APPENDIX F

Aquatic Plants Observed in the Portage Lakes 2017-2018

Appendix F

Aquatic Plant Species Observed in the Portage Lakes

The study team viewed some of the lakes during two boat trips and several shoreline visits between late spring and early autumn, 2017, in order to get a general sense of the types and amounts of aquatic plants.* The observations here are cursory, viewed from boats or limited shoreline access. In order to adequately characterize the type and density of aquatic plants to determine appropriate management measures, a professional aquatic plant survey of the lakes is recommended during the growing season.

The study team noted 13 species or categories of aquatic plants, and took note of emergent when visible, summarizing observations in Table F1 and maps of observed plant species, using geotagged photos and field notes. Observations of plant species from the boat trips and shoreline visits indicated a large amount of aquatic plants in the shallower areas of the lakes (less than 20 feet depth), including extensive areas of invasive species, large stands of high-quality habitat, some high quality habitat plants that may grow very dense in shallow water, and some areas with obvious plant growth at the surface where the type could not be determined . The most frequently observed species include Eurasian watermilfoil, filamentous green algae, water lilies/spatterdock. Coontail, eelgrass, and beneficial pondweeds were observed at several sites.

Because certain invasive species are found extensively throughout the lakes, they are shown on the figure as providing some benefit, but may require more active management due to their extremely dense, aggressive growth patterns. Maps of observed species are also included after this section. Numbers in Table F1 and Figures F1-6 refer to the Gallery of Observed Plants.

Invasive/Harmful Species

Invasive species are abundant throughout the lakes. Some isolated stands may be eradicated, especially if they are not established elsewhere in the lakes. Two of the species, Eurasian watermilfoil and Curly-leaf pondweed are spread so extensively throughout the lakes that eradication is not likely an option. They still provide some habitat benefit as well as the other extremely valuable benefits of aquatic plants. These species should be managed to provide passage, reduce spread, reduce nuisances, and perhaps improve habitat locally.

The first three species noted below reproduce by fragmentation, so are easily spread by boat propellers, harvesting, wave action, or other activities that break them up. Eurasian watermilfoil naturally fragments twice per summer after blooming.

- Eurasian watermilfoil is abundant around much of the lake edges, near docks and marinas, in coves, and near large wetlands. It often grows densely with filamentous green algae in coves. It nearly rings Long Lake, growing dense in the channels at the north end of Long Lake. In Nimisila, it extends a large distance from the coves on the east toward the middle of the lake.

* Note: During September, 2020, additional shoreline observations showed dense growth throughout North Reservoir, in the southern end of Long Lake, and in the Long Lake Feeder.

- Curly-leaf pondweed, which blooms in spring and dies back in the summer, was noted in a few areas during the spring boat trip, but that visit did not focus on vegetation. According to comments by fishermen and boaters, there are stands of "spring weeds" that are so dense they impede traffic between sections of the lakes. Small amounts of curly leaf pondweed were noted in the October trip, after the usual die-off of the plant.
- Brittle naiad was found at a fishing access on West Reservoir.
- The study team did not focus on emergent plants but did note nearly ubiquitous non-native yellow iris. Common reed and cattail (both invasive) occur at the edges of wetlands.
- A small amount of Lyngbya was noted during the October trip. A pontoon boat pilot recalled she had seen some earlier in the year and wondered what it was.

Non-Invasive/Beneficial Habitat Species

- Spatterdock and water lilies occur commonly in coves, near the golf course, and near the wetlands of Long Lake. In some of the shallow coves, growth is quite dense.
- Coontail was noted around the state park boat launch ramp and fishing piers and in moderate amounts in several locations around the lakes.
- Beneficial thin-leafed pondweeds of various species were found at several locations – including the State Park, State Rd. fishing access, and at several locations in Nimisila Reservoir. Floating-leaf pondweeds were noted at several locations in Nimisila Reservoir.
- Large stands of eelgrass were noted near the State Park, the southwestern shoreline of Turkeyfoot Lake, and at several locations in Nimisila Reservoir.
- In several areas, eelgrass or other beneficial species were found mixed in with invasive or other "nuisance" growth. Invasive species often crowd out native plants.
- A large stand of the complex alga, muskgrass, occurs near the farm in Mud Lake. This provides good habitat.
- Emergents - there are some areas of beneficial rushes and sedges, including the state park.

Table F1 Aquatic Vegetation in Portage Lakes Submerged/Floating Plants

Species, Gallery Nos.	Native/ Non-native (Invasive)	Characteristics	Relative Abundance	Comments
Eurasian Watermilfoil (*Myriophyllum spicatum)* L 3-8 E 4,5 CG 1-3 Mi3 W 1-4 W8 W10 T1,3,12 Mu1 Ni 1,4	Non-native invasive	Reproduces by fragments, quickly outcompetes native plants, forming dense tangled mats at water surface. Disrupts fisheries. Four feathery leaves per whorl. Grows as tall as 10-20 feet	Very abundant in coves, near docks, and along much of periphery	Extent likely greater than mapped
Curly-leaf Pondweed (*Potamogeton crispus*) W9 CG3	Non-native invasive	Dense mats near water's surface, outcompetes native Dense growth in spring, early die-off reduces oxygen. Grows as tall as 10-20 feet. Tolerant of turbidity but grows taller in clear water.	Very abundant in certain sites	Extent is likely much greater than observed. Team was not focusing on vegetation during this plant's rapid growing season. Anecdotal reports of dense spring growth ("spring weeds") in Mud Lake, other locations.
Brittle Naiad W6 (*Najas minor*) W6	Non-native invasive	Tolerant of turbidity. Can grow up to 12 feet tall, dense mats out-compete native plants for light and space. Reproduces by fragmentation and fruit.	Found in one location (fishing access)	If the population hasn't spread, this may be an opportunity to prevent further infestation by careful plant removal.
Hydrilla – NOT OBSERVED	Highly invasive	Similar to Elodea but more leaves/ whorl		
Eel grass/Tape grass/Wild Celery (*Vallisneria americana*) E2,3,6 IC2 T3,16	Native, good habitat	Can form thick beds, prefers soft muck beds	Found mixed with other species in some areas, large beds in Turkeyfoot, Cat Swamp, Turkey Island Club	Anecdotal reports that eelgrass beds are expanding
Var. Floating-leaf Pondweeds Ni3, 4, 6 *(Potamogeton sp.)*	Native, good habitat	Floating oval leaves on long stems	Extensive or mixed stands along E side of Nimisilla Res.	
Var thin-leafed pondweeds No-1 E4 W5 W10 T9,10 Ni6	Native, good habitat	Thin leaves	Mixed with other species near State Park, east side Nimisilla Res.	
Elodea (*Elodea canadensis*)	Native, good habitat	Whorls of 3 leaves, no spine leaf underside	Nimisilla Res.	Similar to highly invasive Hydrilla
Coontail (Ceratophyllum demersum) Mi5 T8,13	Native, good habitat	Stiff forked leaves in whorls around hollow stem in groups of 5-12, bushy ends. Lacks true roots, floats near surface later in summer.	Near State Park boat launch ramp, Miller Lake	Thick growth near shore can be problematic.

Table F1 Aquatic Vegetation in Portage Lakes (cont'd) **Floating Plants**

Species, Gallery Nos.	Native/ Non-native (Invasive)	Characteristics	Relative Abundance	Comments
Duckweed (Lemnaceae spp.)	Native	Small green floating plant, may have "root" extending from underside but not rooted.	Coves mixed with other dense growth	
Watermeal (Wolffia spp.)	Native	Extremely small, no larger than a pin heat, shows no visible roots, looks like cornmeal.		

Free-floating mosquito fern (Azolla caroliana or A. filiculoides) was observed in the northwestern limb of Long Lake. This plant favors high nutrients and can grow into dense mats.

Rooted Plants with Floating Leaves

Water lily (Nymphaea odorata) L1-3 CG4 Mi 2,3 W11 T2-6 T11 Mu2 Ni2	Native, good habitat but can grow dense in shallows	Large round pad with cleft running almost to center. White flower with many rows of petals. Can grow in water up to 8 feet deep.	Water lily and spatterdock found in dense stands in coves, near golf course, and mixed with other dense growth (e.g., Eurasian watermilfoil)	
Spatterdock (Nuphar spp.) L1-3 CG4 Mi 2,3 W11 T2-6 T11 Mu2 Ni2	Can grow dense	Emergent oval leaves 6-12 inches long, sometimes held above the water, yellow globular flower. Reproduces from rhizomes, seeds. Can grow in deeper water, more shade than water lily.		
American Water Lotus (Nelumbo lutea)	Can grow dense	Large round floating leaves, not notched, fruit receptacle with oval seeds		Reports of lotus in Nimisilla Res.

Aquatic Vegetation Portage Lakes - Emergents **Emergents**

Species, Gallery Nos.	Native/ Non-native (Invasive)	Characteristics	Relative Abundance	Comments
Cattail (*Typha augustifolia*)	Narrow-leaf cattail is invasive and hybridizes with native broad-leaf cattail.	Grows to 10 feet, produces velvety brown spike of flowers. Dense growth, out-competes native species. Distinguished from broad-leaved cattail by spacing of flower spikes but so aggressive that most visible cattails are narrow-leaved or hybrid.	Found along wetland edges, golf course. Grow in damp soil or shallow water with sufficient nutrients.	

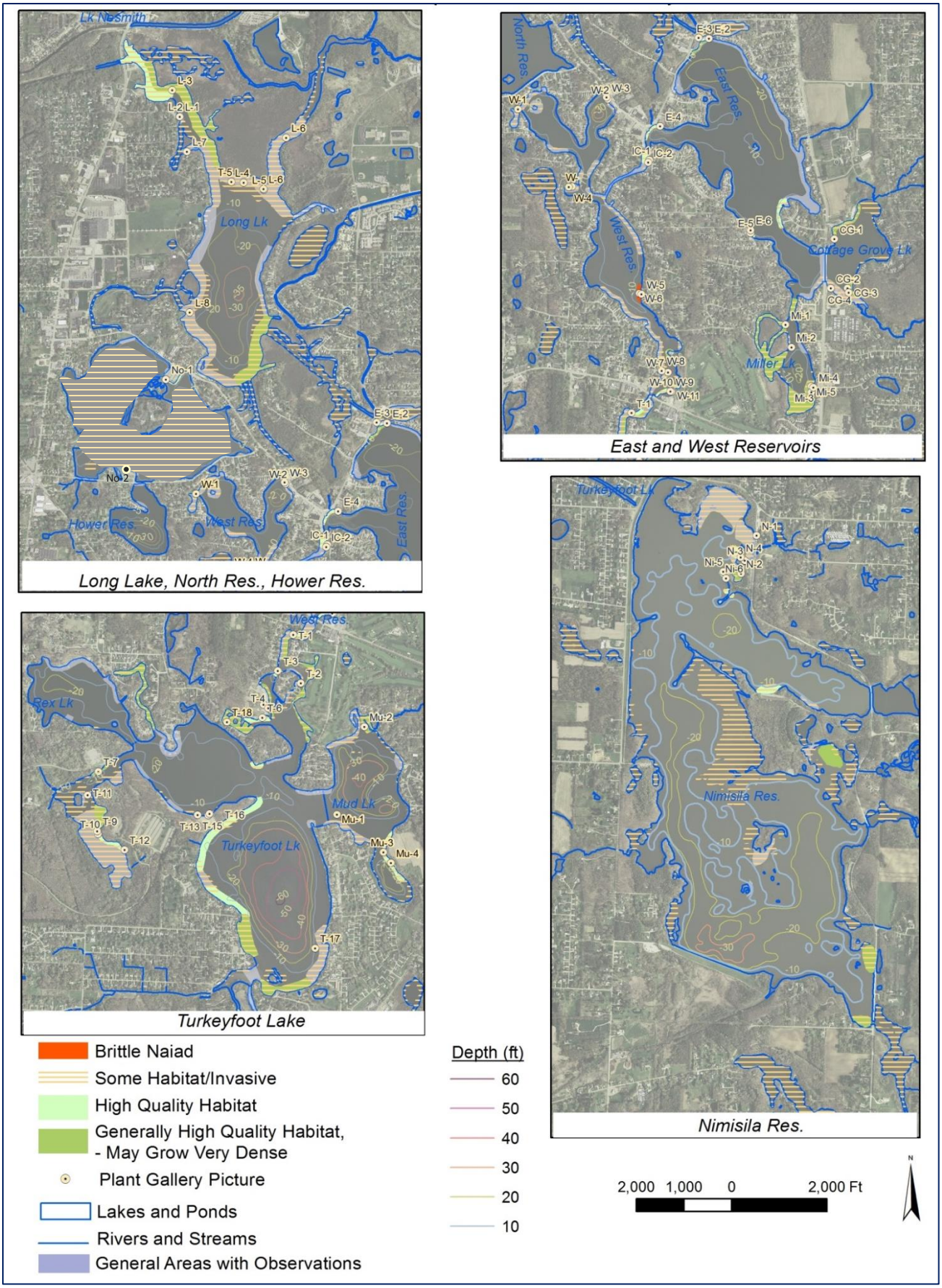
Table F1 **Emergents (cont'd)**

Species, Gallery Nos.	Native/ Non-native (Invasive)	Characteristics	Relative Abundance	Comments
Common Reed Grass (*Phragmites australis*)	Invasive non-native	5-10' tall, hollow stalks, bushy flowers. Form dense mats, out-compete native species. Tolerates brackish conditions and road runoff. Reproduce by rhizome fragments and seeds.	Found at marsh edges. Grow in damp/wet disturbed soil.	
Purple Loosestrife (*Lythrum Salicaria*)	Invasive non-native	Similar to a native species. Magenta flowers on tall spikes. Taproots support 30-50 stems. Produces millions of seeds/yr.		
Yellow Iris/Yellow flag (*Iris pseudocorus*)	Invasive non-native	Used as ornamental, escapes, rapidly out-competes native species.	Wetland plant, found along margins of lakes	
Blue flag				
Bulrush				
Various rushes and sedges				
Arrowhead				
Pickerelweed				

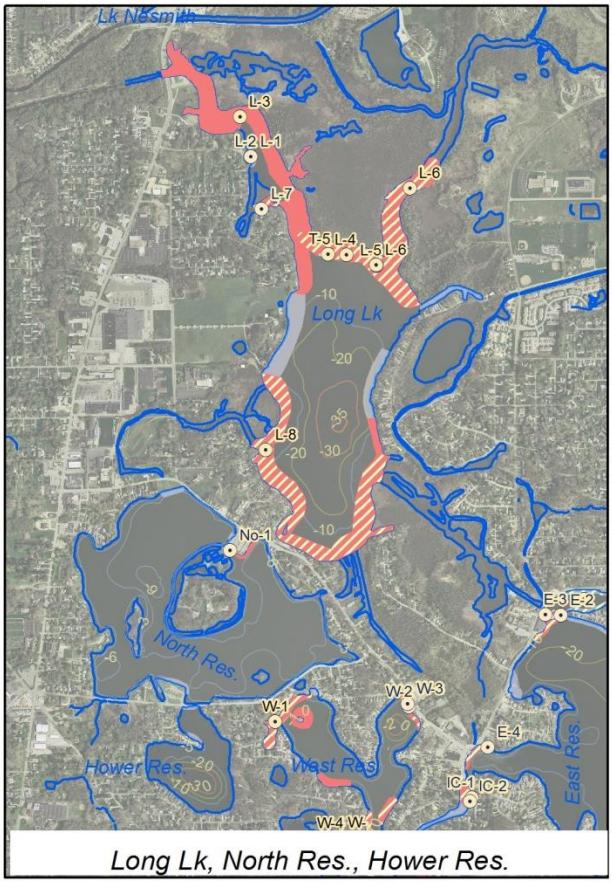
Algae

Species	Native/Non-native (Invasive)	Characteristics	Relative Abundance	Comments
Lyngbya cyanobacteria	Considered Harmful Algal Bloom. Can form dense, choking mats.	Benthic (bottom) mats may be dark blue-black, oxidize at surface. Lyngbya toxins can create acute dermatitis	Some found in Turkeyfoot Lake.	Is it found elsewhere?
Filamentous Green Algae Spyrogyra or cladaphora?	Native. Generates oxygen, good food source	Attaches to bottom, rocks, plants, may become dense. Mats may float to surface with oxygen bubbles generated.	Very abundant in coves	Likely greater extent than mapped, as many areas had undetermined green growth at surface
Muskgrass (*Chara*)	Native, good habitat	Looks like branching plant	Abundant in one location in Mud Lk	

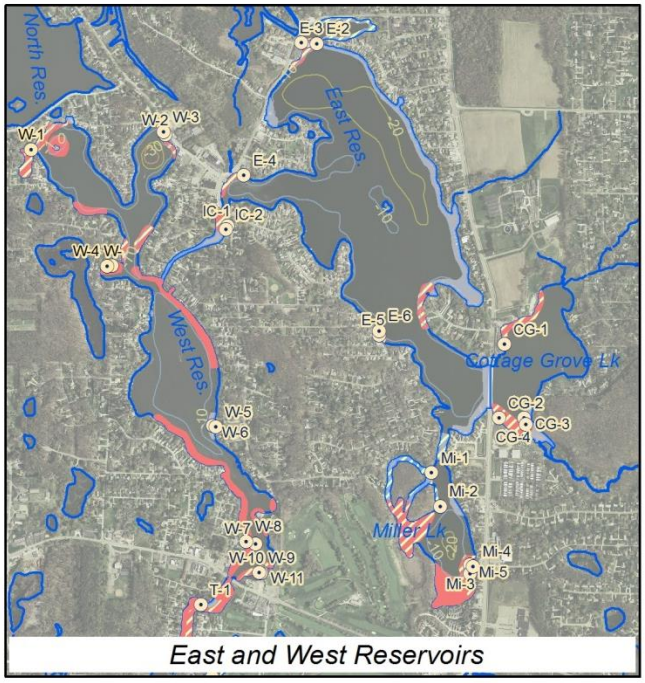
Map F.1 Observed Aquatic Plants - Summary



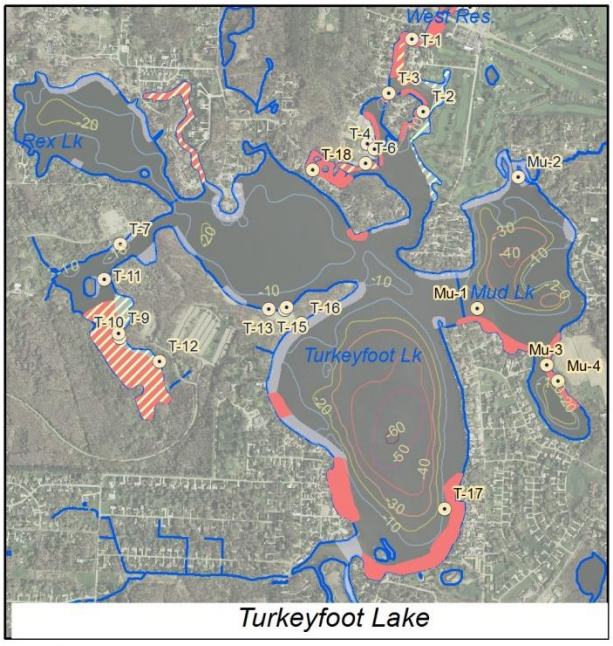
Map F2 Aquatic Plants Observed - Eurasian Watermilfoil, Filamentous Green Algae



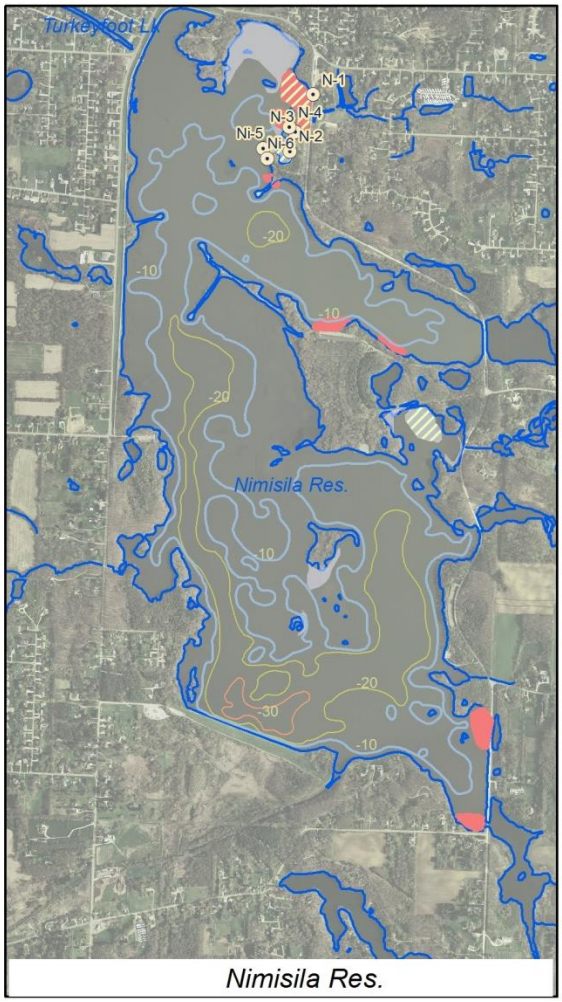
Long Lk, North Res., Hower Res.



East and West Reservoirs



Turkeyfoot Lake



Nimisila Res.

Filamentous Algae

Eurasian Watermilfoil

Plant Gallery Picture

Lakes and Ponds

Rivers and Streams

General Areas with Observations

Depth (ft)

60

50

40

30

20

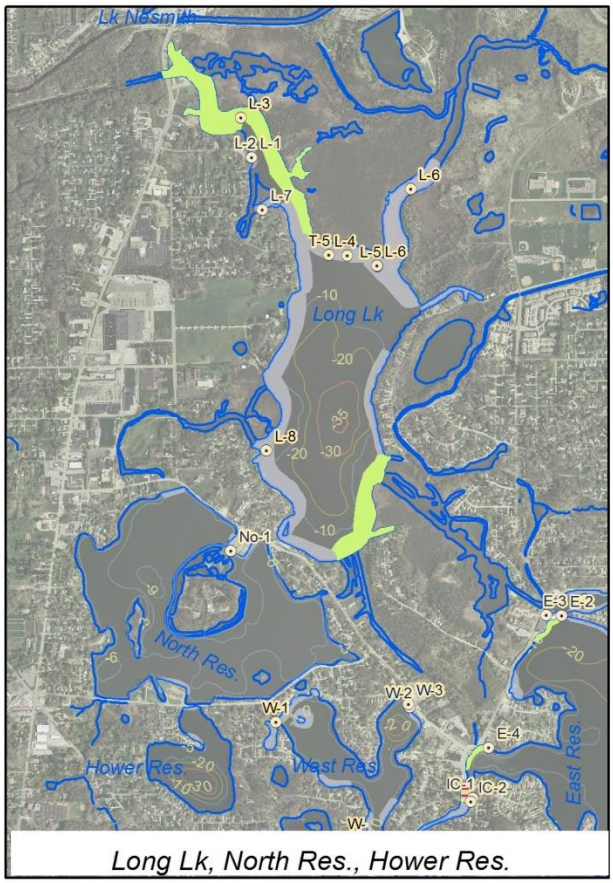
10

2,000 1,000 0 2,000 Ft

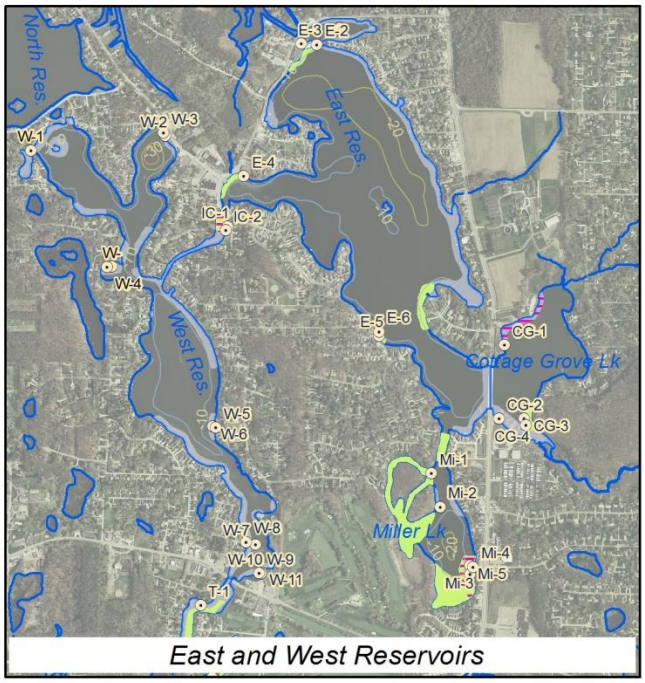
N

Map F3

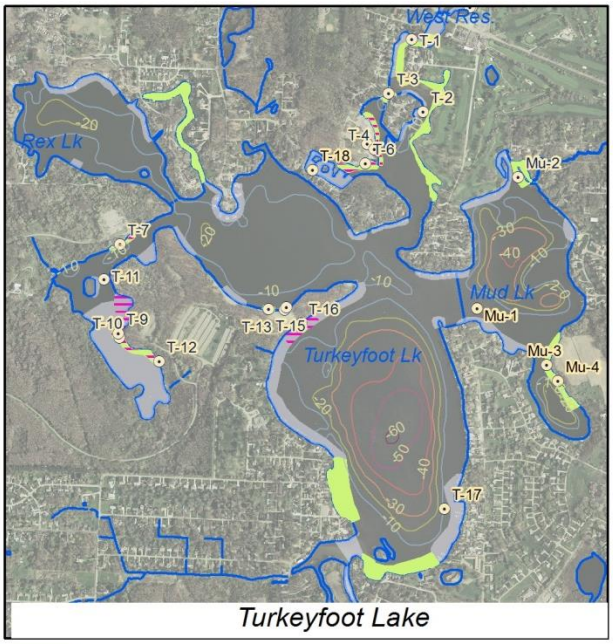
Aquatic Plants Observed - Water Lily/Spatterdock, Coontail



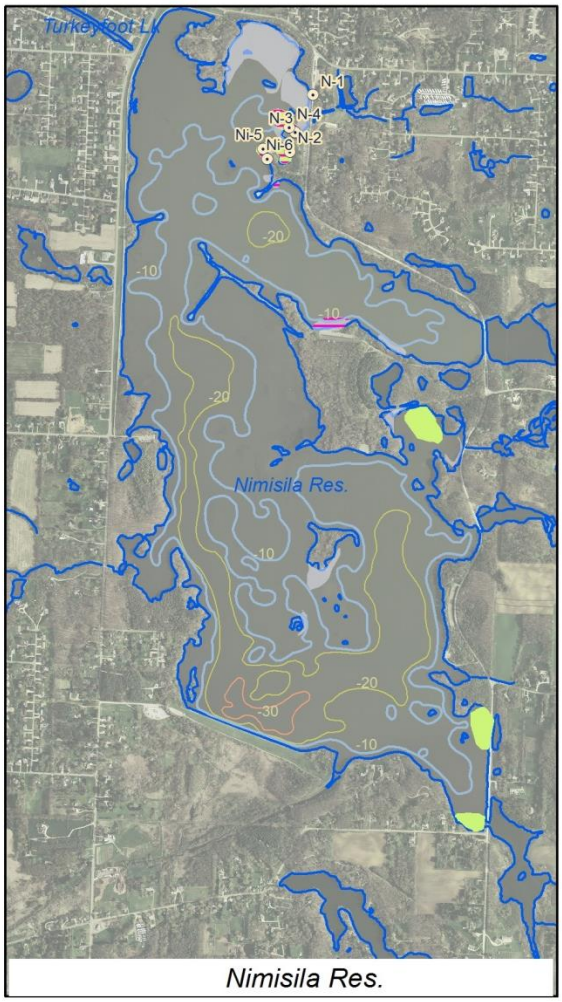
Long Lk, North Res., Hower Res.



East and West Reservoirs



Turkeyfoot Lake



Nimisila Res.

Coontail

Water Lily/Spatterdock

Plant Gallery Picture

Lakes and Ponds

Rivers and Streams

General Areas with Observations

Depth (ft)

60

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40

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20

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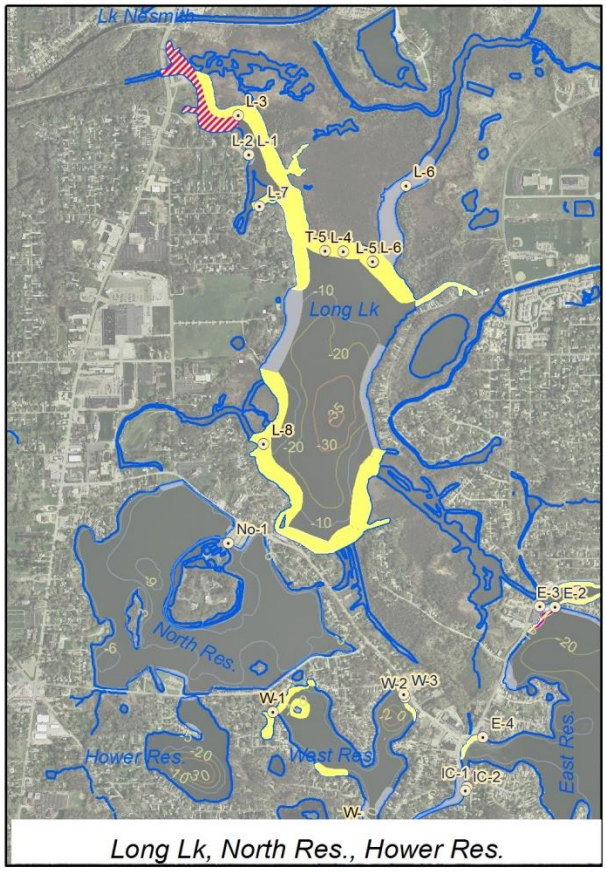
2,000 1,000 0 2,000 Ft

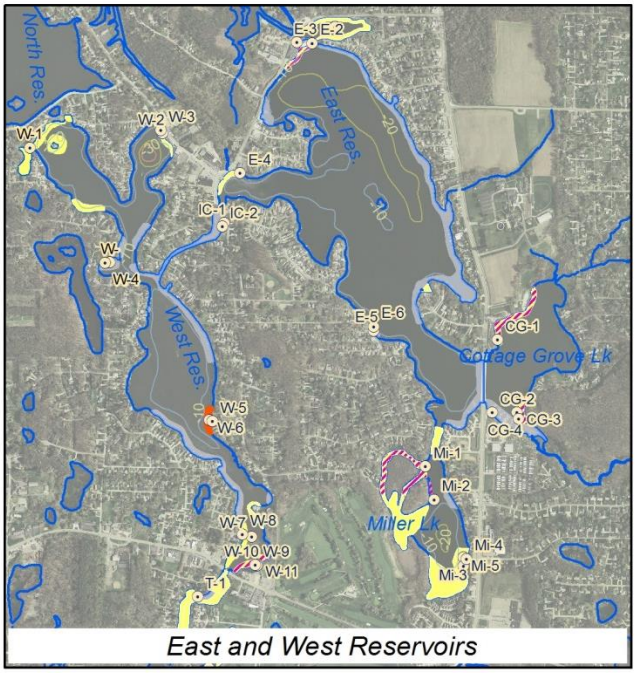
N

Map F4

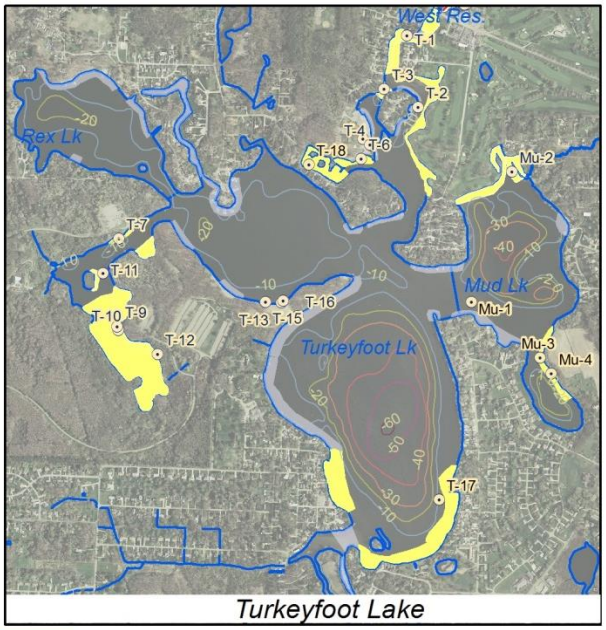
Aquatic Plants Observed - Curly-Leaf Pondweed, Brittle Naiad, Aquatic Plants at Surface



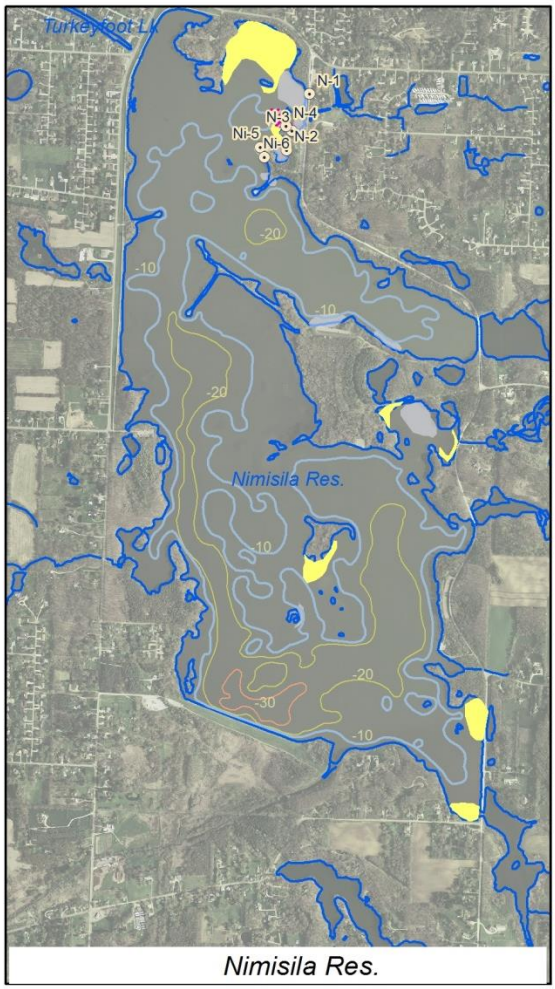
Long Lk, North Res., Hower Res.



East and West Reservoirs



Turkeyfoot Lake



Nimisila Res.

Brittle Naiad

Curly-leafed Pondweed

Aquatic Plants at Surface*

Plant Gallery Picture

Lakes and Ponds

Rivers and Streams

General Areas with Observations

Depth (ft)

60

50

40

30

20

10

2,000 1,000 0 2,000 Ft

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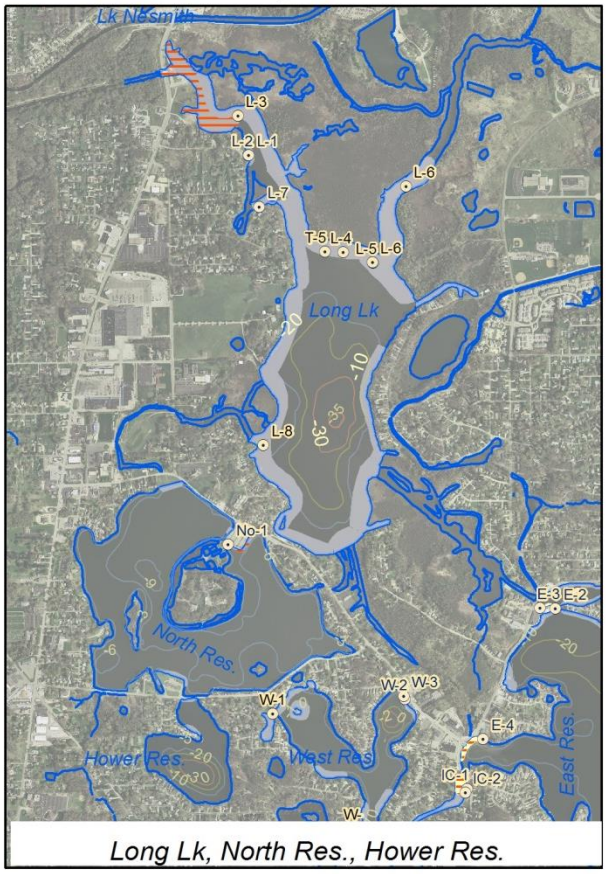
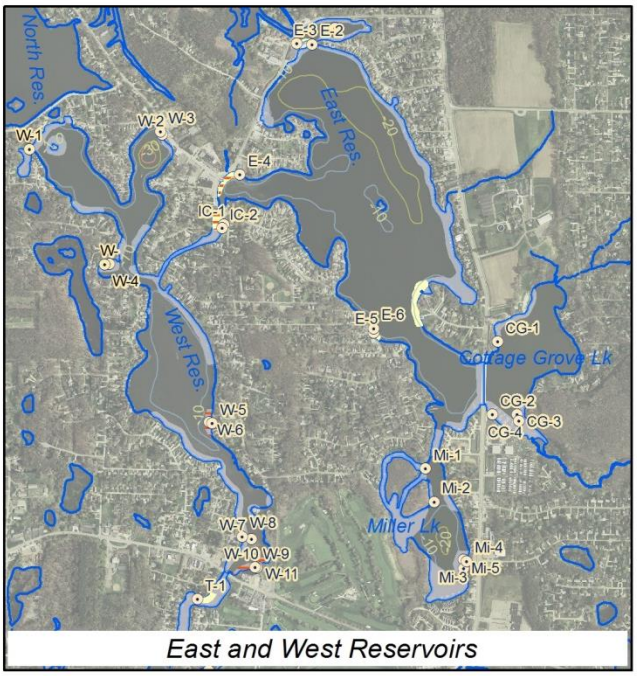
*Note: This map only shows observations from 2017-2018. Extensive growth on North Res. in 2020 not shown here.

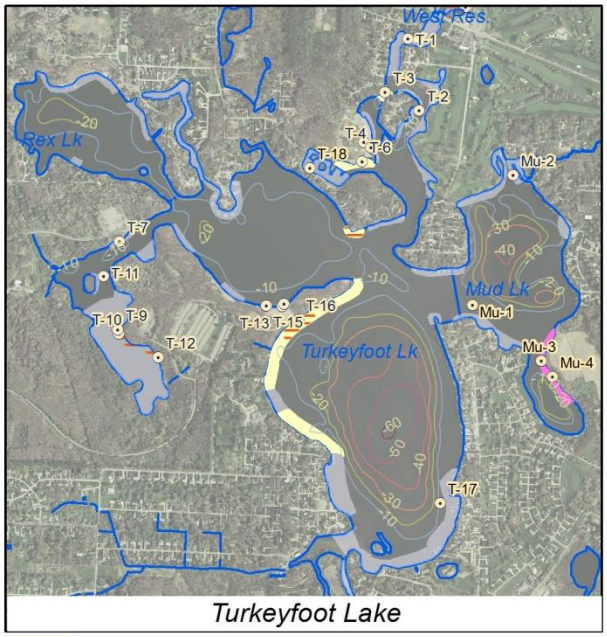
Map F5 Aquatic Plants Observed - Eelgrass, Chara, Var. Pondweeds



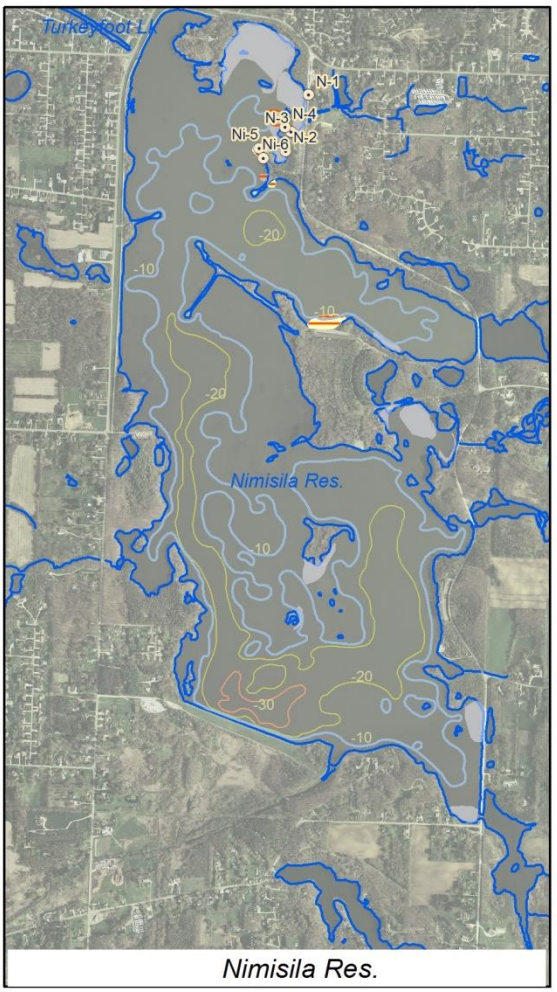
Long Lk, North Res., Hower Res.



East and West Reservoirs



Turkeyfoot Lake



Nimisila Res.

Eelgrass

Beneficial Pondweeds

Musk Grass

Plant Gallery Picture

Lakes and Ponds

Rivers and Streams

General Areas with Observations

Depth (ft)

60

50

40

30

20

10

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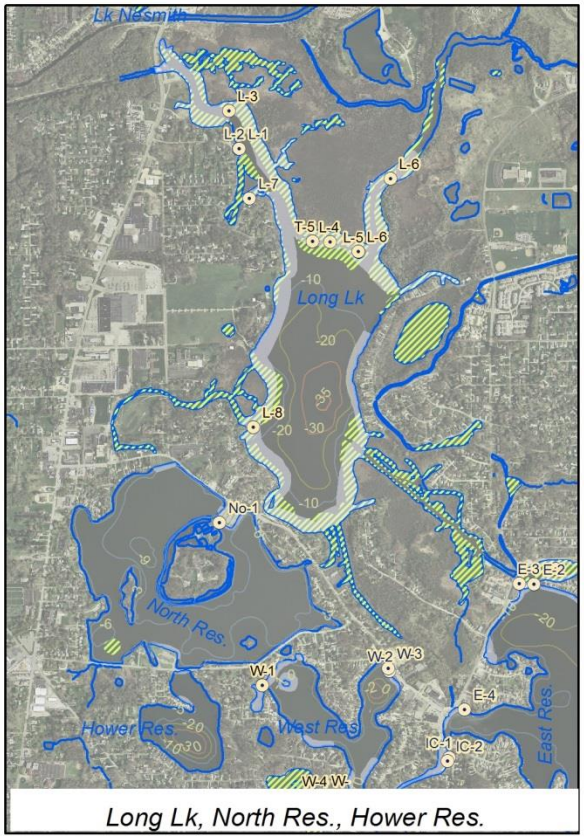
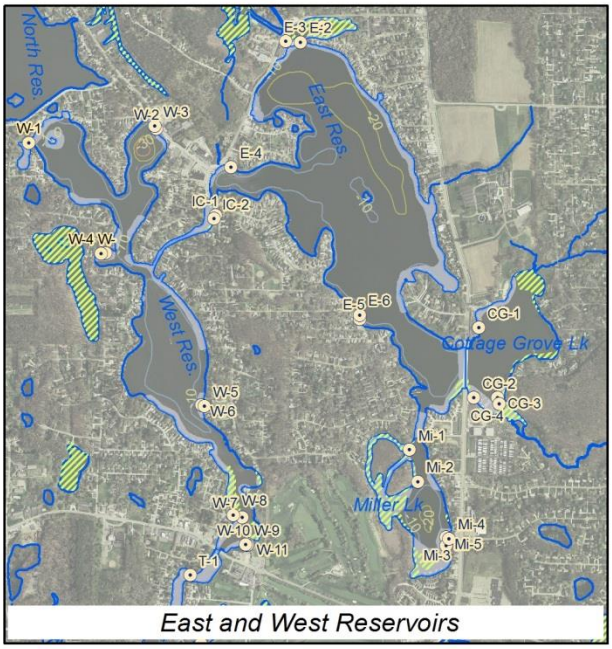
N

Map F6

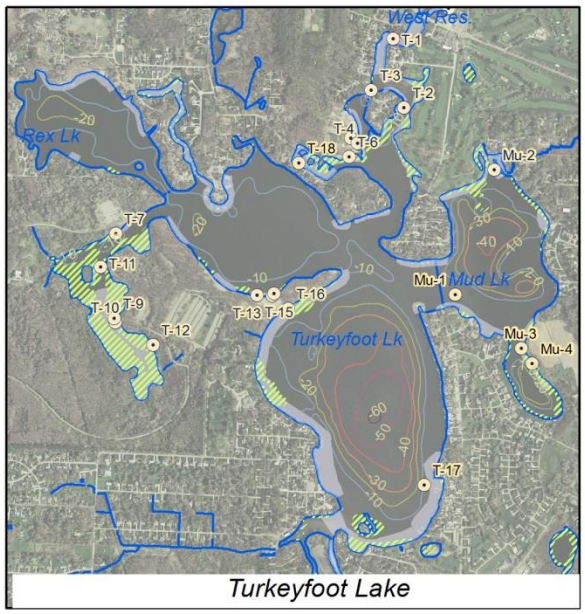
Potential Areas Aquatic Plants



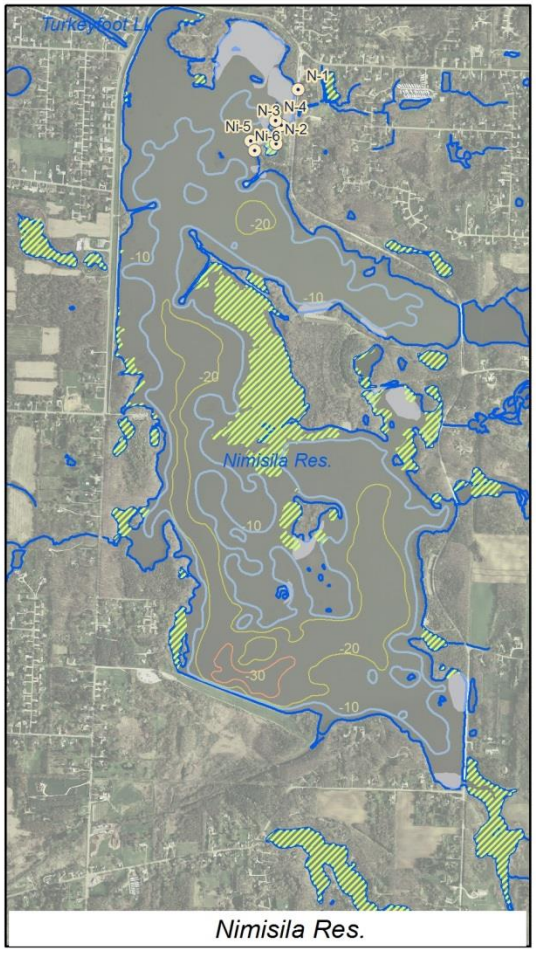
Long Lk, North Res., Hower Res.



East and West Reservoirs



Turkeyfoot Lake



Nimisila Res.

Aquatic Plants Noted by Others (TBD)

Aquatic Vegetation from Aerial Imagery

Plant Gallery Picture

Lakes and Ponds

Rivers and Streams

General Areas with Observations

Depth (ft)

60

50

40

30

20

10

2,000 1,000 0 2,000 Ft

N

Gallery of Observed Plants Portage Lakes 2017

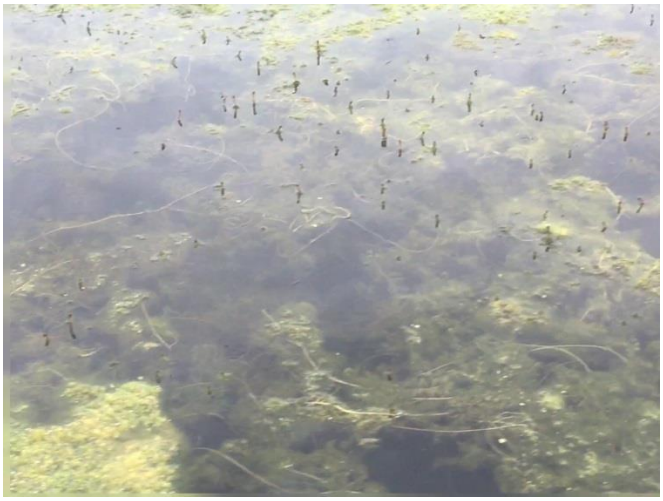
Long Lake

L-1 

L-2 

Spatterdock, water lily, other plants at the surface near marsh (L-1), boat ramp (L-2). These areas contain various other beneficial and invasive plants(e.g., thin-leaved pondweeds, Eurasian watermilfoil, curly-leafed pondweed.) (May, 2017)

L-3, 

L-4 

Dense aquatic plant growth by marsh(spatterdock, Eurasian watermilfoil, fiamentous green algae (Oct., 2017)

L-5 

L-6 

NW end of Long Lake near marsh – dense growth, channel (Eurasian watermilfoil, filamentous algae) (Oct., 2017)
This highly productive environment also supports free-floating mosquito fern (darker olive green).

L-7  L-8 

Aquatic plants in some residential areas may impede passage as well as use of docks. In L-8, Eurasian watermilfoil strands are visible at the surface well past the shoreline.

North Reservoir

No-1

No-2 (Sep. 2020)

Thin-leafed pondweed by fishing area. Eurasian watermilfoil was also observed. No-2 shows dense vegetation throughout North Reservoir in September, 2020.

East Reservoir, Cottage Grove Lake, Miller Lake, Iron Channel

E-1 

 E-2

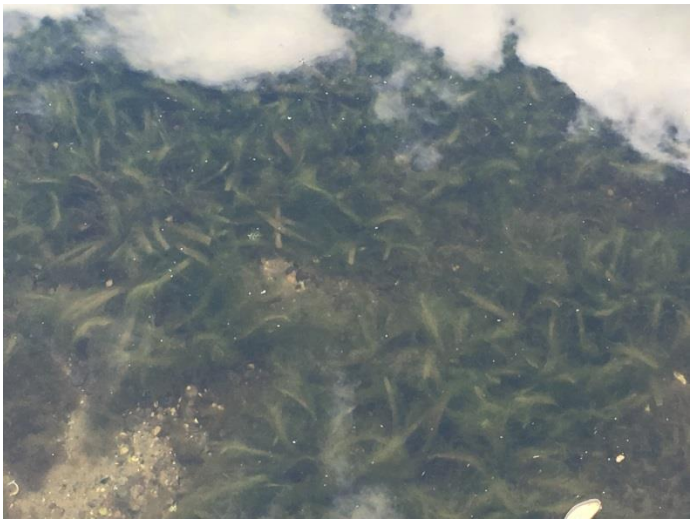
E-1 Filamentous algae, possibly other plants at surface (May 2017); E-2 Eelgrass with filamentous algae (August 2017)

E3

 E4

E-3Eelgrass and filamentous algae by boat in former marina; E-4 Eurasian watermilfoil with thin-leafed pondweed

E5

 E6

Eurasian watermilfoil with filamentous algae by boat

Eelgrass

Cottage Grove Lake

CG-1 

CG-2 

Eurasian watermilfoil around docks/marina slips

CG-3 

Curly-leaf pondweed

CG-4 

Spatterdock and various plants in cove

Miller Lake

Mi-1 

Filamentous Algae, other surface plants in passage to houses

Mi-2 

Spatterdock, other surface plants by golf course

Mi-3 

 Mi-4

Water lily, Eurasian watermilfoil, filamentous green algae, coontail by marina (Mi-3), docks, and residents, Miller Lk

Mi-5 

Coontail

Iron Channel

IC-1 

Various growth at surface

 IC-2

Eelgrass mixed in with other species

West Reservoir

W-1 

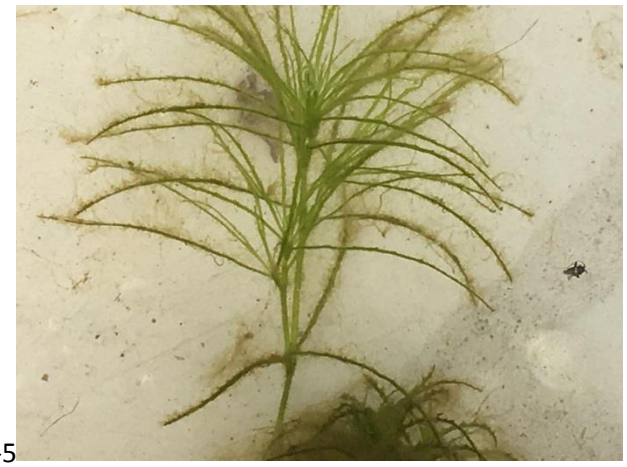

W-2

Eurasian watermilfoil near docks (brown clumps in W-1)


W-3


W-4

Various aquatic plants/clumps of Eurasian watermilfoil at surface near residences.


W-5


W-6

Thin leafed pondweed (W-5) and invasive Brittle Naiad (W-6). Brittle Naiad does not lose its shape out of water.

W-7 

Spatterdock and other plants by residence, with fisherman

W-8 

Eurasian watermilfoil by dock

W-9 

Curly-leaf pondweed

W-10 

Thin-leafed pondweed, Eurasian watermilfoil

W-11 

W-12

Thick growth by Portage Princess dock and Upper Deck WWTP

Turkeyfoot Lake, Rex Lake, Mud Lake

T-1 

Eurasian watermilfoil by residence

T-2 

Spatterdock and other plants by golf course

T-3 

Water lilies, Eurasian watermilfoil, eelgrass

T-4 

Water Lilies across from boat launch

T-5 

T-6 

Water lilies and other plants by Old State Park boat launch. T-5 edge of parking lot, T-6 cove west of boat launch.

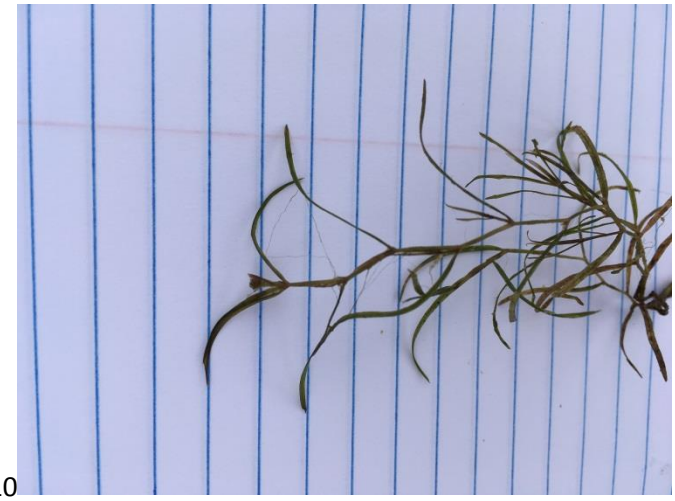
T-7 

 T-8

T-7 Water lilies near fishing docks, State Park boat Launch ramp

T-8 – Coontail

T9 

 T10

Thin-leafed pondweed near Bayside Picnic Area (Aug 2017)

T-11 

 T-12

Water lily, other plants, boat camp area habitat (May 2017)

Dense growth – various plants south of Bayside area

T-13

Coontail – State Park fishing area

T-14

Water lilies by shoreline, State Park fishing area

T-15

Various beneficial emergent plants, State Park

T-16

Eelgrass bed with floating coontail by State Park

T-17

T-18

Dense growth by residential docks (T-17, Oct, 2017; T-18 May 2017)

Mud Lake

Mu-1 

Eurasian watermilfoil by residences

Mu-2 

Spatterdock and other plants by golf course

Mu-3 

Mu-4 

Near farm field, Oct. 2017: Mu3 Dense growth along edge; Mu-4 Muskgrass sample in front of green muskgrass bed,

Nimisila Reservoir

Ni-1 

Dense growth (Eurasian watermilfoil) in Nimisila Res.

Ni-2 

Dense growth of water lilies, spatterdocks, etc. in cove

Ni-3 

Ni-4 

Floating-leafed pondweed (mixed in with Eurasian water milfoil)

Ni-5 

Ni-6 

Thin-leafed pondweed (Ni-6 – with floating-leaf pondweed) – beneficial habitat