 1). Big Charity Island was surveyed in 2011 and Little Charity Island was surveyed in 2013. Big Charity Island is surrounded by coastal marsh infested with dense *Phragmites* in many areas. It has large areas of mature high quality upland forest, sandy shores, an 11 acre inland lake, interdunal wetlands, and large vernal pools throughout the forest. A marina and quarried channel are present and the construction of these features created large areas of limestone debris along

the water's edge. Vegetation observed included federally endangered Pitcher's thistle (*Cirsium pitcheri*). Several bird species nest on Charity Island or pass through during spring and fall migration (U.S. Fish and Wildlife Service 2012). Little Charity Island is a 5.4 acre island which supports an important breeding bird colony with hundreds of birds observed. There was limited coastal marsh on Little Charity Island which supported phragmites, purple loosestrife, and cattail. Herbaceous vegetation was lacking with most plants consisting of shrubs and trees. Most of the island is occupied by a colonial waterbird nesting colony.

11) Saginaw Wetlands

Saginaw Wetlands, which covers approximately 147 acres, is owned by the Michigan Nature Association, and is located in Huron County, Michigan. Portions of two square-mile sections were included in this assessment area (Table 1). The habitat at this site is high-quality and is comprised of fen, grassland, and shrubby/forested areas; however, invasive *Phragmites* has begun to invade the fen.

12) Pinconning County Park

Pinconning County Park is owned by Bay County and is located in Pinconning Township, Bay County, Michigan. This site covers approximately 223 acres in a portion of one square-mile section (Table 1). This site is composed of upland forest containing vernal pools and forested wetlands, old field, wet meadow, and *Phragmites* dominated coastal marsh.

13) Quanicassee State Wildlife Area

Quanicassee State Wildlife Area, located in Bay and Tuscola Counties, Michigan, is maintained by the MDNR. Portions of ten square-mile sections were included in this

assessment area (Table 1), which covered approximately 1,690 acres. This site primarily consists of coastal marsh that is dominated in many areas by *Phragmites* and bordered by a boat launch. A high-quality wet meadow lies adjacent to Knight Road.

14) Wigwam Bay State Wildlife Area

Wigwam Bay State Wildlife Area is maintained by the MDNR and is located in Arenac County, Michigan. Portions of 11 square-mile sections were included in this assessment area (Table 1). This site covers approximately 3,138 acres. This site is comprised of four non-contiguous parcels, and is a mosaic of high-quality habitats. Available habitat at the site are comprised of tussock sedge marsh, young, seasonally wet woods, a cattail marsh, large, clear vernal pools, and old field with some areas of prairie with excellent vegetation structure. The diked wetlands are sparsely colonized by *Phragmites sp.*, and some of the marshes are dominated by reed-canary grass and cattail. Beyond the wetland dike along the coastal marsh on the south side of the wildlife area, *Phragmites* is the dominant vegetation. To the south of Palmer Road there are several acres of high-quality coastal marsh and a wet wooded area. The Pine River runs along the north side of the site, and the northwest portion of the site is dominated by wet meadow.

15) Wildfowl Bay State Wildlife Area

Located in Huron County, Michigan, Wildfowl Bay State Wildlife Area (WBSWA) is managed by the MDNR. Portions of 23 square-mile sections were included in this assessment area (Table 1). The WBSWA covers approximately 2,313 acres comprised of multiple parcels along the coast of the Saginaw Bay. The habitat at this site includes areas of fen, wet prairie, coastal marsh, ponds, vernal pools, forest, dunes, coastal beach, grassland,

and old field. *Phragmites* dominates the coastal wetland areas in several parcels. Other invasive plants, including autumn olive, spotted knapweed, purple loosestrife, reed canary-grass, multi-flora rose, and Japanese barberry, occur in portions of the site. The historical land use for a subset of the parcels was agricultural field that has since been restored to grassland, wetlands, and ponds.

Multiple islands are also present within this WBSWA (some unnamed and recently formed) and many were surveyed during the course of this project. The named islands surveyed include Sumac Island, Heisterman Island, and Middle Grounds Island. All of the islands coasts are heavily invaded by *Phragmites*. Where *Phragmites* has not invaded the coasts consisted of a rocky bottoms. Inner portions of the islands ranged from open forest with pockets of marshland and vernal pools, to dense thickets of shrubs predominantly invasive Japanese barberry.

16) Sleeper State Park

Sleeper State Park, owned and managed by the MDNR, is located in Huron County, Michigan. This site covers approximately 723 acres and is composed of multiple parcels along the coast of the Saginaw Bay. Portions of two square-mile sections were included in this assessment area (Table 1). The habitat at this site includes areas of forest, vernal pools, dunes, coastal beach, and coastal marsh. In portions surveyed *Phragmites* was limited to pockets, though expansion was observed between 2011 and 2013.

17) Rush Lake State Game Area

The MDNR Rush Lake State Game Area is located in Huron County, Michigan. Portions of seven square-mile sections were included in this assessment area (Table 1). This

site covers approximately 2,166 acres and is a diverse mix of upland and wetland areas. Habitat includes areas of forest, vernal pools, high quality sedge marsh, and coastal marsh. At the center of Rush Lake State Game Area is Rush Lake, a shallow lake that is surrounded by dense cattail with intermittent pockets of *Phragmites* located within the cattail. The Northeast portion of the game area has rolling hills of ancient lake edge which provides open sandy habitat with dry mesic to xeric plants present. Overall invasives were limited and localized. Invasive plants within wetlands included *Phragmites* and purple loosestrife. Upland habitat invasives included autumn olive, Japanese barberry, and spotted knapweed.

18) Fish Point State Wildlife Area

Fish Point State Wildlife Area is a complex of several parcels managed by the MDNR and is located in Huron County, Michigan. Portions of 22 square-mile sections were included in this assessment area (Table 1). This site covers approximately 4,075 acres and is composed of multiple parcels along the coast of the Saginaw Bay. The habitat at this site includes food plots, mowed areas, diked wetlands with water levels managed for waterfowl, shrubby uplands, forest, vernal pools, a high quality sedge and shrub fen, sedge and cattail marsh, coastal wetlands, and prairies with some portions dominated by *Phragmites*. Other invasive plants, including purple loosestrife, reed canary grass, spotted knapweed, garlic mustard, honeysuckle, common buckthorn, and barberry, are present on some portions of the site. Some upland portions of this site appear to be mowed as pheasant habitat, and there is an extensive pile of field stone in the southeast corner of the property. Since 1999, the shoreline along the coast of Fish Point State Wildlife Area has moved west-ward and given way to emergent vegetation.

19) Bay City State Recreation Area

The MDNR managed Bay City State Recreation Area is located in Bay County, Michigan. Portions of 12 square-mile sections were included in this assessment area (Table 1). This site, which includes Tobico Marsh and multiple other parcels along the coast of the Saginaw Bay, covers approximately 2,800 acres. The habitat at this site includes coastal marsh, cattail marsh, shrub thicket, high-quality hardwood forest, and sandy dunes.

20) Nyanquing Point State Wildlife Area

Nyanquing Point State Wildlife Area, managed by the MDNR is located in Bay County, Michigan. Portions of 14 square-mile sections were included in this assessment area (Table 1). This site covers approximately 1,400 acres. This site is composed of multiple parcels along the coast of the Saginaw Bay. The habitat at this site includes diked marshes with water levels managed for waterfowl, high quality marsh with waterlilies, cultivated fields for wildlife/waterfowl food plots, sedges, and dispersed cattail patches, sandy dune ridges, grassy uplands with some shrubby vegetation, low-quality fields dominated by reed canary-grass, and interior and coastal marsh. Most of the eastern border of the site is dune ridge. To the east of the dune ridge areas of dense *Phragmites* are beginning to invade adjacent higher quality upland and wetland areas. Between 1999 and 2005, the western area of the site was heavily colonized by aquatic vegetation.

Methods

Historical Review and Site Assessment

Sites were selected based on reviews of historical herpetofaunal data for the region, public ownership, proximity to the coast, and potential for rare and sensitive species to be present. Because little was known for this region, even potentially degraded areas within the assessment area were assessed to determine species presence and habitat quality.

A review of historical conditions at each site was conducted through collection of information from project partners, interpretation of historical aerial photography, and historic species accounts from the site or nearby areas. Aerial photographs over multiple years can be used to show progressive changes in water levels, vegetation types, and land use which can influence amphibian and reptile populations. Land use patterns, which can influence the level of connectivity for amphibian and reptile populations, can be compared against locations of historic populations to determine which areas have the greatest likelihood for various species to be present. In addition, during site surveys, the presence and quality of various upland and aquatic habitats were assessed. These habitats were evaluated for potential species presence based on the natural history requirements of Michigan's amphibians and reptiles.

Herpetofaunal Surveys

Herpetofaunal surveys were conducted from May to September of 2011, April through June of 2012 and April through July of 2013. Intensive visual, aural, and capture surveys were conducted in terrestrial and aquatic habitats within the study area by teams of 2 to 5 surveyors trained in the identification and habitat use of Michigan herpetofauna.

Because amphibians and reptiles utilize a variety of habitats and occupy multiple niches that affect their ability to be detected, multiple methods were employed to assess species richness, community composition, and spatial distribution.

Each type of aquatic habitat was searched for adult, juvenile, and larval or hatchling amphibians and reptiles. Survey techniques included the use of turtle and salamander traps. Sampling for aquatic species involved capturing individuals by hand or dip net, observation through binoculars and aural identification of calling frogs. Time-constrained ground searches were used to inventory terrestrial habitats for evidence of reptiles and amphibians. Techniques used included visual investigation of potential nesting and basking sites, turning over cover materials (logs, boards, debris; Photo 1), visual observations, and anuran (frog and toad) calling surveys.

Amphibians and reptiles discovered during surveys were identified by visual characteristics, and 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. Rare species observations were submitted to the State of Michigan for inclusion in the State's Natural Heritage Database, and all observations were submitted to the Michigan Herpetological Atlas Project. Each positively identified

amphibian or reptile was documented. The following data were collected for each record:

(1) species; (2) gender (when possible); (3) behavior; and (4) reproductive condition of each individual (if it could be determined). Observation locations were recorded using Trimble® Geo XT and Juno SB GPS Units (1-3m accuracy), and mapped using ArcMap® software, and organized according to Public Land Survey (PLS) square-mile sections (Table 1).

Results and Discussion

Twenty-seven species of herpetofauna (13 species of reptiles and 14 species of amphibians) were observed in the Saginaw Bay Watershed in 2011, 2012, and 2013 (Table 1). Amphibians observed were Blue-spotted Salamander (*Ambystoma laterale*), Red-spotted Newt (*Notophthalmus viridescens viridescens*), Red-backed Salamander (*Plethodon cinereus*), Four-toed Salamander (*Hemidactylium scutatum*), Spotted Salamander (*Ambystoma maculatum*), Mudpuppy (*Necturus maculosus maculosus*), Eastern American Toad (*Bufo americanus americanus*), Northern Spring Peeper (*Pseudacris crucifer crucifer*), Western Chorus Frog (*Pseudacris triseriata triseriata*), Gray Treefrog (*Hyla chrysocelis/versicolor*), Northern Green Frog (*Rana clamitans melanota*), Bullfrog (*Rana catesbeiana*), Northern Leopard Frog (*Rana pipiens*), and Wood Frog (*Rana sylvatica*). Observed reptiles were Northern Brown Snake (*Storeria dekayi dekayi*), Northern Red-bellied Snake (*Storeria occipitomaculata occipitomaculata*), Eastern Garter Snake (*Thamnophis sirtalis sirtalis*), Butler's Garter Snake (*Thamnophis butleri*), Northern Ribbon Snake (*Thamnophis sauritus septentrionalis*), Northern Water Snake (*Nerodia sipedon sipedon*), Northern Ring-necked Snake (*Diadophis punctatus edwardsii*), Eastern Snapping Turtle (*Chelydra serpentina serpentina*), Midland Painted Turtle (*Chrysemys picta marginata*), Blanding's Turtle (*Emydoidea blandingii*), Eastern Spiny Softshell Turtle (*Apalone spinifera spinifera*), Northern Map Turtle (*Graptemys geographica*), and Five-lined Skink (*Plestiodon fasciatus*). For the purposes of this report, *Hyla chrysocelis* and *H. versicolor* were combined and listed as Gray Treefrog, and *Notophthalmus viridescens viridescens* and *N. viridescens* were combined and listed as Red-spotted Newt.

Herpetofauna were observed in all but one square-mile sections surveyed in 2011, 2012 and 2013 (Maps 1-13). The only square-mile that no species was observed in during

the course of the survey was 16N09E08 in WildFowl Bay State Wildlife Area (Map 11-13). It should be noted that only a portion of this section was surveyed and was heavily infested with invasive *Phragmites*. Amphibians and reptiles are likely present in unsurveyed portions of the square-mile. The largest number of species observed within one square-mile section was 16, at Sand Point Nature Preserve. Up to nine amphibian species (Maps 3, 6, 9, 12) and up to seven reptile species (Maps 4, 7, 10, 13) were observed in a single section. Over half of the species observed were present in multiple sections (Maps 14-38). The Blanding's Turtle, a state Species of Special Concern, was observed within the study area in twenty-two different square-mile sections, and has been identified as a potential species on at least eight other properties (Map 14). These surveys also detected Northern Map Turtle, species sensitive to water quality, as well as Four-toed Salamander, a species identified by the MDNR as Species of Greatest Conservation Need, outside of their previously recorded ranges (Harding 1997; Eagle, Hay-Chmielewski et al. 2005). The Four-toed Salamander was observed at Sleeper State Park, where the HRM team lodged in 2011 and was observed again during formal surveys in 2013. These observations resulted in a significant range expansion for these species within the Saginaw Bay area.

1) Au Gres Delta Nature Preserve

In 2011 and 2013, a total of eight species of herpetofauna were observed, including four amphibians and four reptiles (Table 1, Map 2-4). These species were the Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Wood Frog, Eastern Garter Snake, Northern Ribbon Snake, Eastern Snapping Turtle and Midland Painted Turtle. Additionally, recent observations in and near Au Gres Nature Preserve have included Eastern American Toad, Northern Spring Peeper, and Western Chorus Frog (Table 2).

Historical review of known herpetofaunal accounts indicates that Pickerel Frog (*Rana palustris*) was observed prior to 2000 (Table 3). Invasive species included common reed (*P. australis* ssp. *australis*), purple loosestrife (*Lythrum salicaria*), and reed canary-grass (*P. arundinacea*) (Newcomb 1977; Voss 2004). One of the most immediate threats to herpetofauna in Au Gres Delta Nature Preserve is the degradation of native habitats by invasive plant species (Photo 2). *Phragmites* was observed along a portion of the preserve that bordered the bay in the coastal marsh. Based on the available habitat types and quality, an additional thirteen species of herpetofauna may occur within Au Gres Delta Nature Preserve. Although not observed in this survey, Red-spotted Newt, Northern Spring Peeper, Western Chorus Frog, Bullfrog, Northern Brown Snake, Butler's Garter Snake, Northern Ribbon Snake, Northern Water Snake, Blue Racer, Eastern Fox Snake, Eastern Massasauga, Northern Map Turtle, and Spotted Turtle may be present (Table 4). The amphibians would potentially use wooded vernal pools and shallow ditches, while most of the snakes and the Spotted Turtle would make use of the open marsh and wet meadow habitats (Harding 1997; Ernst and Lovich 2009; Holman 2012). A riprap berm at the site likely provides habitat for snakes and their prey. Most turtle species and Bullfrogs would probably be found in the open waters and along the edge of the Au Gres River. Basking sites and upland cover (i.e. logs, rock, or other objects) were limited at this site.

2) Pinconning Nature Preserve

A total of six species of herpetofauna were observed in 2011, including four amphibians and two reptiles (Table 1, Map 5-7). These species were the Eastern American Toad, Northern Green Frog, Northern Leopard Frog, Wood Frog, Eastern Garter Snake, and Butler's Garter Snake. Additionally, recent observations in and near Pinconning Nature

Preserve have included Northern Spring Peeper, and Western Chorus Frog (Table 2). Historical review of known herpetofaunal accounts indicates that Pickerel Frog was also observed prior to 2000 (Table 3). Non-native plant species included asparagus (*Asparagus officinalis*), apple (*Malus domestica*), autumn olive (*E. umbellata*), grape-hyacinth (*Muscari sp.*), honeysuckle (*Lonicera sp.*), common reed, and reed canary-grass (Newcomb 1977; Voss 2004).

Based on the available habitat types and quality, the following species of herpetofauna may also occur within Pinconning Nature Preserve, but were not observed in this survey: Blue-spotted Salamander, Northern Spring Peeper, Western Chorus Frog, Gray Treefrog, Bullfrog, Northern Brown Snake, Blue Racer, Eastern Massasauga, Eastern Snapping Turtle, Midland Painted Turtle and Eastern Spiny Softshell (Table 4). The amphibians may be found in wooded vernal pools and shallow ditches, while the snakes would likely make use of the open marsh and grassland (Harding 1997; Ernst and Lovich 2009; Holman 2012). The turtles and Bullfrogs would most likely be found in the open waters and along the edge of the Pinconning River (Photo 3).

3) Pressprich Nature Preserve

A total of three species of herpetofauna were observed in 2011, including two amphibians and one reptile (Table 1, Map 2-4). These species were the Western Chorus Frog, Northern Leopard Frog, and Eastern Garter Snake. Additionally, recent observations in and near Pressprich Nature Preserve have included Eastern American Toad, Northern Spring Peeper, and Wood Frog (Table 2). Historical review of known herpetofaunal accounts indicates that the Pickerel Frog was also present prior to 2000 (Table 3). Twelve non-native or invasive species of plant were observed within this preserve (Newcomb 1977;

Voss 2004). The invasive species noted included autumn-olive, orange daylily (*Hemerocallis fulva*), dame's-rocket (*Hesperis matronalis*), honeysuckle (*Lonicera sp.*), common reed, moneywort (*Lysimachia nummularia*), purple loosestrife, and reed canary-grass.

Based on the available habitat types and quality, the following species of herpetofauna may also occur within Pressprich Nature Preserve, but were not observed in this survey: Northern Spring Peeper, Gray Treefrog, Wood Frog, Northern Brown Snake, Northern Red-bellied Snake, Butler's Garter Snake, Eastern Smooth Green Snake (*Ophedryss vernalis vernalis*), Eastern Milk Snake (*Lampropeltis triangulum triangulum*), and Blue Racer (*Coluber constrictor foxii*) (Table 4). The amphibians would potentially use vernal pools and shallow ditches, while the snakes may use the open marsh and grassland (Holman 2012).

4) Saganing Nature Preserve

A total of nine species of herpetofauna were observed in 2011 and 2013, including six amphibians and three reptiles (Table 1, Maps 5-7). These species were Eastern American Toad, Western Chorus Frog, Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Wood Frog, Midland Painted Turtle, Butler's Garter Snake, and Eastern Garter Snake. Based on historical review of known herpetofaunal accounts, the University of Michigan Museum of Zoology (UMMZ) possesses voucher specimens of two species collected near Saganing Nature Preserve in 1941 (Table 3): Northern Leopard Frog and Midland Painted Turtle. Six species of non-native or invasive species were observed during our surveys included honeysuckle, common reed (Photo 4), purple loosestrife, and reed canary-grass (Table 3) (Newcomb 1977; Voss 2004).

Based on the available habitat types and quality, the following species of herpetofauna may also occur within Saganing Nature Preserve, but were not observed in this survey: Bullfrog, Northern Spring Peeper, Red-spotted Newt, Northern Water Snake, Northern Ribbon Snake, Eastern Snapping Turtle, Northern Map Turtle and Wood Turtle (*G. insculpta*) (Table 4). The amphibians would likely be found in vernal pools and nearby shallow ditches and coastal marsh, while the snakes would make use of the open wet meadow and grassland (Harding 1997; Ernst and Lovich 2009; Holman 2012). The turtles and Bullfrogs would presumably be found in the open waters and edge of the Saganing River.

5) Sand Point Nature Preserve

In 2011, a total of sixteen species of herpetofauna were observed, including nine amphibians and seven reptiles (Table 1, Map 11-13). These species were the Blue-spotted Salamander, Red-spotted Newt (Photo 5), Red-backed Salamander, Eastern American Toad, Northern Spring Peeper (Photo 6), Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Wood Frog, Northern Brown Snake, Eastern Garter Snake (Photo 7), Northern Ribbon Snake (Photo 8), Northern Ring-necked Snake, Five-lined Skink (Photo 9), Eastern Snapping Turtle, and Midland Painted Turtle (Photo 10). Review of recent observations in and near the site includes several of these detected species (Table 2). Additionally, historical observations in and near Sand Point Nature Preserve have included Western Chorus Frog, Blanding's Turtle, Eastern Fox Snake, Eastern Milk Snake, Eastern Hog-nosed Snake (*Heterodon platirhinos*), Northern Water Snake, Eastern Massasauga, Eastern Smooth Green Snake, Northern Red-bellied Snake (Table 3).

Based on the available high quality habitat (Photos 11-12), this site potentially provides significant value for amphibians and reptiles. The mosaic of habitats within this preserve likely provides high quality habitat for many amphibian and reptile species that require numerous habitats and various wetland types. The following species of herpetofauna may also occur within Sand Point Nature Preserve, but were not observed in this survey: Western Chorus Frog, Bullfrog, Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*), Four-toed Salamander, Eastern Fox Snake, Eastern Hog-nosed Snake, Eastern Milk Snake, Northern Water Snake, Eastern Smooth Green Snake, Eastern Massasauga, Northern Red-bellied Snake, Butler's Garter Snake, Eastern Spiny Softshell, Blanding's Turtle, Northern Map Turtle, and Eastern Musk Turtle (*Sternotherus odoratus*) (Table 4) (Harding 1997; Ernst and Lovich 2009; Holman 2012).

6) Sillman Tract

Two species of herpetofauna were observed in 2012, including one amphibian and one reptile (Table 1, Map 8-10). These species were Western Chorus Frog and Midland Painted Turtle. Thirty-three species of plants were observed in 2011, including eight non-native or invasive species (Newcomb 1977; Voss 2004). The invasive species noted included common reed, glossy buckthorn (*Rhamnus frangula*), honeysuckle, and Japanese barberry (*Berberis thunbergii*).

Based on the available habitat types and relatively low habitat quality, the following species of herpetofauna may also occur within the Sillman Tract, but were not observed in this survey: Eastern American Toad, and Eastern Garter Snake (Table 4) (Harding 1997; Ernst and Lovich 2009; Holman 2012).

7) Standish Nature Preserve

A total of three species of herpetofauna were observed in 2011, including two amphibians and one reptile (Table 1, Map 5-7). These species were the Eastern American Toad, Northern Leopard Frog and Butler's Garter Snake. Four non-native or invasive species were noted included autumn olive, honeysuckle and reed canary-grass (Newcomb 1977; Voss 2004).

Based on the available habitat types and quality (Photos 13-14), the following species of herpetofauna may also occur within Standish Nature Preserve, but were not observed in this survey: Northern Spring Peeper, Western Chorus Frog, Gray Treefrog, Northern Green Frog, Wood Frog, Bullfrog, Eastern Garter Snake, Northern Ribbon Snake, Eastern Snapping Turtle, Midland Painted Turtle, Northern Map Turtle, and Blanding's Turtle (Table 4). The amphibians would likely use the wetlands, while the snakes would primarily use the marsh, grassland, and forest edge (Harding 1997; Ernst and Lovich 2009; Holman 2012). Most of the turtle species, as well as Bullfrogs, would most likely be found in the wooded pond or the channel on the bay side of the property.

8) Wah-Sash-Kah-Moqua Nature Preserve

In 2011, a total of four species of herpetofauna were observed, including three amphibians and one reptile (Table 1, Map 5-7). These species were the Eastern American Toad, Northern Green Frog, Northern Leopard Frog and a snake which fled before it could be identified to species. Forty species of plants were observed in 2011, including eight non-native or invasive species. The invasive plant species included autumn olive, honeysuckle,

multiflora rose (*Rosa multiflora*), purple loosestrife and reed canary-grass (Newcomb 1977; Voss 2004).

Based on the available habitat types and quality, the following species of herpetofauna may also occur within Wah-Sash-Kah-Moqua Preserve, but were not observed in this survey: Gray Treefrog, Wood Frog, Bullfrog, Eastern Garter Snake, Butler's Garter Snake, Northern Water Snake, Eastern Smooth Green Snake, Eastern Milk Snake, Blue Racer, Eastern Snapping Turtle, Midland Painted Turtle, and Blanding's Turtle (Table 4). The amphibians would be found in forested vernal pools and shallow ditches, while some amphibians and most of the snakes would make use of the extensive grassland habitat (Harding 1997; Ernst and Lovich 2009; Holman 2012). Most of the turtle species, in addition to Northern Water Snake and Bullfrog, would only be associated with the large ditch on the bay side of the property.

9) Finn Road Park

During surveys in 2011 and 2012, a total of six species of herpetofauna were observed, including three amphibians and three reptiles (Table 1, Map 8-10). These species were the Eastern American Toad, Northern Leopard Frog (Photo 15), Northern Green Frog, Eastern Garter Snake, Midland Painted Turtle, and Blanding's Turtle.

Based on the available habitat types and quality (Photo 16), the following species of herpetofauna may also occur within Finn Road Park, but were not observed in this survey: Northern Water Snake, Eastern Garter Snake, and Eastern Snapping Turtle (Harding 1997; Ernst and Lovich 2009). The Northern Water Snake and Eastern Snapping Turtle would

make use of the coastal wetland, and the Eastern Garter Snake would make use of the upland forest and coastal wetland.

10) Michigan Islands National Wildlife Refuge (Charity Islands)

A total of eight species of herpetofauna were observed in 2011 and 2013, including four amphibians and four reptiles (Table 1, Map 2-4). These species were the Mudpuppy, Blue-spotted Salamander (Photo 17), Gray Treefrog, Northern Green Frog (Photo 19), Eastern Garter Snake (Photo 20), Northern Water Snake (Photo 21), Eastern Snapping Turtle, and Midland Painted Turtle. In 1910 and 1911, the University of Michigan sent biologists to collect specimens from Charity Island, including amphibians and reptiles: ten species were observed and collected, while another four were reported as having occurred on the islands (Table 3) (Thompson and Thompson 1911; Ruthven, Thompson et al. 1912). Since Gray Treefrogs were not recorded in the 1911 survey, but were detected in this study, this species may have been undetected during the 1910 and 1911 survey or it may be a relatively new species to the island. This species likely migrated to the island on lumber and supplies used in the construction of cabins or the rebuilding of the lighthouse keeper home. In addition, exposed limestone along the quarried channel and marina were observed to provide hibernacula and basking sites for Northern Water Snake and Eastern Garter Snake which were commonly observed in this location. Other snakes may also use these limestone areas as hibernacula and basking sites. The mudpuppy was found in flat rocky exposed limestone bedrock areas just offshore of Little Charity Island. The salamander was a juvenile and represents the only observation of Mudpuppies during this survey. Due to the very high density of breeding birds on Little Charity it is unlikely that any other amphibian or reptile

enhabits the island permanently. Seasonal activity may be observed by turtles nesting or possibly (if still present) Eastern Fox Snakes foraging on young birds.

Based on the available habitat types and quality, the following species of herpetofauna may occur or have historically occurred within Charity Island, but were not observed in this survey: Spotted Salamander, Northern Spring Peeper, Western Chorus Frog, Wood Frog, Leopard Frog, Bullfrog, Northern Brown Snake, Northern Red-bellied Snake, Northern Ribbon Snake, Eastern Smooth Green Snake, Eastern Hog-nosed Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Massasauga, and Northern Map Turtle (Table 4).

The amphibians would be associated with wooded vernal pools or coastal marsh.

Millipedes, which were very abundant under fallen logs, could limit the number and diversity of salamanders inhabiting the island due to habitat competition with this toxic arthropod (Photo 24). The snakes and turtles would also be most likely associated with the coastal marsh on the islands (Harding 1997; Ernst and Lovich 2009; Holman 2012). Several species of snakes, including Eastern Fox Snake, Eastern Massasauga, Eastern Hog-nosed Snake, and Eastern Smooth Green Snake, may have been extirpated from Charity Island. However, current conditions on portions of the island may still be suitable for these species; additional surveys may detect these species, and could evaluate specific habitat characteristics to determine suitability for each species. Effort should be made to restore the impacted coastline, which is quickly being overtaken by *Phragmites*. A repatriation project is strongly encouraged for rare species of reptile that historically occurred on Charity Island. This effort should be conducted as part of a comprehensive restoration effort that addresses the coastal invasives.

11) Saginaw Wetlands Preserve

In 2011 and 2012, a total of nine species of herpetofauna were observed, including five amphibians and four reptiles (Table 1, Map 11-13). These species were the Eastern American Toad, Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Wood Frog, Eastern Garter Snake, Northern Water Snake, Midland Painted Turtle, and Blanding's Turtle. Both juvenile and adult Blanding's Turtles, a state Species of Special Concern, were observed in 2012. Additionally, recent observations in and near Saginaw Wetlands Preserve have included Blanding's Turtle as well. In 2007, an unconfirmed account of a Spotted Turtle was reported at this property by Michigan Natural Features Inventory staff but no photo was taken.

Based on the available habitat types and quality (Photo 25), the following species of herpetofauna not observed in this survey could also occur within Saginaw Wetland: Red-spotted Newt, Northern Spring Peeper, Western Chorus Frog, Bullfrog, Northern Brown Snake, Northern Red-bellied Snake, Butler's Garter Snake, Northern Ribbon Snake, Eastern Smooth Green Snake, Eastern Hog-nosed Snake, Eastern Milk Snake, Blue Racer, Eastern Massasauga, Eastern Musk Turtle, Eastern Snapping Turtle, and Spotted Turtle (Table 4). The amphibians within this preserve would likely be found in shallow pools and ditches near the woods, while the snakes and Spotted Turtles could make use of the extensive open marsh and grassland. The other turtles would be associated primarily with the deeper drainage ditches throughout the property (Harding 1997; Ernst and Lovich 2009; Holman 2012).

12) Pinconning County Park

A total of five species of herpetofauna were observed in 2011, including four amphibians and one reptile (Table 1, Map 5-7). These species were the Northern Green Frog, Northern Leopard Frog, Wood Frog, Blue-spotted Salamander, and Eastern Garter Snake (Table 2).

Based on the available habitat types and quality, the following species of herpetofauna may also be present within Pinconning County Park, but were not observed in this survey: Red-spotted Newt, Northern Spring Peeper, Gray Treefrog, Butler's Garter Snake, Northern Ribbon Snake, Northern Brown Snake, Northern Water Snake, Eastern Fox Snake, Eastern Snapping Turtle, Midland Painted Turtle, Northern Map Turtle, and Eastern Spiny Softshell (Table 4). The amphibians and snakes could be found in upland forest, swamp, marsh, or extensive open coastal marsh. The turtles would most likely be found in the open waters of the Bay (Harding 1997; Ernst and Lovich 2009; Holman 2012).

13) Quanicassee State Wildlife Area

In 2011 and 2012, a total of nine species of herpetofauna were observed, including six amphibians and three reptiles (Table 1, Map 8-10). These species were the Northern Green Frog, Northern Leopard Frog, Western Chorus Frog, Eastern American Toad, Eastern Garter Snake, Butler's Garter Snake, Eastern Snapping Turtle, Midland Painted Turtle, and Blanding's Turtle. Other accounts for the Blanding's Turtle for this wildlife area are included in the Michigan Natural Heritage database as recent as 2003 (Table 2). Historical review of known herpetofaunal accounts indicates that Northern Brown Snake was also observed prior to 2000 (Table 3). Herpetofauna were present in areas where

Phragmites sp. was absent or present in low densities. Carp, which are an invasive/non-native species and can have a potentially negative impact on amphibian populations, were observed breeding near the boat launch. This species also disrupts water quality and overall habitat quality and value to wildlife.

Based on the available habitat types and quality (Photo 26), the following species of herpetofauna may also occur within Quanicassee State Wildlife Area, but were not observed in this survey: Blue-spotted Salamander, Red-spotted Newt, Gray Treefrog, Bullfrog, Northern Brown Snake, Northern Water Snake, Eastern Fox Snake, Northern Map Turtle, and Eastern Spiny Softshell (Table 4). The amphibians would be found in shallow ditches and coastal marsh. The snakes would likely make use of open marsh and grassland areas. Turtles could be found in the open water in the diked wetland canals, seasonal wetlands, and portions of the coastal marsh during wet years (Harding 1997; Ernst and Lovich 2009; Holman 2012).

14) Wigwam Bay State Wildlife Area

A total of twelve species of herpetofauna were observed in 2011, including four amphibians and eight reptiles (Table 1, Map 5-7). These species were the Eastern American Toad, Northern Green Frog, Northern Leopard Frog, Wood Frog, Eastern Garter Snake, Butler's Garter Snake (Photo 27), Northern Ribbon Snake, Eastern Snapping Turtle, Midland Painted Turtle, Northern Map Turtle, Blanding's Turtle (Photo 28) and Eastern Spiny Softshell Turtle. Additionally, recent observations in and near Wigwam Bay State Wildlife Area have included Gray Treefrog, Northern Spring Peeper, Western Chorus Frog, and Mudpuppy (Table 2). Based on a review of the MDNR natural heritage database, the Blanding's Turtle was observed at this site in 2007. Historical review of known

herpetofaunal accounts indicates that Pickerel Frog, Red-backed Salamander, Eastern Milk Snake, Wood Turtle were observed prior to 2000 (Table 3). The University of Michigan Museum of Zoology has a voucher sample for the Mudpuppy collected at this location in 1941.

Based on the available high quality habitat, this site potentially provides significant value for amphibians and reptiles. The following species of herpetofauna may also occur within Wigwam Bay State Wildlife Area, but were not observed in this survey: Mudpuppy, Blue-spotted Salamander, Red-spotted Newt, Red-backed Salamander, Four-toed Salamander, Northern Spring Peeper, Western Chorus Frog, Gray Treefrog, Bullfrog, Northern Brown Snake, Northern Red-bellied Snake, Northern Water Snake, Eastern Smooth Green Snake, Blue Racer, Eastern Milk Snake, Eastern Fox Snake, Eastern Massasauga, Eastern Musk Turtle, and Wood Turtle (Table 4). The amphibians would likely be found throughout the wildlife area (Photo 29-30), while the snakes would likely make use of the open marsh and grassland (Photo 30). The turtles would be found in the open water of the diked wetland canals, as well as deeper ponds and the Pine River (Photo 30) (Harding 1997; Ernst and Lovich 2009; Holman 2012). The site contained diked wetlands that were sparsely colonized by *Phragmites* and that can be controlled at the observed level of colonization. Along the coastal marsh, this invasive species dominated the shore and provided little habitat for herpetofauna.

15) Wildfowl Bay State Wildlife Area

During surveys in 2011, 2012, and 2013, a total of 12 species of herpetofauna were observed, including six amphibians and six reptiles (Table 1, Map 11-13). These species were the Blue-spotted Salamander, Eastern American Toad (Photo 31), Gray Treefrog,

Northern Green Frog, Northern Leopard Frog, Wood Frog, Northern Brown Snake (Photo 32), Northern Red-bellied Snake (Photo 33), Eastern Garter Snake, Eastern Snapping Turtle, Midland Painted Turtle, and Blanding's Turtle (Photos 34-35). Adult and juvenile Blanding's Turtles, a state Species of Special Concern, were found here in 2011 and 2012, which indicates that there is a high probability of recruitment. Improving and preserving habitat in this area should be considered a priority in order to protect this species and increase the chances of population growth. Additionally, recent observations in and near Wildfowl Bay State Wildlife Area have included Western Chorus Frog, Red-spotted Newt, and Red-backed Salamander (Table 2). Historical review of known herpetofaunal accounts included Northern Spring Peeper, Pickerel Frog, Five-lined Skink, Eastern Hog-nosed Snake, Eastern Milk Snake, Northern Water Snake, Eastern Smooth Green Snake, Eastern Fox Snake, Eastern Massasauga, Northern Brown Snake, Northern Red-bellied Snake, Northern Ribbon Snake. Based on the available habitat types and quality (Photos 36-37), the following species of herpetofauna may also occur within Wildfowl Bay State Wildlife Area, but were not observed in this survey: Mudpuppy, Red-spotted Newt, Red-backed Salamander, Four-toed Salamander, Spotted Salamander, Eastern Tiger Salamander, Northern Spring Peeper, Western Chorus Frog, Bullfrog, Butler's Garter Snake, Northern Ribbon Snake, Northern Water Snake, Eastern Smooth Green Snake, Blue Racer, Northern Ring-necked Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Hog-nosed Snake, Eastern Massasauga, Eastern Musk Turtle, Northern Map Turtle, Eastern Spiny Softshell, and Spotted Turtle (Table 4). The amphibians may be found in marsh, wet prairie, ponds, vernal pools, and coastal marsh. The snakes would likely use the wet prairie, old field, sandy uplands, and coastal marsh. The turtles would likely make use of the coastal marsh, ponds, and vernal

pools, and female turtles would likely use the upland areas seasonally for nesting (Harding 1997; Ernst and Lovich 2009; Holman 2012).

16) Sleeper State Park

During surveys in 2011 and 2013, a total of twelve species of herpetofauna were observed, nine of which were amphibians and three were reptiles (Table 1, Map 11-13). These species were Blue-spotted Salamander, Spotted Salamander (Photo 68), Eastern American Toad, Gray Treefrog, Four-toed Salamander, Northern Spring Peeper, Red-backed Salamander, Red-spotted Newt, and Wood Frog, Butler's Garter Snake, Eastern Garter Snake and Northern Ribbon Snake. Additionally, recent observations in and near Sleeper State Park have included Eastern American Toad, Northern Spring Peeper, and Western Chorus Frog (Table 2). Historical review of known herpetofaunal accounts indicates that Boreal Chorus Frog, Northern Green Frog, Northern Leopard Frog, Eastern Hog-nosed Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Massasauga, Northern Brown Snake, Butler's Garter Snake, Eastern Garter Snake, Eastern Snapping Turtle, Midland Painted Turtle, Blanding's Turtle have been observed prior to 2000 (Table 3).

Based on the available habitat types and quality (Photos 69-70), the following species of herpetofauna may also occur within Sleeper State Park, but were not observed: Mudpuppy, Red-spotted Newt, Eastern Tiger Salamander, Western Chorus Frog, Bullfrog, Northern Water Snake, Eastern Smooth Green Snake, Blue Racer, Northern Ring-necked Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Hog-nosed Snake, Eastern Massasauga, Eastern Musk Turtle, Northern Map Turtle, Eastern Spiny Softshell, and Spotted Turtle (Table 4). The amphibians may be found in marsh, wet prairie, ponds, vernal pools, and coastal marsh. The snakes would likely use the wet prairie, old field, sandy

uplands, and coastal marsh. The turtles would likely make use of the coastal marsh, ponds, and vernal pools, and female turtles would likely use the upland areas seasonally for nesting (Harding 1997; Ernst and Lovich 2009; Holman 2012).

17) Rush Lake State Game Area

During surveys in 2012 and 2013, a total of fourteen species of herpetofauna were observed, including eight amphibians and six reptiles (Table 1, Map 11-13). These species were the Blue-spotted Salamander, Red-backed Salamander, Eastern American Toad, Northern Leopard Frog, Northern Green Frog, Wood Frog, Gray Treefrog, Northern Spring Peeper, Five-lined Skink (Photo 60), Eastern Garter Snake, Northern Ribbon Snake, Northern Water Snake (Photo 59), Eastern Snapping Turtle, and Midland Painted Turtle. Additionally, recent observations in and near Rush Lake State Game Area have included Gray Treefrog, Northern Spring Peeper, Western Chorus Frog, and Northern Green Frog (Table 2). Historical review of known herpetofaunal accounts indicates that Boreal Chorus Frog, Bullfrog, Red-spotted Newt, Eastern Hog-nosed Snake, Eastern Milk Snake, Northern Brown Snake, Butler's Garter Snake, Midland Painted Turtle have been observed prior to 2000 (Table 3).

Based on the available habitat types and quality (Photos 55-58), the following species of herpetofauna may also occur within Rush Lake State Game Area, but were not observed in this survey: Red-spotted Newt, Four-toed Salamander, Spotted Salamander, Western Chorus Frog, Bullfrog, Eastern Smooth Green Snake, Blue Racer, Northern Ring-necked Snake, Eastern Hog-nosed Snake, Eastern Massasauga, Northern Brown Snake, Northern Red-bellied Snake, Eastern Musk Turtle, Spotted Turtle, and Blanding's Turtle (Table 4). The amphibians may be found in coastal sedge marsh and near vernal pools. The snakes

would likely use the coastal marsh, marsh margins, and sandy upland openings in the forest. The turtles would likely make use of the coastal marsh and vernal pools, and female turtles would likely use the upland areas seasonally for nesting (Harding 1997; Ernst and Lovich 2009; Holman 2012).

18) Fish Point State Wildlife Area

During surveys in 2012, a total of fourteen species of herpetofauna were observed, including eight amphibians and six reptiles (Table 1, Map 11-13). These species were the Blue-spotted Salamander, Bullfrog, Eastern American Toad, Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Western Chorus Frog, Wood Frog, Butler's Garter Snake, Northern Brown Snake, Eastern Garter Snake, Eastern Snapping Turtle, Midland Painted Turtle, and Blanding's Turtle. Adult and juvenile Blanding's Turtles, a state Species of Special Concern, were found here in 2012, which indicates that there is a high probability of recruitment. Additionally, recent and historical observations in and near Fish Point State Wildlife Area have included Spotted Turtle (Table 2 and 3). Improving and preserving habitat in this area should be considered a priority in order to protect this species and increase the chances of population growth. Basking sites were noted as being limited. This simple habitat improvement will likely benefit numerous reptiles and amphibians.

Based on the available habitat types and quality (Photos 42-46), the following species of herpetofauna may also occur within Fish Point State Wildlife Area, but were not observed in this survey: Red-spotted Newt, Red-backed Salamander, Spotted Salamander, Northern Spring Peeper, Five-lined Skink, Northern Ribbon Snake, Northern Water Snake, Eastern Smooth Green Snake, Blue Racer, Northern Ring-necked Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Hog-nosed Snake, Eastern Massasauga, Northern Red-bellied

Snake, Northern Map Turtle, Eastern Spiny Softshell, and Spotted Turtle (Table 4). The amphibians may be found in diked wetlands, sedge fen, vernal pools, and coastal wetlands. The snakes would likely use the margins of coastal wetlands, prairie areas, sedge and shrub fen, and the large pile of fieldstone. The turtles would likely use the coastal marsh, fen areas, and vernal pools, and female turtles would likely use the upland areas seasonally for nesting (Harding 1997; Ernst and Lovich 2009; Holman 2012).

19) Bay City State Recreation Area

During surveys in 2011 and 2012, a total of thirteen species of herpetofauna were observed, including eight amphibians and five reptiles (Table 1, Map 11-13). These species were the Blue-spotted Salamander, Red-backed Salamander, Bullfrog, Eastern American Toad, Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Wood Frog, Five-lined Skink, Northern Brown Snake, Eastern Garter Snake, Eastern Snapping Turtle, and Midland Painted Turtle. Additionally, recent observations in and near Bay City State Recreation Area have included Northern Spring Peeper and Blanding's Turtle (Table 2). Historical review of known herpetofaunal accounts indicates that Northern Red-bellied Snake, Butler's Garter Snake were observed prior to 2000 (Table 3).

Based on the available habitat types and quality (Photos 61-62), the following species of herpetofauna may also occur within Bay City State Recreation Area, but were not observed in this survey: Spotted Salamander, Northern Spring Peeper, Western Chorus Frog, Bullfrog, Five-lined Skink, Butler's Garter Snake, Northern Ribbon Snake, Northern Water Snake, Eastern Smooth Green Snake, Northern Ring-necked Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Hog-nosed Snake, Eastern Massasauga, Northern Brown Snake, Northern Red-bellied Snake, Eastern Musk Turtle, Northern Map Turtle, Eastern Spiny

Softshell, Eastern Snapping Turtle, and Blanding's Turtle (Table 4). The amphibians may be found in interdunal wetlands, vernal pools, and coastal marsh. The snakes would likely use the shrub thicket, sandy dunes, openings in the forest, and coastal marsh. The turtles likely use the interdunal wetlands, coastal marsh, and vernal pools, and female turtles may be found seasonally in upland habitat during the nesting season (Harding 1997; Ernst and Lovich 2009; Holman 2012).

20) Nyanquing Point State Wildlife Area

During surveys in 2012, a total of nine species of herpetofauna were observed, including four amphibians and five reptiles (Table 1, Map 11-13). These species were the Eastern American Toad (Photo 51), Gray Treefrog, Northern Green Frog, Northern Leopard Frog, Eastern Garter Snake, Eastern Snapping Turtle, Midland Painted Turtle, Blanding's Turtle, and Northern Map Turtle. Additionally, recent observations in and near Nyanquing Point State Wildlife Area have included Northern Spring Peeper, Western Chorus Frog, and Wood Frog (Table 2). Historical review of known herpetofaunal accounts indicates that Bullfrog, Pickerel Frog, Blue-spotted Salamander, Spotted Salamander, Mudpuppy, Red-spotted Newt, Eastern Hog-nosed Snake, Eastern Milk Snake, Northern Water Snake, Eastern Smooth Green Snake, Northern Brown Snake, Northern Red-bellied Snake, Butler's Garter Snake, Northern Ribbon Snake, Eastern Box Turtle (*Terrapene carolina*), were observed prior to 2000 (Table 3).

Based on the available habitat types and quality (Photos 47-52), the following species of herpetofauna may also occur within Nyanquing Point State Wildlife Area, but were not observed in this survey: Northern Spring Peeper, Western Chorus Frog, Bullfrog, Wood Frog, Five-lined Skink, Butler's Garter Snake, Northern Ribbon Snake, Northern Water

Snake, Eastern Smooth Green Snake, Blue Racer, Northern Ring-necked Snake, Eastern Milk Snake, Eastern Fox Snake, Eastern Hog-nosed Snake, Northern Brown Snake, Northern Red-bellied Snake, Eastern Musk Turtle, and Eastern Spiny Softshell (Table 4). The amphibians may be found in marsh and coastal wetland areas. The snakes would likely use the dikes along the managed wetlands, sandy and grassy uplands, old field, and coastal wetlands. The turtles would likely make use of the coastal wetlands and marsh areas, and female turtles would likely use the upland areas seasonally for nesting (Harding 1997; Ernst and Lovich 2009; Holman 2012).

Conclusions and Recommendations

Reference Sites

The surveyed sites in the Saginaw Bay Watershed represent a range of conditions and natural communities. Areas for camping and picnicking within several sites (e.g., Finn Road Park, Pinconning County Park, and Sleeper State Park) are intensively managed for human recreation. Areas for hunting, such as Nyanquing Point State Wildlife Area and Fish Point State Wildlife Area, are managed with emphasis on wildfowl. Areas maintained and managed for biodiversity and ecological function include Sand Point Nature Preserve, Wigwam Bay State Wildlife Area, and Saginaw Wetlands. Several of the surveyed sites, such as Wah-Sash-Kah-Moqua Nature Preserve, were historically used for agriculture and have since been restored to a more natural state.

Although the surveyed sites are located within a relatively developed region and none have escaped the presence of invasive plant species, several sites provide areas of high quality herpetofauna habitat. These areas can be considered reference sites for habitat restoration projects in the region that include herpetofauna targets. Nyanquing Point State Wildlife Area and Rush Lake State Game Area have areas of high quality marsh, and Quanicassee State Wildlife Area has a high quality wet meadow area. These wetlands can provide habitat for herpetofauna species such as Northern Water Snake, Blanding's Turtle, and Spotted Turtle. Several coastal areas currently dominated by *Phragmites* may be restored to a similar condition as these existing areas. Wigwam Bay State Wildlife Area and Michigan Islands National Wildlife Refuge (Charity Island) have vernal pools within high quality forested areas, and Sand Point Nature Preserve and Sleeper State Park have inter-dunal

vernal pools. These pools provide breeding grounds, nurseries, and areas for larval growth for various salamander and frog species. Creation and restoration of vernal pools may be considered on a case-by-case, paying close attention to local hydrology, canopy cover and litter cover, plant communities, and habitat structure suitable for herpetofauna communities present. Fish Point State Wildlife Area has high quality sedge and shrub fen. The plant communities and habitat structures in these areas may be restored in degraded fen areas. Bay City State Recreation Area has areas of high quality hardwood forest which provides canopy and understory structure suitable for Blue-spotted Salamander, Spotted Salamander, and Red-backed Salamander species. Saginaw Wetlands, Wigwam Bay State Wildlife Area, and Sand Point Nature Preserve are each composed of a matrix of high quality communities which provides habitat value for various herpetofauna species throughout the year, such as Blanding's Turtle and Eastern Massasauga, as these species migrate between wetlands and uplands for mating, nesting, foraging, and hibernation.

Creating Critical Areas for Herpetofauna

Creation of suitable habitat for amphibians and reptiles is advised to maintain stable populations of herpetofauna and to grow populations of rare and sensitive herpetofauna species on properties surveyed in the Saginaw Bay Watershed. Inclusion of introduced habitat structures, such as basking logs and aquatic nesting mats (layered, small branches), can increase habitat suitability for a variety of species of amphibians and reptiles, and likely increase the species richness of the herpetofauna community on a property at relatively low costs. These habitat features provide foraging, basking, hibernation, and reproductive opportunities necessary for various amphibians and reptiles. Currently, there is a lack of suitable turtle nesting habitat and what is available is heavily patrolled by nest predators such

as raccoons, which likely contributes to a decreased birth rate. This lack of replacement has a negative effect on overall turtle populations within the Bay area. In addition, the creation or restoration of certain habitat types can directly benefit various species: Wood Turtle populations would likely benefit from restoration activities that increase the quality of streams and rivers, and Eastern Massasauga and Spotted Turtle populations can benefit from removal of *Phragmites* *sp.* and restoration of sedge meadow and fen habitat.

Habitat Fragmentation

Much of the Saginaw Bay Watershed landscape has been dramatically altered by agriculture and along the Bay residential and commercial/industrial development. The majority of uplands and wetlands that could be drained are now actively farmed and provide little habitat for herpetofauna. Previously extensive wetlands are now drained and fragmented by a network of deep roadside ditches. This habitat loss has significant negative effects on reptiles and amphibians in the region. The reversal of most agricultural land to habitat is unlikely; however, mitigation of habitat fragmentation is possible. Although large natural areas remain, they are generally separated by active agricultural areas and a grid of roads. When possible, parcels that connect existing protected habitats should be acquired and restored. Also, constructed features such as culverts and lowered curbs may be implemented to increase connectivity and decrease road mortality. Currently, due to low lake levels coastal connectivity is greater. However, dense stands of invasive *Phragmites* function to isolate habitats, and management decisions that allow for habitat degradation activities will lessen the value of this recently exposed lakeshore as habitat and a critical corridor for amphibians and reptiles. Immediate action is necessary to effectively control or remove *Phragmites* from the Saginaw Bay while lake levels are low to allow for maximum

dispersal potential and habitat connectivity.

Invasive Plants

Invasive plants are one of the most serious threats to the natural communities of the Saginaw Bay Watershed. The common reed or more commonly referred to as simply *Phragmites* is the most visibly dominant plant in most shallow water wetlands. This species threatens coastal marsh, inland sedge meadows, fens, interdunal wetlands, and other habitats. Nutrient runoff from agriculture contributes to this species' rapid growth in the coastal marsh. *Phragmites* is significantly taller and grows more densely than native marsh species. This increased shade reduces basking opportunities for turtles and may limit their ability to move through the habitat or locate the shore to nest. Additionally the shading prevents growth of native flora. Studies have shown that *Phragmites* can affect nesting success and development of turtles (Bolton and Brooks 2010). Shade also cools the water, slowing the growth of amphibian eggs and larvae. One study showed that the presence of *Phragmites* can reduce the proportion of larvae that survive to metamorphosis (Cohen, Maerz et al. 2007). Our work identified a biologically significant correlation between the spatial distribution of *Phragmites australis* and herpetofauna communities. This finding suggests that reduction in available habitat due to the invasion of *Phragmites* has resulted in higher densities of animals in relatively small patches of lower quality habitat, which is an unsustainable situation. Where this plant is absent or present only in small patches, amphibian and reptile richness is much higher and spatial distribution is more even.

In open upland habitats in the Saginaw Bay, autumn olive was observed to be the most common non-native plant, followed by shrub honeysuckle. These shrubs shade prairie, old field, dikes and other upland habitats, reducing suitability of these areas as

basking sites for snakes or nesting sites for turtles. In upland woodlands, garlic mustard and Japanese barberry were the most prevalent invasives observed. These plants also shade the ground, which may interfere with thermoregulatory behavior of herpetofauna.

A multi-year plan for control or eradication of invasive plant species could greatly reduce pressure on herpetofauna populations. Control plans may combine mowing, weeding, herbiciding, and/or burning, and should be planned to minimize negative impacts on native animals and their habitat requirements throughout the year.

Vegetation Control and Landscape Maintenance

There are several reasons to manage vegetation: invasive plants (e.g., *Phragmites*, reed canary-grass, autumn olive) alter the ecosystem, ecological restoration plans may require alteration of current vegetation structure, and vegetation can obscure visibility and cause safety concerns along roadways. Timing and techniques used to conduct vegetation management and landscape maintenance can help to reduce impacts directly to herpetofauna. Regardless of which technique is the most suitable for management goals, care should be taken to conduct management activities in a manner and at times that are sensitive to the habitat requirements and life cycle of on-site herpetofauna species. A professional herpetologist or certified wildlife biologist should be consulted with to ensure protection for herpetofauna and other wildlife with complex life requisites which vary with season. Vegetation management should be conducted during times of the year when herpetofauna are not present at the work location (e.g., conducting management activities in a wetland when animals have seasonally migrated to upland areas) or when animals may be inactive (e.g., during times when they are burrowed in substrate, estivating, hibernating). Additionally, burning, mowing with blades set <6", or land scraping can remove vegetation

on which herpetofauna rely for cover. If all vegetation is removed in an area, herpetofauna will be forced to relocate and will likely suffer higher mortality rates.

Controlled or Prescribed Burns

Fire has historically played an important role in creating and maintaining ecosystems in the Midwest, and prescribed burns can be a useful tool to manage vegetation structure of native and invasive plants by reducing mid- and over-story canopy. Unfortunately, most Michigan herpetofauna are not well adapted to fire, and burning can directly harm herpetofauna. If prescribed or controlled burning is used, it is best to burn after an extended cool spell or during the winter when animals are less active and have a greater likelihood of being underground in burrows or hibernacula. Burn infrequently and use slow moving, low intensity fires to increase the number of individuals that can effectively burrow or run to escape the fire. Burning in wetland areas is also an option during the hottest portions of the summer when more animals have either migrated to shaded upland areas or are estivating underground, however, in general burning during warm weather increases herpetofauna mortality (Frese 2003). Additional considerations when burning include avoiding areas near wetlands where herpetofauna are often present and creating fire breaks around critical habitat features where herpetofauna may take cover. Burning vegetation in ditches is to be avoided, however, if that is not possible, burn vegetation early in the spring while the weather is still cold and herpetofauna have not yet emerged. By burning early in the year, fewer individuals are impacted and vegetation will re-grow during spring and summer and provide cover.

Herbicide

Atrazine based herbicides (e.g., AAtrex) and Glyphosate based herbicides (e.g., Roundup®, Rodeo®, Accord®) are commonly used to treat invasive plants and can severely impact amphibian species and cause population declines. Associated problems with Atrazine include malformations resulting in reproductively viable hermaphroditic transformations which skews sex ratios, disrupts population structure, and may reduce genetic diversity (Hayes, Haston et al. 2003; Hayes, Khoury et al. 2010). Glyphosate has been linked to smaller adult herpetofauna, slower rates of maturation, deformities and abnormalities, and higher mortality rates in herpetofauna exposed during developmental stages (Howe, Berrill et al. 2009; Relyea and Jones 2009). Glyphosate based herbicides often contain surfactants, such as POEA (polyethoxylated tallowamine), which can be more lethal to herpetofauna than the actual Glyphosate (Trumbo 2005). To reduce the toxicity of herbicides to herpetofauna, use surfactant-free herbicides. When possible, reduce contact with amphibians and other wildlife by applying herbicide using spot treatments that target specific plants and during seasons when amphibian eggs and larvae are not present (i.e., in late summer and fall), and avoid the application of herbicides near water sources. A greater distance (i.e., buffer zone) between herbicide application and ground and surface waters, including seasonally dry wetlands, results in lower concentrations of herbicides in these waters. Since most herpetofauna heavily rely on water bodies, lower chemical concentrations in water bodies result in healthier herpetofauna communities.

Mowing

The efficacy of mowing invasive species should be evaluated: mowing invasive plant species, such as *Phragmites*, can stimulate root growth and actually increase the severity of the infestation. Although mowing is a common vegetation management technique, mowing

directly causes mortality to amphibians and reptiles. To reduce the impact of mowing on herpetofauna communities mow less frequently and set mower decks high (>6") to avoid ground-dwelling wildlife. Alternatively, if the presence of herpetofauna is not compatible with the use of a landscape area, consistently mowing grass short (<2") can discourage the movement of herpetofauna into mowed areas and will reduce mower-mortality. Avoid mowing during peak foraging times on warm summer evenings and after rain (Harding 1997), during seasonal migrations, and during turtle nesting season. Turtles use edges of lakes and ponds and even sandy or prairie upland areas for nesting. On land most turtles are slow-moving and sometimes require several hours to dig a nest and deposit their eggs. To avoid hitting turtles with mowers, mow after turtle nesting season (i.e., after early July) if possible.

Subsidized Predators

Subsidized predators, most commonly raccoons, opportunistically use human refuse as a primary food source, and can experience a rapid increase in density well above natural levels. These predators are very likely an issue for turtles in Saginaw Bay, particularly in locations with heavy recreational use or where nesting habitat is limited. Since raccoons will continue to consume their normal diet in addition to food provided by humans, raccoon populations can increase, which dramatically intensifies pressures on prey species (Browne and Hecnar 2007). Raccoons have been well documented as primary predators of turtle nests. In many areas, turtle nests can suffer 100% mortality due to an overabundance of raccoons (Harding 1997; HRM 2011). High rates of nest predation are likely in public parks with heavy picnicking and in diked wetlands where all turtle nests are concentrated on the dikes, increasing the likelihood of detection by predators.

Several actions can be taken to minimize negative impacts of subsidized predators on herpetofauna populations. Garbage cans should be made inaccessible to raccoons or removed to encourage a “carry out” policy for trash. Trapping and lethal control of raccoons can be effective and is a viable option for diked wetlands and around known nesting areas of rare and sensitive species. Also, predator excluding structures can be used to protect individual turtle nests. Community education regarding the impacts of releasing nuisance wildlife and the negative effects of rehabilitating subsidized predators such as raccoons is encouraged. For rare species like Blanding’s Turtles, subsidized predation pressure can be lessened by professional guided headstarting programs, where eggs are collected and the hatchlings are released once they have hatched and reached a larger, less vulnerable body size.

Reintroduction of Rare Herpetofauna

In the early 1900’s, the University of Michigan conducted surveys within portions of the Saginaw Bay to document the species presence in that region as noted in Herpetology of Michigan (Ruthven, Thompson et al. 1912). Other work has also provided data on the species present in the Bay. Among the animals historically encountered but not observed during surveys were the Eastern Massasauga, Eastern Fox Snakes, Eastern Hog-nosed Snake, Eastern Smooth Green Snake, and Spotted Turtle. Many of these species and other rare species observed would be excellent candidates for reintroduction and targeted conservation programs that include habitat restoration and creation. Reintroduction projects can be effective and worthwhile endeavors, but must be done only after evaluation and feasibility is determined. Great care and planning must be conducted prior to any recovery or reintroduction project. Before reintroduction, a variety of issues need to be assessed,

including potential for disease introduction, lack of appropriate habitat, or persistence of causes for initial decline. Reintroduction should only be attempted after careful consideration and with the aid of a professional herpetologist who has experience in species recovery and reintroduction.

Education and Outreach

Many threats to amphibian and reptile populations in the Saginaw Bay area can be counteracted with public education about the importance of amphibians and reptiles, which encourages people to conserve herpetofauna and their habitat. Education can result in increased community involvement in conservation activities. An example of this is the protection and population recovery of the Lake Erie Watersnake which was in part achieved through community education and outreach (U. S. Fish and Wildlife Service 2012). Education about the low level of threat that Michigan snakes pose to humans could help increase Massasauga and Eastern Fox Snake populations. Most herpetofauna would benefit from road crossing signs and educational outreach that discourage people from purposefully running over animals, promote the installation of culverts that help animals transverse the landscape without crossing roads, and habitat restoration/ conservation activities that increase habitat quality and connectivity throughout Saginaw Bay. Land managers and the public should be encouraged to actively participate in conservation by contributing herpetofauna observations to the Michigan Herp Atlas database at www.MiHerpAtlas.org.

Tables

Table 1 - Township, range, section, and park location for herpetofauna species observed in the Saginaw Bay Herpetological Inventory and Assessment for 2010 - 2013.

	Au Gres Nature Preserve				Pinconning Nature Preserve
	19N06E24	19N06E25	19N07E19	19N07E30	17N04E25
Eastern American Toad (<i>Bufo americanus americanus</i>)					X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)		X		X	
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)					
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)					
Bullfrog (<i>Rana catesbeiana</i>)					
Northern Green Frog (<i>Rana clamitans melanota</i>)				X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)					X
Blue-spotted Salamander (<i>Ambystoma laterale</i>)					
Four-toed Salamander (<i>Hemidactylium scutatum</i>)					
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)					
Red-backed Salamander (<i>Plethodon cinereus</i>)					
Spotted Salamander (<i>A. maculatum</i>)					
Mudpuppy (<i>Necturus maculosus maculosus</i>)					
Five-lined Skink (<i>Plestiodon fasciatus</i>)					
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)					
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)					
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)				X	
Blanding's Turtle (<i>Emydoidea blandingii</i>)					
Northern Map Turtle (<i>Graptemys geographica</i>)					
Ring-necked Snake (<i>Diadophis punctatus</i>)					
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)					
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)					
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)					
Butler's Garter Snake (<i>Thamnophis butleri</i>)					X
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)				X	
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)				X	X
Amphibian Totals	1	2	1	3	4
Reptile Totals	0	0	0	3	2
Total	1	2	1	6	6



Table 1 (Cont.)

	Pressprich	Saganing	Sand Point Nature		Standish Nature
	Nature Pres.	Nature Pres.	Preserve	Preserve	Preserve
	19N07E17	18N05E32	17N10E08	17NR10E17	18N05E29
Eastern American Toad (<i>Bufo americanus americanus</i>)		X	X		X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)		X	X		
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)			X		
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)	X	X			
Bullfrog (<i>Rana catesbeiana</i>)					
Northern Green Frog (<i>Rana clamitans melanota</i>)		X	X		
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)			X		
Blue-spotted Salamander (<i>Ambystoma laterale</i>)			X		
Four-toed Salamander (<i>Hemidactylium scutatum</i>)					
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)			X		
Red-backed Salamander (<i>Plethodon cinereus</i>)			X		
Spotted Salamander (<i>A. maculatum</i>)					
Mudpuppy (<i>Necturus maculosus maculosus</i>)					
Five-lined Skink (<i>Plestiodon fasciatus</i>)			X		
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)					
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)			X		
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)			X		
Blanding's Turtle (<i>Emydoidea blandingii</i>)					
Northern Map Turtle (<i>Graptemys geographica</i>)					
Ring-necked Snake (<i>Diadophis punctatus</i>)			X		
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)					
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)			X		
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)					
Butler's Garter Snake (<i>Thamnophis butleri</i>)					X
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)			X		
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X	X	X		
Amphibian Totals	2	5	9	1	2
Reptile Totals	1	1	7	0	1
Total	3	6	16	1	3



Table 1 (Cont.)

	Wah-Sash-Kah-Moqua Nature Preserve		Sleepers State Park		Michigan Islands National Wildlife Refuge		
	18N05E31	17N05E06	18N11E20	18N11E19	19N09E28	19N09E33	18N09E06
Eastern American Toad (<i>Bufo americanus americanus</i>)		X	X	X			
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)			X		X	X	
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)			X				
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)	X	X			X		
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X					
Wood Frog (<i>Rana sylvatica</i>)			X	X			
Blue-spotted Salamander (<i>Ambystoma laterale</i>)			X		X	X	
Four-toed Salamander (<i>Hemidactylium scutatum</i>)			X				
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)			X				
Red-backed Salamander (<i>Plethodon cinereus</i>)			X	X			
Spotted Salamander (<i>A. maculatum</i>)			X				
Mudpuppy (<i>Necturus maculosus maculosus</i>)							X
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)						X	
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)					X		
Blanding's Turtle (<i>Emydoidea blandingii</i>)							
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)					X		
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)			X				
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)			X		X	X	
Amphibian Totals	2	3	9	3	3	2	1
Reptile Totals	0	0	3	0	3	2	0
Total	2	3	12	3	6	4	1



Table 1 (Cont.)

	Saginaw Wetlands	Pinconning County Park	Quanicassee /Silman	Quanicassee /Finn Rd. Park	Quanicassee /Hampton Twp. Park
	16N09E22	17N05E19	14N06E07	14N06E09	14N06E08
Eastern American Toad (<i>Bufo americanus americanus</i>)	X	X		X	X
Gray Tree Frog (<i>Hyla chrysoscelis/ versicolor</i>)	X				
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)					
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)			X		X
Bullfrog (<i>Rana catesbeiana</i>)					
Northern Green Frog (<i>Rana clamitans melanota</i>)	X		X	X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)	X	X			
Blue-spotted Salamander (<i>Ambystoma laterale</i>)					
Four-toed Salamander (<i>Hemidactylium scutatum</i>)					
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)					
Red-backed Salamander (<i>Plethodon cinereus</i>)					
Spotted Salamander (<i>A. maculatum</i>)					
Mudpuppy (<i>Necturus maculosus maculosus</i>)					
Five-lined Skink (<i>Plestiodon fasciatus</i>)					
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)					
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)					X
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X		X	X	X
Blanding's Turtle (<i>Emydoidea blandingii</i>)	X			X	X
Northern Map Turtle (<i>Graptemys geographica</i>)					
Ring-necked Snake (<i>Diadophis punctatus</i>)					
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)	X				
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)					
Northern Red-bellied Snake (<i>Storeria o. occipitomaculata</i>)					
Butler's Garter Snake (<i>Thamnophis butleri</i>)					X
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)					
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X	X	X	X	X
Amphibian Totals	5	3	3	3	4
Reptile Totals	4	1	2	3	5
Total	9	4	5	6	9



Table 1 (Cont.)

	Quanicassee State Wildlife Area					
	14N06E14	14N06E16	14N06E17	14N06E23	14N06E24	14N06E25
Eastern American Toad (<i>Bufo americanus americanus</i>)	X		X	X		X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)						
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)						
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)					X	
Bullfrog (<i>Rana catesbeiana</i>)						
Northern Green Frog (<i>Rana clamitans melanota</i>)	X		X	X		
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X	
Wood Frog (<i>Rana sylvatica</i>)						
Blue-spotted Salamander (<i>Ambystoma laterale</i>)						
Four-toed Salamander (<i>Hemidactylium scutatum</i>)						
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)						
Red-backed Salamander (<i>Plethodon cinereus</i>)						
Spotted Salamander (<i>A. maculatum</i>)						
Mudpuppy (<i>Necturus maculosus maculosus</i>)						
Five-lined Skink (<i>Plestiodon fasciatus</i>)						
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)						
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)						
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X	X	X	X	X	
Blanding's Turtle (<i>Emydoidea blandingii</i>)	X					
Northern Map Turtle (<i>Graptemys geographica</i>)						
Ring-necked Snake (<i>Diadophis punctatus</i>)						
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)						
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)						
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)						
Butler's Garter Snake (<i>Thamnophis butleri</i>)						
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)						
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X		X			
Amphibian Totals	3	1	3	3	2	1
Reptile Totals	3	1	2	1	1	0
Total	6	2	5	4	3	1



Table 1 (Cont.)

	Quanicassee Wildlife Area	Wigwam Bay State Wildlife Area					
	14N07E30	18N05E02	18N05E03	18N05E10	18N05E15	18N06E04	18N06E05
Eastern American Toad (<i>Bufo americanus americanus</i>)	X	X			X		
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)							
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)						X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X		X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)							
Blue-spotted Salamander (<i>Ambystoma laterale</i>)							
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)						X	X
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)				X		X	X
Blanding's Turtle (<i>Emydoidea blandingii</i>)						X	
Northern Map Turtle (<i>Graptemys geographica</i>)				X			
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o.</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus</i>)				X			
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)					X		X
Amphibian Totals	2	1	1	1	2	2	2
Reptile Totals	0	0	0	3	1	3	3
Total	2	1	1	4	3	5	5



Table 1 (Cont.)

	Wigwam Bay State Wildlife Area (Cont.)				Wildfowl Bay State Wildlife Area		
	19N05E35	19N06E31	19N06E32	19N06E33	15N09E06	16N09E02	17N09E22
Eastern American Toad (<i>Bufo americanus</i>)			X			X	X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)							
Northern Spring Peeper (<i>Pseudacris crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans</i>)	X	X	X	X		X	
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)	X					X	
Blue-spotted Salamander (<i>Ambystoma</i>)							X
Four-toed Salamander (<i>Hemidactylum</i>)							
Red-spotted Newt (<i>Notophthalmus</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							X
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera</i>)				X			
Snapping Turtle (<i>Chelydra serpentina</i>)	X		X	X		X	X
Midland Painted Turtle (<i>Chrysemys picta</i>)	X		X	X		X	
Blanding's Turtle (<i>Emydoidea blandingii</i>)				X		X	
Northern Map Turtle (<i>Graptemys</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o.</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)		X	X				
Northern Ribbon Snake (<i>Thamnophis sauritus</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis</i>)		X	X			X	X
Amphibian Totals	3	2	3	2	1	4	4
Reptile Totals	2	2	4	4	0	4	2
Total	5	4	7	6	1	8	6



Table 1 (Cont.)

	Wildfowl Bay State Wildlife Area (Cont.)						
	16N09E10	16N09E11	16N09E14	16N09E15	16N09E16	16N09E28	16N09E29
Eastern American Toad (<i>Bufo americanus americanus</i>)	X	X	X	X		X	
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)	X		X	X		X	
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)			X	X		X	
Northern Leopard Frog (<i>Rana pipiens</i>)		X	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)		X	X	X		X	
Blue-spotted Salamander (<i>Ambystoma laterale</i>)		X	X				
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)				X		X	
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)		X		X		X	
Blanding's Turtle (<i>Emydoidea blandingii</i>)	X					X	
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)				X			
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)		X	X	X	X	X	X
Amphibian Totals	2	4	6	5	1	5	1
Reptile Totals	1	2	1	4	1	4	1
Total	3	6	7	9	2	9	2



Table 1 (Cont.)

	Wildfowl Bay State Wildlife Area (Cont.)						
	16N09E32	16N09E33	17N09E28	17N09E29	17N09E32	17N09E33	17N09E35
Eastern American Toad (<i>Bufo americanus americanus</i>)	X						
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)							X
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)				X			
Northern Leopard Frog (<i>Rana pipiens</i>)	X		X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)	X						X
Blue-spotted Salamander (<i>Ambystoma laterale</i>)			X				
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)				X			X
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)							
Blanding's Turtle (<i>Emydoidea blandingii</i>)							
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)	X						X
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X	X	X	X	X		X
Amphibian Totals	3	0	2	2	1	1	3
Reptile Totals	2	1	1	2	1	0	3
Total	5	1	3	4	2	1	6



Table 1 (Cont.)

	Saginaw Wetlands/ Wildfowl Bay (Cont.)					
	16N09E21	16N09E03	16N09E09	16N09E05	16N09E04	16N09E08
Eastern American Toad (<i>Bufo americanus americanus</i>)	X		X			
Gray Tree Frog (<i>Hyla chrysoscelis/ versicolor</i>)			X	X		
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)						
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)						
Bullfrog (<i>Rana catesbeiana</i>)						
Northern Green Frog (<i>Rana clamitans melanota</i>)	X	X				
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X		
Wood Frog (<i>Rana sylvatica</i>)						
Blue-spotted Salamander (<i>Ambystoma laterale</i>)						
Four-toed Salamander (<i>Hemidactylium scutatum</i>)						
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)						
Red-backed Salamander (<i>Plethodon cinereus</i>)						
Spotted Salamander (<i>A. maculatum</i>)						
Mudpuppy (<i>Necturus maculosus maculosus</i>)						
Five-lined Skink (<i>Plestiodon fasciatus</i>)						
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)						
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)			X			
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X					
Blanding's Turtle (<i>Emydoidea blandingii</i>)						
Northern Map Turtle (<i>Graptemys geographica</i>)						
Ring-necked Snake (<i>Diadophis punctatus</i>)						
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)						
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)						
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)						
Butler's Garter Snake (<i>Thamnophis butleri</i>)						
Northern Ribbon Snake (<i>Thamnophis sauritus</i>)						
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X	X			X	
Amphibian Totals	3	2	3	2	0	0
Reptile Totals	2	1	1	0	1	0
Total	5	3	4	2	1	0



Table 1 (Cont.)

	Rush Lake State Game Area						
	18N11E26	18N11E14	18N11E15	18N11E2	18N11E22	18N11E23	18N11E2
Eastern American Toad (<i>Bufo americanus</i>)				X	X		X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)			X	X			
Northern Spring Peeper (<i>Pseudacris crucifer</i>)						X	
Western Chorus Frog (<i>Pseudacris triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)						X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X			X	X		
Wood Frog (<i>Rana sylvatica</i>)				X	X	X	X
Blue-spotted Salamander (<i>Ambystoma laterale</i>)	X		X	X	X		
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)		X	X	X	X	X	
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)		X	X	X		X	
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)		X					
Midland Painted Turtle (<i>Chrysemys picta</i>)							X
Blanding's Turtle (<i>Emydoidea blandingii</i>)							
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)					X		
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o.</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus</i>)				X	X	X	
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)			X	X	X	X	
Amphibian Totals	2	1	3	6	5	4	3
Reptile Totals	0	2	2	3	3	3	1
Total	2	3	5	9	8	7	4



Table 1 (Cont.)

	Fish Point State Wildlife Area						
	14N07E01	14N07E02	14N07E11	14N07E14	14N07E15	14N07E21	14N07E22
Eastern American Toad (<i>Bufo americanus americanus</i>)		X	X		X		
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)							
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)	X		X		X		
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)					X		X
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)					X		
Blue-spotted Salamander (<i>Ambystoma laterale</i>)	X		X				
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)					X		
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)			X		X	X	
Blanding's Turtle (<i>Emydoidea blandingii</i>)			X		X	X	
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)				X			
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)		X	X	X	X	X	X
Amphibian Totals	3	2	4	1	5	1	2
Reptile Totals	0	1	3	2	4	3	1
Total	3	3	7	3	9	4	3



Table 1 (Cont.)

	Fish Point State Wildlife Area (Cont.)						
	15N08E09	15N08E10	15N08E12	15N08E13	15N08E14	15N08E15	15N08E16
Eastern American Toad (<i>Bufo americanus americanus</i>)				X	X	X	
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)				X			
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							X
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)	X	X			X	X	X
Northern Leopard Frog (<i>Rana pipiens</i>)		X	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)							
Blue-spotted Salamander (<i>Ambystoma laterale</i>)							
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)		X			X	X	X
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X	X		X	X	X	X
Blanding's Turtle (<i>Emydoidea blandingii</i>)		X				X	X
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)				X	X		
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)		X	X	X	X	X	X
Amphibian Totals	1	2	1	3	3	3	3
Reptile Totals	1	4	1	3	4	4	4
Total	2	6	2	6	7	7	7



Table 1 (Cont.)

	Fish Point State Wildlife Area (Cont.)						
	15N08E20	15N08E21	15N08E22	15N08E23	15N08E26	15N08E27	15N08E29
Eastern American Toad (<i>Bufo americanus americanus</i>)				X	X		
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)							
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)	X						X
Bullfrog (<i>Rana catesbeiana</i>)							X
Northern Green Frog (<i>Rana clamitans melanota</i>)		X	X				X
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X	X	X
Wood Frog (<i>Rana sylvatica</i>)							
Blue-spotted Salamander (<i>Ambystoma laterale</i>)							
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)			X				
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)		X	X	X			X
Blanding's Turtle (<i>Emydoidea blandingii</i>)			X		X		X
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X			X			X
Amphibian Totals	2	2	2	2	2	1	4
Reptile Totals	1	1	3	2	1	0	3
Total	3	3	5	4	3	1	7



Table 1 (Cont.)

	Fish Point State Wildlife Area (Cont.)	Bay City State Recreation Area					
		15N08E30	14N05E06	15N04E11	15N04E13	15N04E14	15N04E24
Eastern American Toad (<i>Bufo americanus</i>)						X	X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)				X		X	X
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)		X					
Northern Green Frog (<i>Rana clamitans melanota</i>)	X		X	X		X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X					X	X
Wood Frog (<i>Rana sylvatica</i>)						X	X
Blue-spotted Salamander (<i>Ambystoma laterale</i>)							X
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							X
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)							
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)			X			X	X
Blanding's Turtle (<i>Emydoidea blandingii</i>)							
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							X
Northern Red-bellied Snake (<i>Storeria o.</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)		X					
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)						X	X
Amphibian Totals	2	1	1	2		5	7
Reptile Totals	0	0	1	0		2	3
Total	2	1	2	2		7	10



Table 1 (Cont.)

	Bay City State Recreation Area (Cont.)						
	15N04E25	15N04E36	15N05E19	15N05E29	15N05E30	15N05E31	15N05E32
Eastern American Toad (<i>Bufo americanus americanus</i>)	X			X	X		
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)					X		
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)				X			
Northern Green Frog (<i>Rana clamitans melanota</i>)	X				X		X
Northern Leopard Frog (<i>Rana pipiens</i>)	X				X		X
Wood Frog (<i>Rana sylvatica</i>)	X		X		X		X
Blue-spotted Salamander (<i>Ambystoma laterale</i>)					X		
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)					X		
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)	X						
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)	X	X	X				
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X				X	X	
Blanding's Turtle (<i>Emydoidea blandingii</i>)							
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X				X		
Amphibian Totals	4	0	1	2	7	0	3
Reptile Totals	4	1	1	0	2	1	0
Total	8	1	2	2	9	1	3



Table 1 (Cont.)

	Nyanquing Point State Wildlife Area						
	16N04E01	16N04E11	16N04E12	16N04E13	16N04E14	16N04E23	16N04E24
Eastern American Toad (<i>Bufo americanus americanus</i>)	X			X		X	X
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)				X			X
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)		X	X	X	X	X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X		X	X		X	X
Wood Frog (<i>Rana sylvatica</i>)							
Blue-spotted Salamander (<i>Ambystoma laterale</i>)							
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)				X		X	X
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X		X	X		X	X
Blanding's Turtle (<i>Emydoidea blandingii</i>)				X			
Northern Map Turtle (<i>Graptemys geographica</i>)						X	
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X			X			X
Amphibian Totals	2	1	2	4	1	3	4
Reptile Totals	2	0	1	4	0	3	3
Total	4	1	3	8	1	6	7



Table 1 (Cont.)

	Nyanquing Point State Wildlife Area (Cont.)						
	16N04E25	16N04E26	16N05E06	16N05E07	16N05E18	17N04E36	17N05E31
Eastern American Toad (<i>Bufo americanus americanus</i>)			X	X			
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)					X	X	
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)							
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)							
Bullfrog (<i>Rana catesbeiana</i>)							
Northern Green Frog (<i>Rana clamitans melanota</i>)					X	X	X
Northern Leopard Frog (<i>Rana pipiens</i>)	X	X	X	X	X	X	
Wood Frog (<i>Rana sylvatica</i>)							
Blue-spotted Salamander (<i>Ambystoma laterale</i>)							
Four-toed Salamander (<i>Hemidactylium scutatum</i>)							
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)							
Red-backed Salamander (<i>Plethodon cinereus</i>)							
Spotted Salamander (<i>A. maculatum</i>)							
Mudpuppy (<i>Necturus maculosus maculosus</i>)							
Five-lined Skink (<i>Plestiodon fasciatus</i>)							
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)							
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)	X	X					
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)	X						
Blanding's Turtle (<i>Emydoidea blandingii</i>)							
Northern Map Turtle (<i>Graptemys geographica</i>)							
Ring-necked Snake (<i>Diadophis punctatus</i>)							
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)							
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)							
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)							
Butler's Garter Snake (<i>Thamnophis butleri</i>)							
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)							
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)	X			X		X	
Amphibian Totals	1	1	2	2	3	3	1
Reptile Totals	3	1	0	1	0	1	0
Total	4	2	2	3	3	4	1



Table 1 (Cont.)

	Non-site				
	18N10E26	17N09E36	17N10E03	17N10E30	18N12E07
Eastern American Toad (<i>Bufo americanus americanus</i>)		X			
Gray Tree Frog (<i>Hyla chrysoscelis/versicolor</i>)			X		
Northern Spring Peeper (<i>Pseudacris crucifer crucifer</i>)					
Western Chorus Frog (<i>Pseudacris triseriata triseriata</i>)					
Bullfrog (<i>Rana catesbeiana</i>)					
Northern Green Frog (<i>Rana clamitans melanota</i>)			X		X
Northern Leopard Frog (<i>Rana pipiens</i>)					
Wood Frog (<i>Rana sylvatica</i>)					
Blue-spotted Salamander (<i>Ambystoma laterale</i>)					
Four-toed Salamander (<i>Hemidactylium scutatum</i>)					
Red-spotted Newt (<i>Notophthalmus viridescens viridescens</i>)					
Red-backed Salamander (<i>Plethodon cinereus</i>)					
Spotted Salamander (<i>A. maculatum</i>)					
Mudpuppy (<i>Necturus maculosus maculosus</i>)					
Five-lined Skink (<i>Plestiodon fasciatus</i>)					
Spiny Softshell Turtle (<i>Apalone spinifera spinifera</i>)					
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)				X	
Midland Painted Turtle (<i>Chrysemys picta marginata</i>)		X			
Blanding's Turtle (<i>Emydoidea blandingii</i>)	X			X	
Northern Map Turtle (<i>Graptemys geographica</i>)					
Ring-necked Snake (<i>Diadophis punctatus</i>)					
Northern Water Snake (<i>Nerodia sipedon sipedon</i>)					
Northern Brown Snake (<i>Storeria dekayi dekayi</i>)					
Northern Red-bellied Snake (<i>Storeria o. occipitamaculata</i>)					
Butler's Garter Snake (<i>Thamnophis butleri</i>)					
Northern Ribbon Snake (<i>Thamnophis sauritus septentrionalis</i>)					
Eastern Garter Snake (<i>Thamnophis sirtalis sirtalis</i>)		X			
Amphibian Totals	0	1	2	0	1
Reptile Totals	1	2	0	2	0
Total	1	3	2	2	1



Table 2 - List of recently (2000-present) observed herpetofauna species on studied properties.

Species Name	Common Name	Wigwam Bay	Au Gres Nature Preserve	Bay City State Recreation Area	Fish Point State Wildlife Area
<i>Bufo americanus americanus</i>	Eastern American Toad	X	X	X	X
<i>Hyla chrysoscelis/ versicolor</i>	Gray Treefrog	X	X	X	X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	X	X	X	
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog	X	X		X
<i>Rana catesbeiana</i>	Bullfrog				
<i>Rana clamitans melanota</i>	Northern Green Frog	X	X	X	X
<i>Rana pipiens</i>	Northern Leopard Frog	X	X	X	
<i>Rana sylvatica</i>	Wood Frog	X	X	X	
<i>Ambystoma laterale</i>	Blue-spotted Salamander				
<i>Hemidactylum scutatum</i>	Four-toed Salamander				
<i>Ambystoma maculatum</i>	Spotted Salamander				
<i>Necturus maculosus maculosus</i>	Mudpuppy	X			
<i>Notophthalmus v. viridescens</i>	Red-spotted Newt				
<i>Plethodon cinereus</i>	Red-backed Salamander				
<i>Plestiodon fasciatus</i>	Five-lined Skink				
<i>Thamnophis butleri</i>	Butler's Garter Snake				X
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake				
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	X			
<i>Nerodia sipedon sipedon</i>	Northern Water Snake				
<i>Storeria dekayi dekayi</i>	Northern Brown Snake				
<i>Storeria o. occipitamaculata</i>	Northern-Red-bellied Snake				
<i>Diadophis punctatus</i>	Ring-necked Snake				
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle	X	X	X	X
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	X	X	X	X
<i>Clemmys guttata</i>	Spotted Turtle				X
<i>Emydoidea blandingii</i>	Blanding's Turtle			X	X
<i>Graptemys geographica</i>	Northern Map Turtle				
<i>Apalone spinifera spinifera</i>	Spiny Softshell Turtle				



Table 2 (Cont.)

Species Name	Common Name	Nyanqing Point State Wildlife Area	Rush Lake	Sand Point	Wildfowl Bay
<i>Bufo americanus americanus</i>	Eastern American Toad	X	X	X	X
<i>Hyla chrysocelis/ versicolor</i>	Gray Treefrog	X	X	X	X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	X	X	X	
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog	X	X		X
<i>Rana catesbeiana</i>	Bullfrog				
<i>Rana clamitans melanota</i>	Northern Green Frog	X	X	X	X
<i>Rana pipiens</i>	Northern Leopard Frog	X	X	X	X
<i>Rana sylvatica</i>	Wood Frog	X	X		
<i>Ambystoma laterale</i>	Blue-spotted Salamander				X
<i>Hemidactylum scutatum</i>	Four-toed Salamander				
<i>Ambystoma maculatum</i>	Spotted Salamander				
<i>Necturus maculosus maculosus</i>	Mudpuppy				
<i>Notophthalmus v. viridescens</i>	Red-spotted Newt				X
<i>Plethodon cinereus</i>	Red-backed Salamander				X
<i>Plestiodon fasciatus</i>	Five-lined Skink				
<i>Thamnophis butleri</i>	Butler's Garter Snake				
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake				
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake				X
<i>Nerodia sipedon sipedon</i>	Northern Water Snake				
<i>Storeria dekayi dekayi</i>	Northern Brown Snake				
<i>Storeria o. occipitamaculata</i>	Northern-Red-bellied Snake				
<i>Diadophis punctatus</i>	Ring-necked Snake				
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle				X
<i>Chrysemys picta marginata</i>	Midland Painted Turtle				
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle	X			X
<i>Graptemys geographica</i>	Northern Map Turtle				
<i>Apalone spinifera spinifera</i>	Spiny Softshell Turtle				



Table 2 (Cont.)

Species Name	Common Name	Pinconning County Park	Saginaw Wetlands	Quanicassee State Wildlife Area	Non-site, Bay Area survey vicinity
<i>Bufo americanus americanus</i>	Eastern American Toad		X		X
<i>Hyla chrysocelis/versicolor</i>	Gray Treefrog				X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper				X
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog				X
<i>Rana catesbeiana</i>	Bullfrog				X
<i>Rana clamitans melanota</i>	Northern Green Frog				X
<i>Rana pipiens</i>	Northern Leopard Frog		X		X
<i>Rana sylvatica</i>	Wood Frog				X
<i>Ambystoma laterale</i>	Blue-spotted Salamander	X			
<i>Hemidactylium scutatum</i>	Four-toed Salamander				
<i>Ambystoma maculatum</i>	Spotted Salamander				X
<i>Necturus maculosus maculosus</i>	Mudpuppy				X
<i>Notophthalmus v. viridescens</i>	Red-spotted Newt				
<i>Plethodon cinereus</i>	Red-backed Salamander				X
<i>Plestiodon fasciatus</i>	Five-lined Skink				
<i>Thamnophis butleri</i>	Butler's Garter Snake				
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake				X
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake				
<i>Nerodia sipedon sipedon</i>	Northern Water Snake				
<i>Storeria dekayi dekayi</i>	Northern Brown Snake				
<i>Storeria o. occipitomaculata</i>	Northern-Red-bellied Snake				
<i>Diadophis punctatus</i>	Ring-necked Snake				
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle				
<i>Chrysemys picta marginata</i>	Midland Painted Turtle				
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle		X	X	
<i>Graptemys geographica</i>	Northern Map Turtle				
<i>Apalone spinifera spinifera</i>	Spiny Softshell Turtle				



Table 3 - List of historically observed herpetofauna species on and near studied properties.

Species Name	Common Name	Charity Island/Michigan Islands National Wildlife Refuge (Observed 1910-1911)	Quanicassee State Wildlife Area (Observed 1964 and 2003)	Saganing Nature Preserve (Observed 1941)	Wigwam Hansell (Observed 1941)
<i>Bufo americanus americanus</i>	Eastern American Toad	X			
<i>Hyla chrysocelis/ versicolor</i>	Gray Treefrog				
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper				
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog				
<i>Pseudacris triseriata maculata</i>	Boreal Chorus Frog				
<i>Rana catesbeiana</i>	Bullfrog				
<i>Rana clamitans melanota</i>	Northern Green Frog	X			
<i>Rana palustris</i>	Pickerel Frog				
<i>Rana pipiens</i>	Northern Leopard Frog	X		X	
<i>Rana sylvatica</i>	Wood Frog				
<i>Ambystoma laterale</i>	Blue-spotted Salamander	X			
<i>Ambystoma maculatum</i>	Spotted Salamander				
<i>Necturus maculosus maculosus</i>	Mudpuppy				X
<i>Notophthalmus viridescens</i>	Red-spotted Newt	X			
<i>Plethodon cinereus</i>	Red-backed Salamander				
<i>Plestiodon fasciatus</i>	Five-lined Skink				
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake				
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	X			
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	X			
<i>Opheodrys vernalis</i>	Eastern Smooth Green Snake				
<i>Pantherophis gloydi</i>	Eastern Fox Snake				
<i>Pantherophis vulpina vulpina</i>	Western Fox Snake				
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	X			
<i>Storeria dekayi dekayi</i>	Northern Brown Snake		X		
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake				

Table 3 (Cont.)



Species Name	Common Name	Charity Island/Michigan Islands National Wildlife Refuge (Observed 1910-1911)	Quanicassee State Wildlife Area (Observed 1964 and 2003)	Saganing Nature Preserve (Observed 1941)	Wigwam Hansell (Observed 1941)
<i>Thamnophis butleri</i>	Butler's Garter Snake				
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake				
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	X			
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle	X			
<i>Chrysemys picta marginata</i>	Midland Painted Turtle			X	
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle		X		
<i>Glyptemys insculpta</i>	Wood Turtle				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle				



Table 3 - List of historically observed herpetofauna species on and near studied properties.

Species Name	Common Name	Charity Island/Michigan Islands National Wildlife Refuge (Observed 1910-1911)	Quanicassee State Wildlife Area (Observed 1964 and 2003)	Saganing Nature Preserve (Observed 1941)	Wigwam Hansell (Observed 1941)
<i>Bufo americanus americanus</i>	Eastern American Toad	X			
<i>Hyla chrysocelis/versicolor</i>	Gray Treefrog				
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper				
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog				
<i>Pseudacris triseriata maculata</i>	Boreal Chorus Frog				
<i>Rana catesbeiana</i>	Bullfrog				
<i>Rana clamitans melanota</i>	Northern Green Frog	X			
<i>Rana palustris</i>	Pickerel Frog				
<i>Rana pipiens</i>	Northern Leopard Frog	X		X	
<i>Rana sylvatica</i>	Wood Frog				
<i>Ambystoma laterale</i>	Blue-spotted Salamander	X			
<i>Ambystoma maculatum</i>	Spotted Salamander				
<i>Necturus maculosus maculosus</i>	Mudpuppy				X
<i>Notophthalmus viridescens</i>	Red-spotted Newt	X			
<i>Plethodon cinereus</i>	Red-backed Salamander				
<i>Plestiodon fasciatus</i>	Five-lined Skink				
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake				
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	X			
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	X			
<i>Opheodrys vernalis</i>	Eastern Smooth Green Snake				
<i>Pantherophis gloydi</i>	Eastern Fox Snake				
<i>Pantherophis vulpina vulpina</i>	Western Fox Snake				
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	X			
<i>Storeria dekayi dekayi</i>	Northern Brown Snake		X		
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake				

Table 3 (Cont.)



Species Name	Common Name	Charity Island/Michigan Islands National Wildlife Refuge (Observed 1910-1911)	Quanicassee State Wildlife Area (Observed 1964 and 2003)	Saganing Nature Preserve (Observed 1941)	Wigwam Hansell (Observed 1941)
<i>Thamnophis butleri</i>	Butler's Garter Snake				
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake				
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	X			
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle	X			
<i>Chrysemys picta marginata</i>	Midland Painted Turtle			X	
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle		X		
<i>Glyptemys insculpta</i>	Wood Turtle				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle				



Table 3 (Cont.)

Species Name	Common Name	Wigwam Bay (Observed 1979, 1996- 1998)	Au Gres Nature Preserve (1991)	Au Gres Nature Preserve (1912)	Bay City State Recreation Area (Observed, 1926, 1978, 1979, 1996, 1997, and 1998)	Fish Point State Wildlife Area (Observed 1997 and 1998)
<i>Bufo americanus americanus</i>	Eastern American Toad	X	X		X	X
<i>Hyla chrysocelis/ versicolor</i>	Gray Treefrog	X	X		X	X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	X	X		X	
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog	X				X
<i>Pseudacris triseriata maculata</i>	Boreal Chorus Frog					
<i>Rana catesbeiana</i>	Bullfrog					X
<i>Rana clamitans melanota</i>	Green Frog	X			X	X
<i>Rana palustris</i>	Pickerel Frog	X		X		
<i>Rana pipiens</i>	Northern Leopard Frog	X			X	X
<i>Rana sylvatica</i>	Wood Frog	X			X	X
<i>Ambystoma laterale</i>	Blue-spotted Salamander					
<i>Ambystoma maculatum</i>	Spotted Salamander					
<i>Necturus maculosus maculosus</i>	Mudpuppy	X				
<i>Notophthalmus viridescens</i>	Red-spotted Newt					
<i>Plethodon cinereus</i>	Red-backed Salamander	X				
<i>Plestiodon fasciatus</i>	Five-lined Skink				X	
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake					
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	X				
<i>Nerodia sipedon sipedon</i>	Northern Water Snake					
<i>Opheodrys vernalis</i>	Eastern Smooth Green Snake					
<i>Pantherophis gloydi</i>	Eastern Fox Snake					
<i>Pantherophis vulpina vulpina</i>	Western Fox Snake					

Table 3 (Cont.)



Species Name	Common Name	Wigwam Bay (Observed 1979, 1996- 1998)	Au Gres Nature Preserve (1991)	Au Gres Nature Preserve (1912)	Bay City State Recreation Area (Observed, 1926, 1978, 1979, 1996, 1997, and 1998)	Fish Point State Wildlife Area (Observed 1997 and 1998)
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga					
<i>Storeria dekayi dekayi</i>	Northern Brown Snake					
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake				X	
<i>Thamnophis butleri</i>	Butler's Garter Snake				X	
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake					
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake				X	
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle					
<i>Chrysemys picta marginata</i>	Midland Painted Turtle					
<i>Clemmys guttata</i>	Spotted Turtle					X
<i>Emydoidea blandingii</i>	Blanding's Turtle					
<i>Glyptemys insculpta</i>	Wood Turtle	X				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle					



Table 3 (Cont.)

Species Name	Common Name	Nyanquing Point State Wildlife Area (Observed 1996-1998)	Rush Lake (Observed 1908)	Rush Lake (Observed 1976, 1996- 1998)	Pressprich Nature Preserve (Observed 1912)
<i>Bufo americanus americanus</i>	Eastern American Toad	X	X	X	
<i>Hyla chrysocelis/ versicolor</i>	Gray Treefrog	X	X	X	
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	X	X	X	
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog	X		X	
<i>Pseudacris triseriata maculata</i>	Boreal Chorus Frog		X		
<i>Rana catesbeiana</i>	Bullfrog	X	X		
<i>Rana clamitans melanota</i>	Northern Green Frog	X	X	X	
<i>Rana palustris</i>	Pickerel Frog	X			X
<i>Rana pipiens</i>	Northern Leopard Frog	X	X	X	
<i>Rana sylvatica</i>	Wood Frog	X	X	X	
<i>Ambystoma laterale</i>	Blue-spotted Salamander	X		X	
<i>Ambystoma maculatum</i>	Spotted Salamander	X			
<i>Necturus maculosus maculosus</i>	Mudpuppy	X			
<i>Notophthalmus viridescens</i>	Red-spotted Newt	X		X	
<i>Plethodon cinereus</i>	Red-backed Salamander		X	X	
<i>Plestiodon fasciatus</i>	Five-lined Skink		X	X	
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake	X	X		
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	X	X		
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	X	X		
<i>Opheodrys vernalis</i>	Eastern Smooth Green Snake	X			
<i>Pantherophis gloydi</i>	Eastern Fox Snake				
<i>Pantherophis vulpina vulpina</i>	Western Fox Snake				
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga				
<i>Storeria dekayi dekayi</i>	Northern Brown Snake	X	X	X	
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake	X			



Table 3 (Cont.)

		Nyanquing Point State Wildlife Area (Observed 1996-1998)	Rush Lake (Observed 1908)	Rush Lake (Observed 1976, 1996- 1998)	Pressprich Nature Preserve (Observed 1912)
<i>Thamnophis butleri</i>	Butler's Garter Snake	X	X		
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake	X	X	X	
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	X	X	X	
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle	X			
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	X	X		
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle	X			
<i>Glyptemys insculpta</i>	Wood Turtle				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle	X			



Table 3 (Cont.)

Species Name	Common Name	Sand Point (Observed 1908 and 1929, 1931, 1933, 1941)	Sand Point (Observed 1978, 1996- 1998)	Wildfowl Bay (Observed 1908, 1929, 1931, 1933, 1941)	Wildfowl Bay (Observed 1978, 1996- 1998)
<i>Bufo americanus americanus</i>	Eastern American Toad		X		X
<i>Hyla chrysocelis/versicolor</i>	Gray Treefrog	X	X	X	X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	X	X	X	
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog		X		
<i>Pseudacris triseriata maculata</i>	Boreal Chorus Frog	X		X	
<i>Rana catesbeiana</i>	Bullfrog				
<i>Rana clamitans melanota</i>	Green Frog	X	X	X	X
<i>Rana palustris</i>	Pickerel Frog				X
<i>Rana pipiens</i>	Northern Leopard Frog	X	X	X	X
<i>Rana sylvatica</i>	Wood Frog	X	X	X	
<i>Ambystoma laterale</i>	Blue-spotted Salamander	X		X	
<i>Ambystoma maculatum</i>	Spotted Salamander				
<i>Necturus maculosus maculosus</i>	Mudpuppy				
<i>Notophthalmus viridescens</i>	Red-spotted Newt	X		X	
<i>Plethodon cinereus</i>	Red-backed Salamander				
<i>Plestiodon fasciatus</i>	Five-lined Skink	X	X	X	X
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake	X		X	
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	X		X	
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	X		X	
<i>Opheodrys vernalis</i>	Eastern Smooth Green Snake	X		X	
<i>Pantherophis gloydi</i>	Eastern Fox Snake	X		X	
<i>Pantherophis vulpina vulpina</i>	Western Fox Snake	X		X	
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	X		X	
<i>Storeria dekayi dekayi</i>	Northern Brown Snake	X		X	
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake	X		X	



Table 3 (Cont.)

Species Name	Common Name	Sand Point (Observed 1908 and 1929, 1931, 1933, 1941)	Sand Point (Observed 1978, 1996- 1998)	Wildfowl Bay (Observed 1908, 1929, 1931, 1933, 1941)	Wildfowl Bay (Observed 1978, 1996- 1998)
<i>Thamnophis butleri</i>	Butler's Garter Snake				
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake	X		X	
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	X		X	
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle	X		X	
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	X		X	
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle	X		X	
<i>Glyptemys insculpta</i>	Wood Turtle				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle				



Table 3 (Cont.)

Species Name	Common Name	Sleeper State Park (Observed 1908, 1931, 1932, 1936)	Sleeper State Park (Observed 1996)	Non-site, in the general Bay Area survey vicinity (1908, 1910-1912, 1926, 1936, 1947)	Non-site, in the general Bay Area survey vicinity (1970, 1996-1998)
<i>Bufo americanus americanus</i>	Eastern American Toad	X		X	X
<i>Hyla chrysocelis/versicolor</i>	Gray Treefrog	X		X	X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper				X
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog				X
<i>Pseudacris triseriata maculata</i>	Boreal Chorus Frog	X		X	
<i>Rana catesbeiana</i>	Bullfrog				
<i>Rana clamitans melanota</i>	Northern Green Frog	X		X	X
<i>Rana palustris</i>	Pickerel Frog				
<i>Rana pipiens</i>	Northern Leopard Frog	X	X	X	X
<i>Rana sylvatica</i>	Wood Frog	X		X	X
<i>Ambystoma laterale</i>	Blue-spotted Salamander	X			
<i>Ambystoma maculatum</i>	Spotted Salamander				
<i>Necturus maculosus maculosus</i>	Mudpuppy			X	
<i>Notophthalmus viridescens</i>	Red-spotted Newt	X			
<i>Plethodon cinereus</i>	Red-backed Salamander			X	
<i>Plestiodon fasciatus</i>	Five-lined Skink			X	X
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake	X		X	
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	X		X	
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	X			
<i>Opheodrys vernalis</i>	Eastern Smooth Green Snake				
<i>Pantherophis gloydi</i>	Eastern Fox Snake			X	
<i>Pantherophis vulpina vulpina</i>	Western Fox Snake	X			
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	X			



Table 3 (Cont.)

Species Name	Common Name	Sleeper State Park (Observed 1908, 1931, 1932, 1936)	Sleeper State Park (Observed 1996)	Non-site, in the general Bay Area survey vicinity (1908, 1910-1912, 1926, 1936, 1947)	Non-site, in the general Bay Area survey vicinity (1970, 1996- 1998)
<i>Storeria dekayi dekayi</i>	Northern Brown Snake	X		X	
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake				
<i>Thamnophis butleri</i>	Butler's Garter Snake	X			
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake	X			
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	X			
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle	X			
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	X			
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Emydoidea blandingii</i>	Blanding's Turtle	X		X	
<i>Glyptemys insculpta</i>	Wood Turtle				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle				

Table 4 - List of unobserved herpetofauna species that are likely present at locations surveyed in 2011, 2012 and 2013. Species listed at each site are based on the presence of suitable habitat.

Species Name	Common Name	Au Gres Nature Preserve	Michigan Islands	Hampton Township Park	Saginaw Wetlands	Pinconning County Park	Pinconning Nature Preserve	Pressprich Nature Preserve	Quanicassee East	Quanicassee West	Sagaming Nature Preserve	Sand Point Nature Preserve	Sillman Tract	Standish Nature Preserve	Wah-Sash-Kah-Moqua	Wigwam	Wigwam East	Wigwam Hansell	Wigwam Langdon	Wigwam West	Wildfowl Bay State	Finn Road Park	Fish Point	Rush Lake	Nyanquing Point Wildlife	Bay City State Rec. Area	Sleeper State Park
<i>Bufo americanus</i>	Eastern American Toad			X									X				X										
<i>Hyla chrysocelis/versicolor</i>	Gray Treefrog			X		X	X	X	X					X	X	X				X				X			
<i>Pseudacris triseriata</i>	Western Chorus Frog	X	X		X		X					X		X		X					X			X	X	X	X
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	X	X		X	X	X	X			X			X		X			X	X	X		X	X	X	X	
<i>Rana catesbeiana</i>	Bullfrog	X	X	X	X		X		X	X	X	X		X	X	X				X	X			X	X	X	
<i>Rana clamitans melanota</i>	Northern Green Frog							X						X			X			X			X				X
<i>Rana pipiens</i>	Northern Leopard Frog		X														X										
<i>Rana sylvatica</i>	Wood Frog		X	X			X			X				X	X				X	X					X		
<i>Ambystoma laterale</i>	Blue-spotted Salamander						X	X								X				X							X
<i>Ambystoma maculatum</i>	Spotted Salamander		X																		X		X	X			X
<i>Ambystoma tigrinum</i>	Eastern Tiger Salamander											X									X						
<i>Plethodon cinereus</i>	Red-backed Salamander															X				X	X		X				X
<i>Hemidactylium scutatum</i>	Four-toed Salamander											X				X				X	X		X				



Table 4 (Cont.)

Species Name	Common Name	Au Gres Nature Preserve	Michigan Islands	Hampton Township Park	Saginaw Wetlands	Pinconning County Park	Pinconning Nature Preserve	Pressprich Nature Preserve	Quanicassee East	Quanicassee West	Saganing Nature Preserve	Sand Point Nature Preserve	Sillman Tract	Standish Nature Preserve	Wah-Sash-Kah-Moqua	Wigwam	Wigwam East	Wigwam Hansell	Wigwam Langdon	Wigwam West	Wildfowl Bay State	Finn Road Park	Fish Point	Rush Lake	Nyanquing Point Wildlife Area	Bay City State Rec. Area	Sleeper State Park
<i>Necturus maculosus maculosus</i>	Mudpuppy															X					X						
<i>Notophthalmus viridescens</i>	Red-spotted Newt	X			X	X			X	X						X				X	X		X	X			
<i>Plestiodon fasciatus</i>	Five-lined Skink																						X		X	X	X
<i>Coluber constrictor foxi</i>	Blue Racer	X			X		X	X							X	X			X	X	X	X	X	X			
<i>Diadophis punctatus edwardsii</i>	Northern Ring-necked Snake																				X	X	X	X	X	X	
<i>Elaphe gloydi</i>	Eastern Fox Snake	X	X			X			X		X					X			X	X	X		X		X	X	
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake		X		X							X									X	X	X	X	X	X	
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake		X		X		X					X			X	X			X		X		X		X	X	X
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	X				X			X	X	X				X	X			X	X	X	X	X		X	X	X
<i>Opheodrys vernalis</i>	Smooth Green Snake		X		X		X					X			X	X			X	X	X		X	X	X	X	
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	X	X		X		X					X				X			X	X	X		X		X		
<i>Storeria dekayi dekayi</i>	Northern Brown Snake	X	X	X	X	X	X	X	X						X				X	X				X	X	X	X
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake		X	X	X		X					X				X			X	X			X	X	X	X	X





Table 4 (Cont.)

Species Name	Common Name	Au Gres Nature Preserve	Michigan Islands	Hampton Township Park	Saginaw Wetlands	Pinconning County Park	Pinconning Nature Preserve	Pressprich Nature Preserve	Quanicassee East	Quanicassee West	Saganing Nature Preserve	Sand Point Nature Preserve	Sillman Tract	Standish Nature Preserve	Wah-Sash-Kah-Moqua	Wigwam	Wigwam East	Wigwam Hansell	Wigwam Langdon	Wigwam West	Wildfowl Bay State	Finn Road Park	Fish Point	Rush Lake	Nyanquing Point Wildlife Area	Bay City State Rec. Area	Sleeper State Park
<i>Thamnophis butleri</i>	Butler's Garter Snake	X			X	X	X	X			X	X			X		X	X	X	X	X				X	X	
<i>Thamnophis sauritus septentrionalis</i>	Northern Ribbon Snake	X	X	X	X	X					X			X							X		X		X	X	
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake												X	X	X		X	X	X		X						
<i>Apalone spinifera spinifera</i>	Eastern Spiny Softshell Turtle					X	X		X		X						X				X		X		X	X	
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle				X	X	X				X			X	X		X			X	X		X		X	X	
<i>Chrysemys picta marginata</i>	Midland Painted Turtle					X	X				X			X	X		X						X				X
<i>Clemmys guttata</i>	Spotted Turtle	X			X																X		X	X			X
<i>Emydoidea blandingii</i>	Blanding's Turtle											X		X	X		X	X		X			X		X	X	X
<i>Glyptemys insculpta</i>	Wood Turtle		X								X					X				X							
<i>Graptemys geographica</i>	Northern Map Turtle	X				X			X	X	X	X		X							X		X			X	
<i>Sternotherus odoratus</i>	Eastern Musk Turtle				X							X				X					X		X	X	X	X	X

Maps

Map Text

Map 1. Location of study area and key for detailed maps.

Map 2. Area A: Map depicting total number of reptiles and amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 3. Area A: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 4. Area A: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 5. Area B: Map depicting total number of reptiles and amphibian species by section within the Saginaw Bay Herpetological 2011 Inventory and Assessment Area.

Map 6. Area B: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 7. Area B: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 8. Area C: Map depicting total number of reptiles and amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 9. Area C: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 10. Area C: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 11. Area D: Map depicting total number of reptiles and amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 12. Area D: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 13. Area D: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 14. Area E: Map depicting total number of amphibian and reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 15. Area E: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 16. Area E: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 17. Map depicting the observed distribution of Blanding's Turtle (*Emydoidea blandingii*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 18. Map depicting the observed distribution of Blue-spotted Salamander (*Ambystoma laterale*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 19. Map depicting the observed distribution of Bullfrog (*Rana catesbeiana*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 20. Map depicting the observed distribution of Butler's Garter Snake (*Thamnophis butleri*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 21. Map depicting the observed distribution of Eastern American Toad (*Bufo americanus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 22. Map depicting the observed distribution of Eastern Garter Snake (*Thamnophis sirtalis*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 23. Map depicting the observed distribution of Eastern Gray Treefrog (*Hyla versicolor*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 24. Map depicting the observed distribution of Red-spotted Newt (*Notophthalmus viridescens*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 25. Map depicting the observed distribution of Eastern Snapping Turtle (*Chelydra serpentina*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 26. Map depicting the observed distribution of Eastern Spiny Softshell Turtle (*Apalone spinifera*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 27. Map depicting the observed distribution of Five-lined Skink (*Eumeces fasciatus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 28. Map depicting the observed distribution of Four-toed Salamander (*Hemidactylium scutatum*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 29. Map depicting the observed distribution of Green Frog (*Rana clamitans*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 30. Map depicting the observed distribution of Midland Painted Turtle (*Chrysemys picta marginata*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 31. Map depicting the observed distribution of Northern Brown Snake (*Storeria dekayi*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 32. Map depicting the observed distribution of Northern Leopard Frog (*Rana pipiens*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 33. Map depicting the observed distribution of Northern Map Turtle (*Graptemys geographica*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 34. Map depicting the observed distribution of Northern Red-bellied Snake (*Storeria occipitomaculata*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 35. Map depicting the observed distribution of Northern Ribbon Snake (*Thamnophis sauritus septentrionalis*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 36. Map depicting the observed distribution of Northern Ringneck Snake (*Diadophis punctatus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 37. Map depicting the observed distribution of Northern Spring Peeper (*Pseudacris crucifer*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 38. Map depicting the observed distribution of Northern Water Snake (*Nerodia sipedon*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

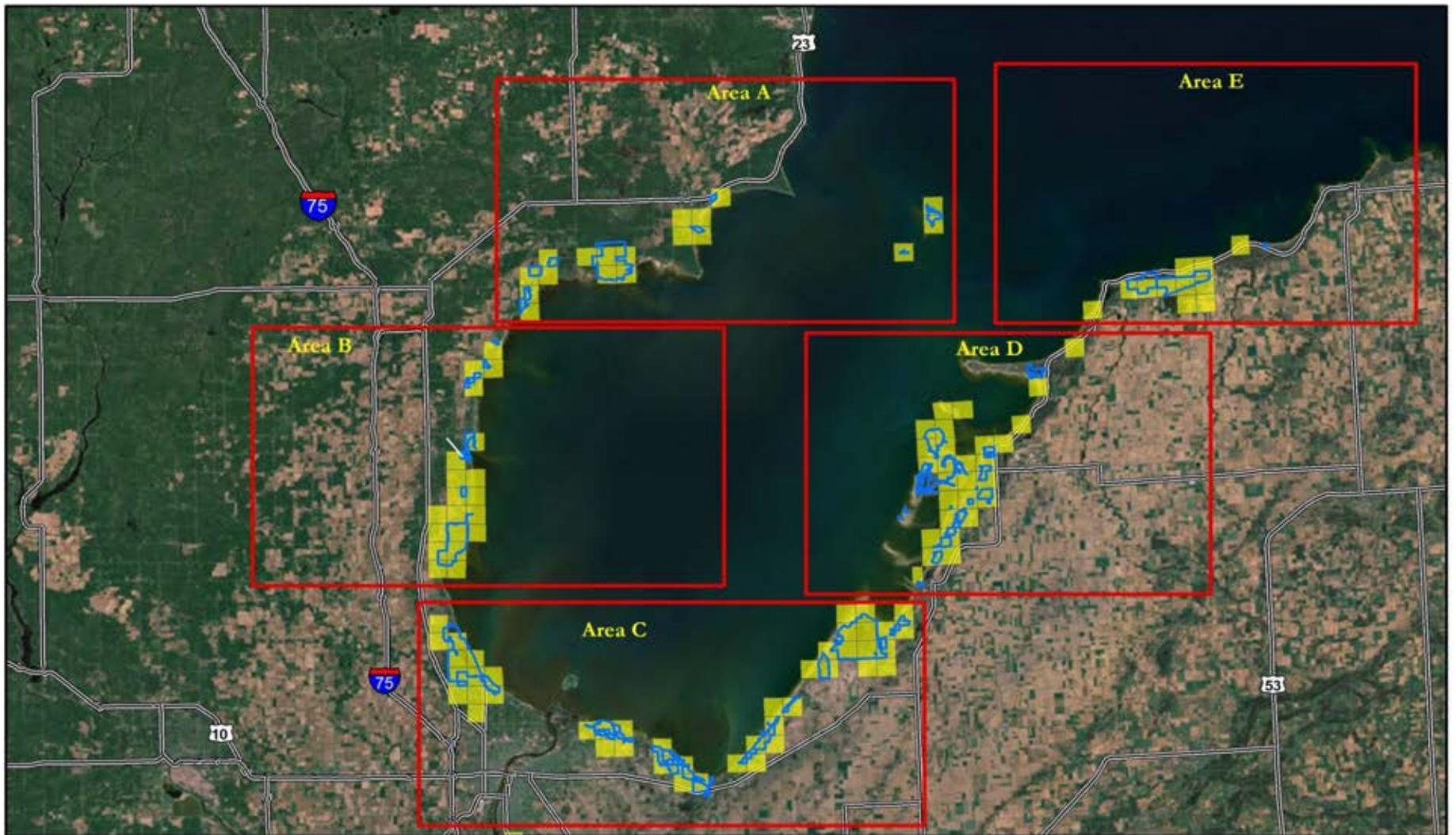
Map 39. Map depicting the observed distribution of Red-backed Salamander (*Plethodon cinereus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 40. Map depicting the observed distribution of Western Chorus Frog (*Pseudacris triseriata*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 41. Map depicting the observed distribution of Wood Frog (*Rana sylvatica*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 42. Map depicting the observed distribution of Spotted Salamander (*Ambystoma maculatum*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

Map 43. Map depicting the observed distribution of Mudpuppy (*Necturus maculosus maculosus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Saginaw Bay Herpetological Assessment - Phase II
 Map 1 - Location of Study Areas, Sampled Sections, and Key for Detailed Maps



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.

- Legend**
-  Site Boundary
 -  Sampled Square Mile Sections



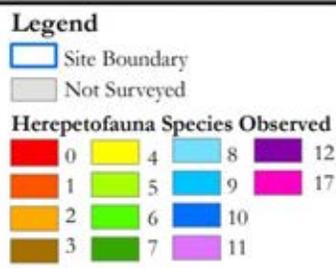


Saginaw Bay Herpetological Assessment - Phase II

Map 2 – Area A: Map depicting total number of amphibian and reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.





Saginaw Bay Herpetological Assessment - Phase II

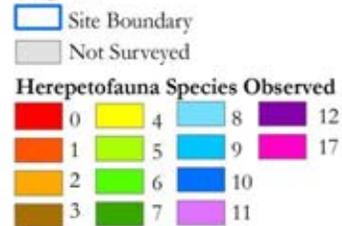
Map 3 – Area A: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

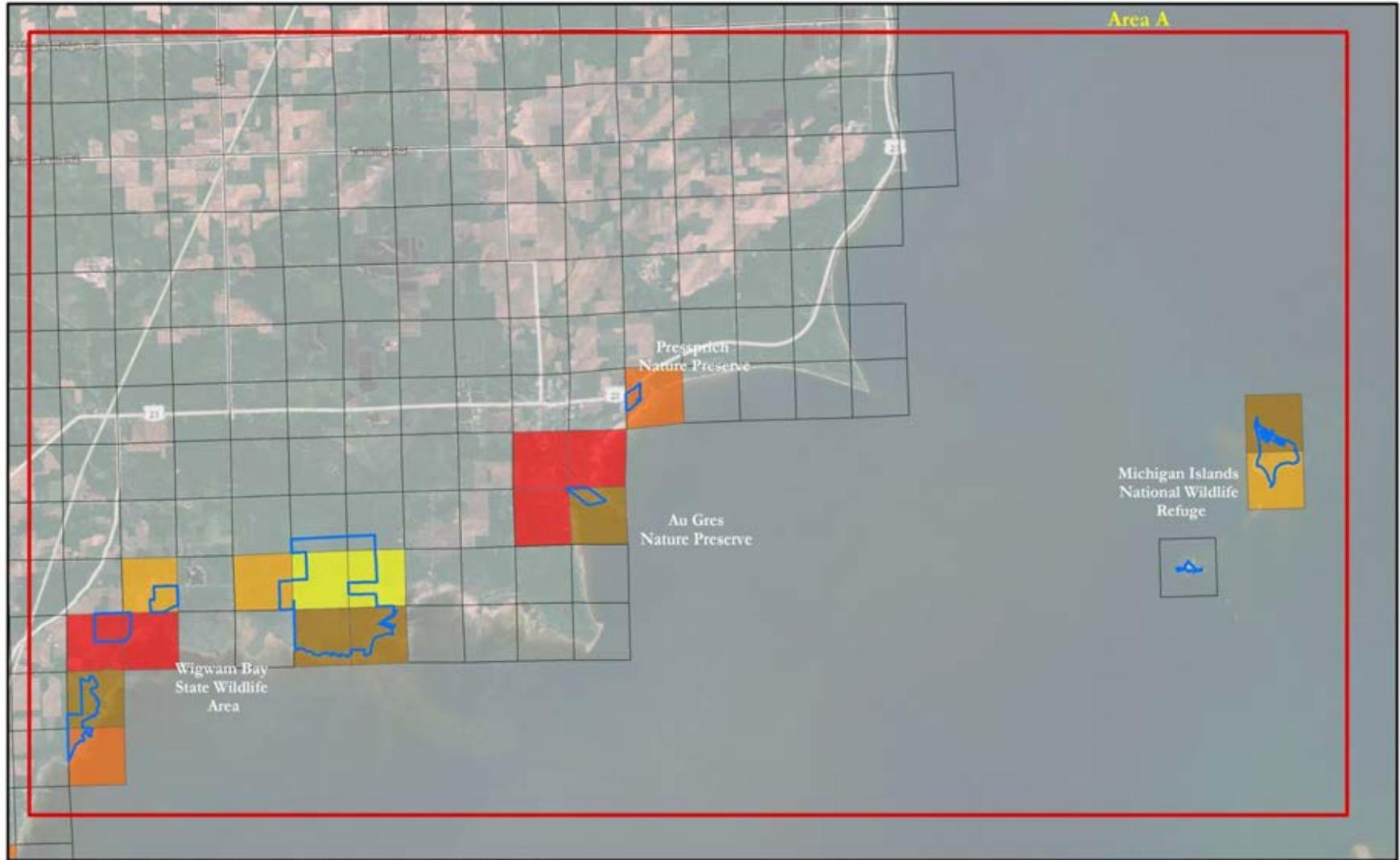


Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

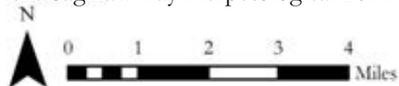
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Saginaw Bay Herpetological Assessment - Phase II

Map 4 – Area A: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

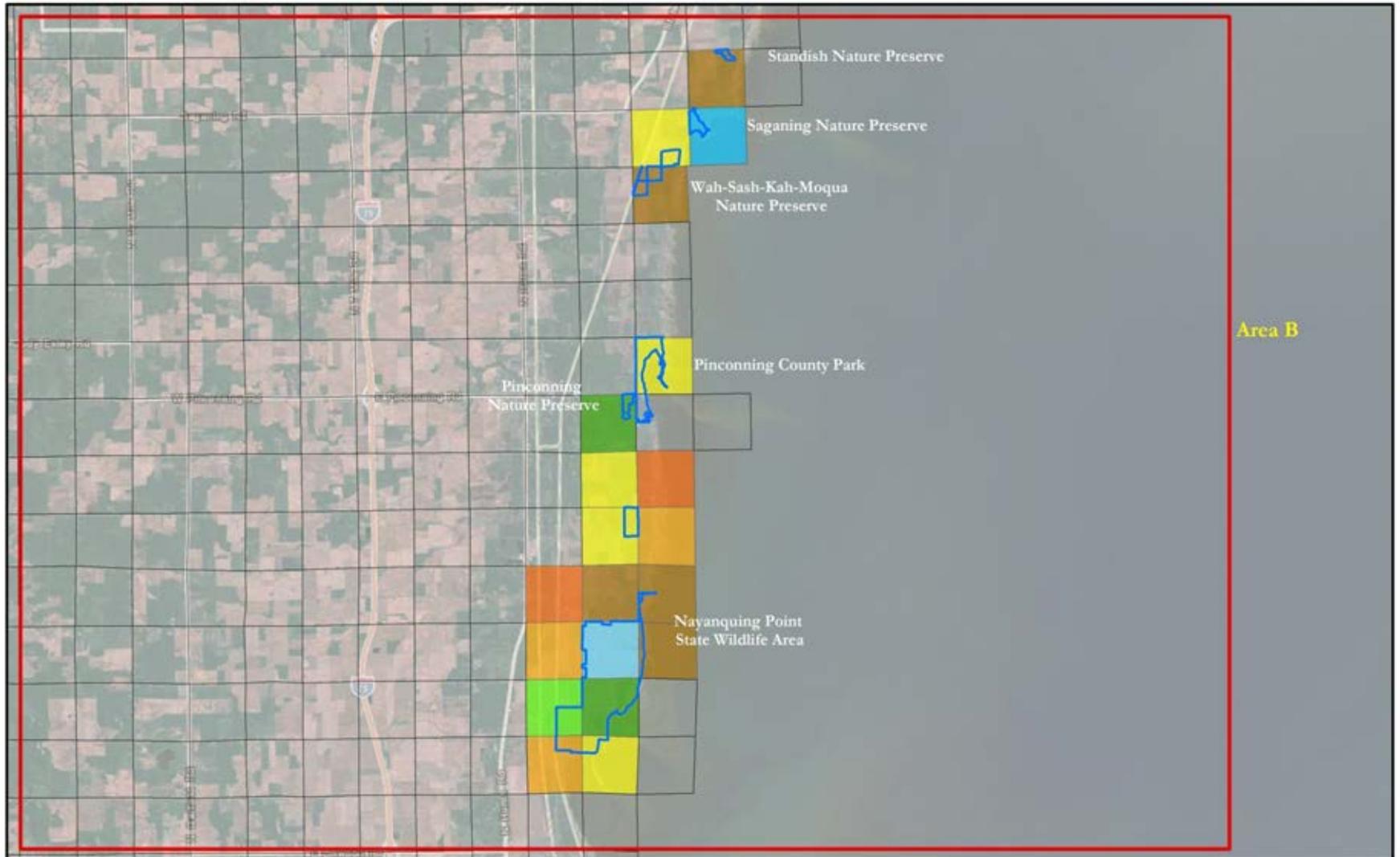
Legend

- Site Boundary
- Not Surveyed

Herpetofauna Species Observed

0	4	8	12
1	5	9	17
2	6	10	
3	7	11	





Saginaw Bay Herpetological Assessment - Phase II

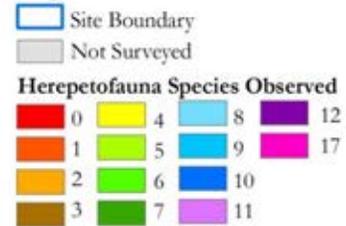
Map 5 – Area B: Map depicting total number of amphibian and reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

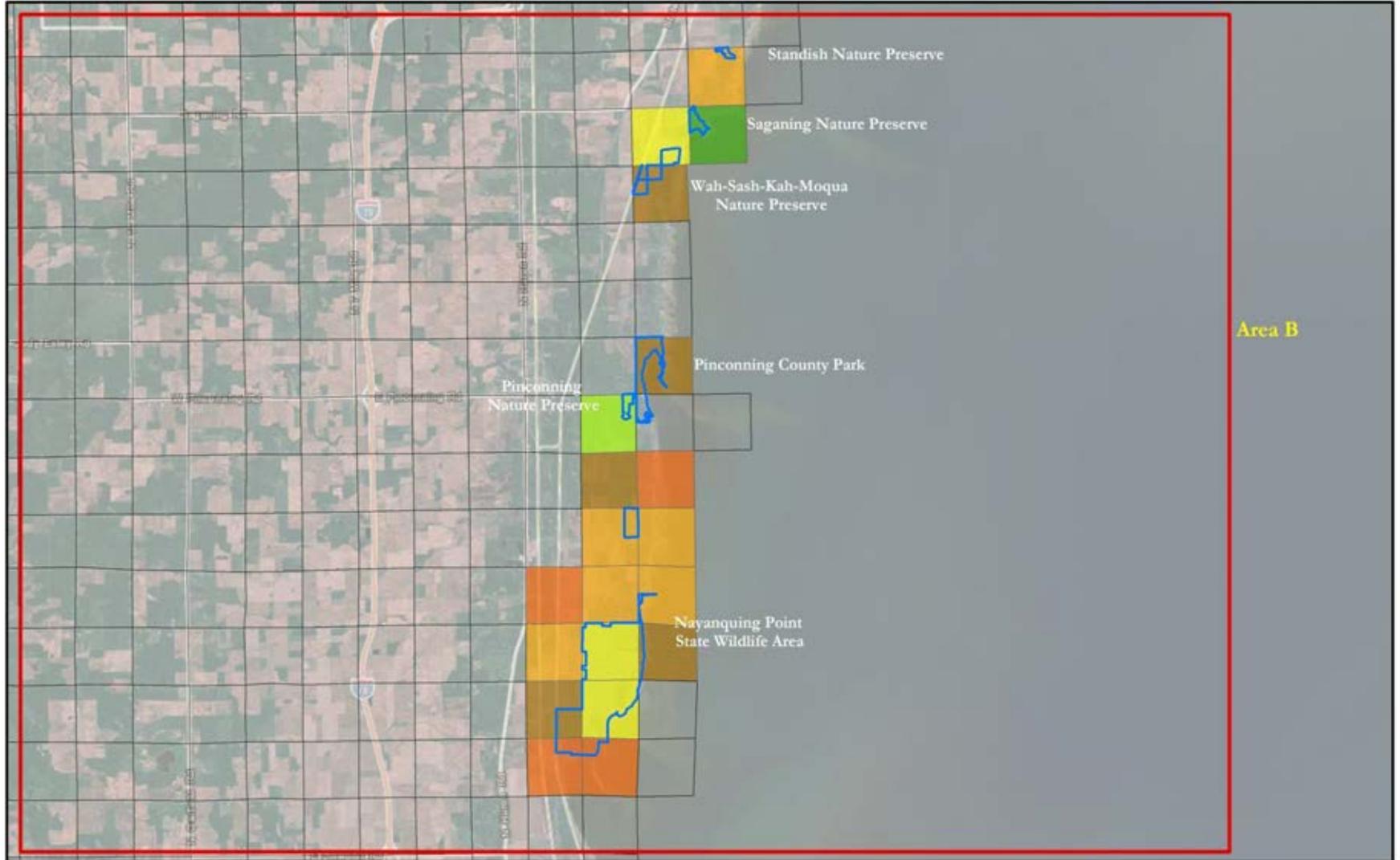


Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

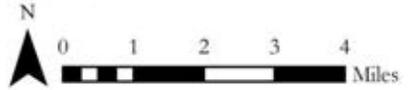
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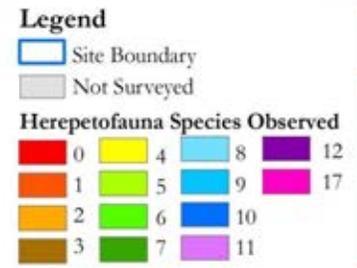


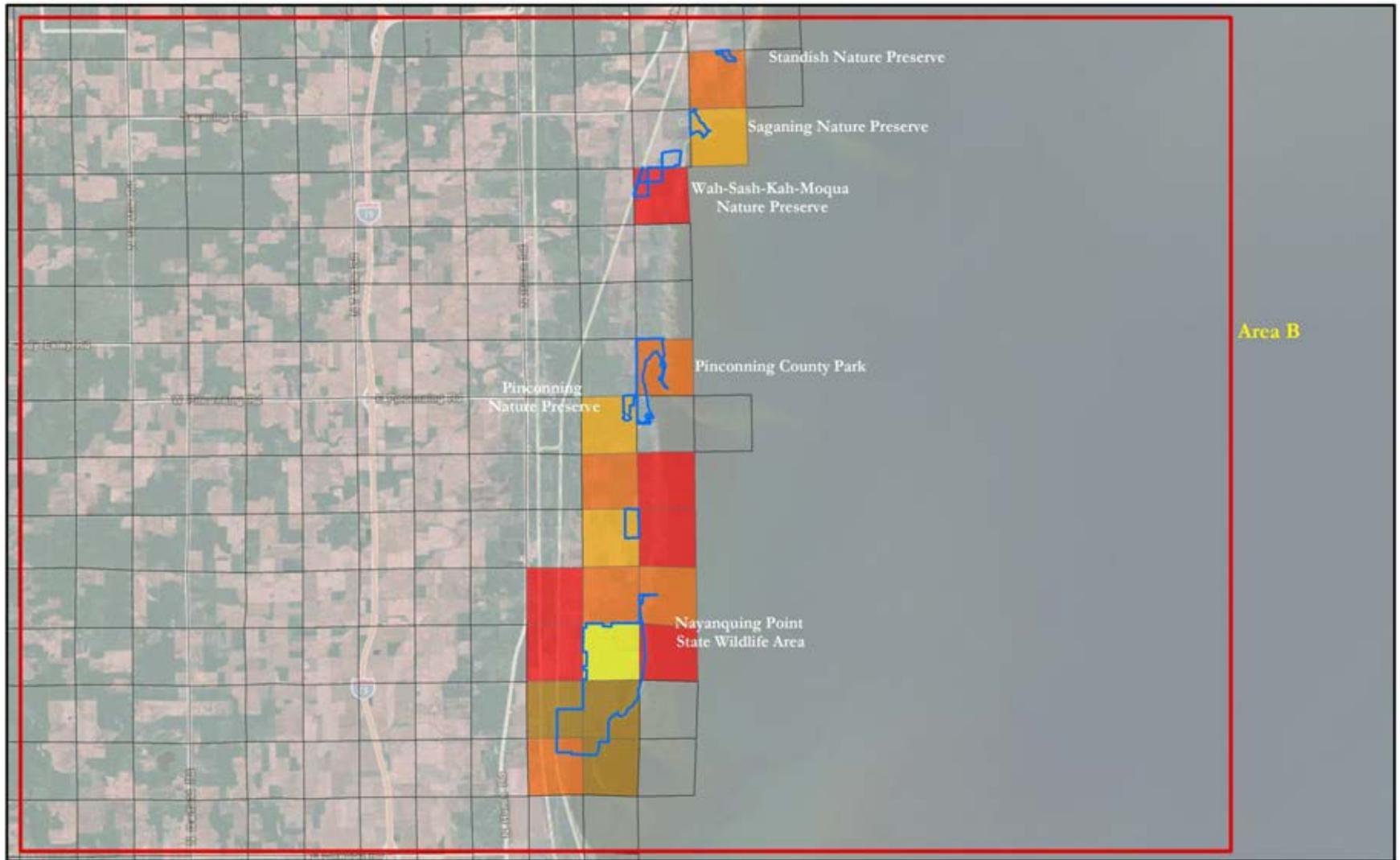
Saginaw Bay Herpetological Assessment - Phase II

Map 6 – Area B: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.





Saginaw Bay Herpetological Assessment - Phase II
 Map 7 – Area B: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

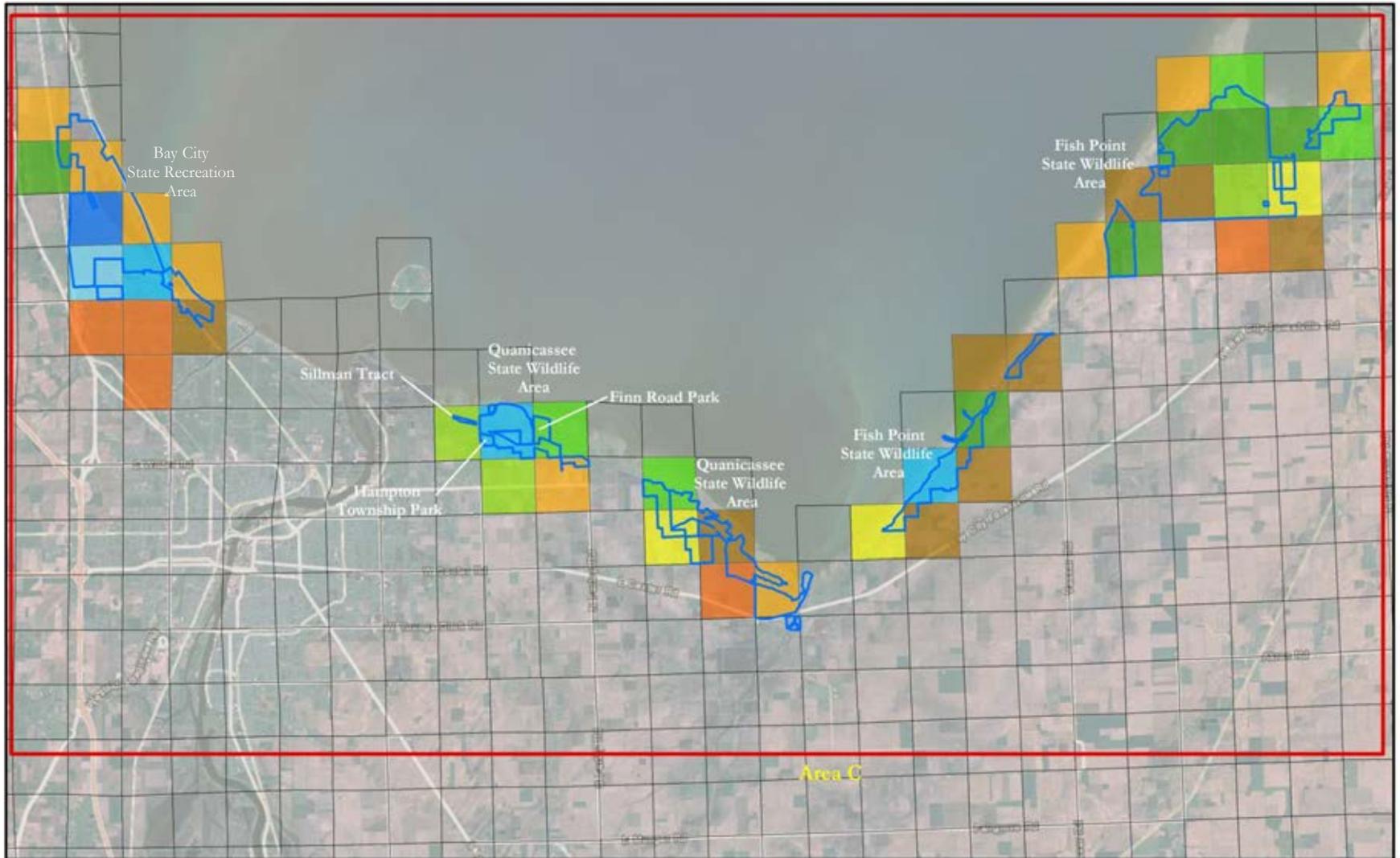
Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Not Surveyed

Herpetofauna Species Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 8 – Area B: Map depicting total number of amphibian and reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

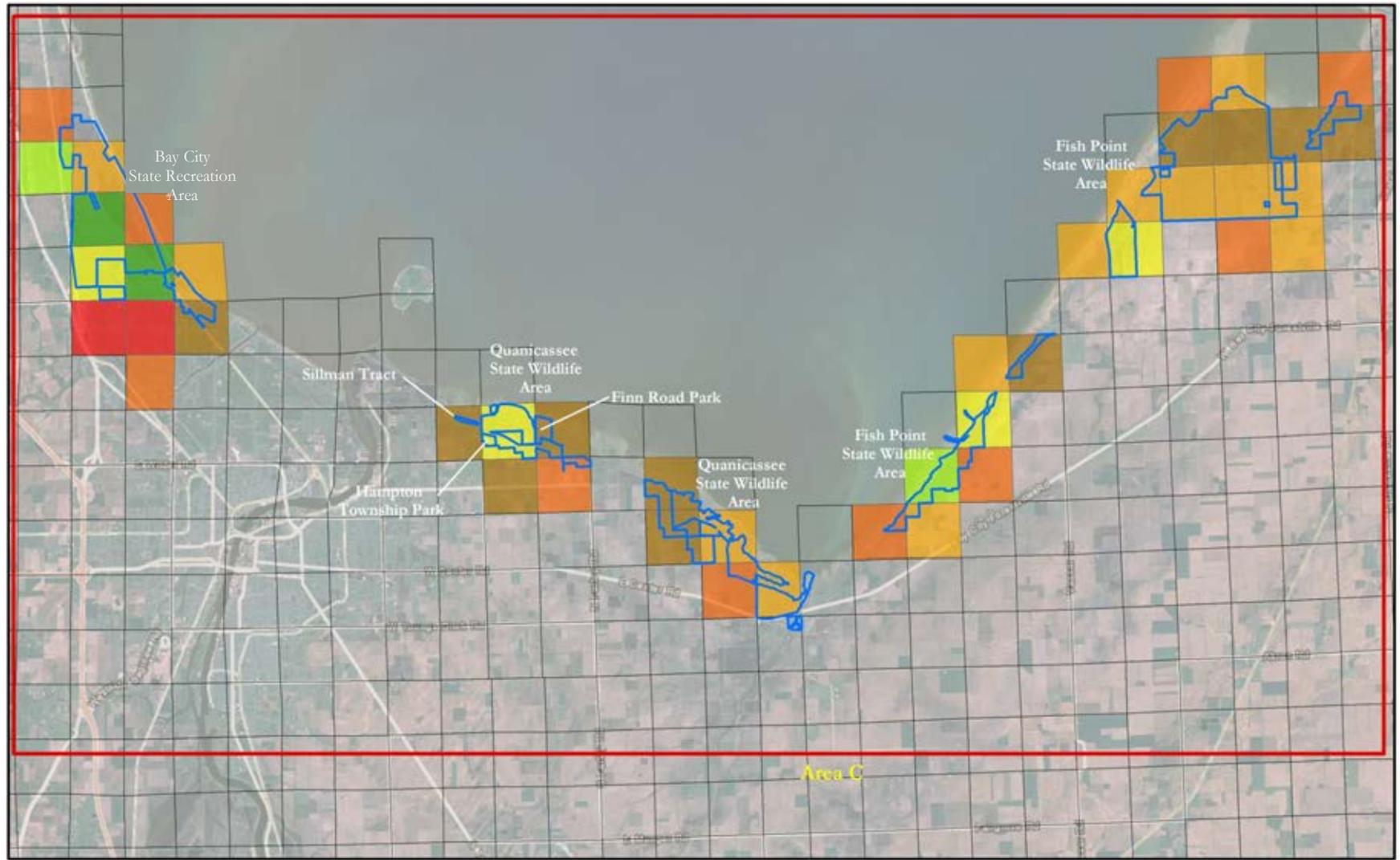
Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Not Surveyed

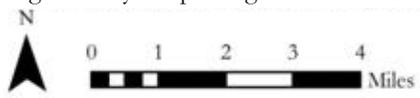
Herpetofauna Species Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 9 – Area C: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

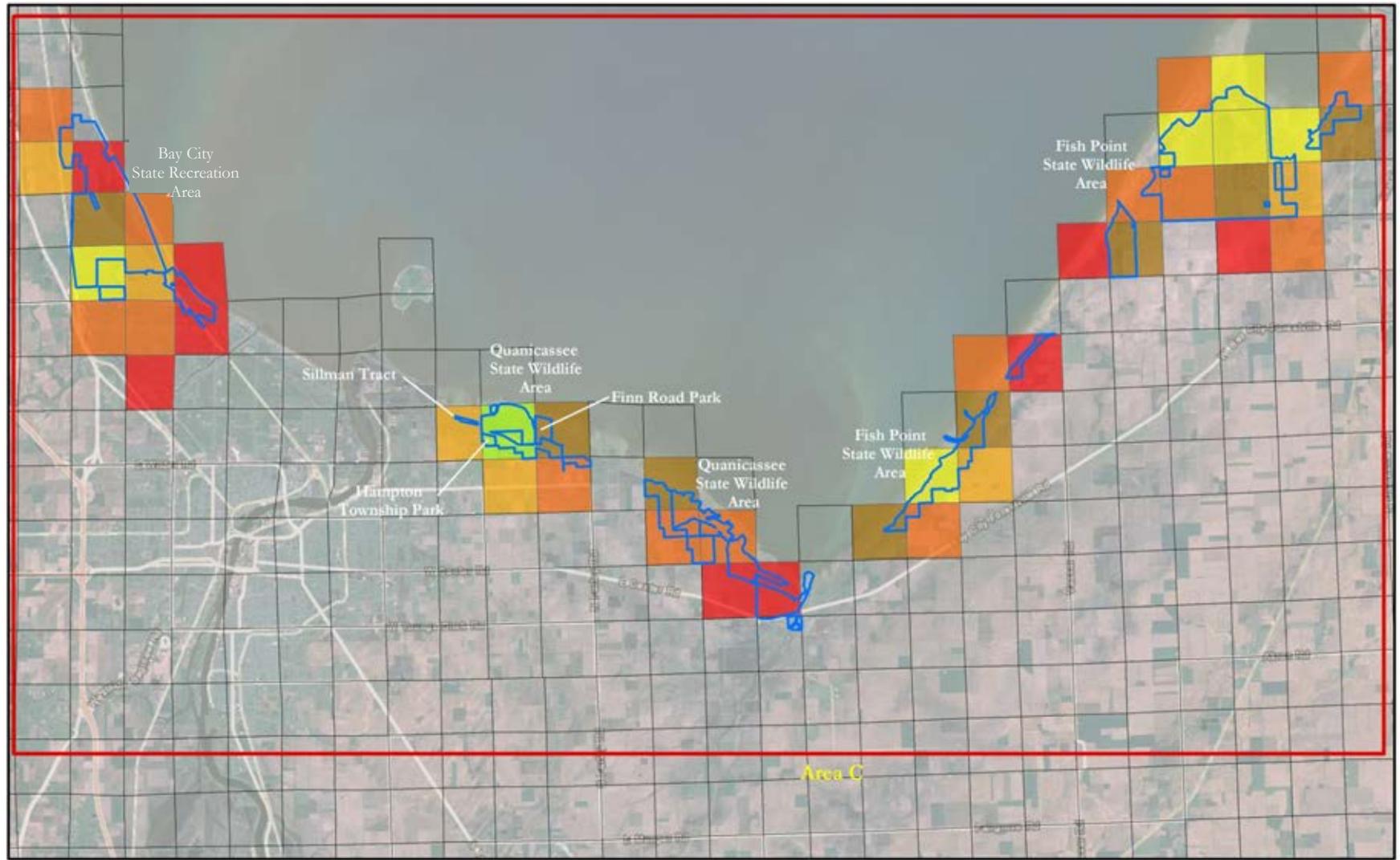
Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Not Surveyed

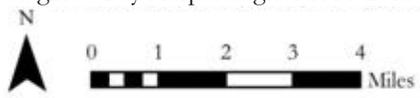
Herpetofauna Species Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 10 – Area C: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

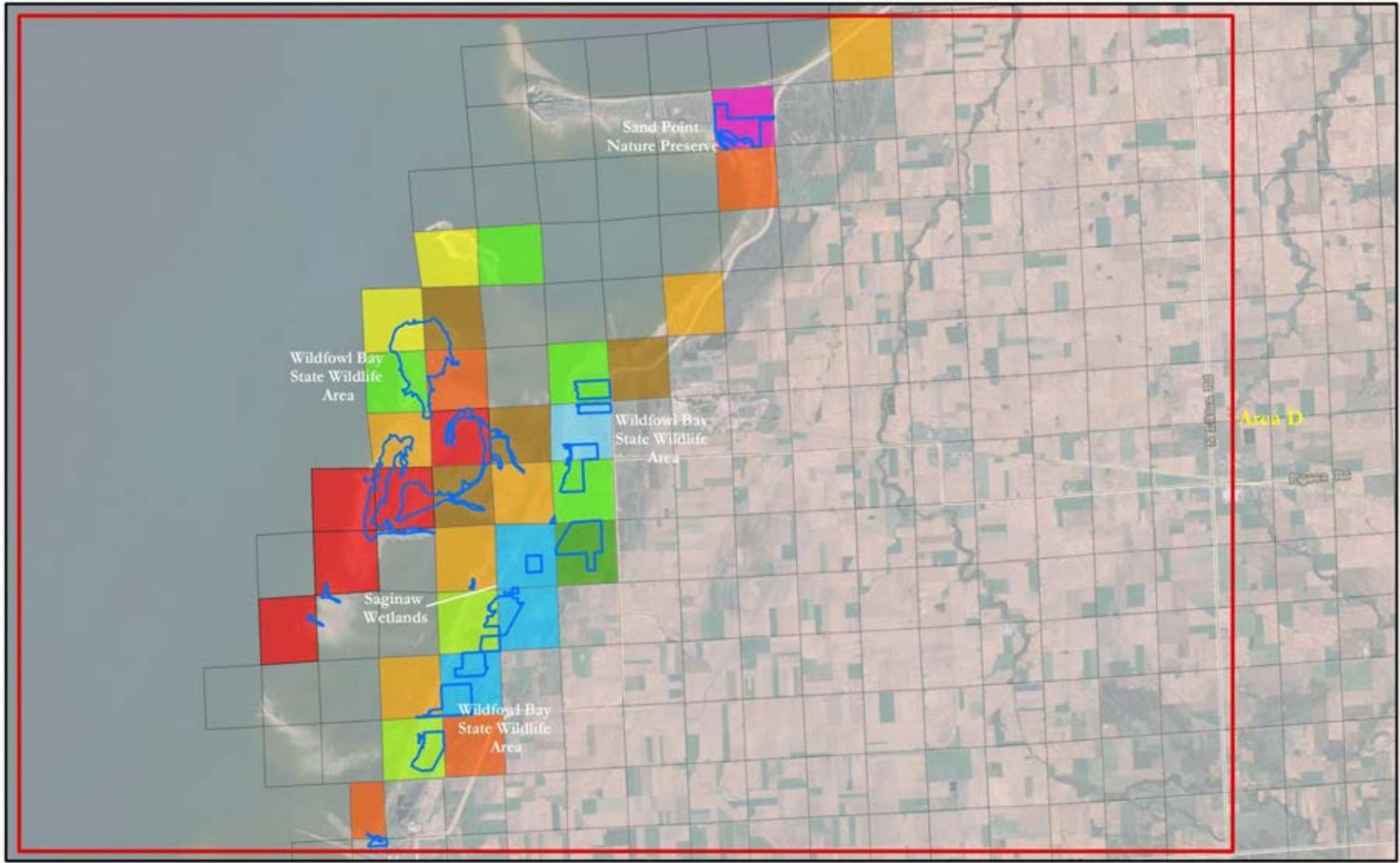
Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Not Surveyed

Herepetofauna Species Observed



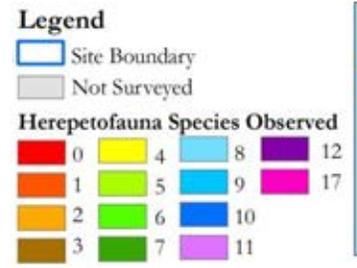


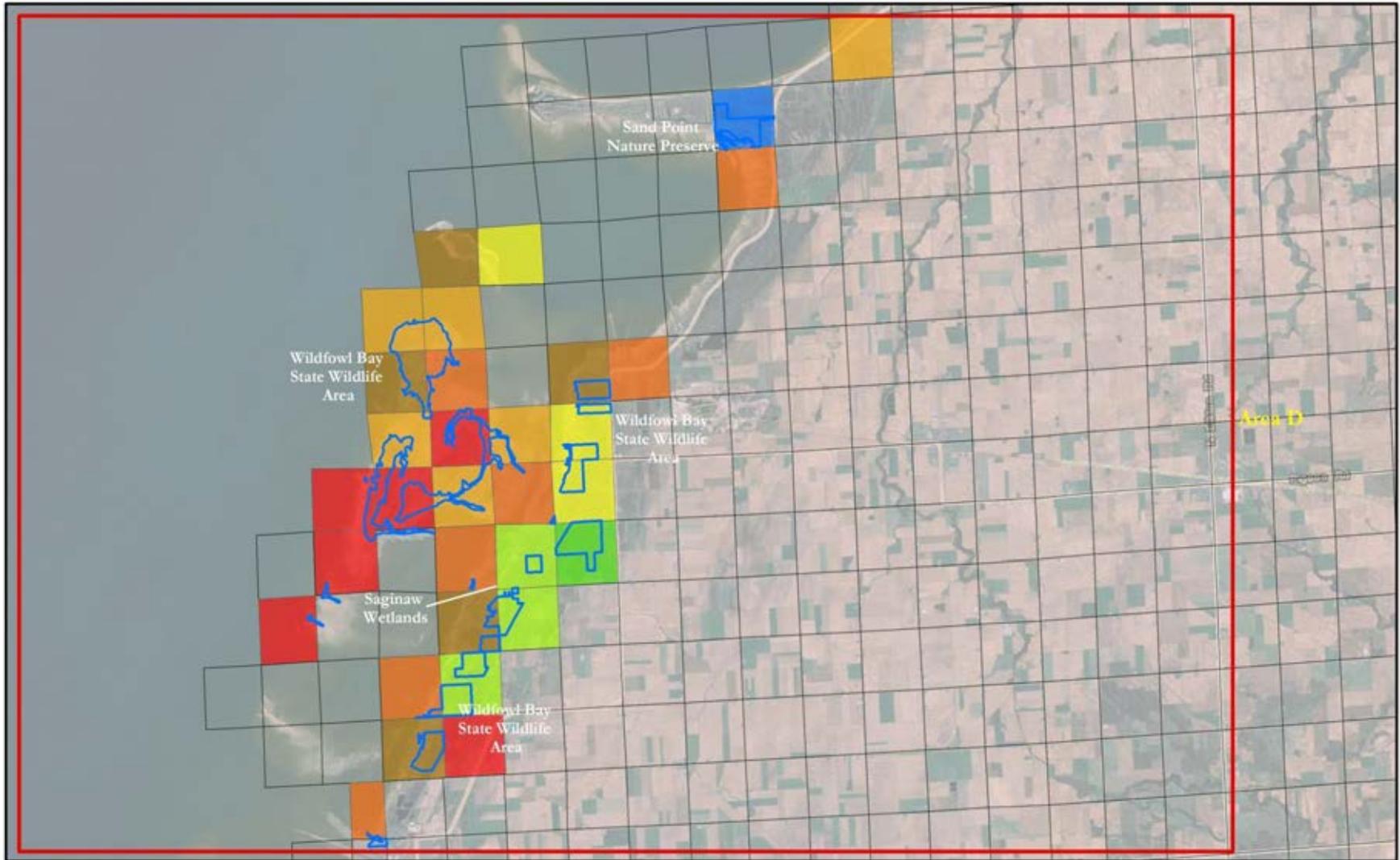
Saginaw Bay Herpetological Assessment - Phase II

Map 11 – Area D: Map depicting total number of amphibian and reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.





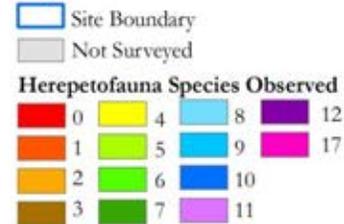
Saginaw Bay Herpetological Assessment - Phase II

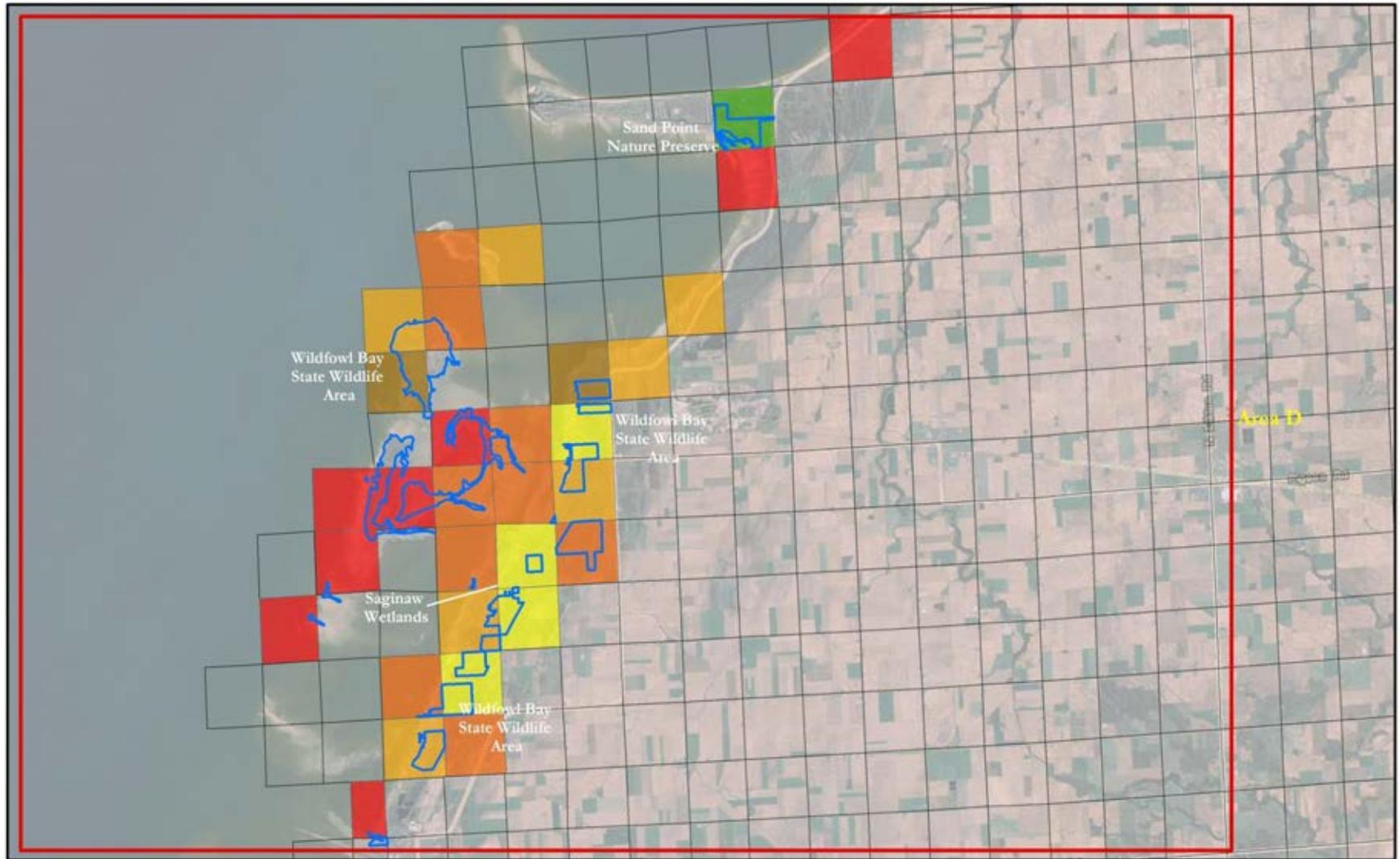
Map 12 – Area D: Map depicting total number of amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend





Saginaw Bay Herpetological Assessment - Phase II

Map 13 – Area D: Map depicting total number of reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

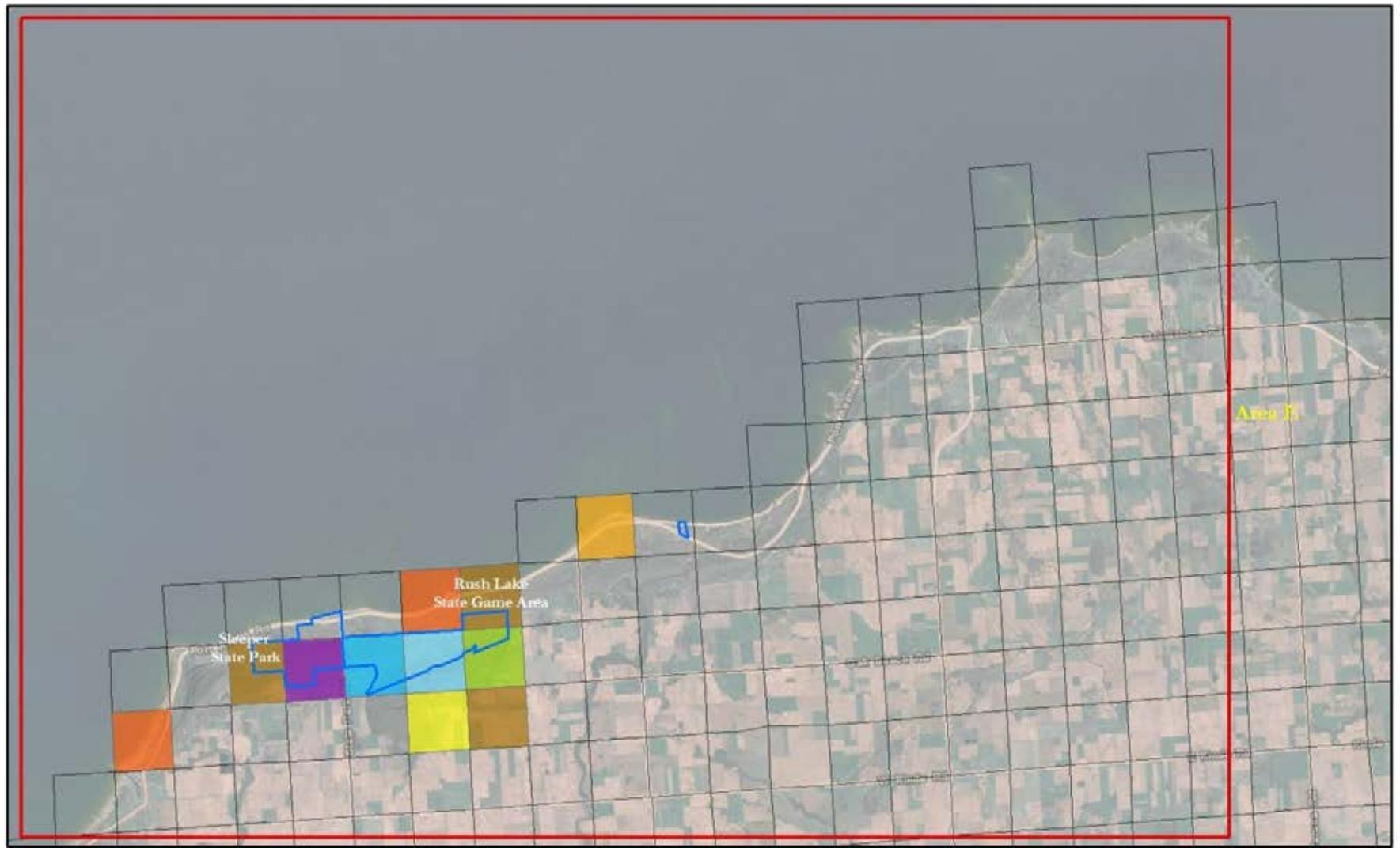
Legend

- Site Boundary
- Not Surveyed

Herpetofauna Species Observed

0	4	8	12
1	5	9	17
2	6	10	
3	7	11	





Saginaw Bay Herpetological Assessment - Phase II

Map 14 - Area E: Map depicting total amphibian and reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

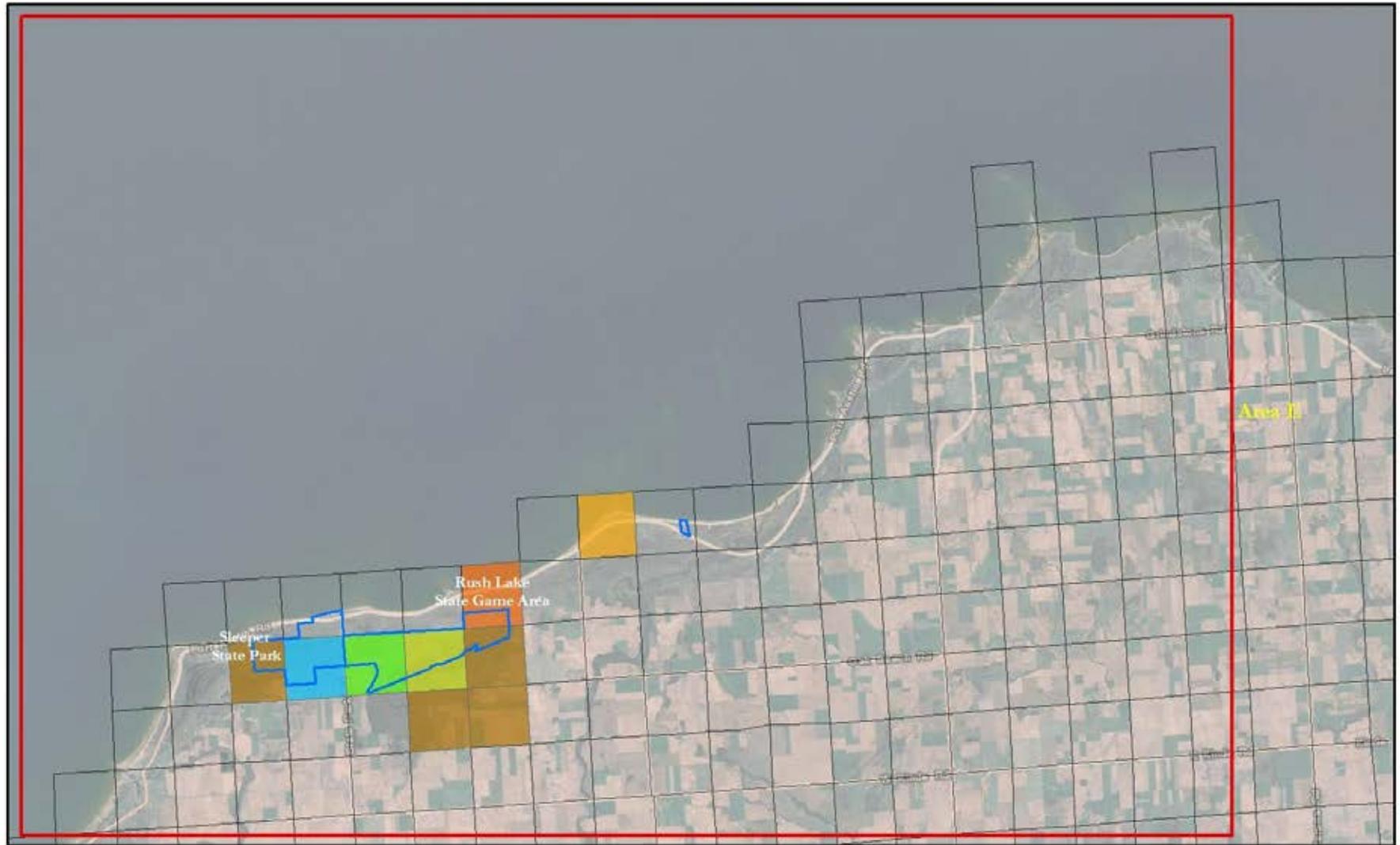


Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

	Site Boundary						
	Not Surveyed						
Herpetofauna Species Observed							
	0		4		8		12
	1		5		9		17
	2		6		10		
	3		7		11		





Saginaw Bay Herpetological Assessment - Phase II

Map 15 - Area E: Map depicting total amphibian species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

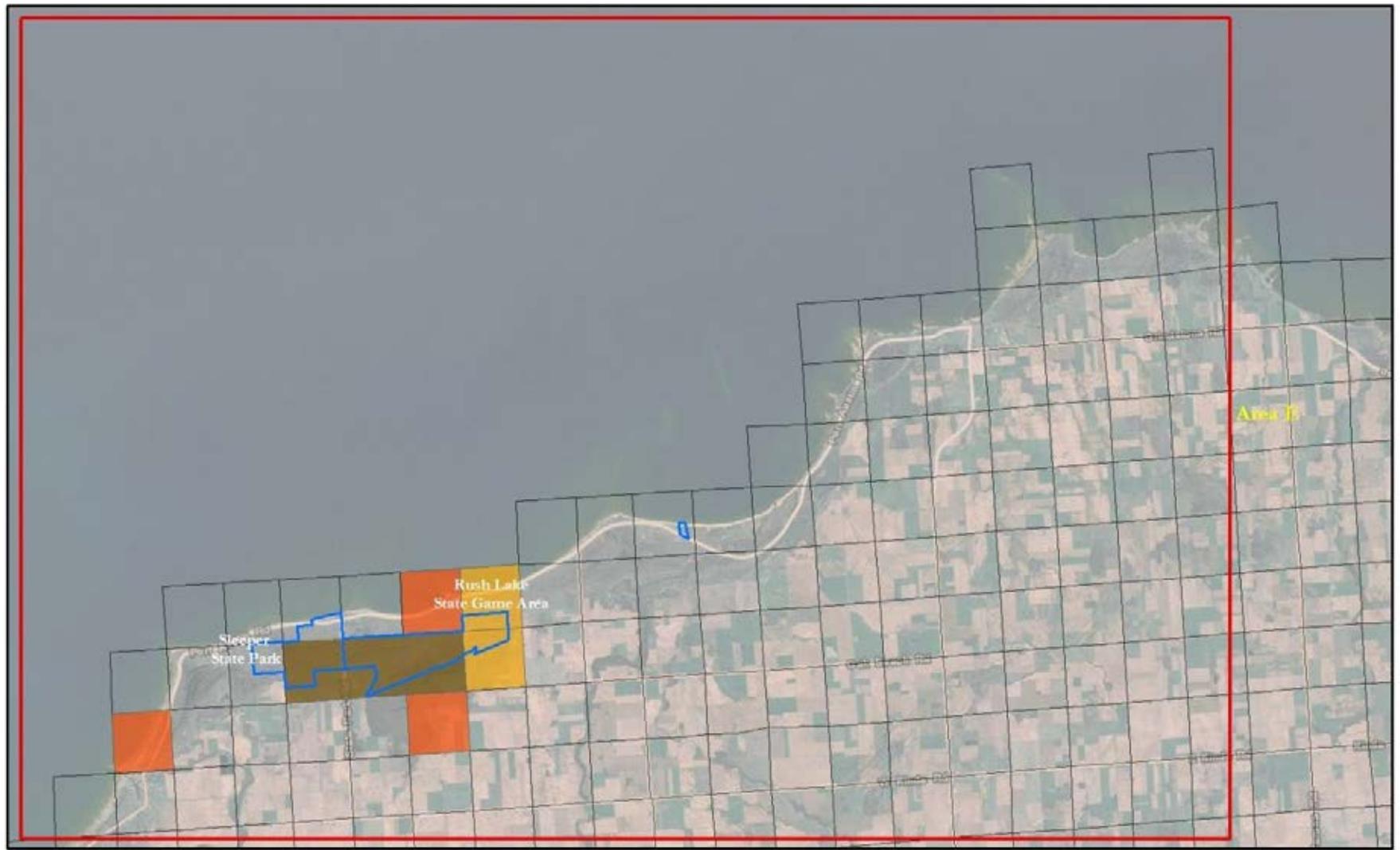
Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Not Surveyed

Herpetofauna Species Observed

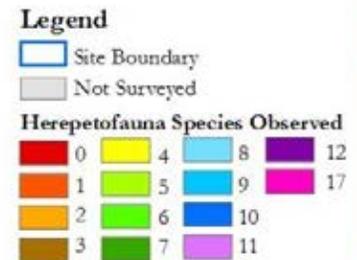


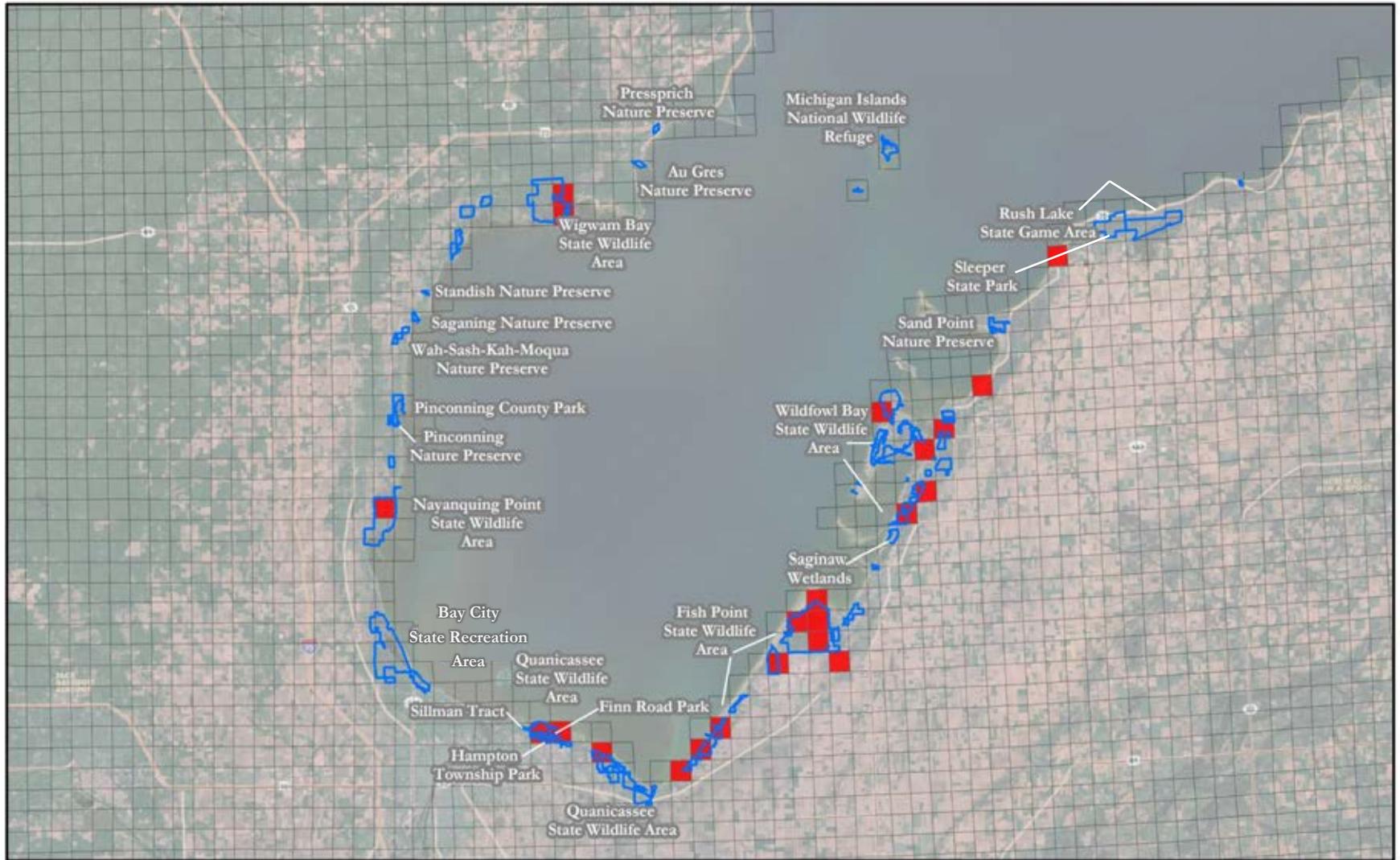


Saginaw Bay Herpetological Assessment - Phase II
 Map 16 - Area E: Map depicting total reptile species by section within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.





Saginaw Bay Herpetological Assessment - Phase II

Map 17 – Observed distribution of Blanding’s Turtle (*Emydoidea blandingii*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



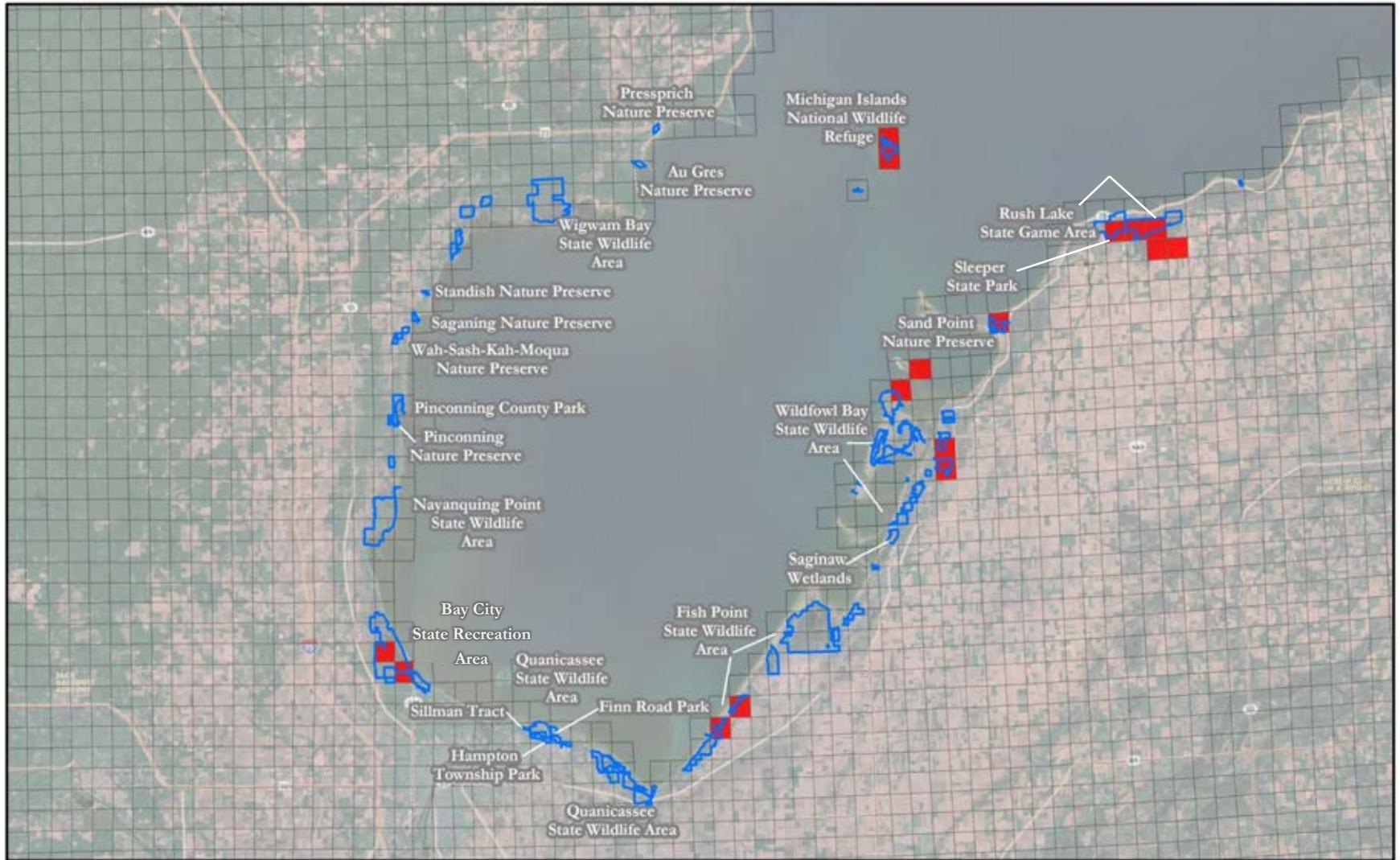
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Blanding's Turtle Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 18 – Observed distribution of Blue-Spotted Salamander (*Ambystoma laterale*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



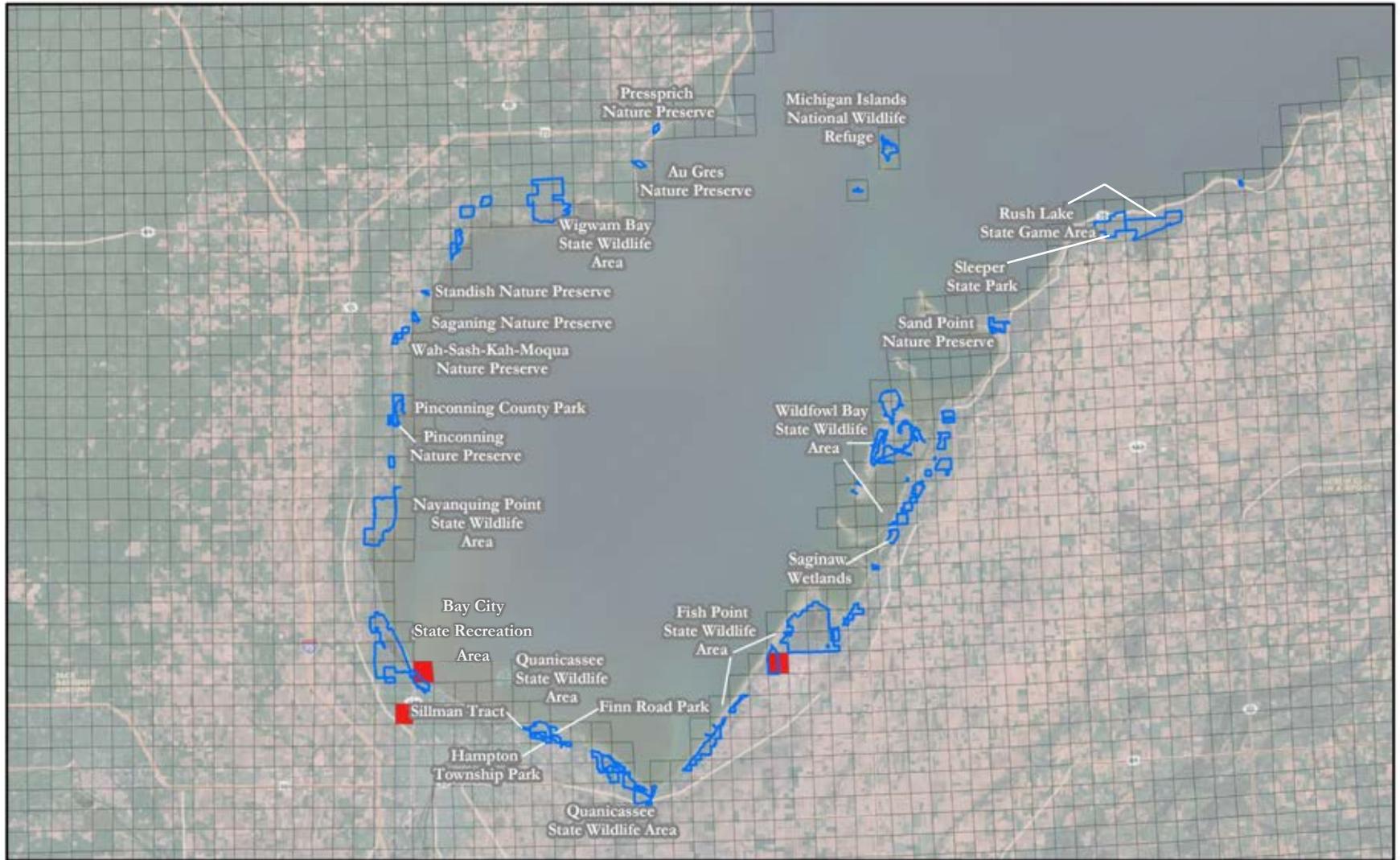
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Blue-spotted Salamander Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 19 – Observed distribution of Bullfrog (*Rana catesbeiana*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



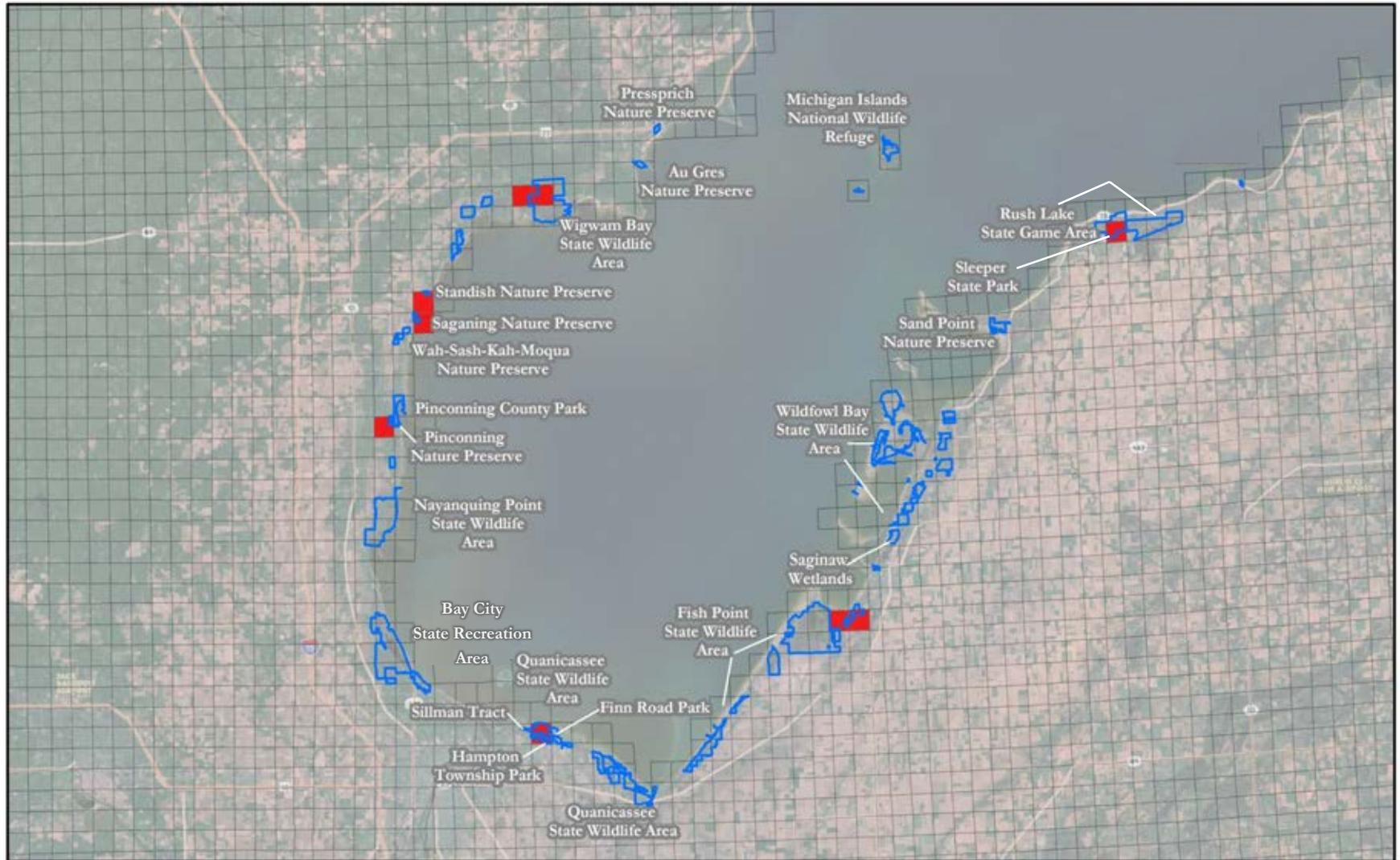
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

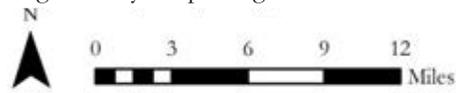
- Site Boundary
- Bullfrog Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 20 – Observed distribution of Butler’s Garter Snake (*Thamnophis butleri*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



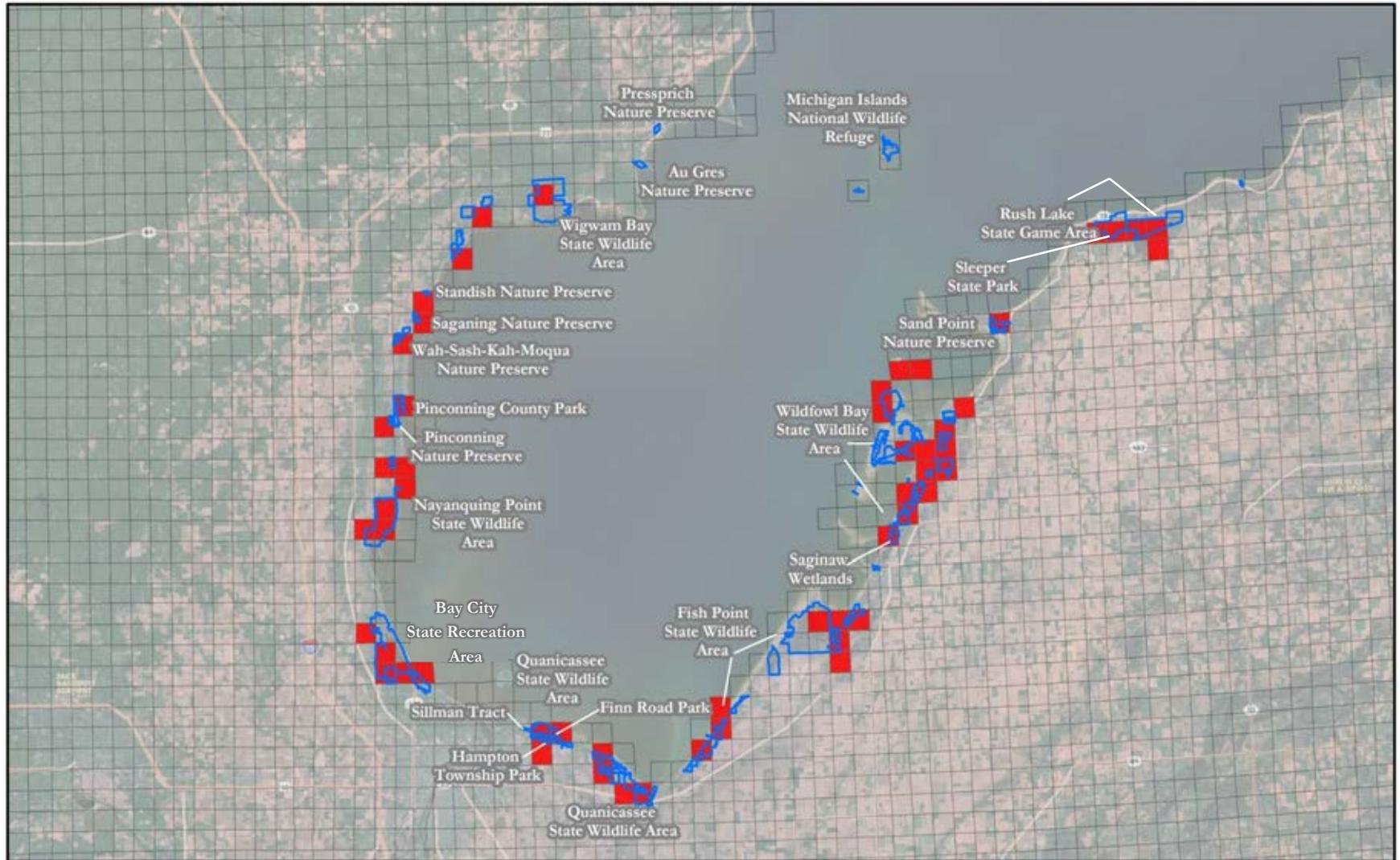
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Butler's Garter Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 21 – Observed distribution of Eastern American Toad (*Bufo americanus americanus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



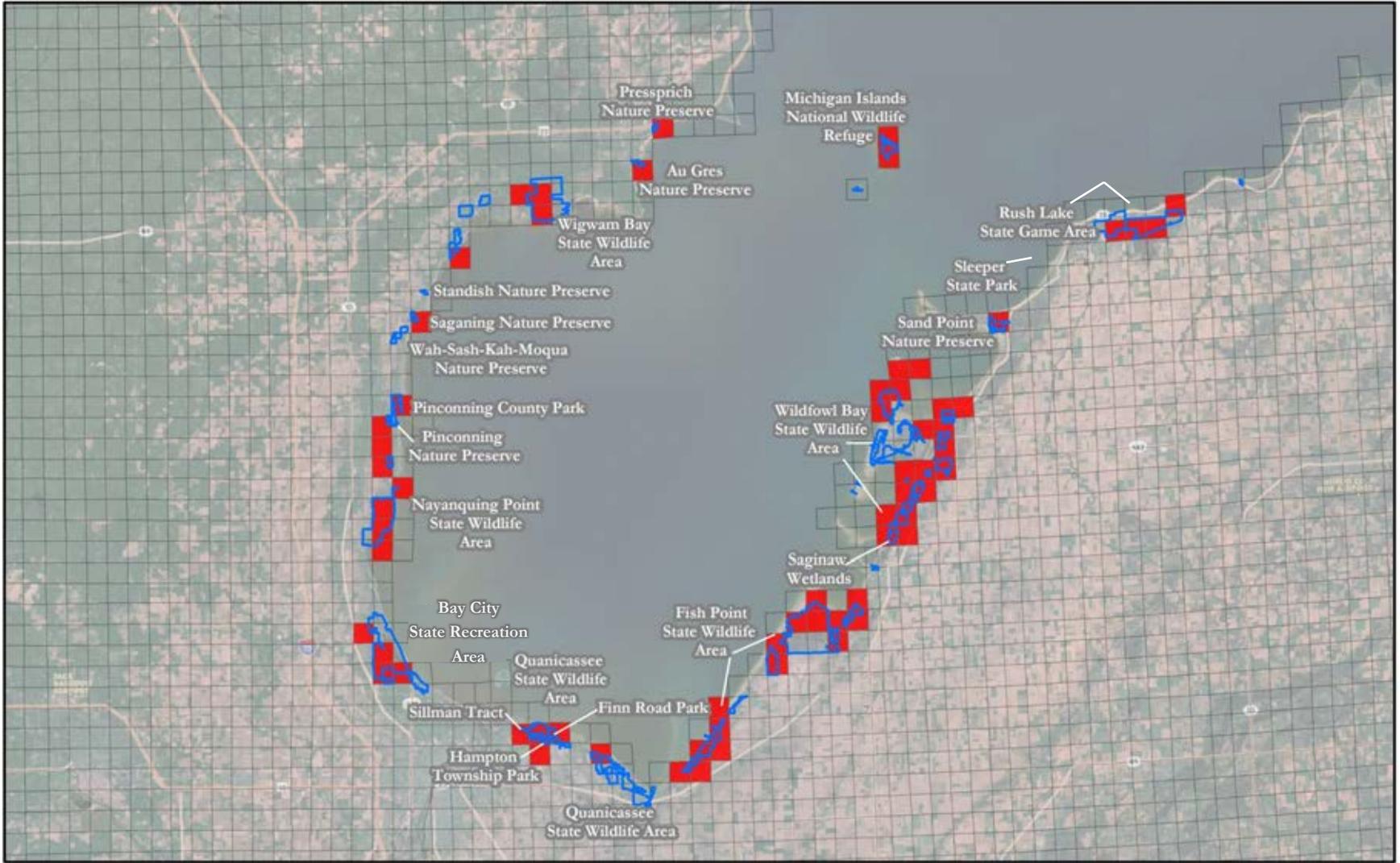
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

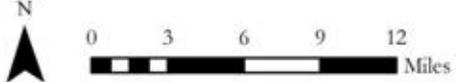
- Site Boundary
- Eastern American Toad Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 22 – Observed distribution of Eastern Garter Snake (*Thamnophis sirtalis sirtalis*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

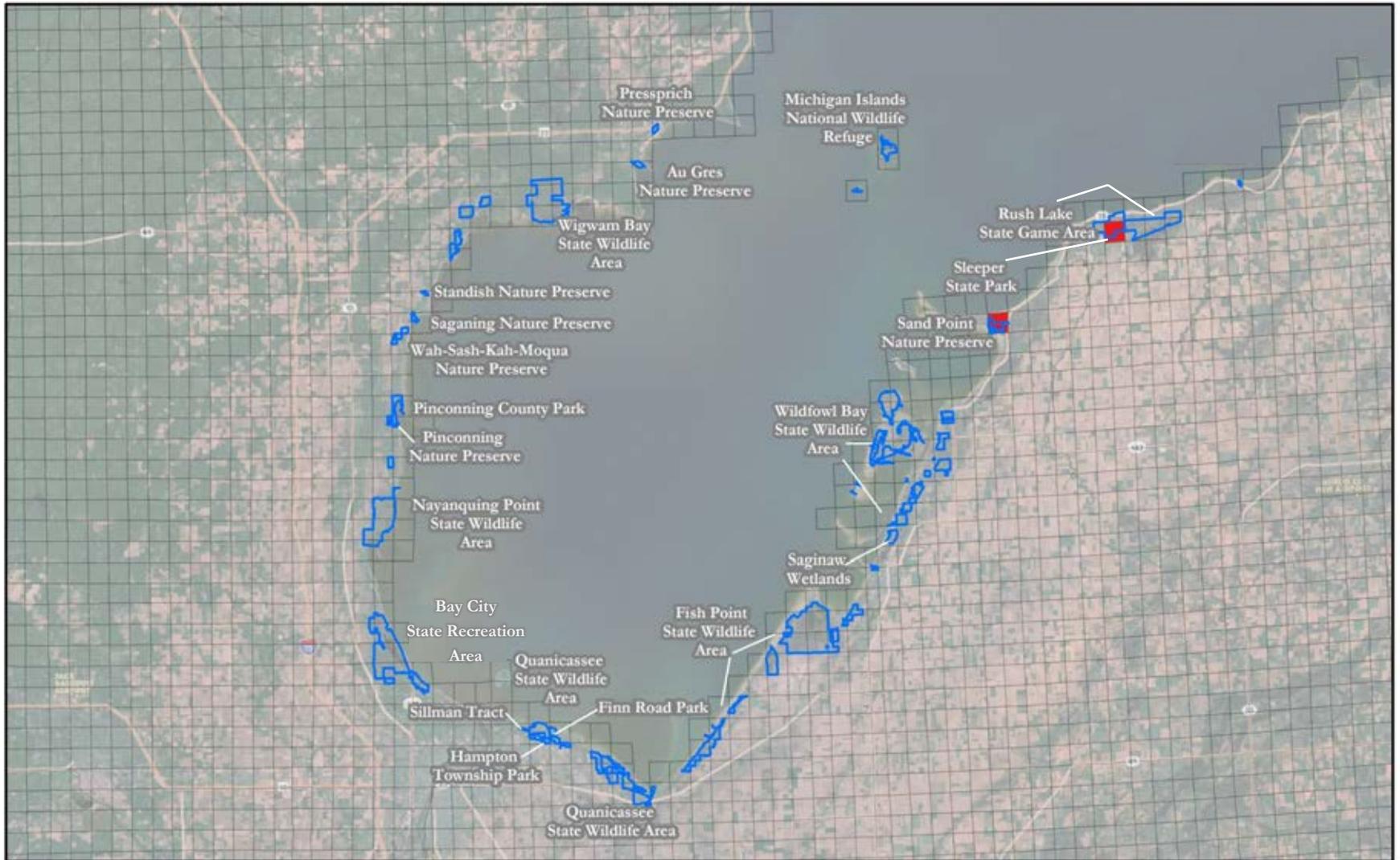


Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Eastern Garter Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 23 – Observed distribution of Eastern Newt (*Notophthalmus viridescens viridescens*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



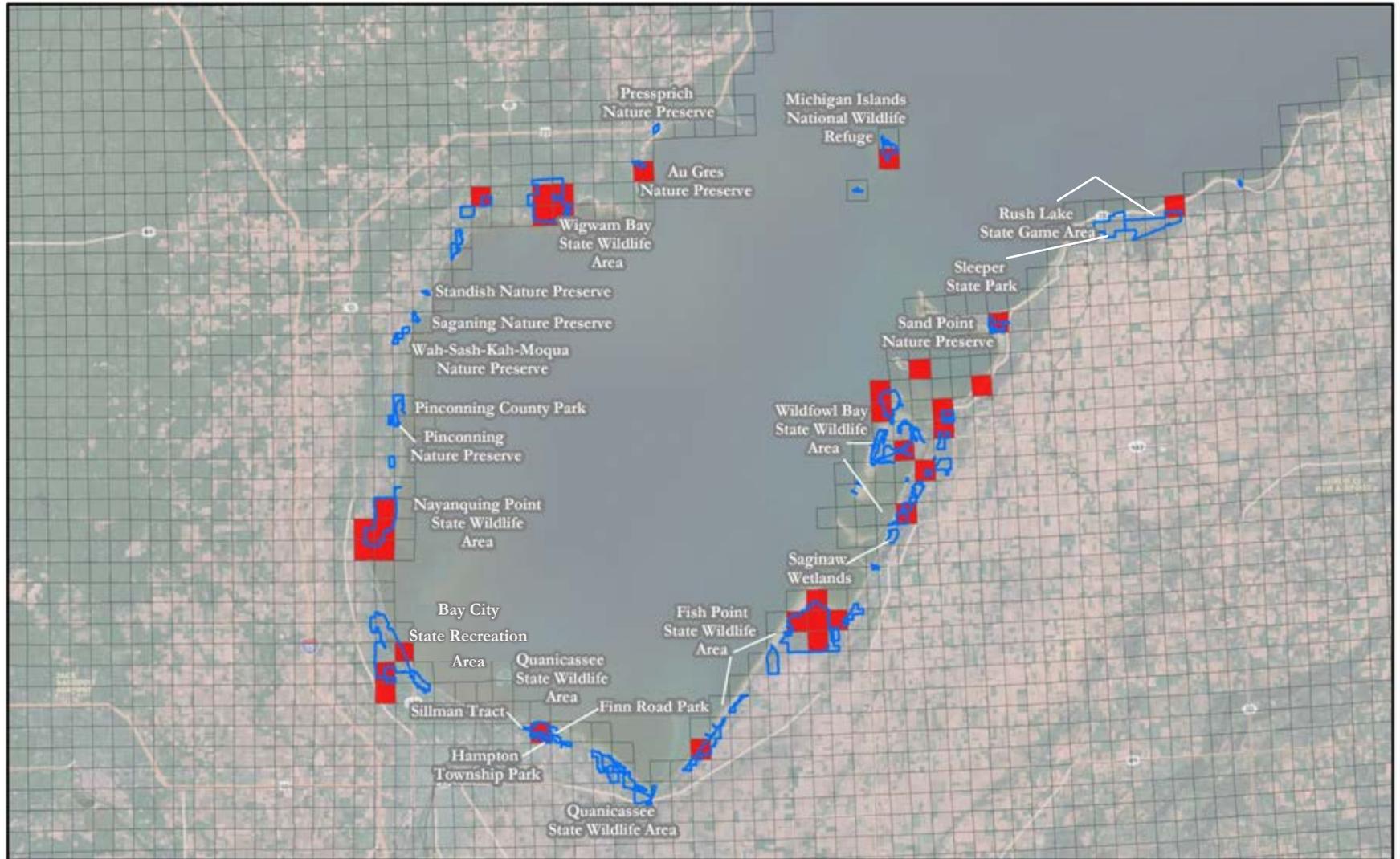
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Eastern Newt Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 24 – Observed distribution of Eastern Snapping Turtle (*Chelydra serpentina serpentina*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



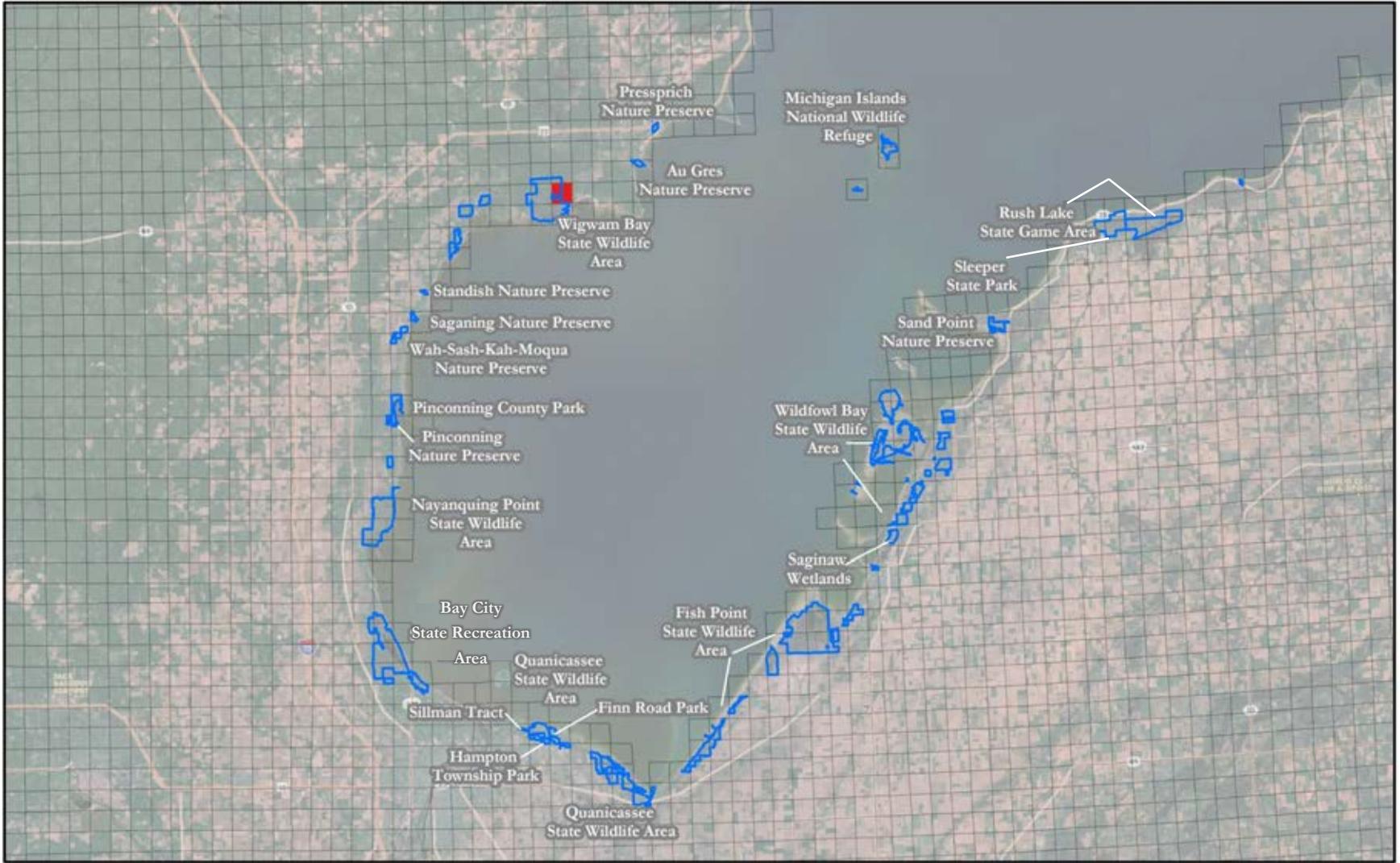
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Eastern Snapping Turtle Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 25 – Observed distribution of Eastern Spiny Softshell Turtle (*Apalone spinifera spinifera*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.

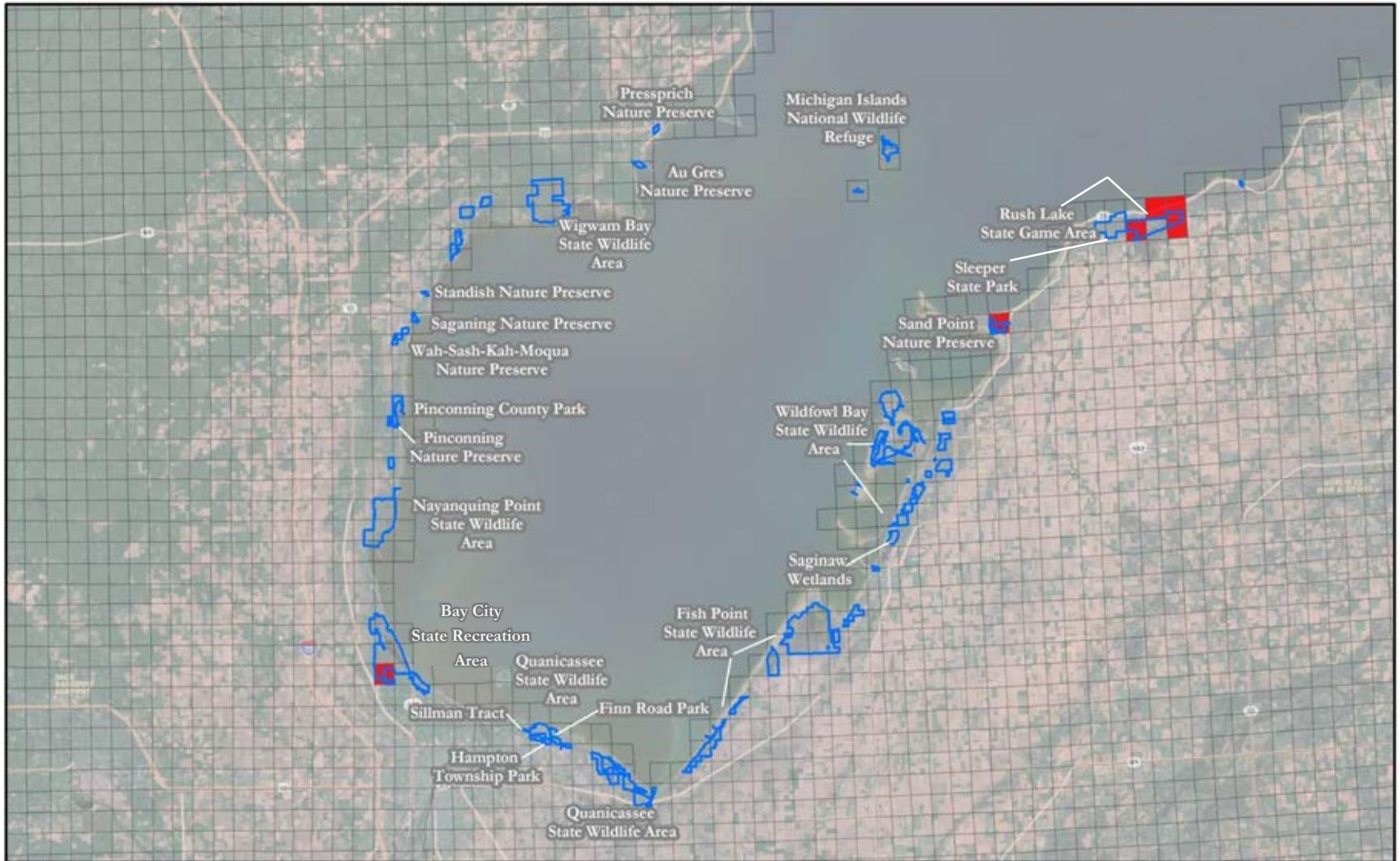


Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library
 Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Eastern Spiny Softshell Turtle Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 26 – Observed distribution of Five-lined Skink (*Eumeces fasciatus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



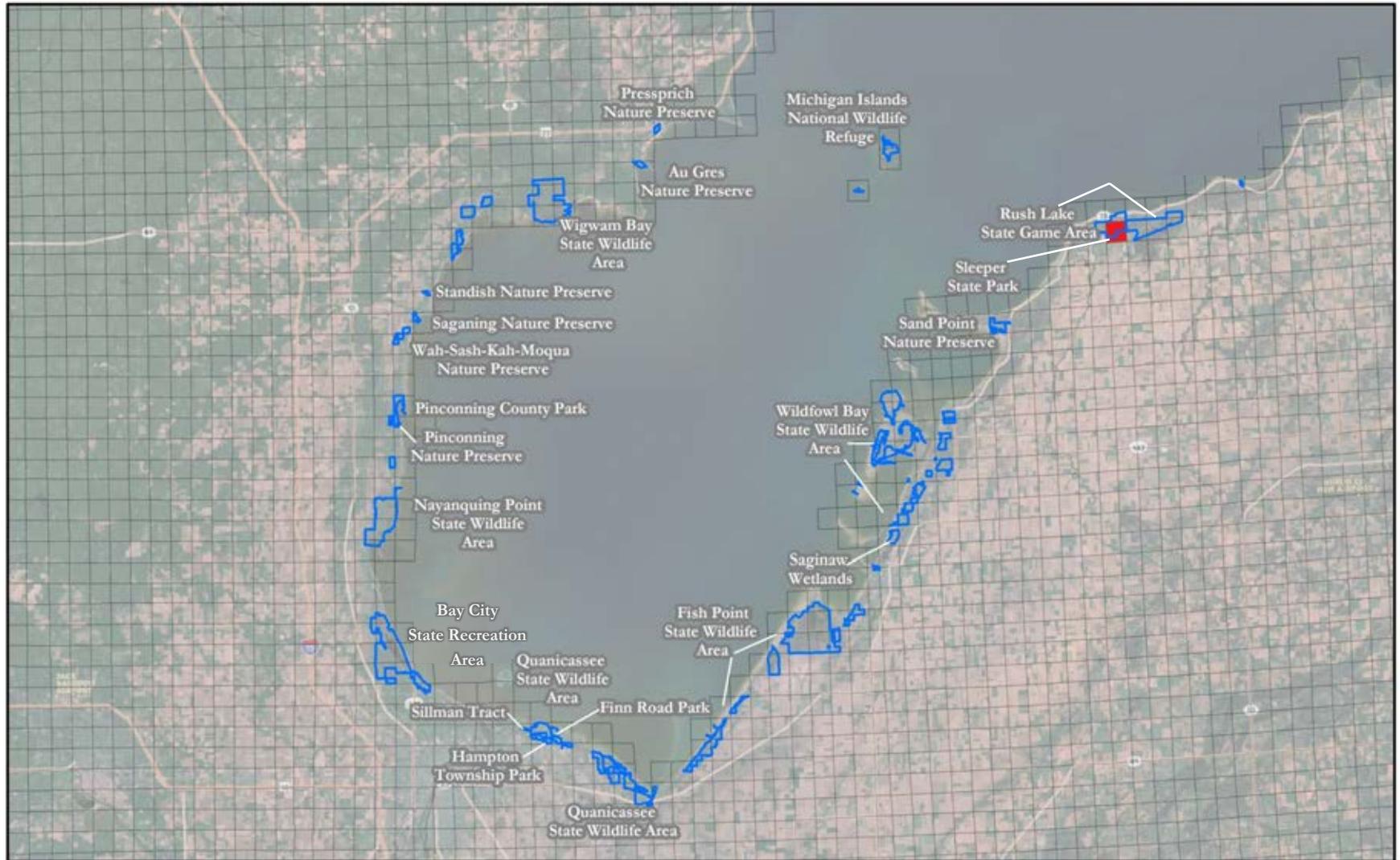
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

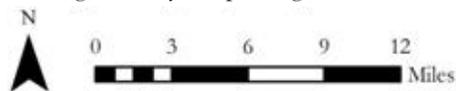
- Site Boundary
- Five-lined Skink Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 27 – Observed distribution of Four-toed Salamander (*Hemidactylum scutatum*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

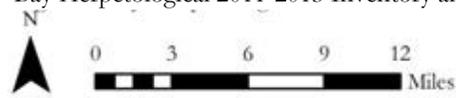
- Site Boundary
- Four-toed Salamander Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 28 – Observed distribution of Gray Treefrog (*Hyla versicolor*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



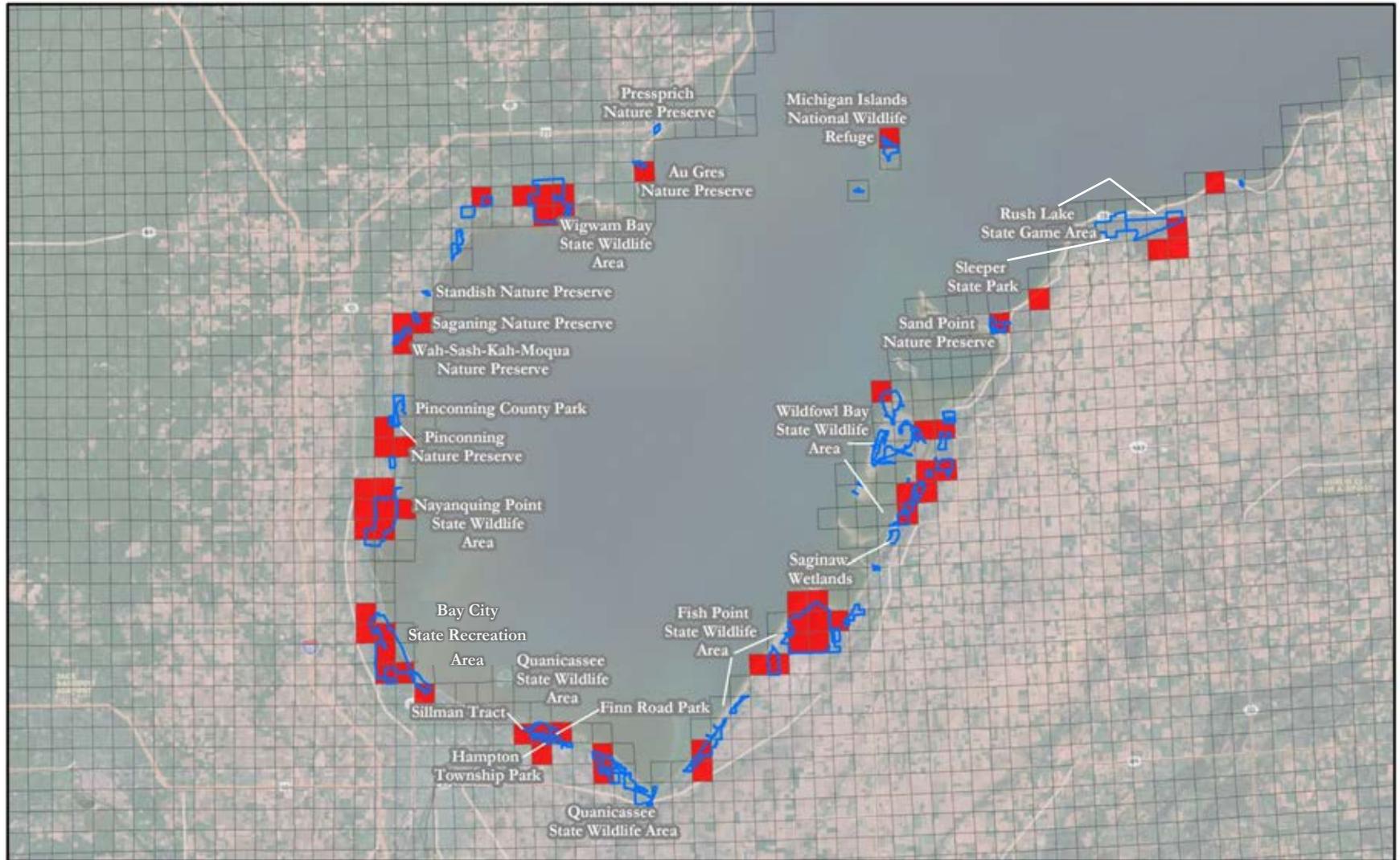
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

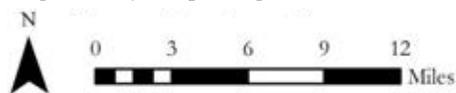
- Site Boundary
- Gray Treefrog Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 29 – Observed distribution of Green Frog (*Rana clamitans melanota*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



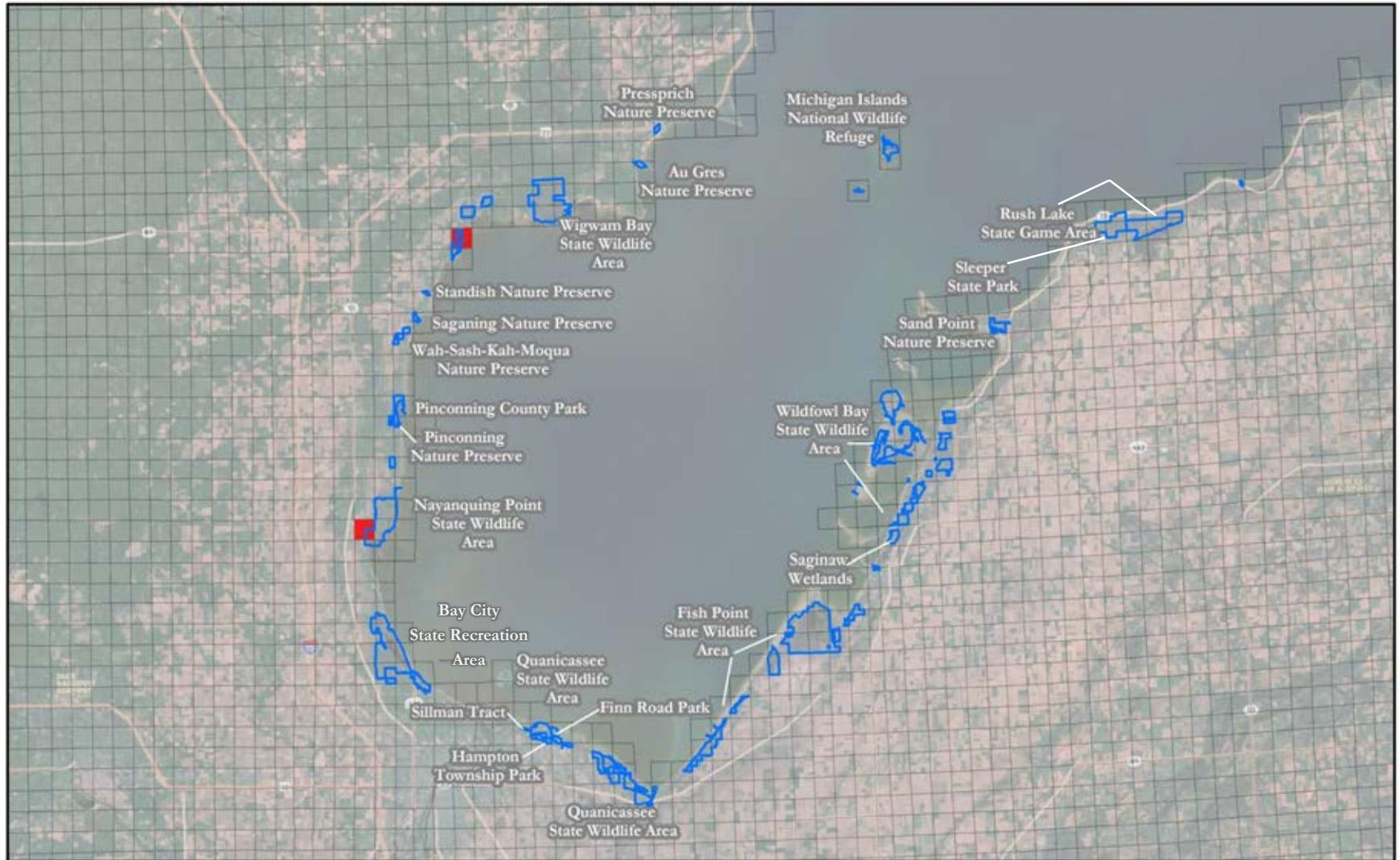
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

-  Site Boundary
-  Green Frog Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 30 – Observed distribution of Map Turtle (*Graptemys geographica*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



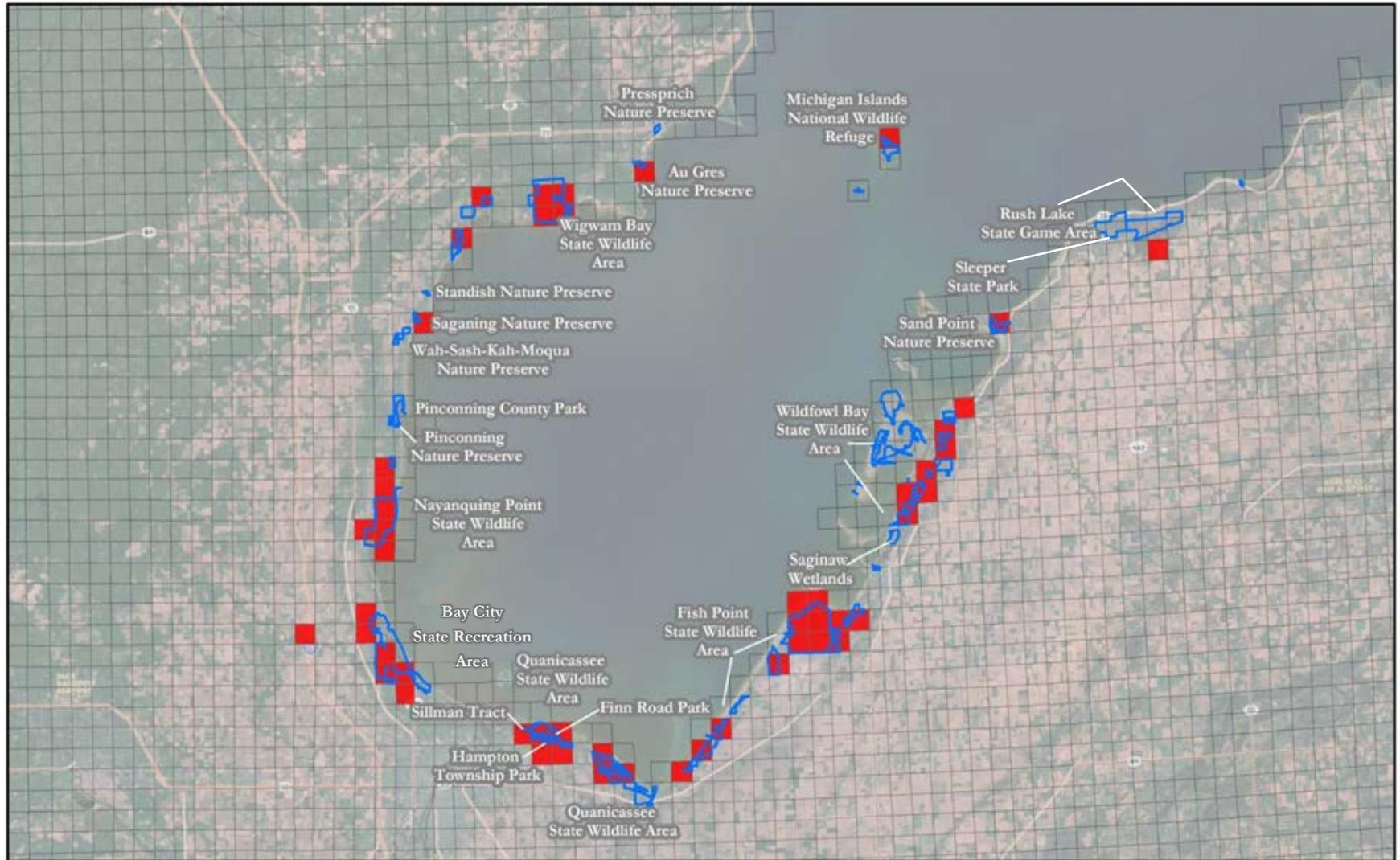
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

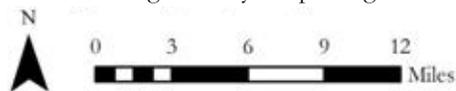
- Site Boundary
- Map Turtle Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 31 – Observed distribution of Midland Painted Turtle (*Chrysemys picta marginata*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



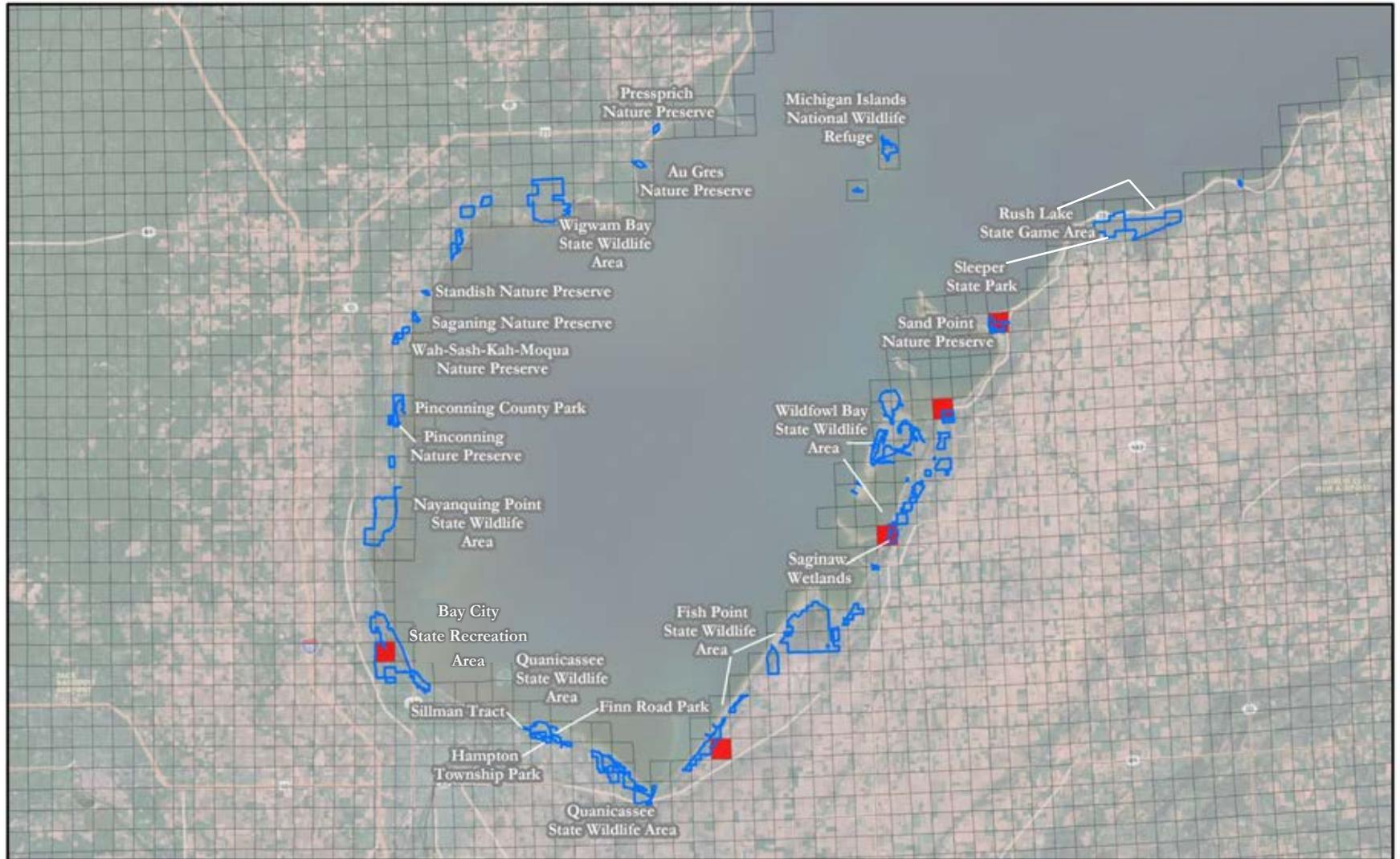
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

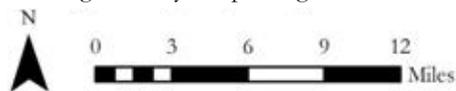
-  Site Boundary
-  Midland Painted Turtle Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 32 – Observed distribution of Northern Brown Snake (*Storeria dekayi dekayi*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



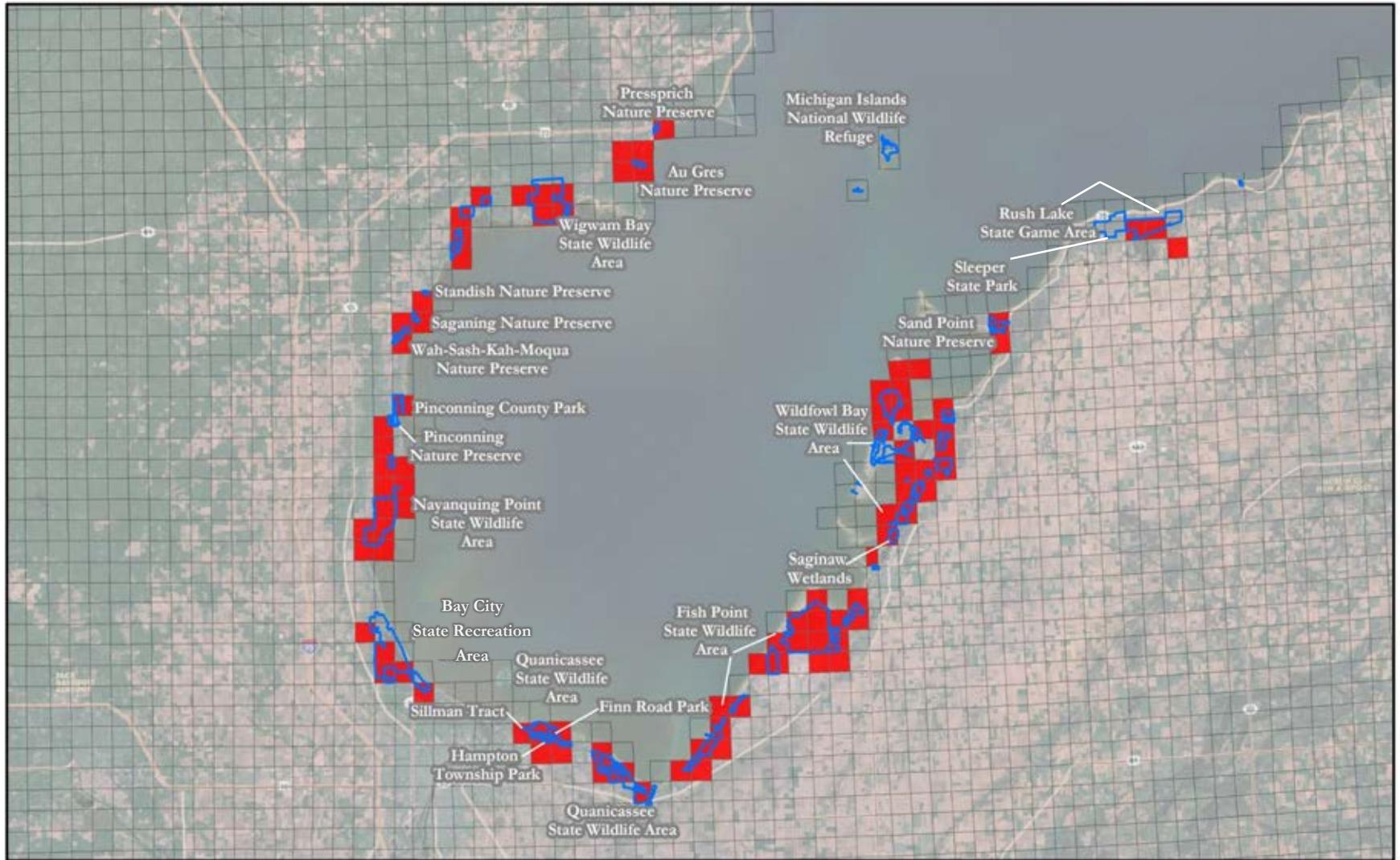
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

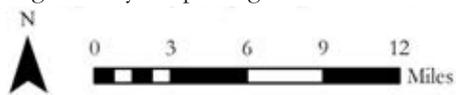
- Site Boundary
- Northern Brown Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 33 – Observed distribution of Northern Leopard Frog (*Rana pipiens*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



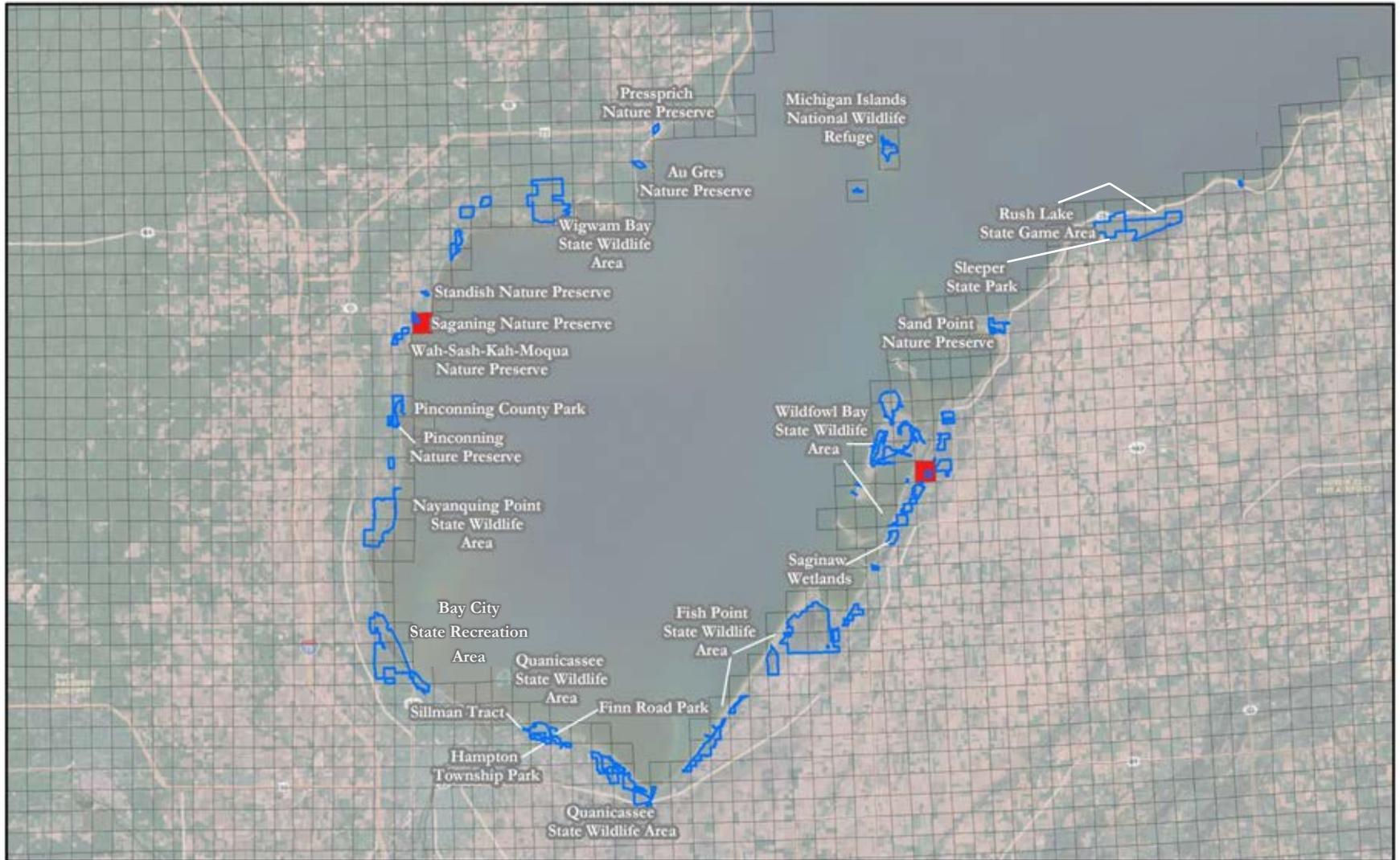
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

-  Site Boundary
-  Northern Leopard Frog Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 34 – Observed distribution of Northern Red-bellied Snake (*Storeria occipitomaculata*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



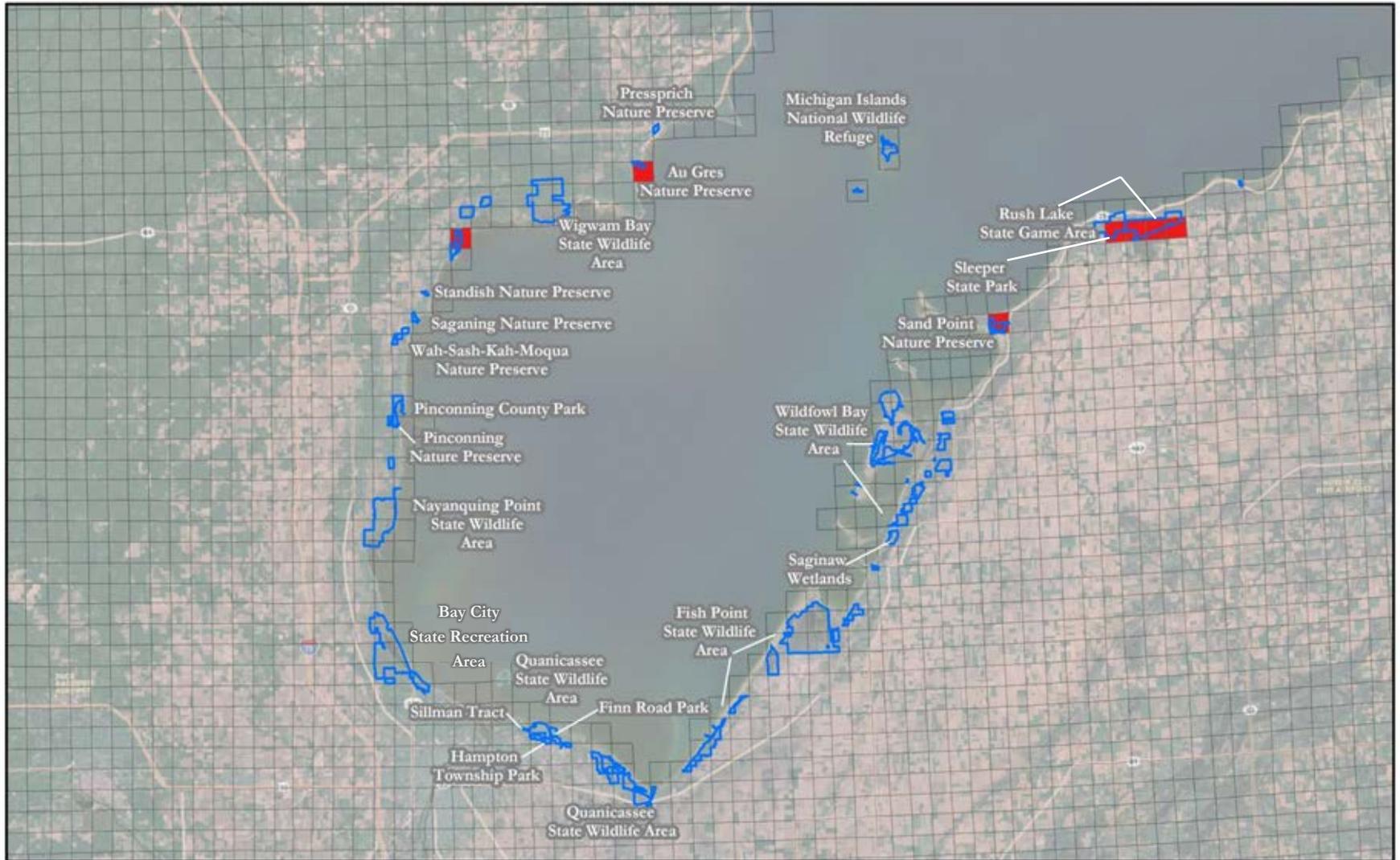
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Northern Red-bellied Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 35 – Observed distribution of Northern Ribbon Snake (*Thamnophis sauritis septentrionalis*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



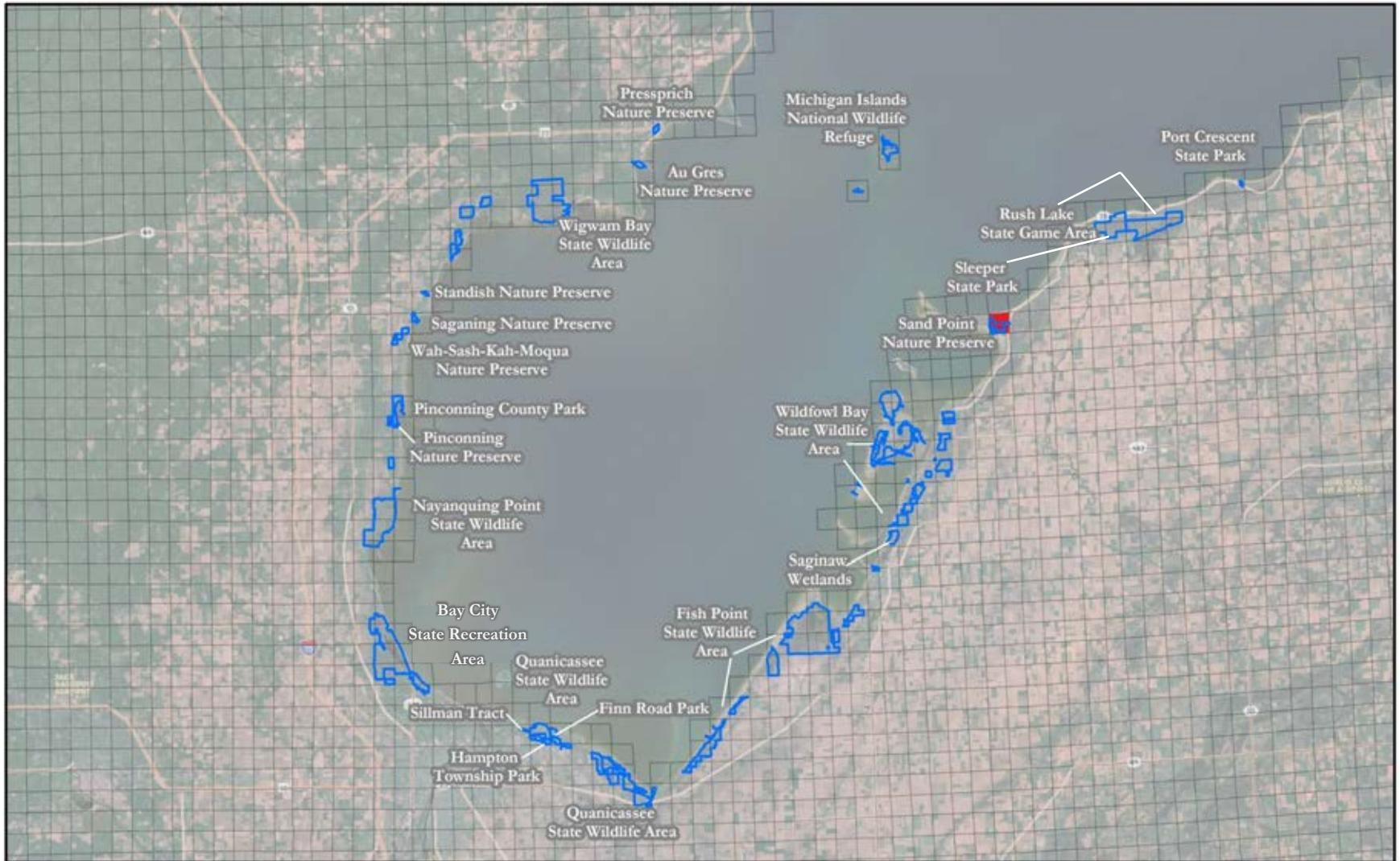
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Northern Ribbon Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 36 – Observed distribution of Northern Ring-necked Snake (*Diadophis punctatus edwardsii*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



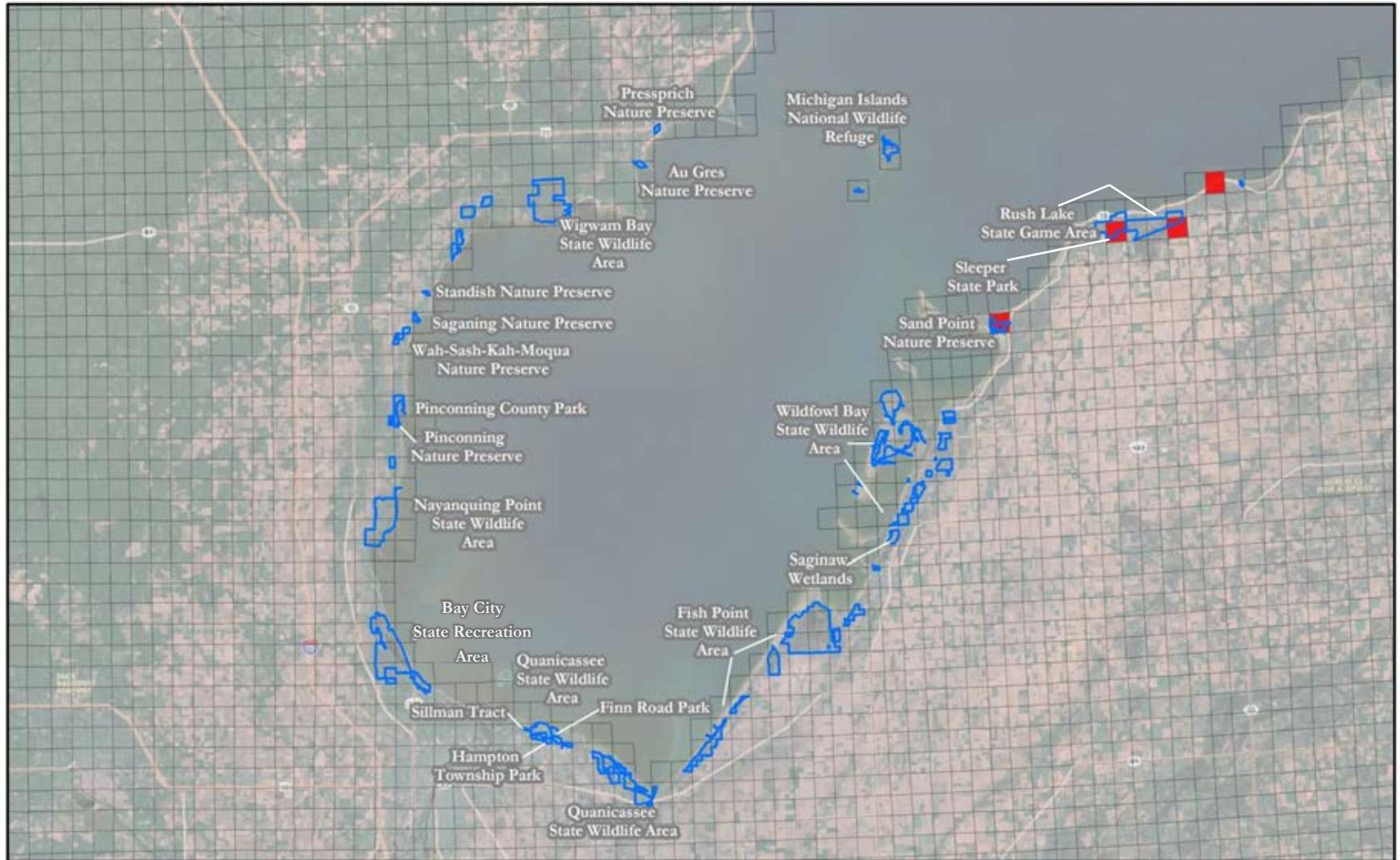
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Northern Ring-necked Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 37 – Observed distribution of Northern Spring Peeper (*Pseudacris crucifer crucifer*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



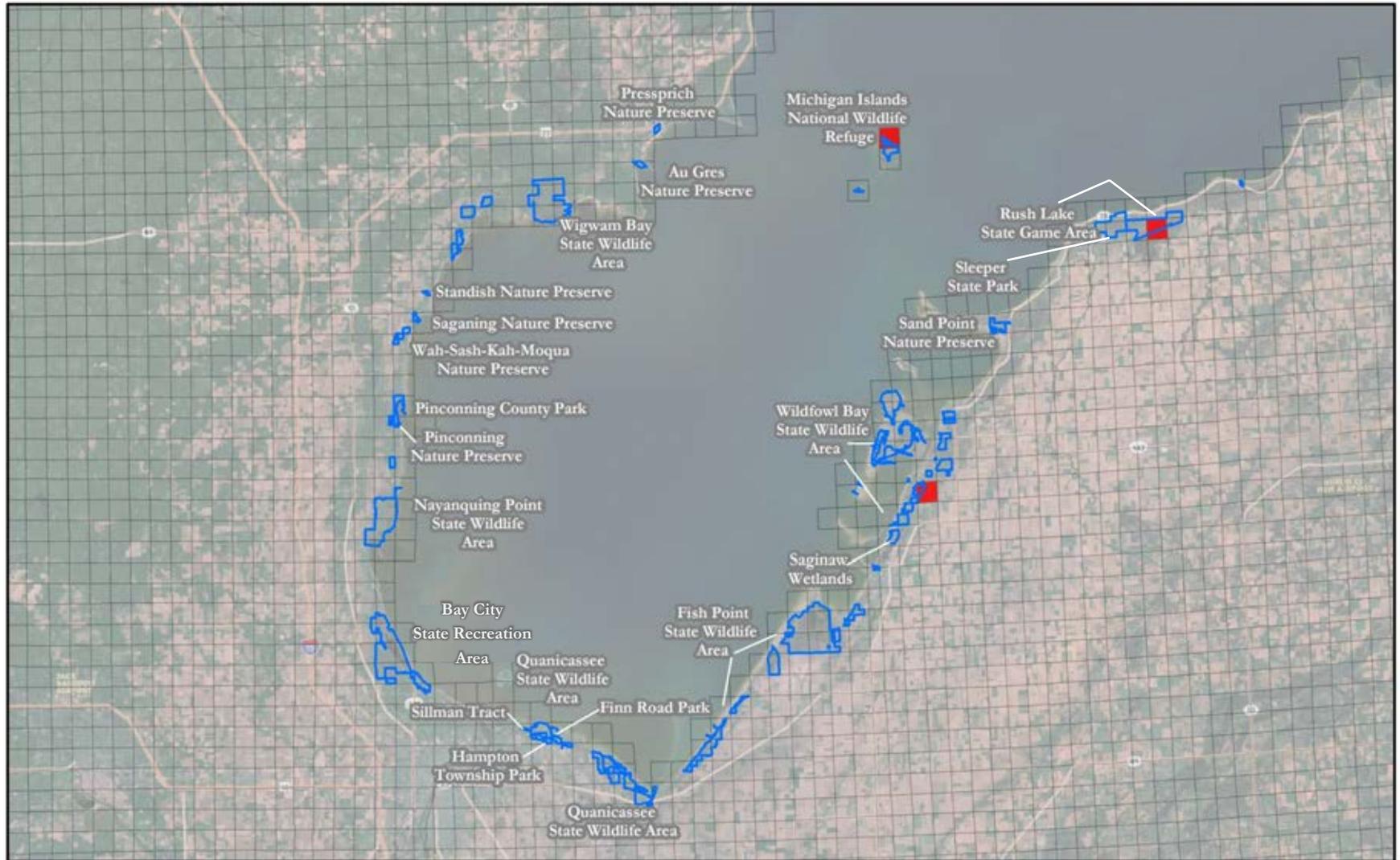
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Northern Spring Peeper Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 38 – Observed distribution of Northern Water Snake (*Nerodia sipedon sipedon*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



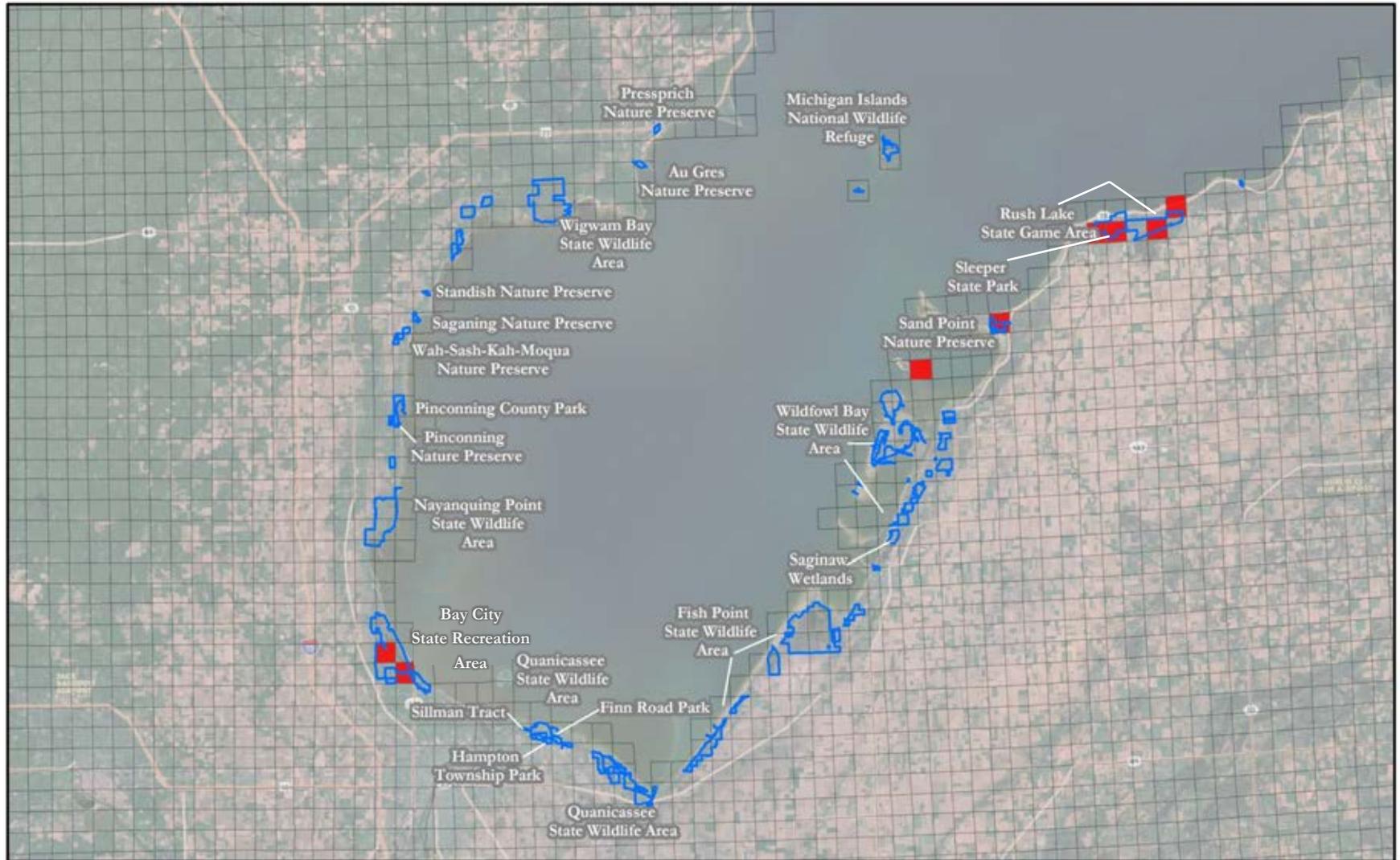
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Northern Water Snake Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 39 – Observed distribution of Red-backed Salamander (*Plethodon cinereus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



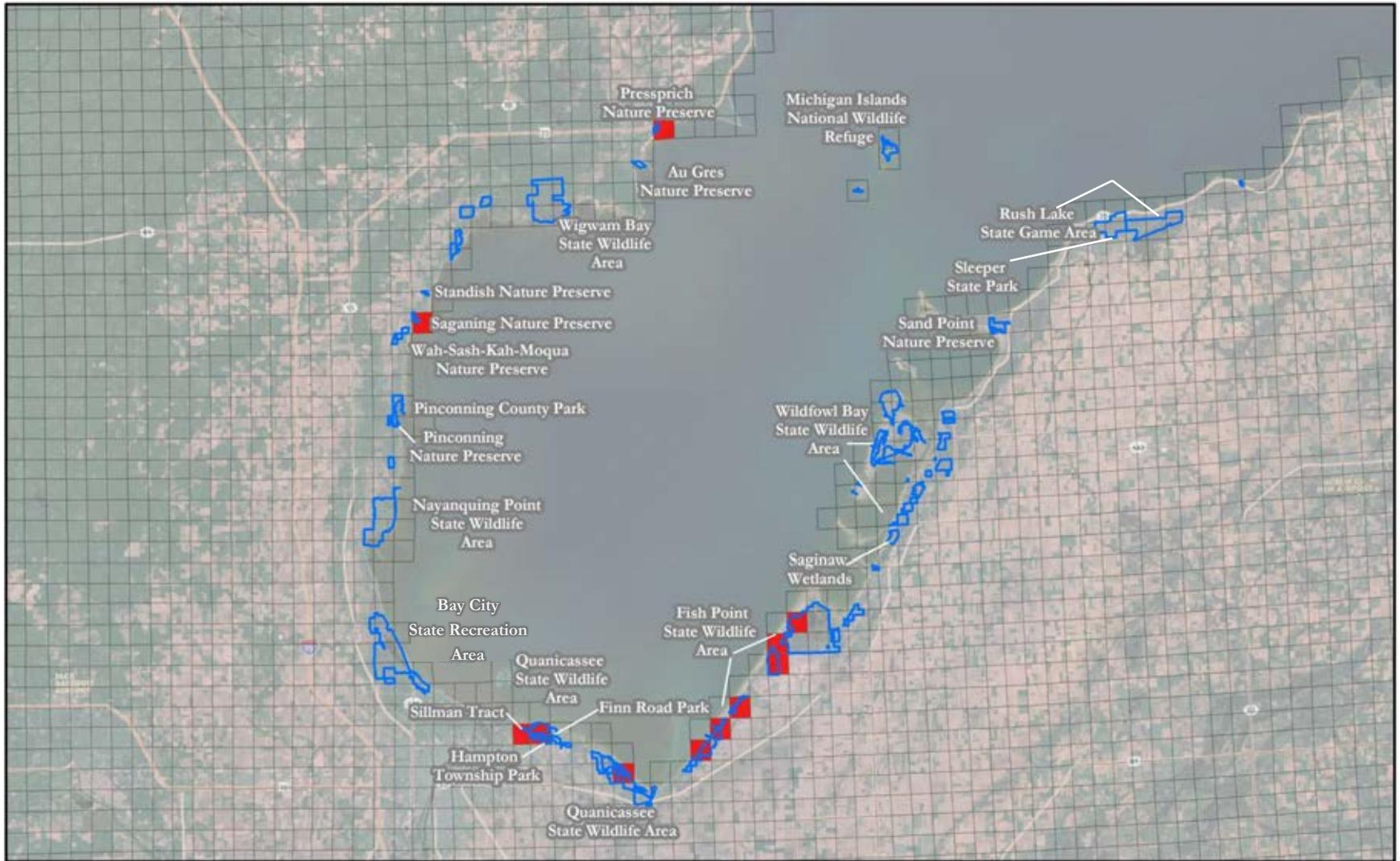
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Red-backed Salamander Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 40 – Observed distribution of Western Chorus Frog (*Pseudacris triseriata triseriata*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



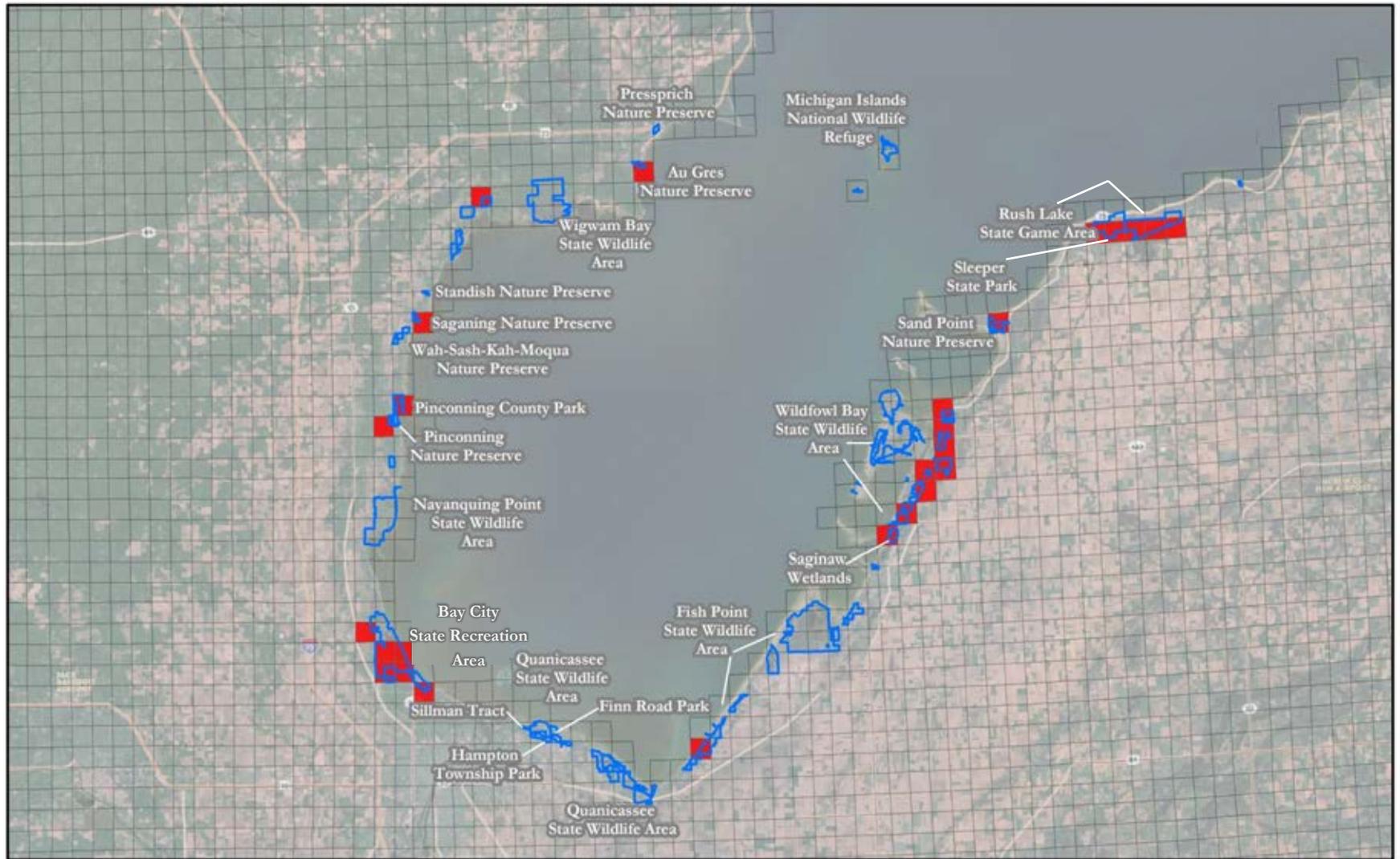
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Western Chorus Frog Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 41 – Observed distribution of Wood Frog (*Rana sylvatica*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



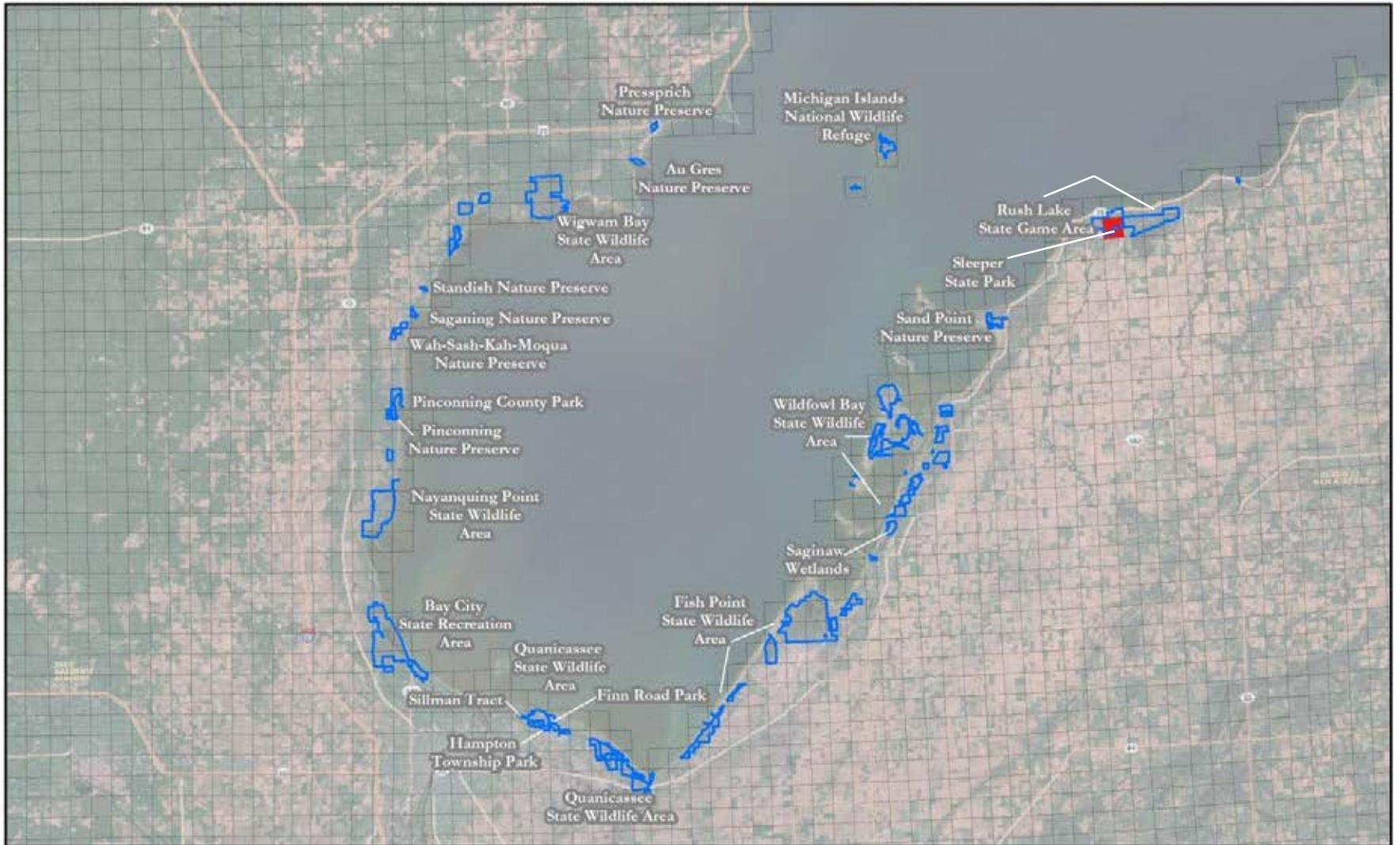
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Wood Frog Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 42 – Observed distribution of Spotted Salamander (*Ambystoma maculatum*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



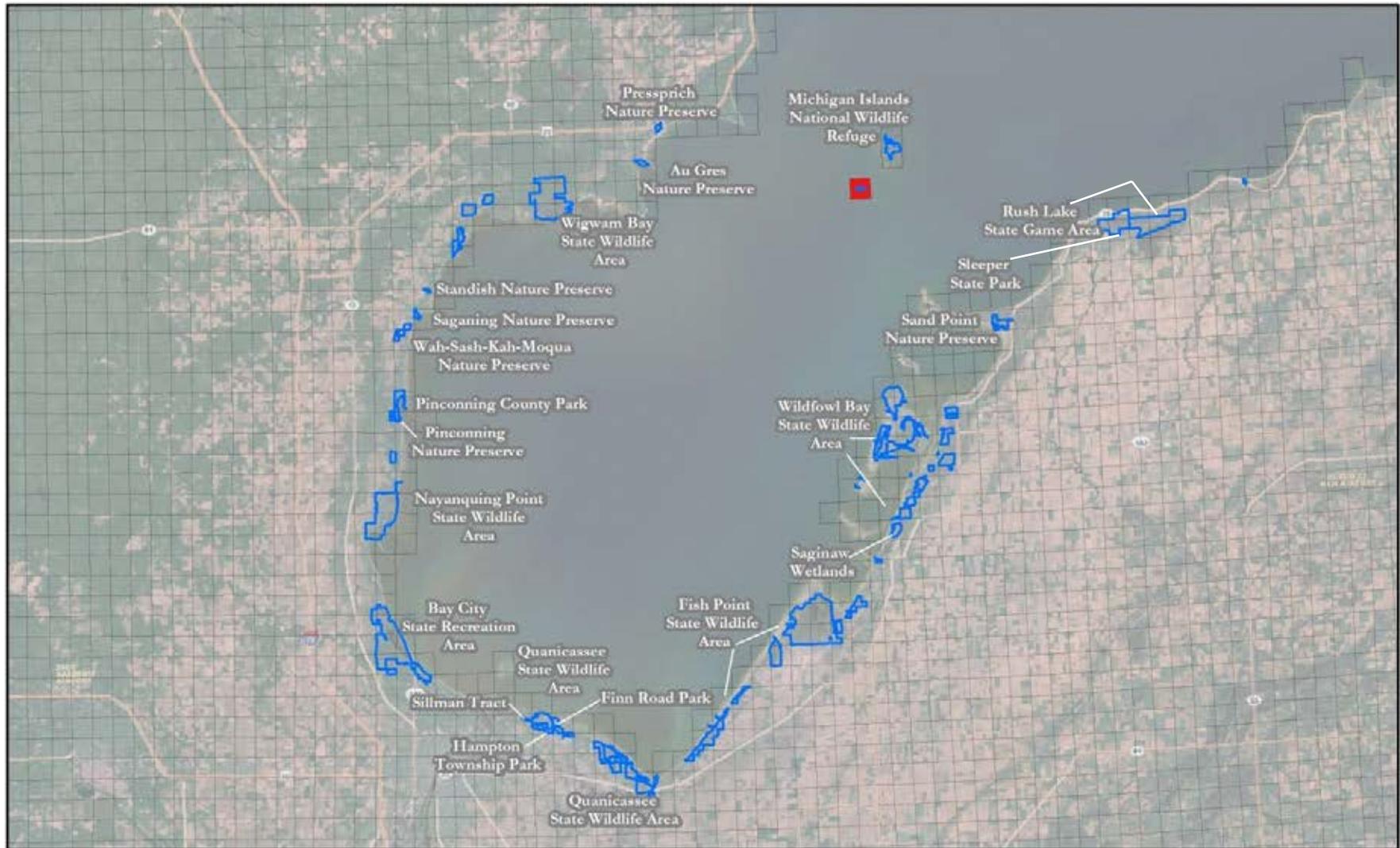
Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

-  Site Boundary
-  Spotted Salamander Observed





Saginaw Bay Herpetological Assessment - Phase II

Map 43 – Observed distribution of Mudpuppy (*Necturus maculosus maculosus*) within the Saginaw Bay Herpetological 2011-2013 Inventory and Assessment Area.



Data Source: ESRI Data Library, MCGI Data Library, HRM GIS Data Library

Note: This information is illustrated for general reference purposes only. Boundaries are not official.

Legend

- Site Boundary
- Mudpuppy Observed



Photos



Photo 1. A field biologist turning dead woody materials.



Photo 2. *Phragmites australis* dominated coastal marsh at Au Gres Delta Nature Preserve.



Photo 3. The Pinconning River provides potential habitat for several turtle and snake species at Pinconning Nature Preserve.



Photo 4. Coastal marsh remains at Saganing Preserve where *Phragmites* is beginning to encroach.



Photo 5. A gravid female Red-spotted Newt (*N. viridescens*) caught in large, shallow pond at Sand Point Nature Preserve.



Photo 6. A Northern Spring Peeper (*P. c. crucifer*) in shallow pond at Sand Point Nature Preserve.



Photo 7. A very colorful Eastern Garter Snake (*T. s. sirtalis*) basking on the trail at Sand Point Nature Preserve.



Photo 8. A Northern Ribbon Snake (*T. sauritus septentrionalis*) near woodland pond at Sand Point Nature Preserve.



Photo 9. A juvenile Five-lined Skink (*P. fasciatus*) found under a log near lake at Sand Point Nature Preserve.



Photo 10. A Midland Painted Turtle (*C. picta marginata*) at Sand Point Nature Preserve.



Photo 11. A large, very shallow pond that supports a wide diversity of herpetofauna, including Red-spotted Newts (*N. viridescens*) at Sand Point Nature Preserve. Common Reed (*Phragmites australis*), is beginning to invade at one end at Sand Point Nature Preserve.



Photo 12. Upland woods that support Five-lined Skinks (*P. fasciatus*) and Northern Ring-necked Snakes (*D. punctatus edwardsii*) at Sand Point Nature Preserve.



Photo 13. A ditch along the road at Standish Nature Preserve. There are ditches on several sides of the Preserve provide amphibian habitat.



Photo 14. A swamp forest at Standish Nature Preserve. This swamp may have too little adjacent upland to support salamanders.



Photo 15. A Northern Leopard Frog (*R. pipiens*) at Finn Road Park.



Photo 16. A ditch that supports amphibians in an extensive power line cut at Finn Road Park.



Photo 17. A Blue-spotted Salamander (*A. laterale*) found under a log on Charity Island.



Photo 18. Forested uplands on Charity Island. Most of Charity Island is forested uplands which support Blue-spotted Salamanders (*A. laterale*).



Photo 19. A Northern Green Frog (*R. clamitans melanota*) in the only pond on Charity Island.



Photo 20. An Eastern Garter Snake (*T. s. sirtalis*) basking on riprap on Charity Island.



Photo 21. Three male Northern Water Snakes (*N. s. sipedon*) in pursuit of a female on Charity Island.



Photo 22. Privately-owned riprap on Charity Island. This structure supports a large number of Northern Water Snakes (*N. s. sipedon*) and Eastern Garter Snakes (*T. s. sirtalis*).



Photo 23. The only pond on Charity Island. This pond is home to Midland Painted Turtles (*C. p. marginata*) and Northern Green Frogs (*C. clamitans melanota*).



Photo 24. Large millipedes (*Narceus sp.*) on Charity Island. These millipedes were incredibly abundant under fallen logs and may outcompete salamanders for habitat on Charity Island.



Photo 25. High-quality fen habitat at Saginaw Wetland.



Photo 26. Coastal marsh at Quanicassee State Wildlife Area. Much of the coastal marsh at Quanicassee has been invaded by *Phragmites*.



Photo 27. A Butler's Garter Snake (*T. butleri*) observed along trail at Wigwam Bay State Wildlife Area east unit.



Photo 28. Blanding's Turtle (*E. blandingii*) eggs eaten by predator at Wigwam Bay State Wildlife Area east unit.



Photo 29. Forest at Wigwam Bay State Wildlife Area.



Photo 30. A diked canal at Wigwam Bay east unit. These canals are excellent turtle habitat.



Photo 31. An Eastern American Toad (*B. a. americanus*) in a ditch at Wildfowl Bay State Wildlife Area.



Photo 32. A Northern Brown Snake (*S. d. dekayi*) inside a rotting log at Wildfowl Bay State Wildlife Area.



Photo 33. A gravid female Northern Red-bellied Snake (*S. o. occipitamaculata*) found basking in a high spot in the coastal marsh at Wildfowl Bay State Wildlife Area.



Photo 34. A road-killed Blanding's Turtles (*E. blandingii*) at Wildfowl Bay State Wildlife Area. This sight is common.



Photo 35. A juvenile Blanding's Turtle (*E. blandingii*) found in the coastal marsh at Wildfowl Bay State Wildlife Area.



Photo 36. A small patch of open coastal marsh at Wildfowl Bay State Wildlife Area. The juvenile Blanding's Turtle in Photo 35 was found in this small patch of open coastal marsh surrounded by *Phragmites*.



Photo 37. A swamp forest where many Wood Frog (*R. sylvatica*) metamorphs were found at Wildfowl Bay State Wildlife Area.



Photo 38. A Blanding's Turtle (*E. blandingii*).



Photo 39. An Eastern Snapping Turtle (*C. s. serpentina*).



Photo 40. A Mudpuppy (*N. m. maculosus*).



Photo 41. An Eastern Fox Snake (*E. gloydi*)



Photo 42. An extensive fieldstone pile in the southeast corner of Fish Point in 2012.



Photo 43. Flooded shrub area east of the upland area on the west side of Fish Point in 2012.



Photo 44. Fish Point in 2012.



Photo 45. Dune ridge at Fish Point in 2012.



Photo 46. Marsh area where Blanding's Turtle was observed at Fish Point in 2012.



Photo 47. Cattail marsh at Nyanqing Wildlife Refuge in 2012.



Photo 48. Conditions at a field used by waterfowl at Nyanqing Wildlife Refuge in 2012.



Photo 49. Dune ridge conditions at Nyanqing Wildlife Refuge in 2012.



Photo 50. Old field dominated by reed canarygrass (*P. arundinacea*) at Nyanqing Wildlife Refuge in 2012.



Photo 51. Eastern American Toad (*B. a. americanus*) larvae observed at Nyanqing Wildlife Refuge in 2012.



Photo 52. Grassy field along western border of diked Prevo Road at Nyanqing Wildlife Refuge in 2012.



Photo 53. Trail and adjacent marsh dominated by common reed (*Phragmites* sp.) at Quanicassee State Wildlife Area in 2012.



Photo 54. Coastal marsh and lake edge conditions at Quanicassee State Wildlife Area in 2012.



Photo 55. Wetland shrub habitat at Rush Lake State Game Area in 2012.



Photo 56. Sedge meadow marsh at Rush Lake State Game Area in 2012.



Photo 57. Lake and marsh edge conditions at Rush Lake State Game Area in 2012.



Photo 58. Crayfish tower observed at Rush Lake State Game Area in 2012.



Photo 59. Northern Water Snake (*N. s. sipedon*) observed at Rush Lake State Game Area in 2012.



Photo 60. Five-lined Skink (*P. fasciatus*) eggs found under a log in Rush Lake State Game Area in 2012.



Photo 61. Open forest conditions at Bay City State Recreation Area in 2012.



Photo 62. Wetland conditions at Bay City State Recreation Area in 2012.



Photo 63. Bullfrog (*R. catesbeiana*) larvae observed at Tobico Marsh in 2012.



Photo 64. Eastern Gray Treefrog (*H. versicolor*) observed at Tobico Marsh in 2012.



Photo 65. Lake edge conditions at Tobico Marsh in 2012. Cattails (*Typha sp.*) are the dominant vegetation.



Photo 66. Wet forest conditions at Tobico Marsh in 2012.



Photo 67. Small island which could potentially be herpetofauna habitat within Small Beaver Road Lake at Tobico Marsh in 2012.



Photo 68. Spotted Salamander (*A. maculatum*) found at Sleeper State Park 2013.



Photo 69. Vernal pool and dune ridge at Sleeper State Park 2013.



Photo 70. Wooded area of Sleeper State Park 2013.



Photo 71. Wooded area on Middle Ground Island 2013.



Photo 72. Open field dominated by tall grasses on Middle Grounds Island 2013.



Photo 73. Dense shrub coverage on Middle Grounds Island 2013.



Photo 74. Coastal area of Middle Grounds Island 2013.



Photo 75. Tall grasses covered much of Middle Grounds Island 2013.



Photo 76. Heisterman Island 2013.



Photo 77. Wooded area of Heisterman Island 2013.



Photo 78. Vernal pool found on Heisterman Island 2013.



Photo 79. Heisterman Island 2013.



Photo 80. A southern portion of Rush Lake 2013.



Photo 81. Vernal pool at Rush Lake 2013.



Photo 82. Marshy field at Rush Lake State Game Area 2013. Field in 2012 was mostly dry.



Photo 83. Birds nesting on Little Charity Island 2013.



Photo 84. Little Charity Island.

Appendix

Herpetofauna Species Summaries

The following summaries are of species that are of the highest conservational concern within the Saginaw Bay watershed. Each definition includes information about the specified herpetofauna including, traits, habitat, and threats.

Blanding's Turtle

In Michigan, the Blanding's Turtle (Photo 38) is listed as a Species of Special Concern. While these turtles are considered threatened and even endangered in the southern portions of their range, they are still locally common in some parts of Michigan, although the species is in decline throughout much of the state. This species requires a mosaic of wetland habitats for their survival. For much of the year, they prefer open water areas with structures such as logs or stumps to bask. Females require well drained soils, usually with southern exposure, for nesting and will travel long distances to locate a suitable nesting location. Because of the variety of habitats this species uses and their propensity to travel during nesting season, Blanding's Turtles are greatly impacted by habitat fragmentation and road mortality. Hibernation occurs within ponds where Blanding's Turtle burrow into the mud below the frost line. Blanding's Turtle has a life span of approximately 80 years, and does not reach sexual maturity until around 15 to 20 years of age. Adults have few natural predators, but hatchling and juvenile turtles suffer very high mortality rates due to predation. Annual nest predation by predators, especially raccoons, is often 100%. For this reason, it may take one adult female decades to produce enough turtles to replace herself and her mate, and thus maintain a stable population. Due to their very low reproductive rate, it is extremely important to maintain ample nesting areas, as well as floating leaves and shrub swamp wetland to shelter young Blanding's Turtles. Although the number of Blanding's Turtles collected for pet trade is relatively

small compared to other threats, this also contributes to declines in population (Harding 1997; Ernst and Lovich 2009).

Spotted Turtle

Spotted Turtle is a State Threatened species that inhabits shallow ponds, wet meadows, tamarack swamps, bogs, fens, coastal marsh, vernal pools, marsh channels, sphagnum seepages, and slow streams (Eagle, Hay-Chmielewski et al. 2005). Spotted Turtle are most likely to be found in clear, shallow water with mud or muck bottom and ample aquatic and emergent vegetation. These turtles will travel over land, and can move long distances during mating season. These turtles are relatively small, with adults ranging 3-6” in carapace length, and are patterned by small yellow spots on a smooth black shell. Spotted Turtle populations have suffered from loss of critical habitats, raccoon predation, and collection for the pet trade. Nesting occurs in mid-June in well-drained soil or grassy areas, and eggs hatch 2-3 months later (Harding 1997; Holman 2012).

Eastern Snapping Turtle

Eastern Snapping Turtles (Photo 39) prefer quiet, mud-bottomed ponds, lakes, and slow streams with dense aquatic vegetation. This species appears to be relatively tolerant of lower quality waters. Eastern Snapping Turtles are brownish in color, and their plastron is small, which leaves much exposed skin around the legs. These bottom-dwelling turtles are omnivores, as well as scavengers that also feed on detritus. Because Eastern Snapping Turtles have powerful jaws to catch the occasional fish or frog, they have been wrongly characterized as vicious towards humans. These turtles generally keep to themselves, avoid people in the water, and have no negative effect on sport fish densities. Because this species eats carrion, it helps keep ecosystems clean and healthy, which can contribute to greater productivity in fisheries. From May through July, female Eastern Snapping

Turtles venture into upland areas to nest. After 2-3 months, the eggs hatch, and hatchlings emerge (Harding 1997).

Mudpuppy

Mudpuppies (Photo 40) are large entirely aquatic salamanders. They are easily recognized by their large size (up to 1.5 feet long) and large external gills just behind the head (Harding 1997). 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 (*Simpsonaias ambigua*), a state Endangered species (Eagle, Hay-Chmielewski 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.

Eastern Fox Snake

Eastern Fox Snakes (Photo 41) have a small range restricted to areas along and adjacent to the shores of Lake Huron and Lake Erie (Harding 1997). They are a State Threatened species in Michigan (Eagle, Hay-Chmielewski et al. 2005), and are listed as an Endangered Species in Canada (Row and Lougheed 2007). Fox Snakes require grassland habitat that is rarely mowed or burned,

and often prefer to seek shelter and overwinter in adjacent riprap or similar rocky shoreline 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.

Northern Leopard Frog

Northern Leopard Frog (Photo 15) is a historically common species in Michigan that ranges across most of the northern United States and well into Canada. Adults are up to 4.5 inches long and are iridescent green or brown with large, rounded dark brown spots. Most native frogs lack large, distinct spots. A similar species in Michigan, the Pickerel Frog, *Rana palustris*, has spots which are more rectangular that are more obviously arranged in a double row down the back and is normally restricted to cool-water habitats such as streams. Pickerel Frogs are toxic and have bright yellow patches at the bases of their legs that they can display to warn predators of their bad taste. Some Leopard Frogs, which are not poisonous, display pale yellow patches, presumably mimicking the Pickerel Frog. Leopard Frogs can also be identified during the breeding season by the male's call, which consists of a long snore followed by several clucks. They escape from predators with long leaps in a characteristic zigzag pattern. Males and females are not easily distinguished, though males are smaller and develop thickened pads on their thumbs during the breeding season. This

species has noticeably declined in Michigan and other parts of its range, in part due to sensitivity to chemicals, such as heavy metals, herbicides, pesticides, fungicides which are introduced into the habitat by human activities and the loss and degradation of habitat.

Butler's Garter Snake

Butler's Garter Snake (Photo 27) is becoming increasingly rare in Michigan and is already protected in other states. In Canada it is listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Species at Risk in Ontario (SARO), but has not yet been upgraded from Threatened under the Canadian Species at Risk Act (SARA). Although similar in appearance to other Garter Snakes, the Butler's Garter Snake can be distinguished by its relatively small head that is barely wider than its neck, and by the position of its side stripes. This species prefers wet open grassy areas, but can also be found on residential woodlots. Butler's Garter Snakes feed primarily on earthworms, but have been known to also eat leeches, salamanders, and small frogs. Their active period is relatively long, starting in late March to early April and continuing through October or November. Mating usually occurs after emerging from over-wintering sites and young snakes are born live in mid to late summer. Although these snakes can be somewhat locally common, their previous range seems to be declining as more of their habitat is lost to development. In addition to loss of habitat, many individuals are killed while crossing roads (Harding 1997).

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