VLAWMO

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Sustainable Lake Management Report

Sucker and East Vadnais Lakes, Ramsey County, MN

Prepared by Dawn Tanner and Tyler Thompson

March 2022

VLAWMO Sustainable Lake Management Report (SLMR): Sucker and East Vadnais Lakes, March 2022

This SLMR includes monitoring, surveys, projects, and partnerships in Vadnais-Sucker Lake Regional Park, including Sucker and East Vadnais Lakes. Information is compiled here to provide a synthesis of efforts and projects to date to improve the park and the lakes, build an understanding of present water quality, and present upcoming projects. This area of the watershed has been the focus of projects for many years. A sampling of recent efforts includes a major channel stabilization and restoration effort that was completed in 2018, in partnership with Ramsey County Parks and St Paul Regional Water Services (SPRWS); wildlife monitoring to establish baseline data using remote cameras from 2018/2019; surveys for vegetation, lake contours, and wetlands during 2020; and lead poisoning of Trumpeter swans at the Sucker Channel and north end of East Vadnais Lakes became a focus of partnership efforts among VLAWMO, Minnesota Department of Natural Resources (MN DNR), University of Minnesota (UMN) Veterinary Diagnostic Center, the Minnesota Pollution Control Agency (MPCA), and Ramsey County Parks beginning in 2019. A stream meander/restoration and sheetpile replacement project was completed on Lambert Creek, which flows directly into East Vadnais Lake, during 2021 with funding from the MPCA/EPA 319 grant program and a 0% interest loan from the Clean Water Partnership loan program, funded through the Clean Water State Revolving Fund (CWSRF). A 45-acre restoration project is in final planning stages in partnership with Great River Greening, Ramsey County Parks, and SPRWS, with funding from the MN DNR Outdoor Heritage Fund. Initial buckthorn removal is scheduled to begin during fall 2022.

Our mission at VLAWMO is to protect and enhance water resources in the watershed through water quality monitoring, wetland protection, and water quality improvement projects. The cornerstone of our success is our partnerships. We appreciate all of our partners' work and assistance to help us fulfill our mission.

Figure 1: Sucker and East Vadnais Lakes from 2018 aerial imagery. West Vadnais Lake is also visible to the west of East Vadnais Lake. Vadnais-Sucker Lake Regional Park includes Sucker and East Vadnais Lakes. The park is important because of its high-quality habitat and presence of relatively undisturbed native plant communities in large wetland areas. Major roads that bound the area are Highway 96 to the north of Sucker Lake and West Vadnais Blvd to the south of East Vadnais Lake. 694 is just visible on the southern edge of the image.

Vadnais Lake Area Water Management Organization
800 County Road E East
Vadnais Heights, MN 55127
651-204-6070
www.vlawmo.org

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Vadnais Lake Area
Water Management Organization

TABLE OF CONTENTS

full reports (below) indicated in appendix available on vlawmo website -> Sucker Lake and Vadnais Lakes: East and West

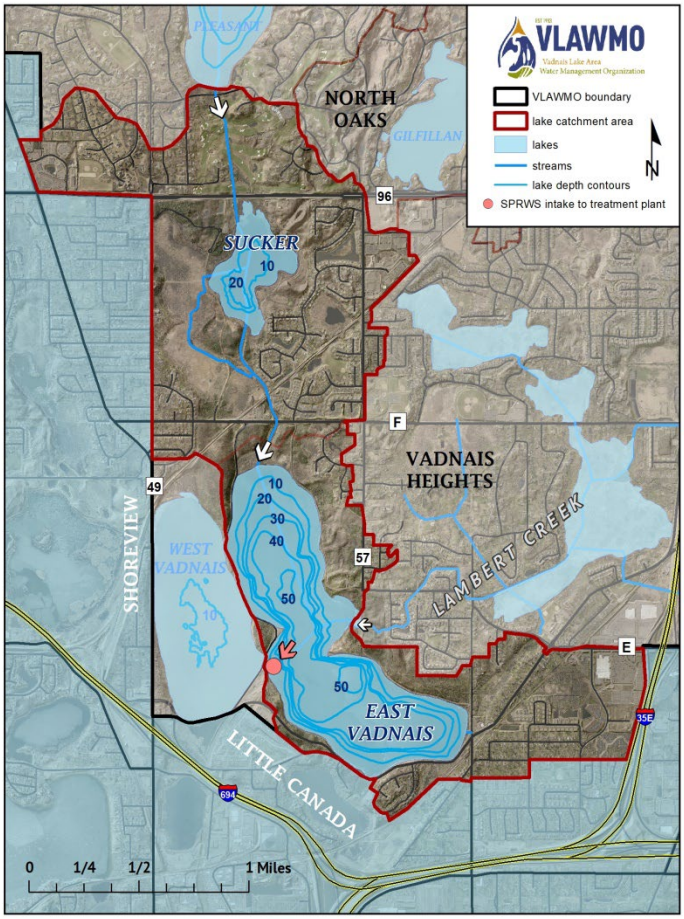
Vadnais Sucker Lake Wetland Assessment and Updated Invasive Species Checks (2020 by SEH)
Sucker and East Vadnais Lake Aquatic and Shoreline Vegetation and Contour (Bathymetry) Surveys (2020 by RCSWCD)
Frog and Toad Call Survey Report (2019-2020)
Remote Camera Survey Report (2018-2020)
Retrofit Analysis/Report (2013)

2 WATERSHED FEATURES

1.1 INTRODUCTION

Sucker Lake and East Vadnais Lake are located in Vadnais Heights, Ramsey County, and in the Vadnais Lake Area Watershed. Both lakes receive water as part of the drinking water supply that is run by St. Paul Regional Water Services (SPRWS). Water is pumped from the Mississippi River at the intake facility in Fridley and through the chain of lakes including Charley, Pleasant, Sucker, and East Vadnais Lakes. East Vadnais Lake is the reservoir for drinking water for St. Paul and surrounding communities. From East Vadnais Lake, water flows out of the watershed and is further treated at the McCarrons Water Treatment Plant in St. Paul. Vadnais-Sucker Lake Regional Park was established to protect the drinking water supply chain and provides high-quality habitat and green space within the watershed.

Figure 2: East Vadnais and Sucker Lakes and Subcatchment Area.



Because of the drinking water supply/pumping through Sucker Lake and possible effect on lake stratification, it has not been determined if this lake should be managed as a deep lake or a shallow lake. Sucker Lake has sufficient depth for a deep lake, but data regarding whether or not the lake fully stratifies are needed to make a determination for the appropriate lake category. Sucker Lake has an average depth of 8 feet, maximum depth of 26 feet, surface area of 61 acres, and a contributing subcatchment (subwatershed) area of 1,085 acres. East Vadnais Lake is a deep lake with an average depth of 30 feet, maximum depth of 58 feet, surface area of 389 acres, and a contributing subcatchment area of 889 acres.

Sucker Lake has water quality score of 53 (2020) that falls between “moderately clear/mesotrophic” and “green/eutrophic” according to the TSI (Trophic State Index, MPCA). East Vadnais Lake has water quality score of 48 (2020), corresponding to a rating of “moderately clear/mesotrophic” according to the TSI (Trophic State Index, MPCA). Sucker and East Vadnais Lakes receive chloride from nearby roads and neighborhoods and nutrients from developed areas. Both lakes are protected by riparian buffers and parkland that is part of the Vadnais-Sucker Lake Regional Park. The park is owned by SPRWS and maintained by Ramsey County Parks. VLAWMO works in partnership with both entities. The lakes receive inflow from the surrounding subcatchments and upstream from the drinking water chain of lakes. East Vadnais Lake also receives inflow from Lambert Creek; East Goose Lake is the headwaters for the creek.

In addition to efforts briefly introduced here, SPRWS undertook an important BMP in East Vadnais Lake by upgrading an existing aeration system to a liquid oxygenation system in 2011. That upgrade has helped to prevent anoxic conditions that could otherwise occur especially during late summer and winter, when waterbodies in Minnesota have lower oxygen levels and may release phosphorus from their sediments. The

liquid oxygenation system will be discussed in more detail later in this report and appears to have had positive water-quality results.

Access for the general public to the park in the winter has varied over time. Prior to 2021, the main road into the park was closed in the winter. During 2021, Ramsey County Parks plowed the road and provided winter access for the general public. Accessibility is planned to continue at the time of the preparation of this report. Increased access for winter recreation has also highlighted the lead poisoning issue with Trumpeter swans because people from the public are more frequently encountering swans that are obviously sick or have recently died. In the winter, Trumpeter swans and other waterfowl congregate at Sucker Channel where the water remains open due to water pumping, even during extremely cold winter temperatures. This has become a notable birding spot and also a focus of bird deaths due to lead poisoning from lead sinkers and fishing tackle. Documentation of swan deaths led to recent partnerships, education about the risk lead poses to wildlife, and the installation of a lead dropbox in partnership with the MPCA and Ramsey County Parks in 2021. The park is also the focus of a large restoration effort with Great River Greening and other partners that is starting in 2022.

2 WATERSHED FEATURES

2.1 AERIAL PHOTO HISTORY

An excellent book is available with historical information about the City of Vadnais Heights including Vadnais-Sucker Lake Regional Park, Sucker Lake, and East Vadnais Lake. *Reflections from the Lake: A 160-Year History of the Vadnais Heights Community* is available from the City of Vadnais Heights at City Hall. A summary of information is included here.

Pre-European Settlement and Characterization of the Area from *Reflections from the Lake*

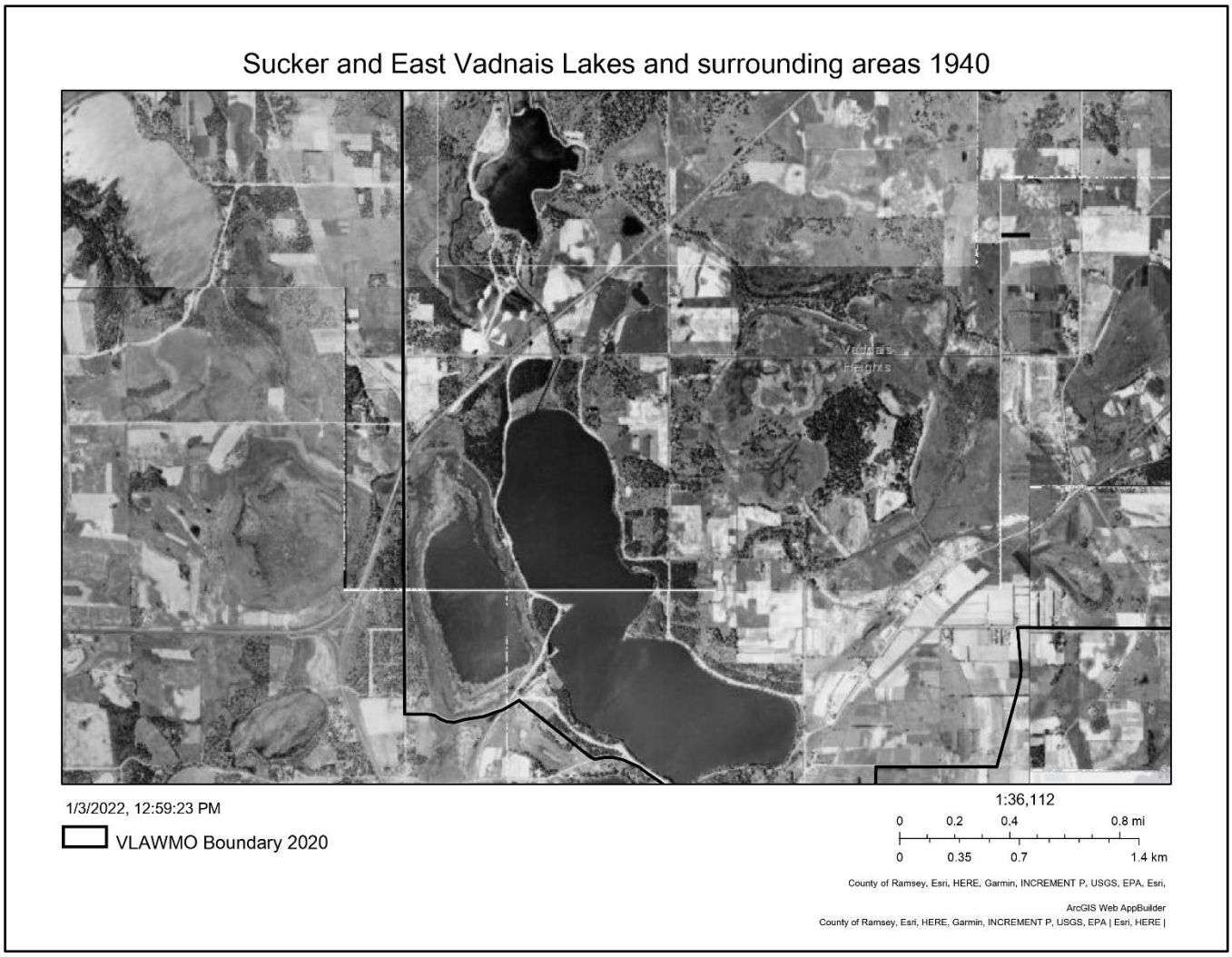
An early map, that includes a sketch of the lakes from 1848, shows that the Dakota were present in what is now Vadnais Heights, including East and West Vadnais Lakes. The Kaposia Band of the Mdewakanton Dakota used hunting areas that stretched from St Paul to north of Lake Vadnais. Trails and roads that were part of Dakota land and travel routes became roads that are still in use today.

A federal government survey in 1847 showed that land around the lakes was composed of: open meadows; marsh; large stands of oak and basswood trees; and patches of maple, nuts trees, and elm. Marshes were edged with willow and tamaracks. Streams connected the lake with a chain of marshes to the north.

> *Creeks flowed to shallow Lambert's Lake on the eastside of the Lake Vadnais area and to Lakes Gervais and Savage to the south. Lake Vadnais lay in a transition zone between the pine forests of the north and the vast hardwood forests east of the Mississippi River. Glaciers had left ponds dammed by mounds of gravel and silt as they melted, so their water drained poorly and swamps dotted the land.* (*Reflections*, p. 21)

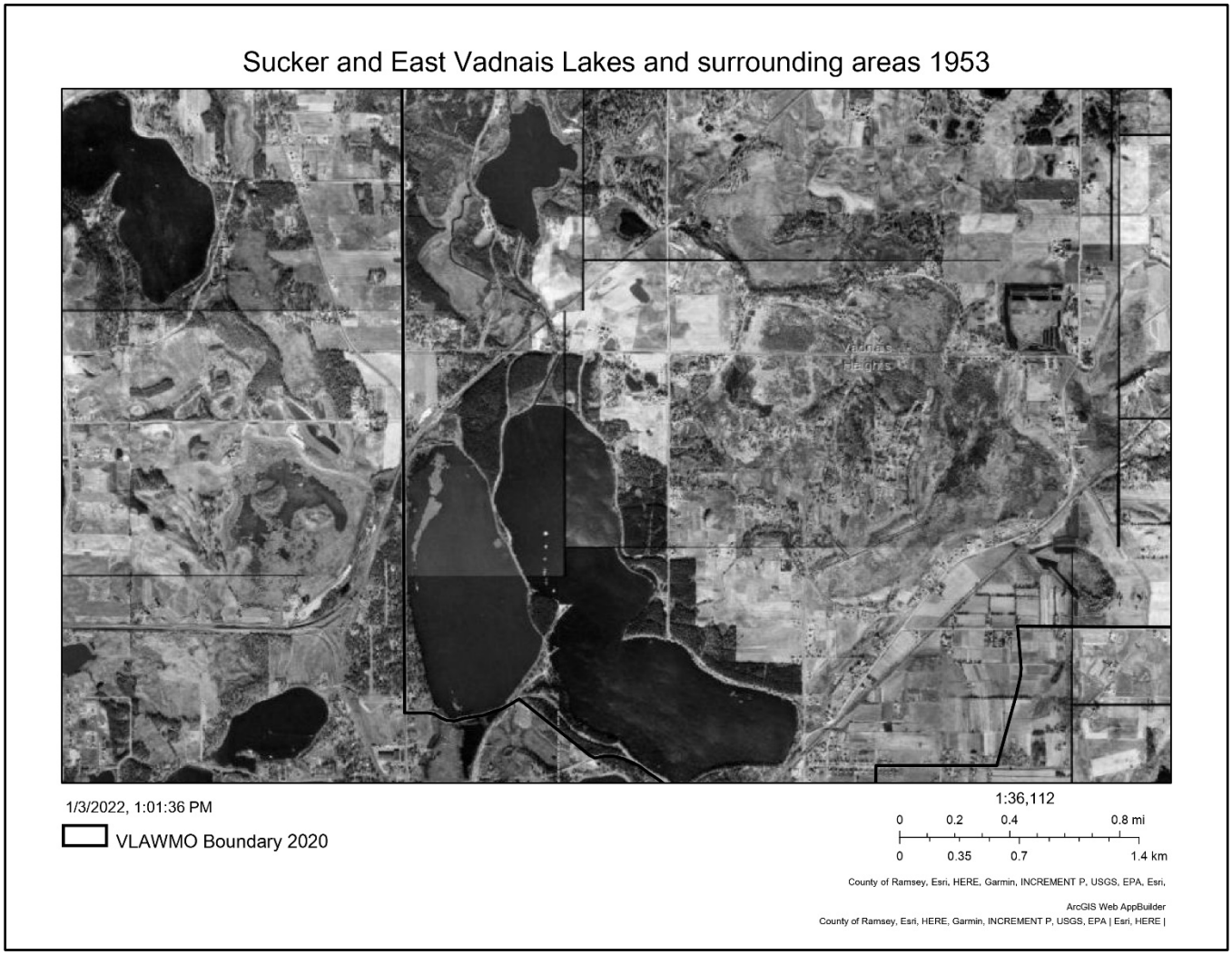
Two French Canadian families (Jean Vadnais, Jean Garceau, and their families) settled the area around the lakes. Jean Vadnais was the namesake of the lakes and city to come. A map of the area including settlers' home locations in 1854 can be found on p. 35 of *Reflections*.

Figure 3: 1940 aerial photo of Sucker and East Vadnais Lakes



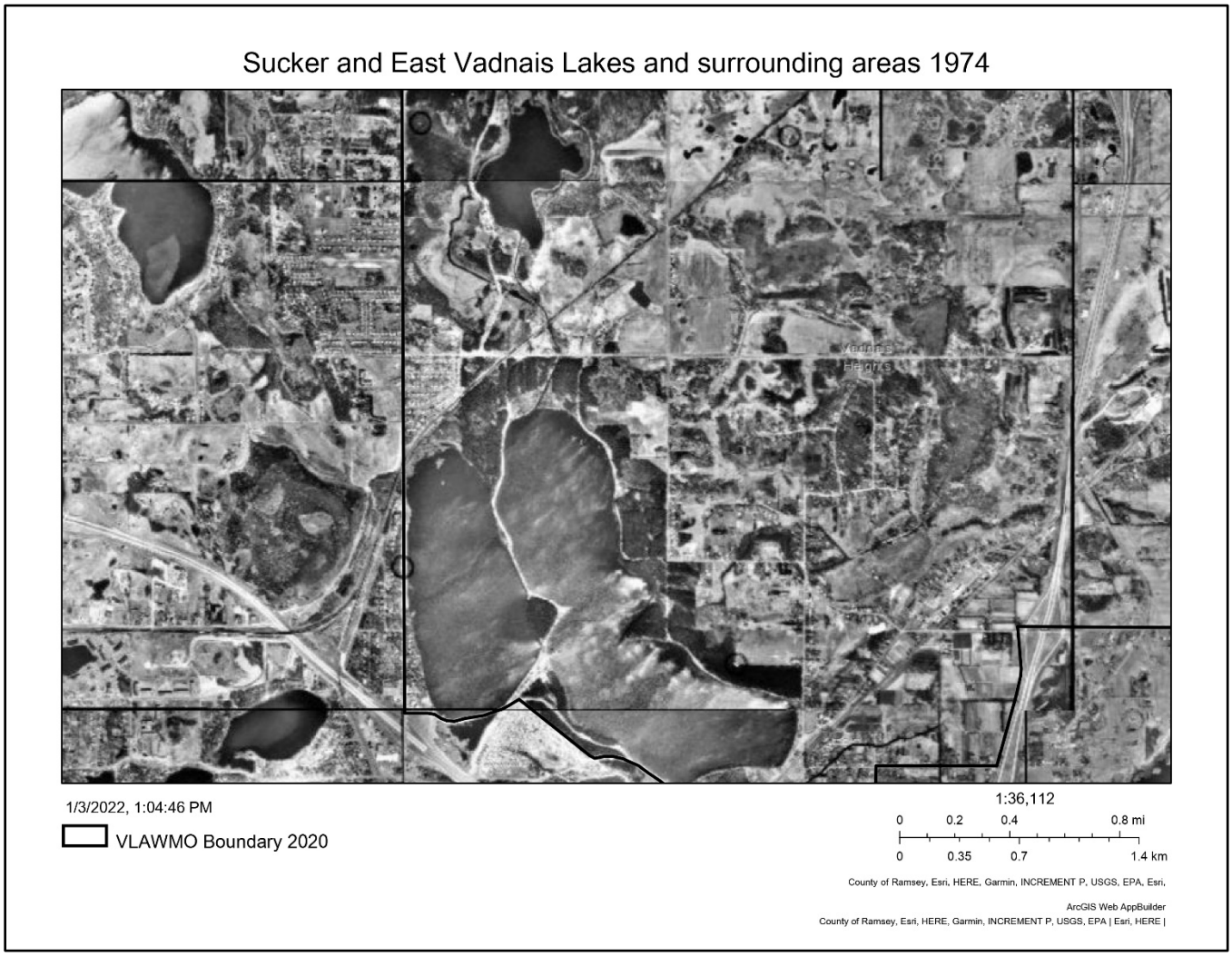
In 1940, aerial photos from Ramsey County show that the land surrounding the lakes was largely agricultural, and the road that is now County Road F was in place to the north of East Vadnais Lake. The Lake Vadnais area was part of White Bear Township. County roads were paved, while smaller roads were still laid out and graded by hand (*Reflections*, p. 108). The township area primarily consisted of farms and small proprietors. Vadnais-Sucker Lake Regional Park was present by 1937 (*Reflections,* p. 195).

Figure 4: 1953 aerial photo of Sucker and East Vadnais Lakes



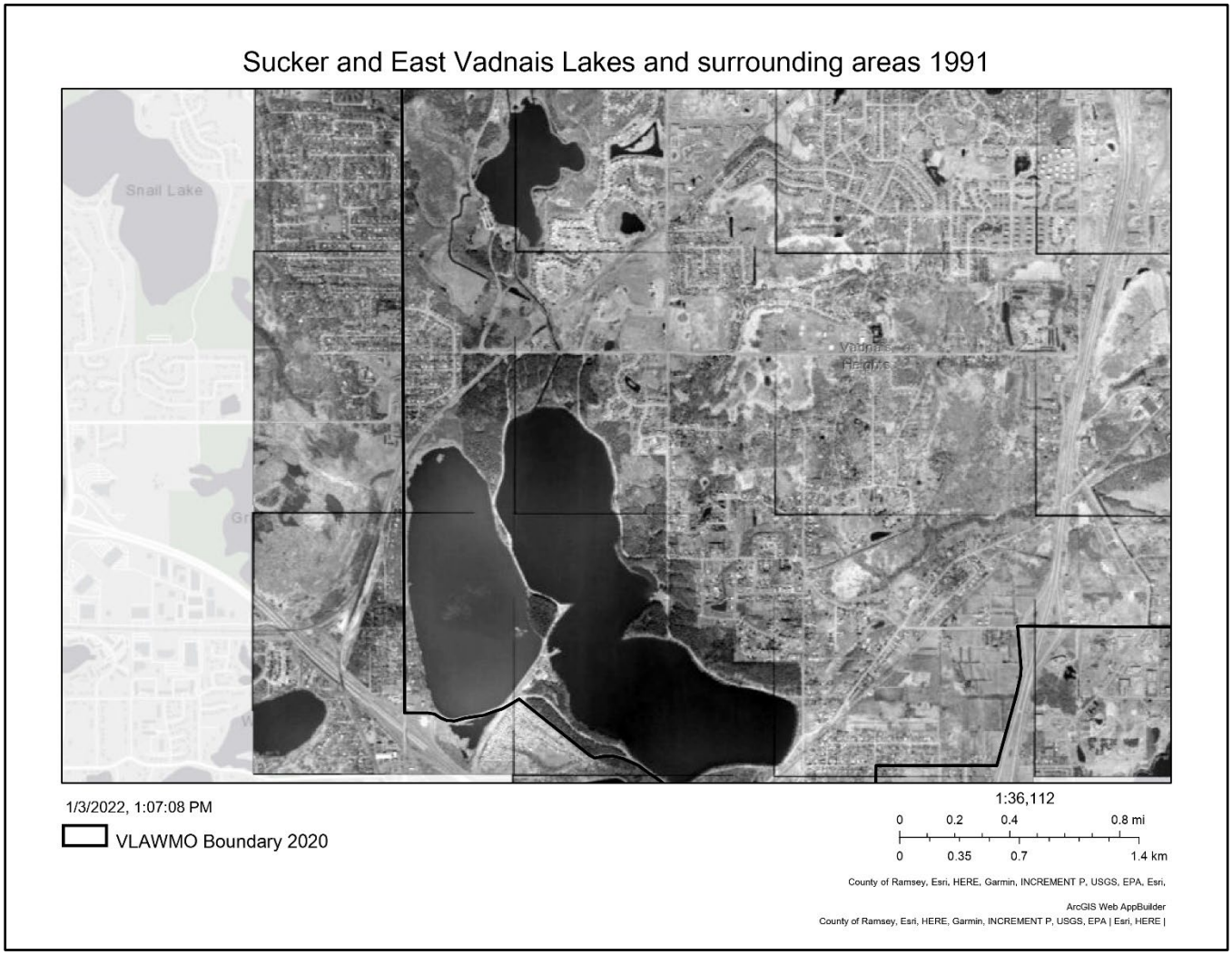
In 1953, the area is still mostly agricultural with some residential development. World War II ended in 1945. In the 10 years after, the area around the lakes changed rapidly. More homes were built. By 1957, the population had increased from 750 prior to the war to 1,977 (*Reflections,* p. 115). Wetlands were being drained and filled for housing development. The Village of Vadnais Heights was incorporated in 1957.

Figure 5: 1974 aerial photo of Sucker and East Vadnais Lakes



By 1974, Interstate 694 is in place, and development increased. In 1971, there were 28 businesses in Vadnais Heights. A few farms remained in the 1970s, especially along County Road E. A rapid conversation from remaining farmland to residential and commercial development occurred during this time. Vadnais Heights officially became a city in 1975.

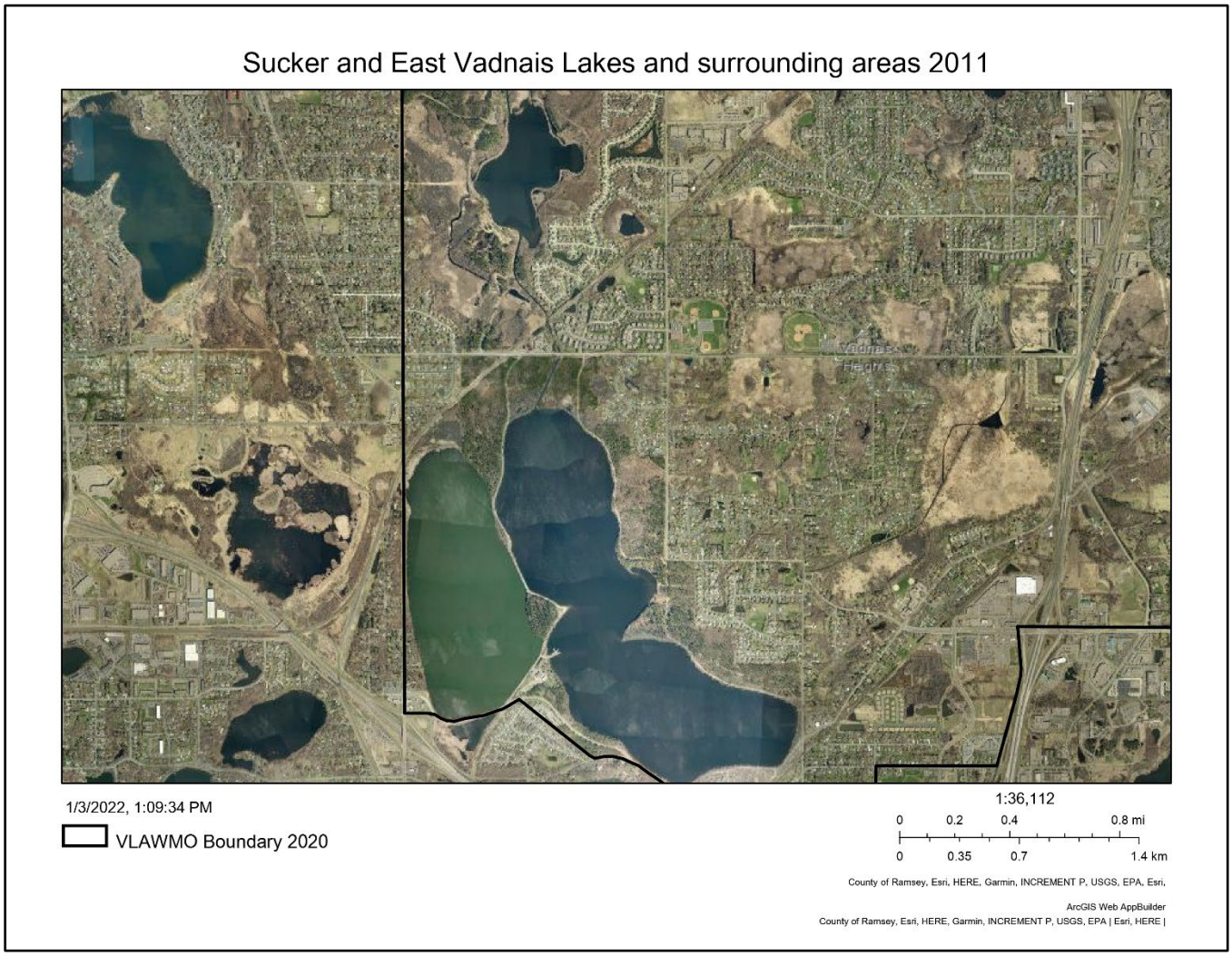
Figure 6: 1991 aerial photo of Sucker and East Vadnais Lakes



By 1991, some commercial development is visible, residential areas have expanded, and the park area around the lakes is clearly defined by road boundaries. Roadways were being expanded during this time.

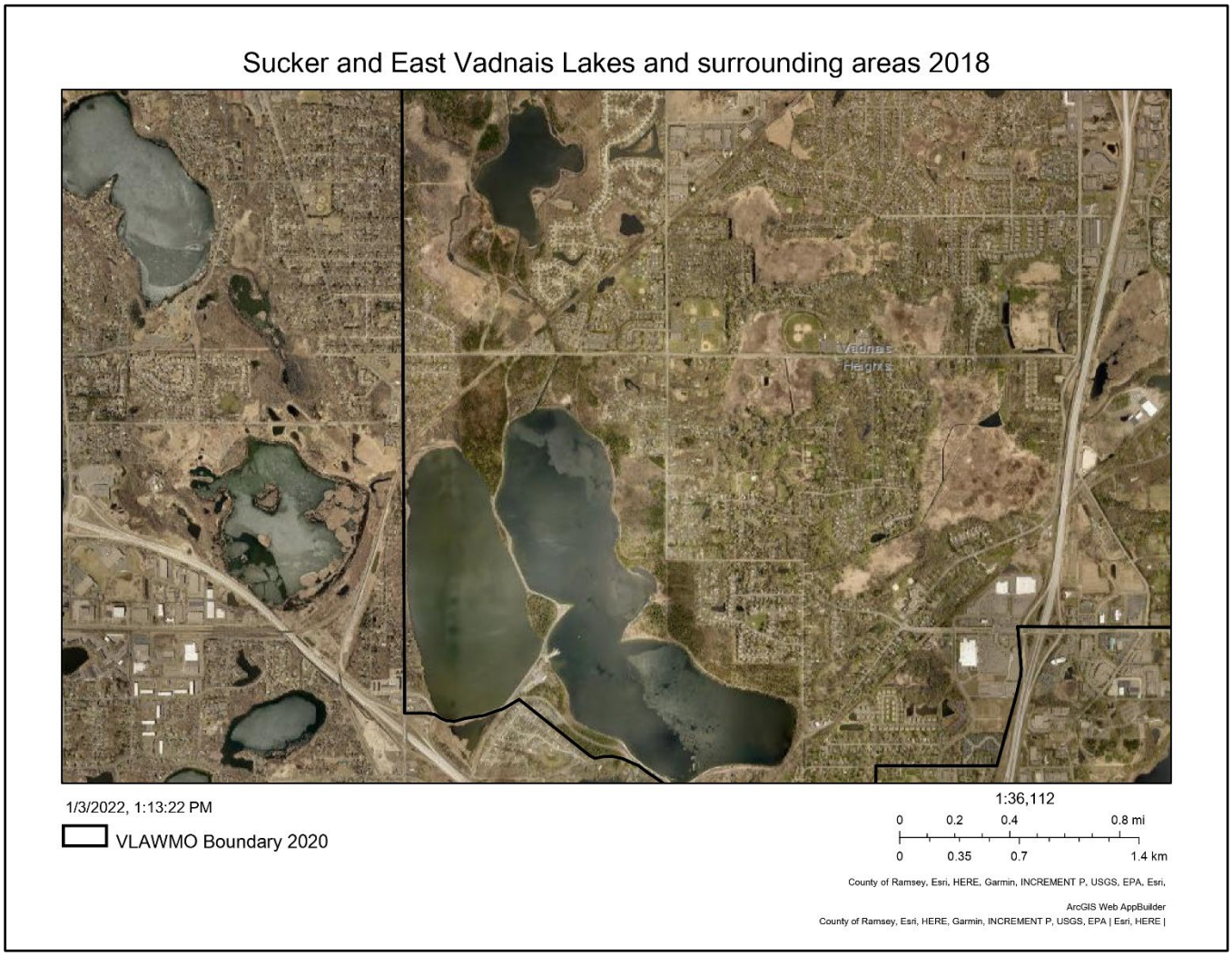
> *To accommodate the higher volume of traffic that Wal-Mart and Target generate, the County Road E bridge over I-35E was widened in 1992. Highway 96 renovation rerouted traffic into the city during the mid-90s, and the reconstruction of the Edgerton Street bridge over I-694 took a year beginning in July, 2004… A new Fire Station went up in 1994, and a new City Hall rose at City Center in 2001* (*Reflections*, p. 172).

Figure 7: 2011 aerial photo of Sucker and East Vadnais Lakes



In 2011, the green hue of algae is clearly visible indicating poor water quality in West Vadnais Lake. Lambert stormwater pond (built in 2004) is present on this map, as is the ditch system discharging from the pond and flowing into East Vadnais Lake. This stormwater pond was the focus of sheetpile replacement in 2021, and the straight-line ditch that used to flow out of the pond was converted to a meandering stream with vegetation restoration.

Figure 8: 2018 aerial photo of Sucker and East Vadnais Lakes



In 2018, an early season photo shows ice still present on East Vadnais Lake. Note that additional years of aerials are available on the VLAWMO GIS Map, linked on the website under Resources.

2 WATERSHED FEATURES

2.2 SUCKER AND EAST VADNAIS LAKES DRAINAGE AREAS

Sucker Lake has a surface area of 61 acres and a contributing subcatchment (subwatershed) area of 1,049 acres. East Vadnais Lake has a surface area of 389 acres and a contributing subcatchment area of 918 acres. The subcatchment areas are shown below (shaded area in Figure 9), noting the lightly-shaded red boundary, just south of County Road F, that is the subcatchment boundary between Sucker and East Vadnais drainage areas.

Figure 9: Sucker and East Vadnais Lakes Drainage Area and Flow Patterns

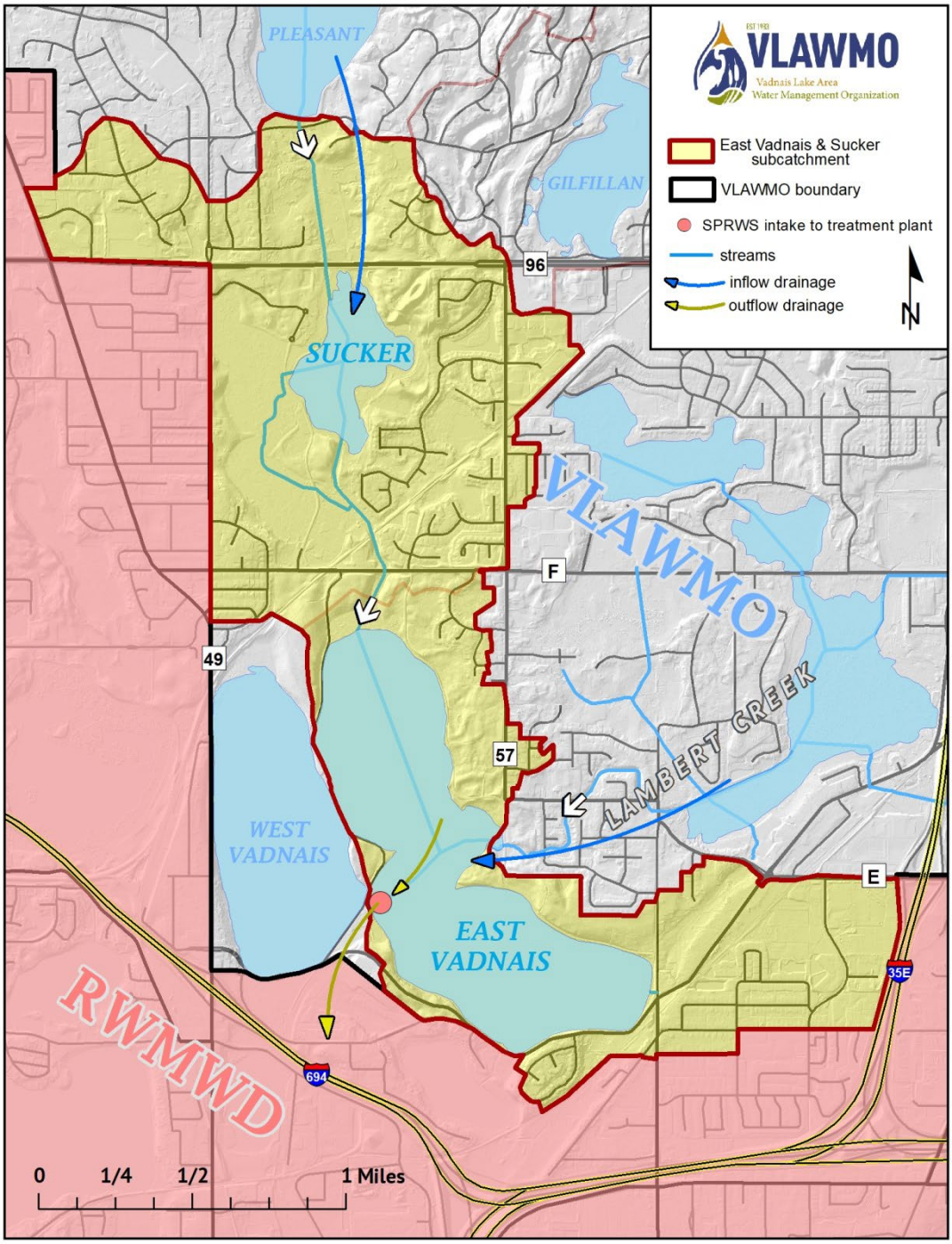
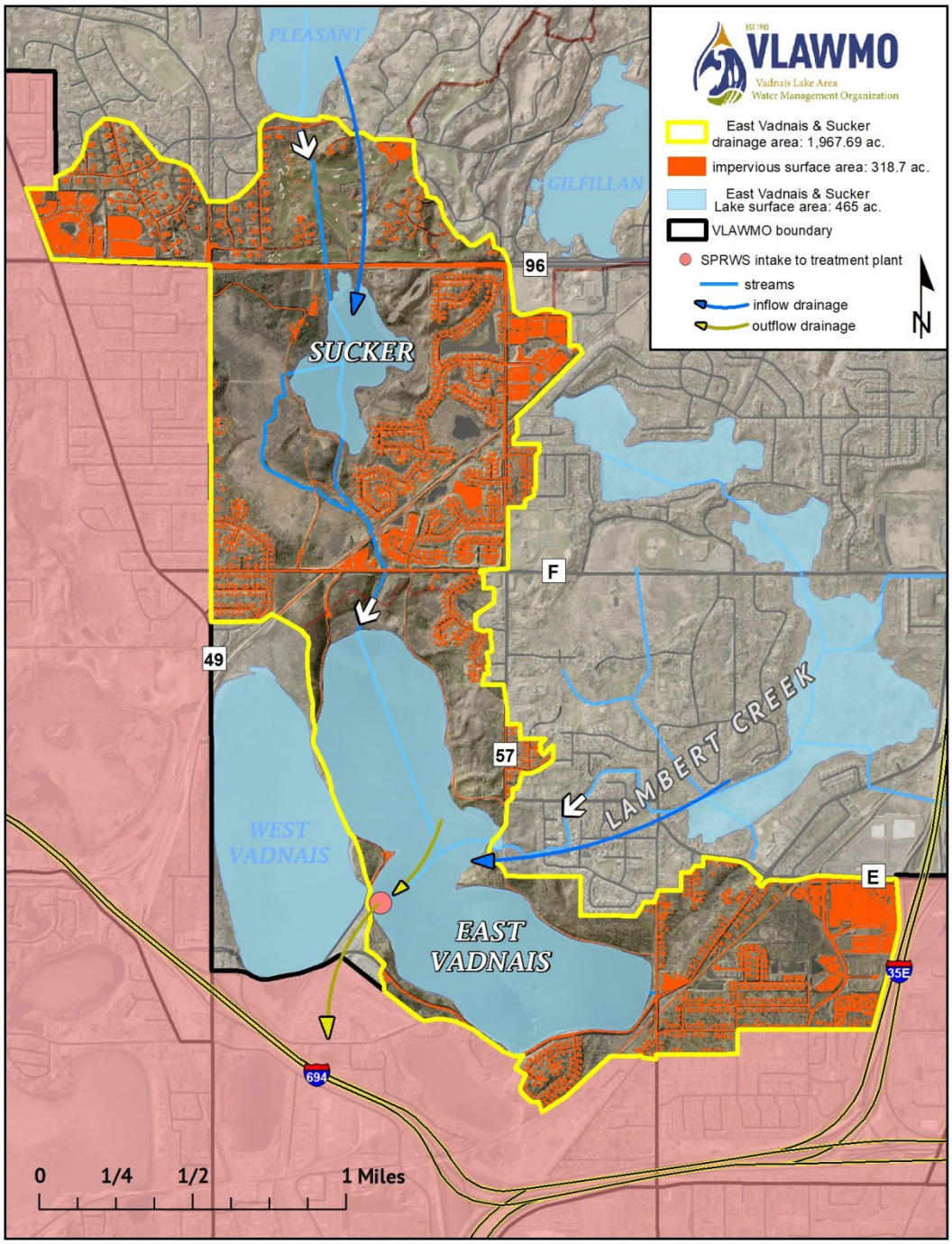


Figure 10 shows that a modest amount of land cover in the Sucker and East Vadnais Lake areas is developed, with a sizeable land area of open and undeveloped space in the larger Ramsey County Vadnais-Snail and Sucker Regional Park network. Impervious surfaces make up 319 acres of total land area or 16% within the Sucker and East Vadnais subcatchment areas, including water surface area and terrestrial surface area. Not including West Vadnais & Sucker Lakes' surface water areas, impervious surface area comprises 21% of the 1,503 acres of terrestrial land cover. The majority of precipitation that falls on those

surfaces moves rapidly into downstream lakes, wetlands, and streams.

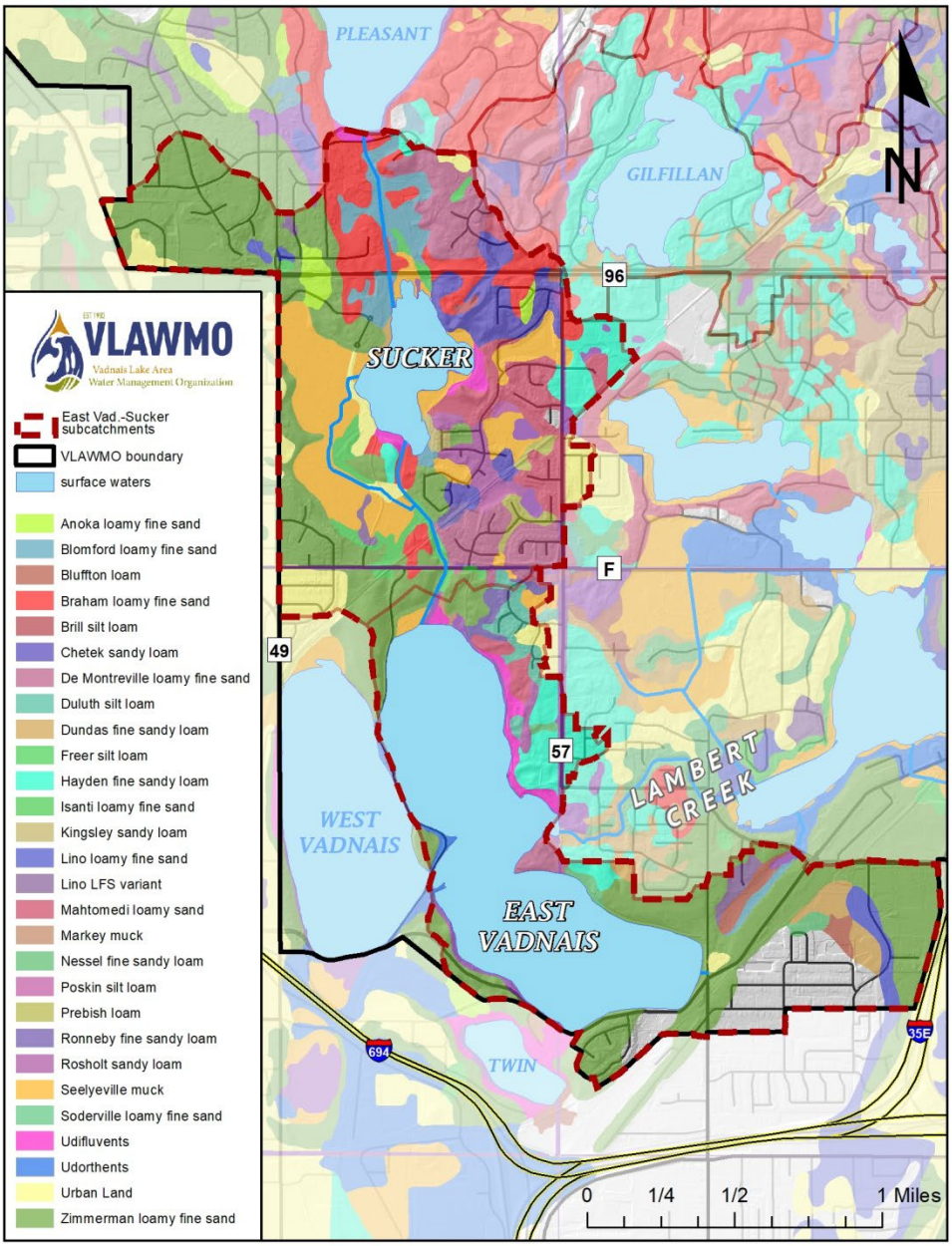
Figure 10: Impervious Surfaces in Sucker and East Vadnais Lakes Drainage Area



2.3 SUCKER AND EAST VADNAIS LAKES SOILS

Soils in the Sucker and East Vadnais Lakes subcatchment drainage areas are mainly comprised of varying loams, sandy loams, loamy fine sands, mucks, urban land, udifluvents and udorthents. Loamy fine sands, for example, are moderately well drained, allowing precipitation and water runoff to infiltrate quickly through undeveloped or undisturbed soils. Soil infiltration funnels precipitation into the water table and recharges shallow groundwater. With urban soils associated with land development, much of the soils have been compacted, moved, and paved, which leaves less shallow groundwater recharge than prior to development. A large portion of runoff is diverted into lakes, wetlands, and streams. Retrofit Best Management Practices (BMPs), such as raingardens, infiltration basins, and filtration basins, are designed to help facilitate and restore some of the shallow groundwater and water table recharge that was been lost due to development.

Figure 11: Sucker and East Vadnais Lakes Area Soils



2.4 Sucker and East Vadnais Lakes Wetlands and Rare Plant Communities

A detailed wetland assessment was conducted by SEH in 2020 in Vadnais-Sucker Lake Regional Park. The area was selected because of the high-quality remaining habitat in an otherwise largely developed landscape, remaining native plant community areas (as identified by the MN DNR) that are relatively undisturbed, and potential for partnership-based restoration opportunities. The wetland assessment was important because it identified and categorized wetland areas, and established a baseline for comparison as part of future work. Invasive species of concern were also identified and delineated as part of this process. Infestation follow-up has continued with VLAWMO staff including checking locations for possible invasive Phragmites (so far Phragmites in the park have all been verified as native) and Yellow iris (either identified

as native Blue flag iris, or confirmed as invasive Yellow iris and removed by VLAWMO staff). Invasive species checks are included in the updated memo/report from SEH. Invasive species monitoring for these two particular species should continue so that any new infestations can be promptly identified and treated or mechanically removed.

The wetland assessment was conducted in portions of sections 19, 29, 30, 31 and 32 of Township 30 North, Range 22 West in Vadnais Heights, Ramsey County, Minnesota. The site assessed is 1,200 acres and consists of a variety of upland and wetland plant communities. A total of 41 wetland basins were identified, delineated, and classified. The full report by SEH includes the dominant species of vegetation and the soil and hydrologic characteristics at representative locations around each basin. Some of these basins were quite large; for further classification, these largest basins were subdivided into areas with similar plant communities for a total of 49 wetlands.

A primary purpose of the site evaluation was an assessment and classification of the wetland habitat within the park boundary. To determine the quality of wetlands onsite, MnRAM (3.4) was utilized to provide a basis of wetland management recommendations. The MnRAM database classifies a wetland into 1 of 4 categories: Preserve, Manage 1, Manage 2, or Manage 3. During the on-site investigation, scientists compiled a plant list for each wetland community, making note of any invasive or noxious weeds, as well as any rare or endangered species present. Vegetation assessments provide a detailed perspective to aid future initiatives, inform decisions on planning efforts for restoration priorities, identify candidate high-quality wetlands for preservation, and provide baseline data for assessing long-term monitoring efforts.

Overall, the site conditions were considered good. Of the 49 MnRAM scores, 22 were rated “Preserve”, 16 were rated “Manage 1”, 10 were rated “Manage 2” and only 1 was rated “Manage 3”. Vegetation quality ratings were, on average, medium. A total of 58 individual vegetation communities were rated in the park, and 31 received a “medium” value score. Generally, medium or low value communities contained some invasive or non-native species including Narrow-leaf cat-tail (*Typha angustifolia*), Reed canary grass (*Phalaris arundinacea*), European/Common buckthorn (*Rhamnus cathartica*). Management of these target species may result in a large improvement of the score of the wetland. While no rare or endangered species were observed in the project limits, several high-quality vegetation ratings were observed within the park property. These communities are shown in the full report from SEH.

Figures from the SEH wetland inventory are shown next, followed by the MN DNR Native Plant Communities located within Vadnais-Sucker Lake Regional Park, and the upcoming 45-acre restoration area.

Figure 12: Project Location for the Wetland Assessment

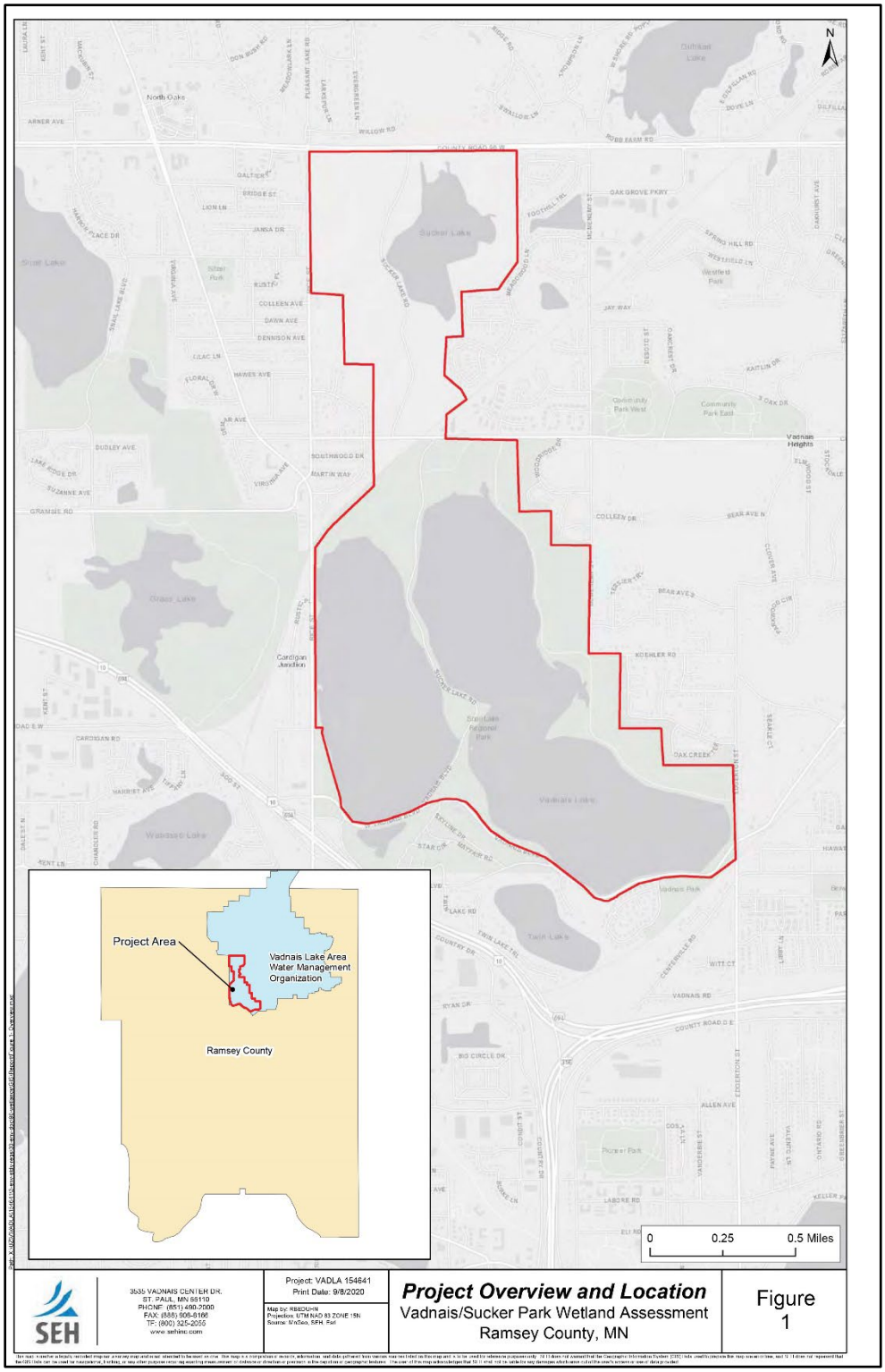


Figure 13: MnRAM Assessment Scores for Wetlands Identified in Assessment

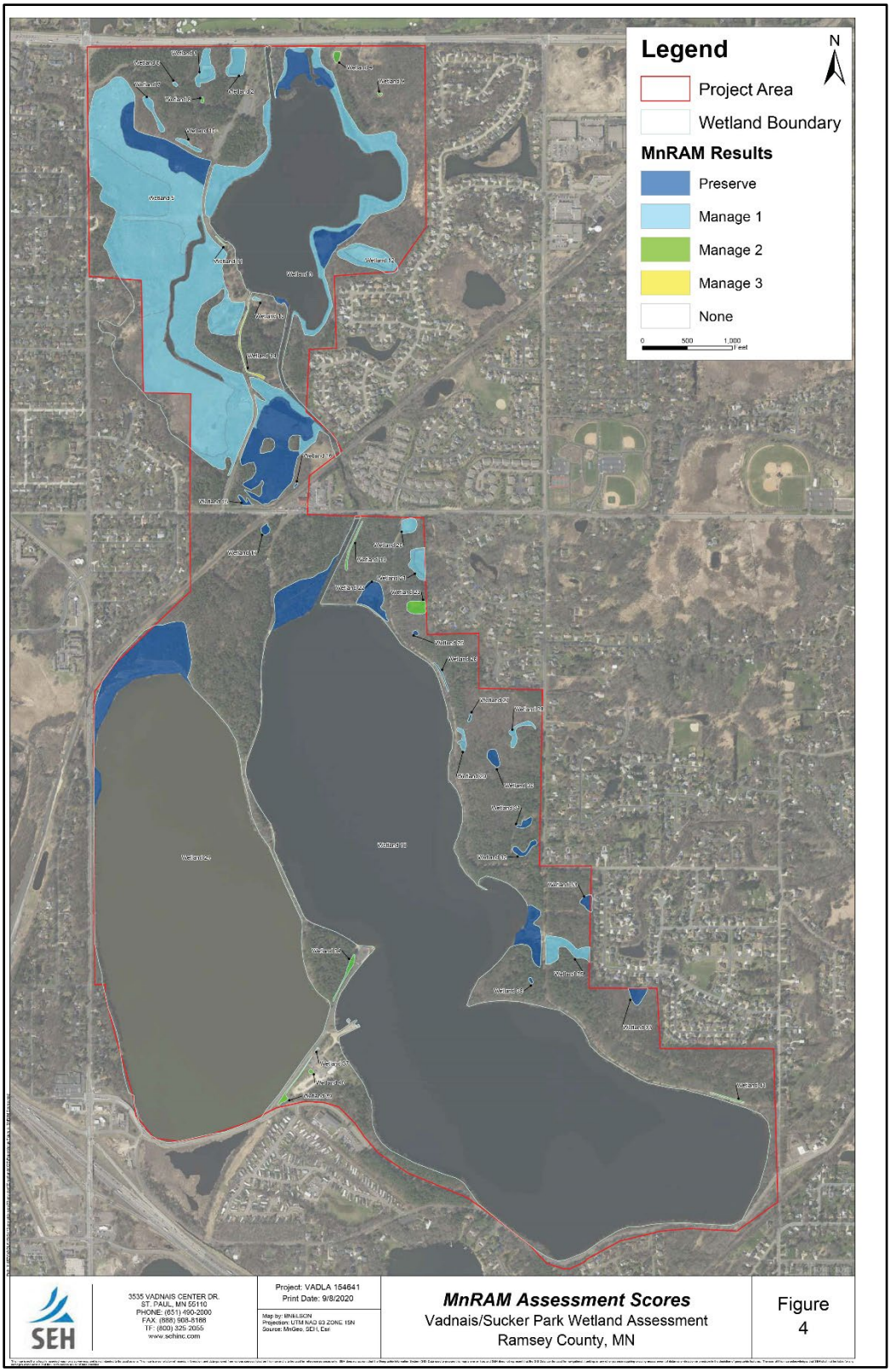


Figure 14: More Detailed Wetland Classifications within Management Types

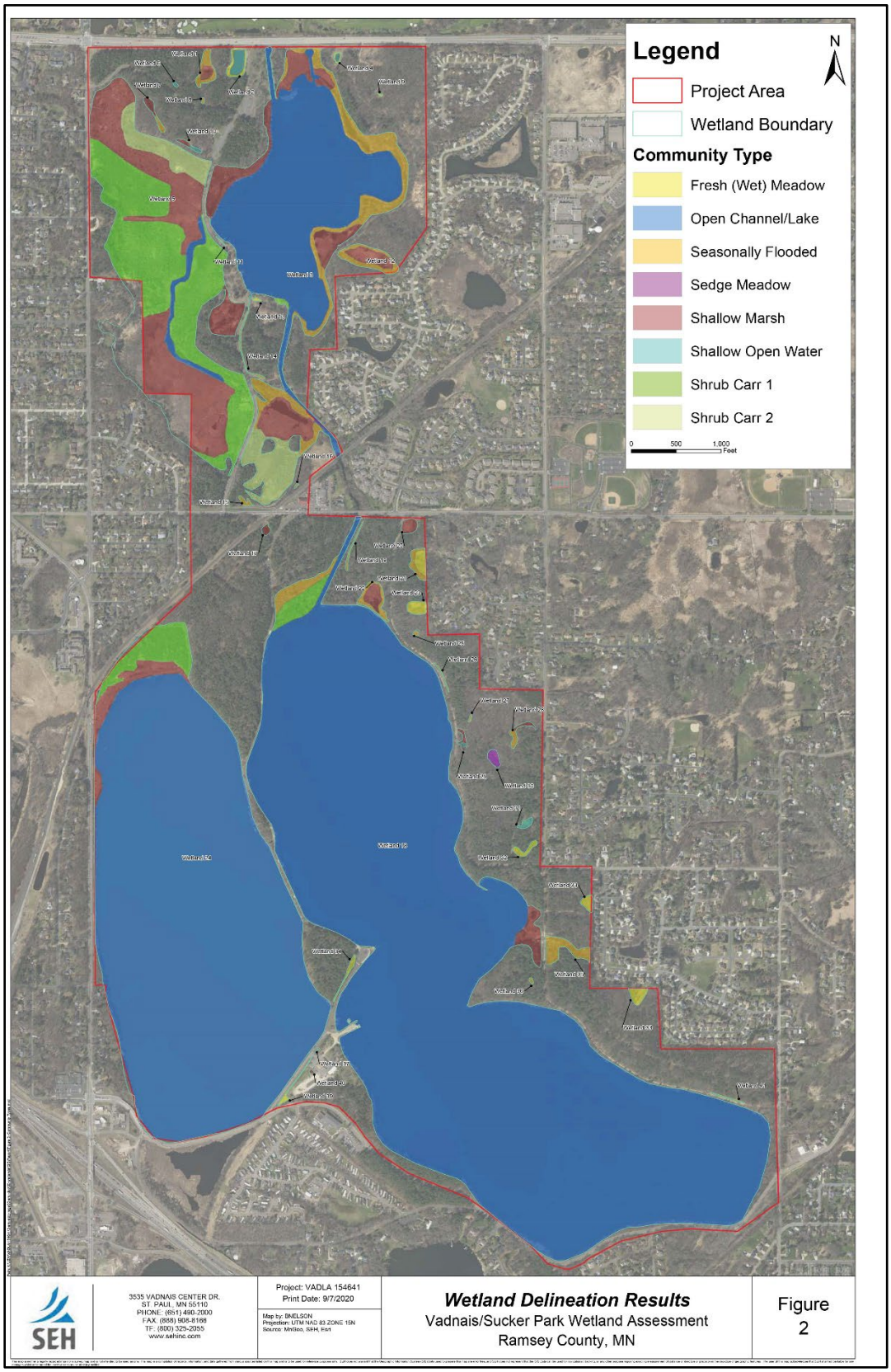


Figure 15: MN DNR Native Plant Communities
This layer is available on the VLAWMO GIS web resource.

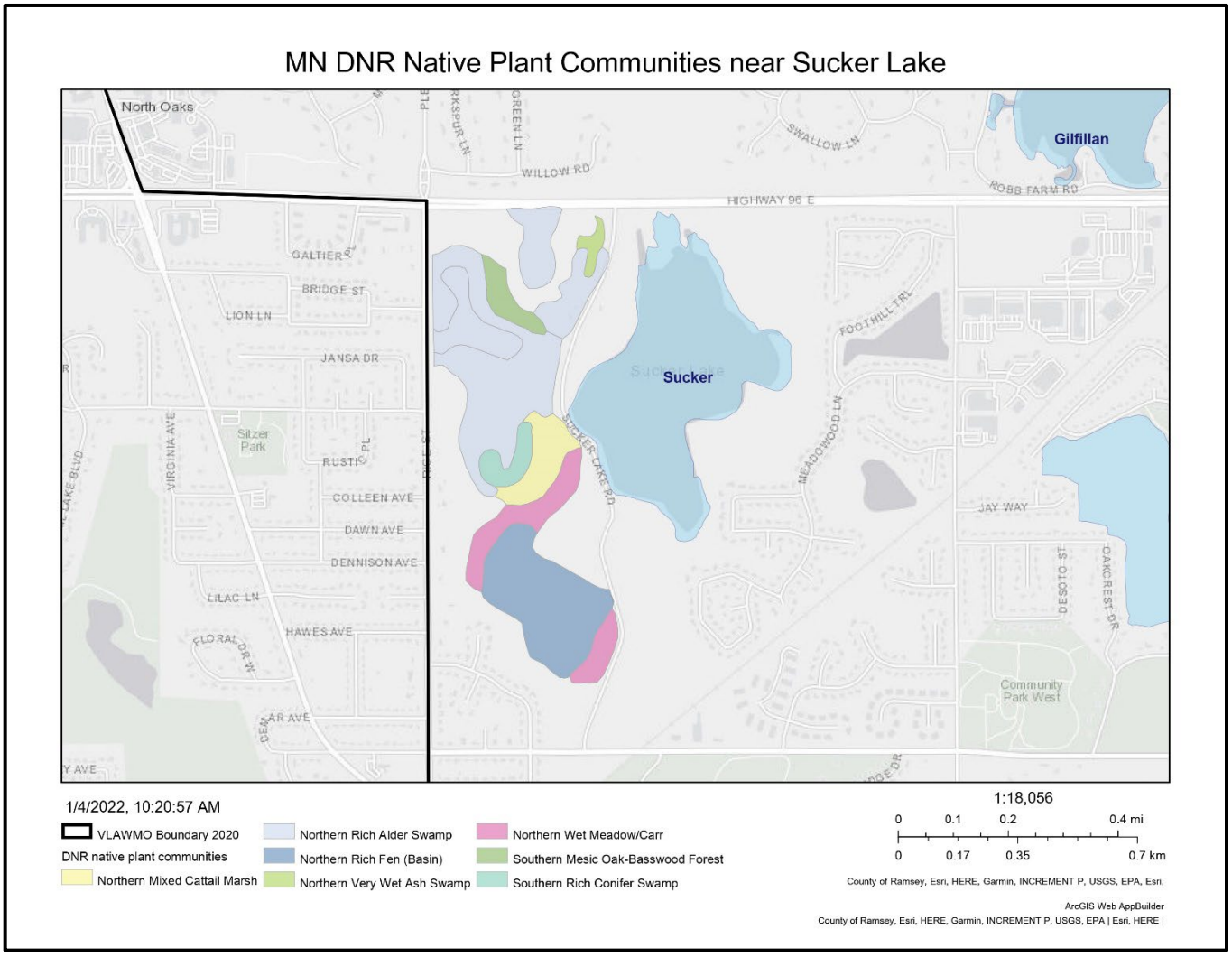


Figure 16: Upcoming Restoration in Vadnais-Sucker Lake Regional Park with Great River Greening, Ramsey County Parks, and SPRWS, shown here for context and relationship to wetland areas

2.5 Sucker and East Vadnais Lakes Shoreline Vegetation

A shoreline survey was conducted by RCSWCD and VLAWMO staff for Sucker Lake on August 25, 2020, and for East Vadnais Lake on August 31, 2020. The full shoreline vegetation reports are available on the VLAWMO website. A synopsis is included here.

Sucker Lake has a shoreline length of 2.12 miles (MN DNR, 2020). The Minnesota Department of Natural Resources (MN DNR) classified the adjacent areas west of Sucker Lake into 5 categories, which may influence plant communities of the lake shoreline. Those 5 categories are: Northern Mixed Cattail Marsh (MRn83), Black Ash-Yellow Birch-Red Maple-Alder Swamp (WFn64b), Alder-Maple-Loosestrife Swamp (FPn73a), Tamarack Swamp (FPs63a), and Willow-Dogwood Shrub Swamp (WMn82a) (MN DNR, 2014). Within the U.S. Fish & Wildlife Service's National Wetland Inventory (Cowardin Classification System), the Sucker Lake shoreline is predominantly classified as PEMF and PUBF, which correspond to semi-permanently flooded areas of emergent vegetation and unconsolidated bottom. Approximately three-fourths of the shoreline is classified as palustrine-emergent (PEM). Small sections along the north shore and a section of the southeast shore are classified as palustrine-unconsolidated bottom (PUB). The north shore also includes a section classified as PUBGx, where Gx indicates a human-excavated channel with intermittent exposure of the bottom. A sliver of the east shoreline is classified as palustrine-forested (PFO), further coded with 1C, which indicates a seasonally flooded area of broad-leaved deciduous trees.

East Vadnais Lake has a shoreline length of 4.9 miles (MN DNR, 2020). The lake serves as a drinking water reservoir for the City of Saint Paul and is managed by St. Paul Regional Water Services (SPRWS). As a result, boat use of any kind is prohibited unless authorized by SPRWS. The lake shoreline has a diverse morphology. The west side lacks shade and has a thin buffer strip, as a recreational walking trail limits the potential for expansion. The north shoreline consists of a series of wetlands, has mostly flat topography with a buckthorn overstory, and is the receiving end of a tributary connected to Sucker Lake. The east shoreline wavers between steep topography and flat areas of wetlands. It has extended lengths of large overstory and tends to be closer to residential dwellings. The south also has very steep topography adjacent to a roadway. The southwest shoreline is flat, where public access is restricted due to the area being the main operation site for SPRWS.

While there is limited data on native plant community classifications along the shoreline of East Vadnais Lake, the surrounding wetlands have been classified within the U.S. Fish & Wildlife Service's National Wetland Inventory (Cowardin Classification System). The East Vadnais Lake shoreline is not dominated by any single classification. The shoreline consists of or is surrounded by a diverse class of wetlands. Nearly every direction of shoreline is in the vicinity of PFO1A class – a forested palustrine system with broad-leaved deciduous plants, where the ground is temporarily flooded during the growing season. Also present throughout the shoreline is PEM, indicating palustrine-emergent. Depending on location, this classification may be further coded with 1C – a variable water table dominated by species that remain standing until the beginning of next season – or 1A – a temporarily flooded ground dominated by species that remain standing until the beginning of next season. Less common is PABH, which indicates a permanently flooded palustrine system where plants grow on or below the water surface for the majority of the growing season. The west shoreline is bordered by West Vadnais Lake, which is also surrounded by PEM1C while introducing classes PSS1C – a seasonally flooded palustrine system dominated by woody vegetation under 20 feet tall – and PUBF – a semi-permanently flooded palustrine system with less than 30% vegetative cover, known as an unconsolidated bottom.

Figure 17: Cowardin Classifications for Sucker and East Vadnais Lake Shoreline Areas

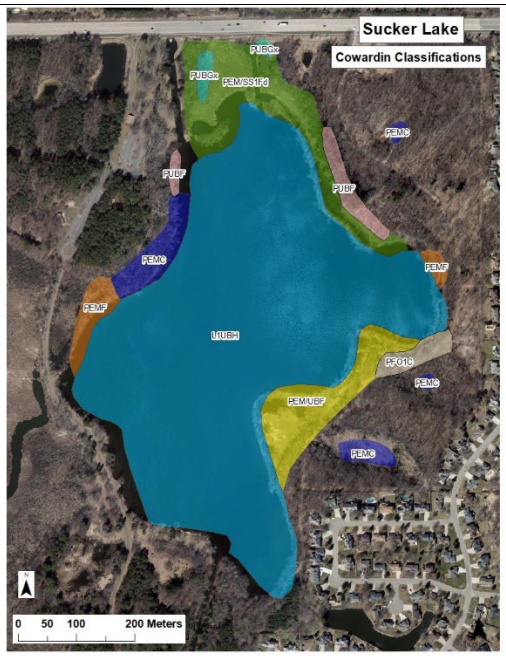


Figure 3. Cowardin classifications of wetlands surrounding Sucker Lake (U.S. Fish & Wildlife Service's National Wetland Inventory).

Wetland classifications can be decoded on U.S. Fish & Wildlife Service's website at https://fwsprimary.wim.usgs.gov/decoders/wetlands.aspx.

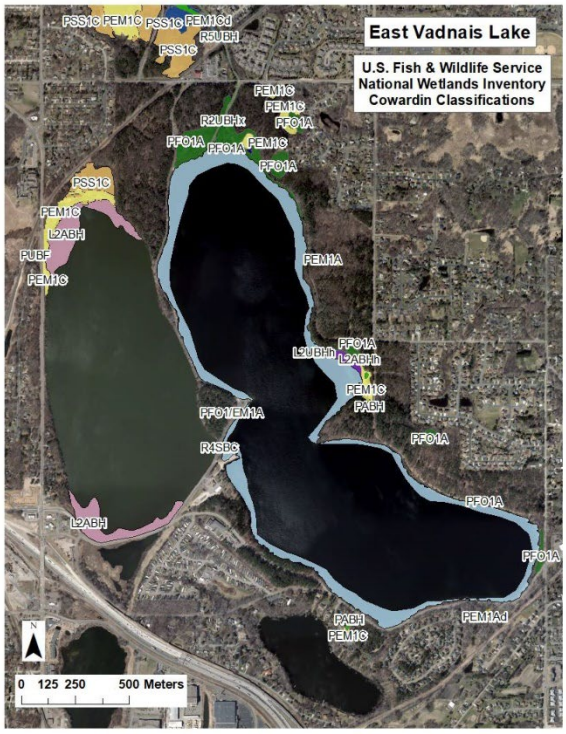


Figure 2. Cowardin classifications of wetlands surrounding West (left) and East (right) Vadnais Lakes (U.S. Fish & Wildlife Service's National Wetland Inventory).

Figure 18: Sucker and East Vadnais Lakes Transect Locations

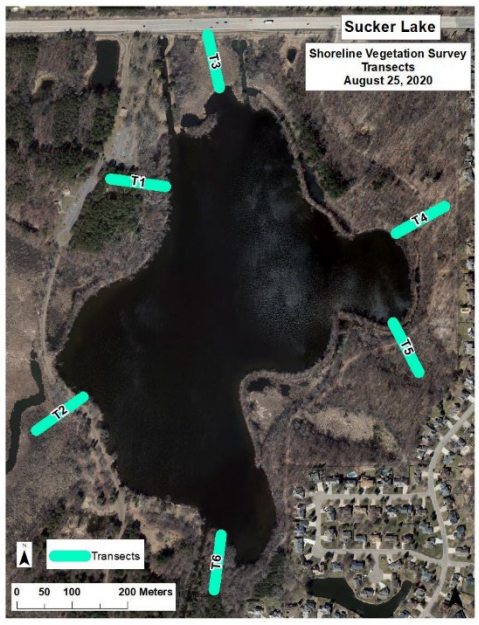


Figure 4. Transects (T) selected for shoreline vegetation survey. Transect locations were selected based on objective of capturing the best plant diversity across the lake shoreline.

Shoreline Vegetation Survey 5

Figure 3. Transects (T) selected for shoreline vegetation survey. Transect locations were selected based on objective of capturing the best plant diversity across the lake shoreline.

Shoreline Vegetation Survey 4

Table 1: A total of 84 species were identified during the shoreline vegetation surveys. These included 67 native and 17 invasive species. More information and locations are available in the full reports. Invasive species (identified with red text) removal would improve habitat quality in general within the park. Wetland and aquatic invasive species are a priority for VLAWMO.

Number	Common Name	Scientific Name
1	Amur Maple	*Acer ginnala*
2	Boxelder	*Acer negundo*
3	Silver Maple	*Acer saccharinum*
4	Garlic Mustard	*Alliaria petiolata*
5	Speckled Alder	*Alnus incana*
6	American Hog Peanut	*Amphicarpaea bracteata*
7	Canada Anemone	*Anemone canadensis*
8	Groundnut	*Apios americana*
9	Dogbane (Indian Hemp)	*Apocynum cannabinum*
10	Common Milkweed	*Asclepias syriaca*
11	Unknown Aster	*Asteraceae sp.*
12	Lady Fern	*Athyrium filix-femina*

13	Paper Birch	*Betula papyrifera*
14	Nodding Bur-marigold	*Bidens cernua*
15	Swamp Beggarticks	*Bidens connata*
16	Discoid Beggarticks	*Bidens discoidea*
17	Devil's Beggarticks	*Bidens frondosa*
18	False Brome	*Brachypodium sylvaticum*
19	Canada Bluejoint	*Calamagrostis canadensis*
20	Bottlebrush Sedge	*Carex hystericina*
21	Lake Sedge	*Carex lacustris*
22	Bulblet-bearing Water Hemlock	*Cicuta bulbifera*
23	Enchanter's Nightshade	*Circaea lutetiana*
24	Red-osier Dogwood	*Cornus sericea*
25	Straw-colored Flatsedge	*Cyperus strigosus*
26	Tick Trefoil	*Desmodium sp.*
27	Bush Honeysuckle	*Diervilla lonicera*
28	Smooth Crab Grass	*Digitaria ischaemum*
29	Smooth Scouring Rush	*Equisetum laevigatum*
30	Meadow Horsetail	*Equisetum pratense*
31	Leafy Spurge	*Euphorbia virgata*
32	Fescue	*Festuca sp.*
33	Glossy Buckthorn	*Frangula alnus*
34	Northern Bedstraw	*Galium boreale*
35	Wild Geranium	*Geranium maculatum*
36	Creeping Charlie	*Glechoma hederacea*
37	Jewelweed	*Impatiens capensis*
38	Jewelweed	*Impatiens pallida*
39	Iris	*Iris sp.*
40	Marsh Vetchling	*Lathyrus palustris*
41	Rice Cutgrass	*Leersia oryzoides*
42	Honeysuckle	*Lonicera sp.*
43	Birds-foot Trefoil	*Lotus corniculatus*
44	American Water Horehound	*Lycopus americana*
45	Northern Bugleweed	*Lycopus uniflorus*
46	Purple Loosestrife	*Lythrum salicaria*
47	Canada Mayflower	*Maianthemum canadense*
48	False Solomon's Seal	*Maianthemum racemosum*
49	White Sweet Clover	*Melilotus alba*
50	Sensitive Fern	*Onoclea sensibilis*
51	Cinnamon Fern	*Osmundastrum cinnamomeum*
52	Ironwood	*Ostrya virginiana*
53	Southern Wood Sorrel	*Oxalis dillenii*
54	Virginia Creeper	*Parthenocissus quinquefolia*
55	Pennsylvania Smartweed	*Persicaria pensylvanica*
56	Dotted Smartweed	*Persicaria punctata*
57	Arrow-leaved Tearthumb	*Persicaria sagittata*
58	Reed Canary	*Phalaris arundinacea*
59	American Lopseed	*Phryma leptostachya*

60	Dwarf Clearweed	*Pilea pumila*
61	Common Plantain	*Plantago major*
62	Kentucky Bluegrass	*Poa pratensis*
63	Cherry	*Prunus sp.*
64	White Oak	*Quercus alba*
65	Swamp White Oak	*Quercus bicolor*
66	Red Oak	*Quercus rubra*
67	Common Buckthorn	*Rhamnus cathartica*
68	Raspberry	*Rubus sp.*
69	Curly Dock	*Rumex crispus*
70	Arrowhead	*Sagittaria sp.*
71	Willow	*Salix sp.*
72	Little Bluestem	*Schizachyrium scoparium*
73	Mad-dog Skullcap	*Scutellaria lateriflora*
74	Late Goldenrod	*Solidago altissima*
75	Canada Goldenrod	*Solidago canadensis*
76	Zigzag Goldenrod	*Solidago flexicaulis*
77	Hairy Goldenrod	*Solidago hispida*
78	Arrowleaf Aster	*Symphyotrichum urophyllum*
79	Common Dandelion	*Taraxacum officinale*
80	American Basswood	*Tilia americana*
81	Marsh Fern	*Thelypteris palustris*
82	Alsike Clover	*Trifolium hybridum*
83	Narrowleaf Cattail	*Typha angustifolia*
84	Wild Grape	*Vitis riparia*

3 LAKE FEATURES

3.1 WEST VADNAIS LAKE DEPTH

A bathymetry survey was completed by Ramsey County Soil and Water Conservation Division (RCSWCD) on June 23, 2020 (East Vadnais Lake) and June 30, 2020 (Sucker Lake), to develop maps of the bottom and determine lake depths. The deepest location detected by sonar was 7.2 meters (23.6 feet) in Sucker Lake and 16.4 meters (53.8 feet) in East Vadnais Lake.

Figure 19: Sucker Lake Depths with 1-meter Contours

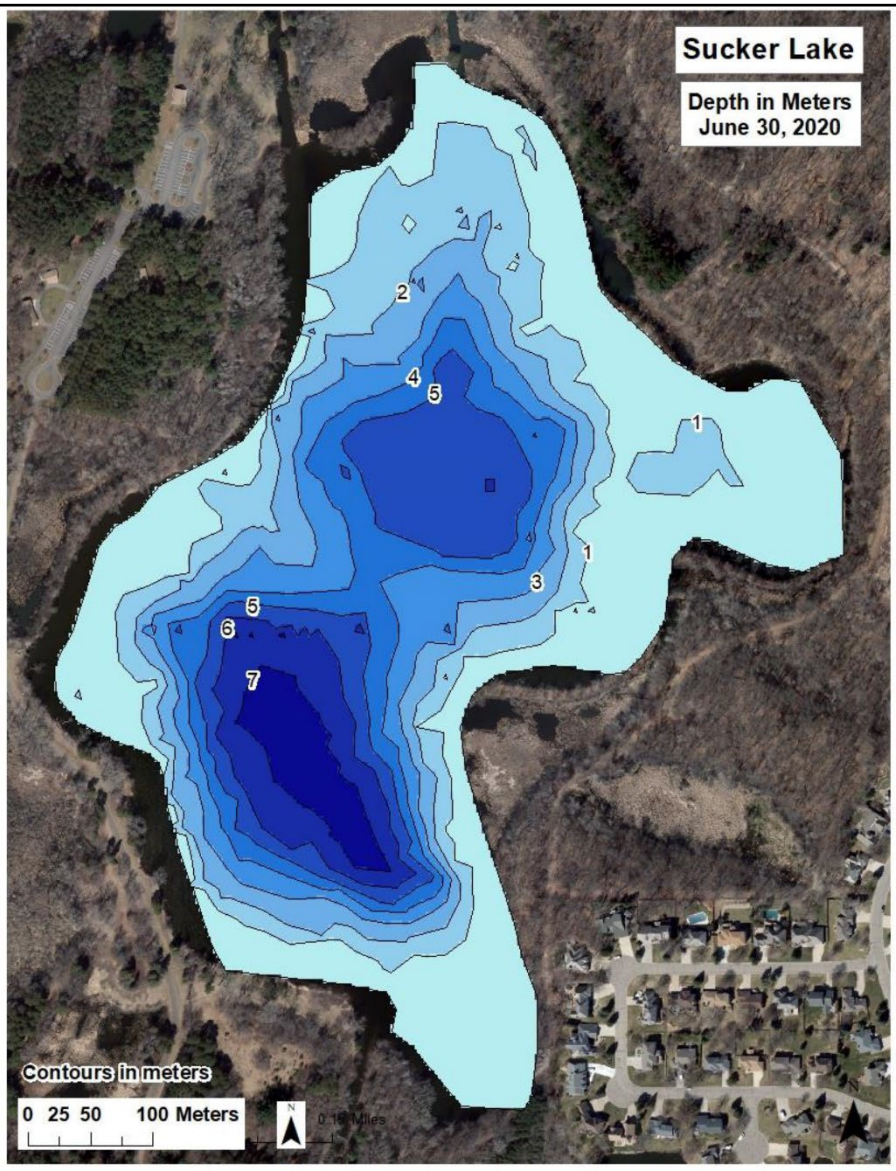


Figure 5. Sucker Lake depth with one-meter contours – June 2020 map used.

Figure 20: East Vadnais Lake Depths with 1-meter Contours

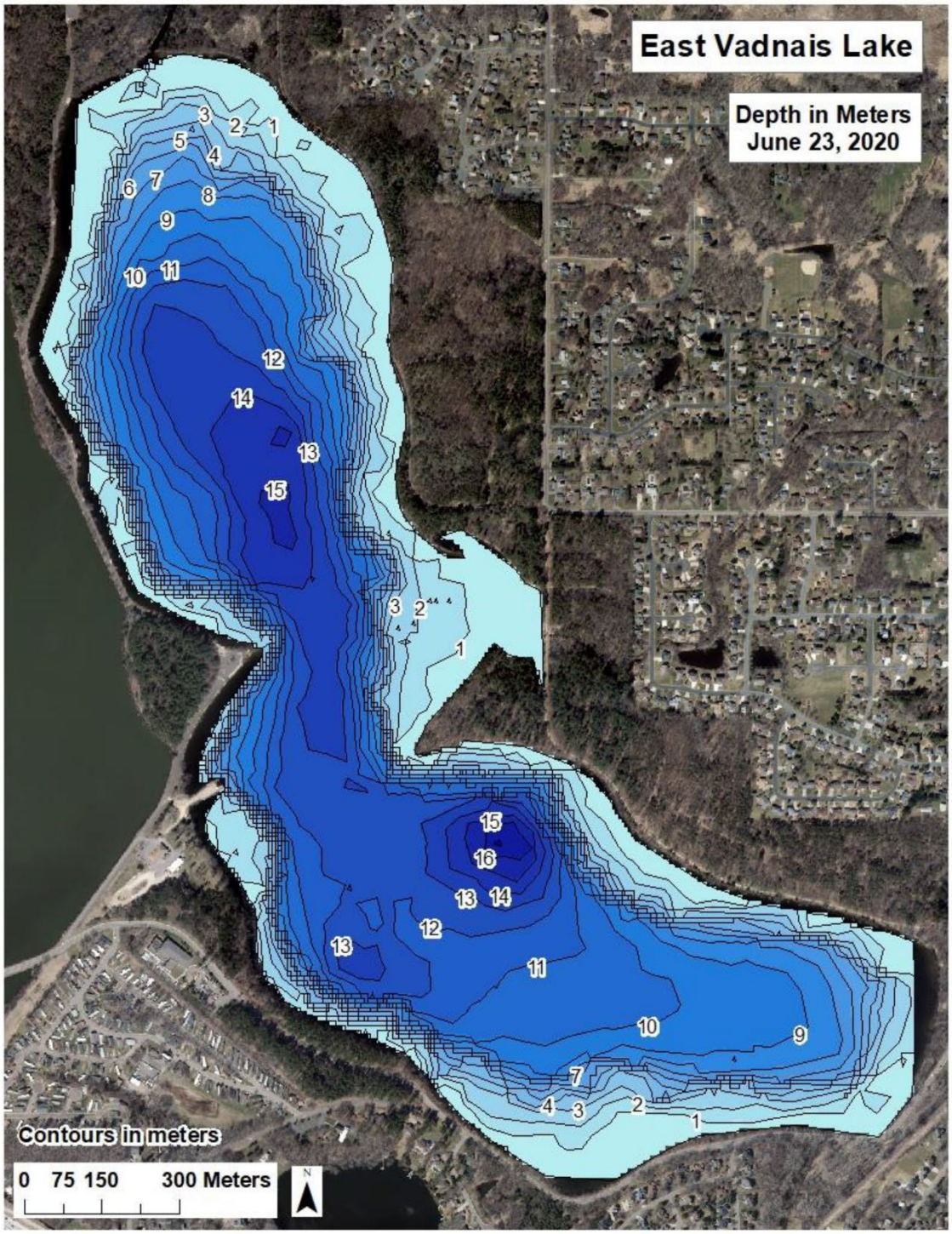


Figure 5. East Vadnais Lake depth with one-meter contours – June 2020 map used.

Aquatic Macrophyte, Contour, Biovolume and Bottom Composition Survey 10

3.2 West Vadnais Lake Biovolume and Aquatic Vegetation

Biovolume and Aquatic Vegetation

Ramsey Soil and Water Conservation Division (RCSWCD) conducted a biovolume and aquatic vegetation survey on June 23, 2020 in East Vadnais Lake and on June 30, 2020 in Sucker Lake. Biovolume measures the density of plant life within the lake. Blue signifies 0% plant life, and red signifies 100% plant life. At depths greater than 4-6 feet, there is commonly no plant life in Minnesota lakes. Plant growth is limited because the sun does not penetrate the water column below those depths enough to allow photosynthesis to occur.

For the aquatic macrophyte survey, 45 points were surveyed on Sucker Lake, and 120 points were surveyed on East Vadnais Lake using the metal portion of a rake/tines tied to a rope. Aquatic macrophytes were found at 42 of 45 points surveyed in Sucker Lake and 63 of 120 points surveyed in East Vadnais. The 3 most common species detected in Sucker Lake were Coontail (*Ceratophyllum demersum*), Greater Duckweed (*Spirodela polyrhiza*), and Lesser Duckweed (*Lemna minor*). Other moderately common species observed included Flat-stem Pondweed (*Potamogeton zosteriformis*) and Star Duckweed (*Lemna trisulca*). In East Vadnais Lake, the most common species observed (62% occurrence) was Greater Duckweed (*Spirodela polyrhiza*). Other relatively common species observed included Coontail (*Ceratophyllum demersum*), Curly-leaf Pondweed (*Potamogeton crispus*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Flat-stem Pondweed (*Potamogeton zosteriformis*), and Star Duckweed (*Lemna trisulca*).

Figure 21: Photo of RCSWCD and VLAWMO staff conducting lake surveys in 2020

Figure 22: Sucker Lake Biovolume

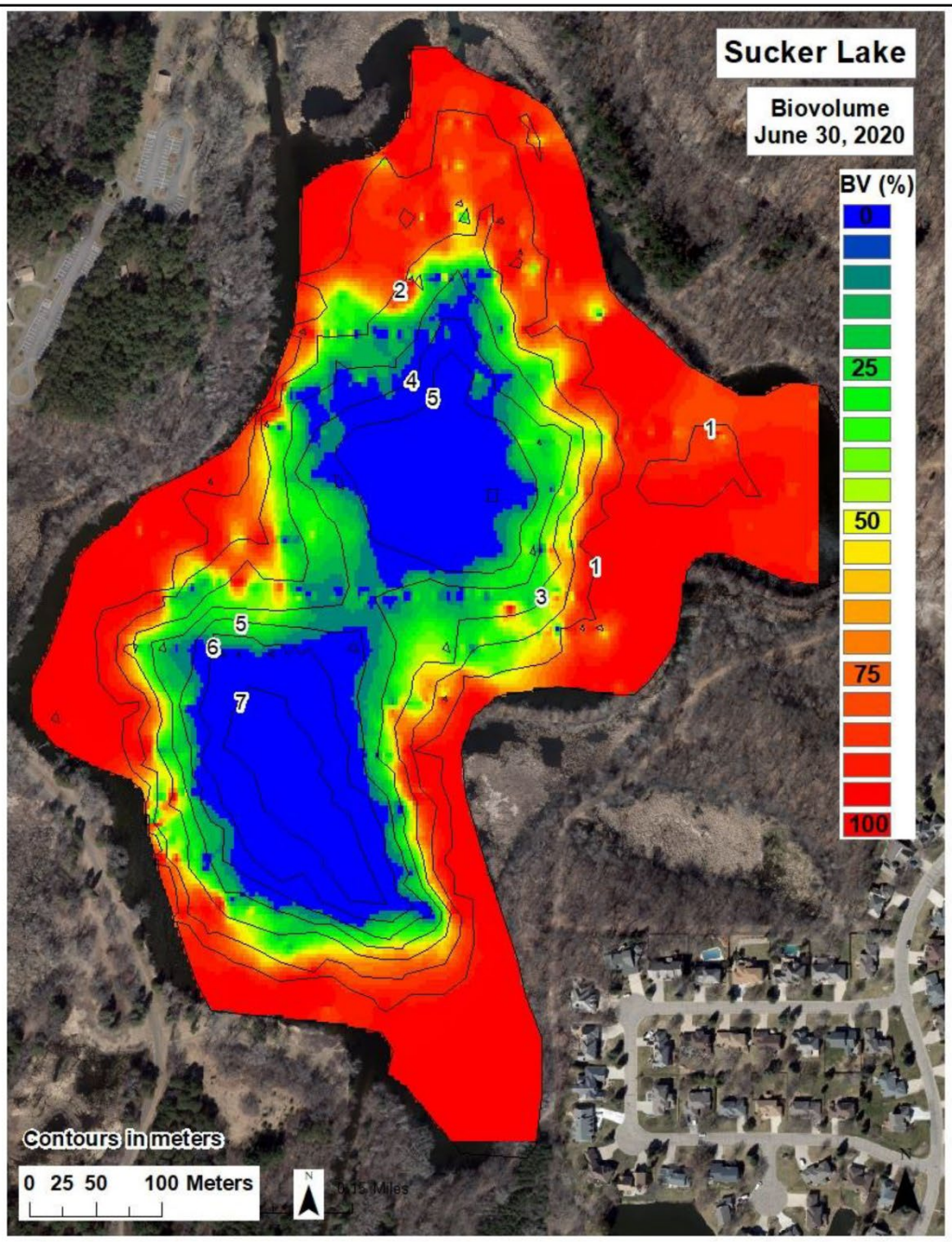


Figure 6. Sucker Lake vegetation biovolume with one-meter contours. Percent values range from zero to one hundred; Blue = 0%, Yellow = 50% and Red = 100%.

Figure 23: East Vadnais Lake Biovolume

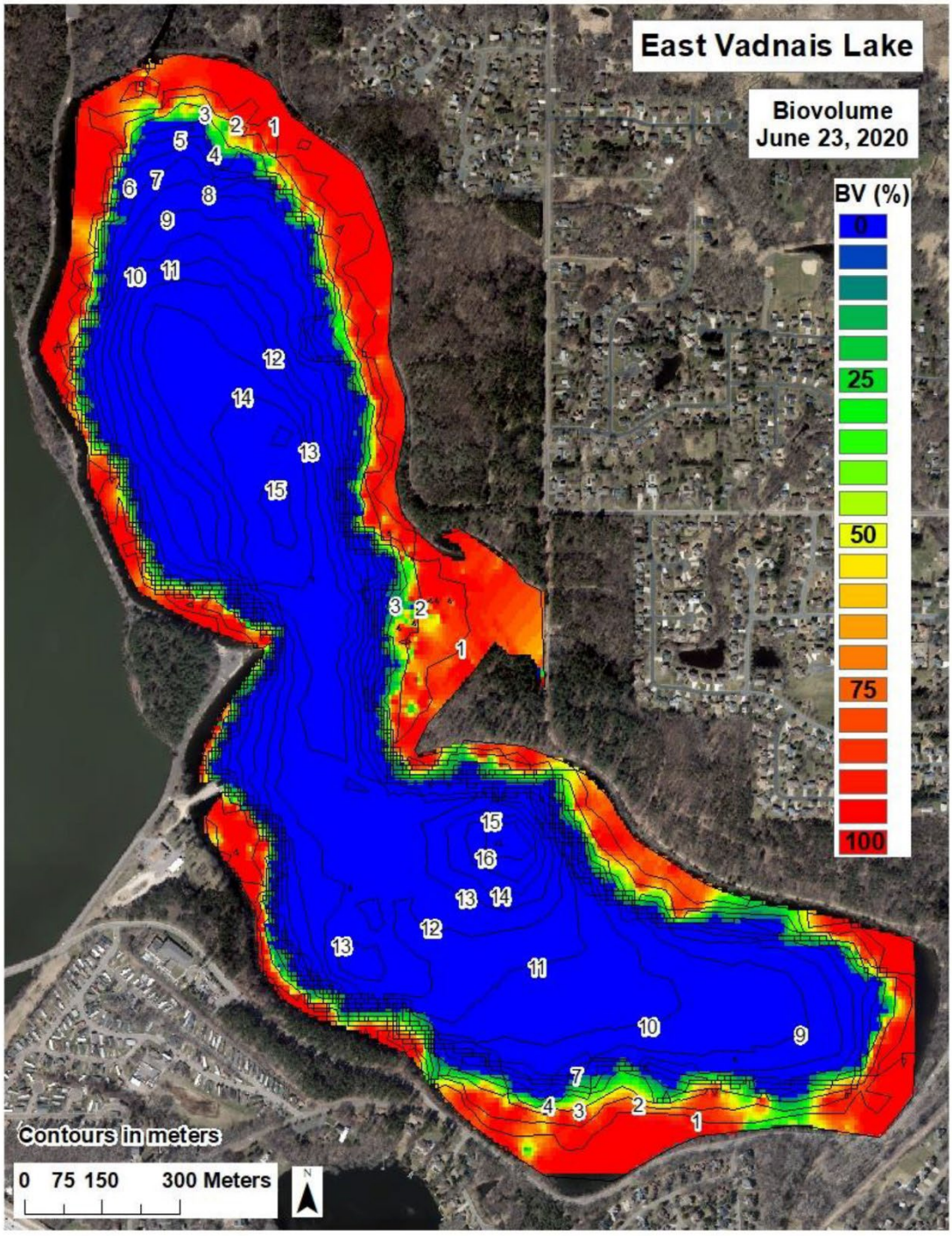
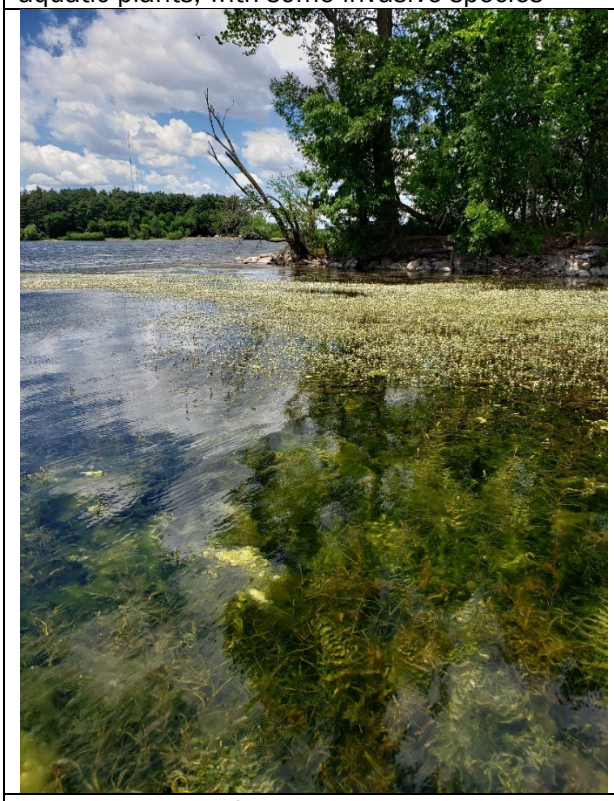
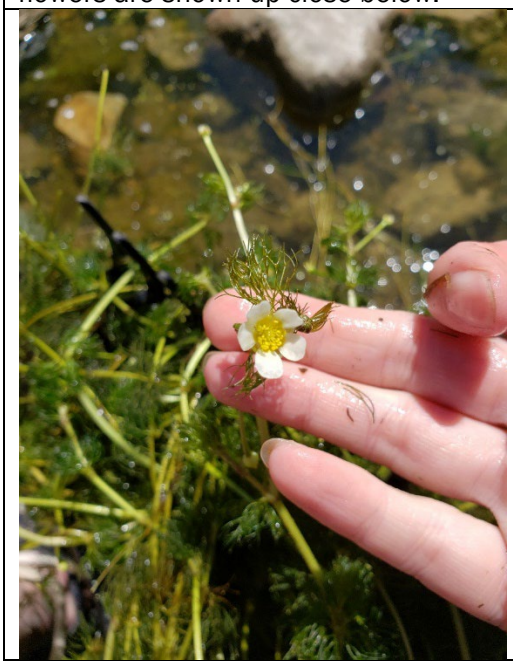


Figure 6. East Vadnais Lake vegetation biovolume with one-meter contours. Percent values range from zero to one hundred; Blue = 0%, Yellow = 50% and Red = 100%.

Figure 24: Photos of Aquatic Vegetation in East Vadnais Lake

East Vadnais Lake has a healthy community of aquatic plants, with some invasive species	A sample of plants collected on the rake
	
White water crowfoot (*Ranunculus aquatilis*) was especially abundant in areas during this survey. It is the emergent plant visible in the photo above. The flowers are shown up close below.	RCSWCD and VLAWMO staff worked together to conduct surveys during 2020
	

3.3 WILDLIFE MONITORING (INCLUDING TRUMPETER SWAN SUMMARY) AND FISH SURVEYS

Wildlife Monitoring

Wildlife monitoring has been conducted in Vadnais-Sucker Lake Regional Park through:

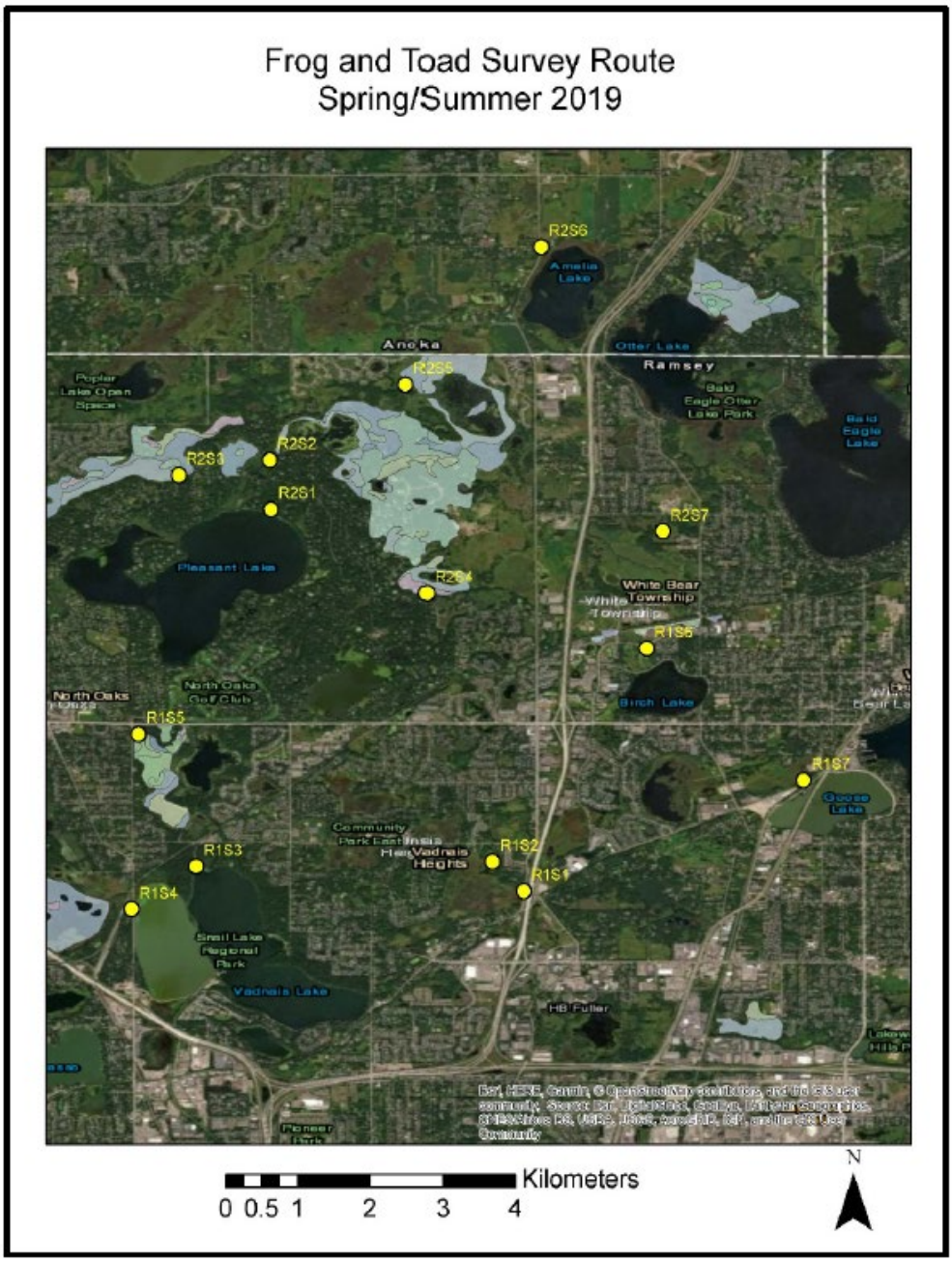
1. Frog and toad call surveys
2. Remote-camera monitoring
3. Trumpeter swan/carcass data collection
4. Fish surveys conducted by the MN DNR

Each of these techniques and relevant results within the park are described in this section. Full information and reports are available that include more detailed information on the VLAWMO website and through the MN DNR LakeFinder online tool.

1. Frog and Toad Call Surveys

During 2019-2020, VLAWMO conducted frog and toad call surveys in representative locations throughout the watershed. Vadnais-Sucker Lake Regional Park had especially high diversity of frogs and toads compared to other sampled locations in the watershed. The wetland near the parking lot on the north end of East Vadnais and wetlands along the main entry road to Sucker Lake all had strong calls and high diversity. Eight species were detected in the watershed; all 8 species were detected in Vadnais-Sucker Lake Regional Park. Species included: Wood frogs, Boreal chorus frogs, Spring peepers, Northern leopard frogs, American toads, Gray tree frogs, Cope's gray tree frogs, and Green frogs. A full report from these surveys is available on the VLAWMO website and as a StoryMap.

Figure 25: Frog and Toad Call Sampling Locations Watershed-wide



2. Remote-camera Monitoring

During 2018-2020, VLAWMO conducted remote-camera monitoring in representative locations throughout the watershed. Vadnais-Sucker Lake Regional Park had especially high diversity of mammals compared to other sampled locations in the watershed. Otter activity within the park led to a small-scale behavioral study on otters, a focused otter monitoring project at the Lambert meander project site, and the development of a citizen-science Otter Spotter StoryMap/reporting tool. The full remote-camera monitoring report is available on the VLAWMO website. The remote camera StoryMap and Otter Spotter StoryMap are also available on the website. A traveling photo exhibit was also developed and displayed at the City of White Bear Lake library, RCSWCD park headquarters, and other locations. Local press covered the exhibits, and photos from the exhibit were featured in Press Publications articles.

Table 2: An excerpt from a summary table in the remote-camera monitoring report that shows monitoring in Vadnais-Sucker Lake Regional Park

Site	Locations	Total cameras	Dates	Weeks	Trapnights
Vadnais-Sucker Regional Park	9	2	Nov. 26-Dec. 12, 2018	~11	276
		1	Nov. 26-Dec. 22, 2018		
		2	Nov. 26, 2018-Feb. 3, 2019		
		2	Dec. 13-Dec. 20, 2018		
		1	Dec. 22, 2018-Feb. 3, 2019		
		1	Jan. 23-Feb. 13, 2019		

Figure 26: Remote-camera Monitoring Locations Watershed-wide

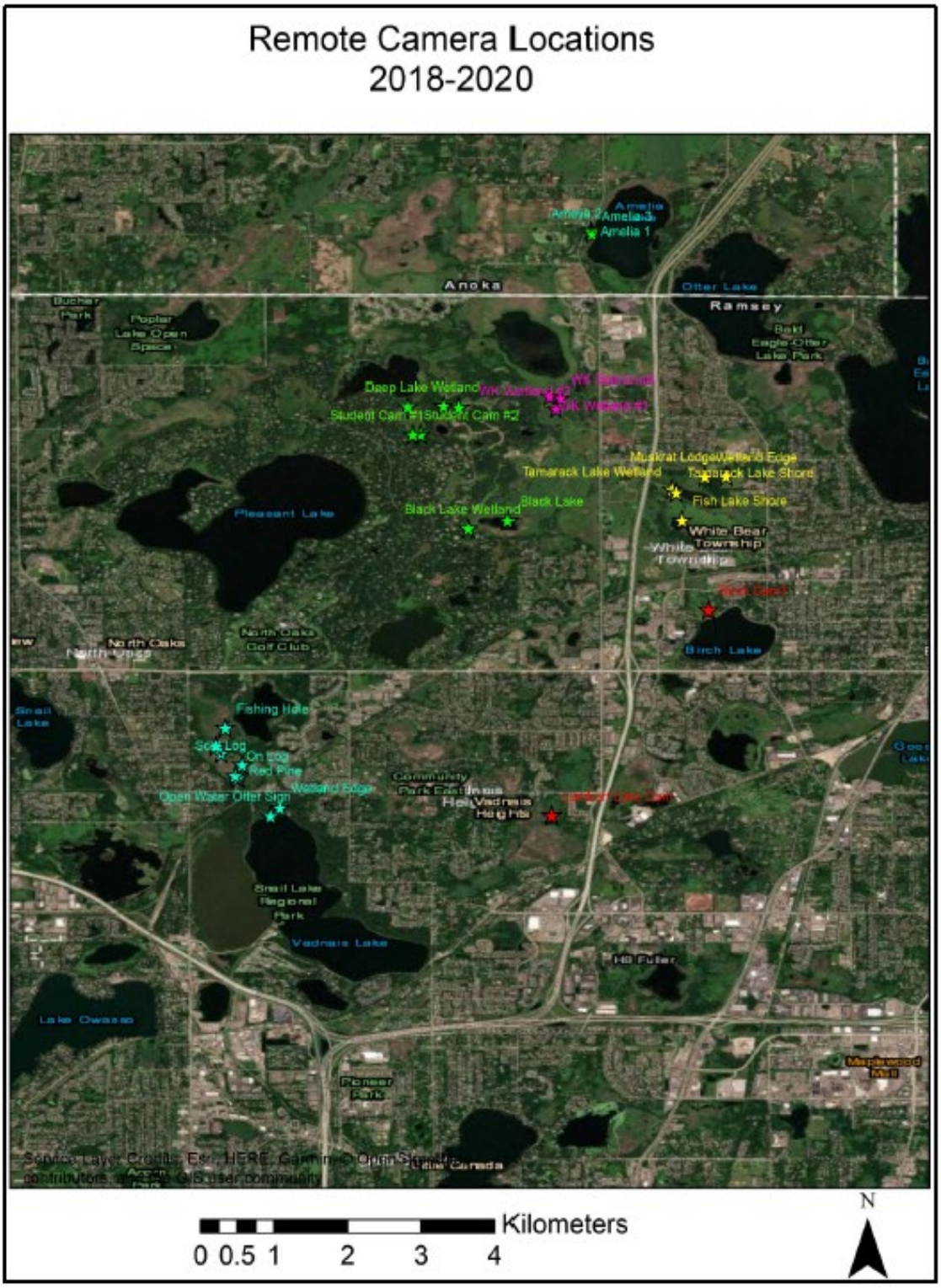
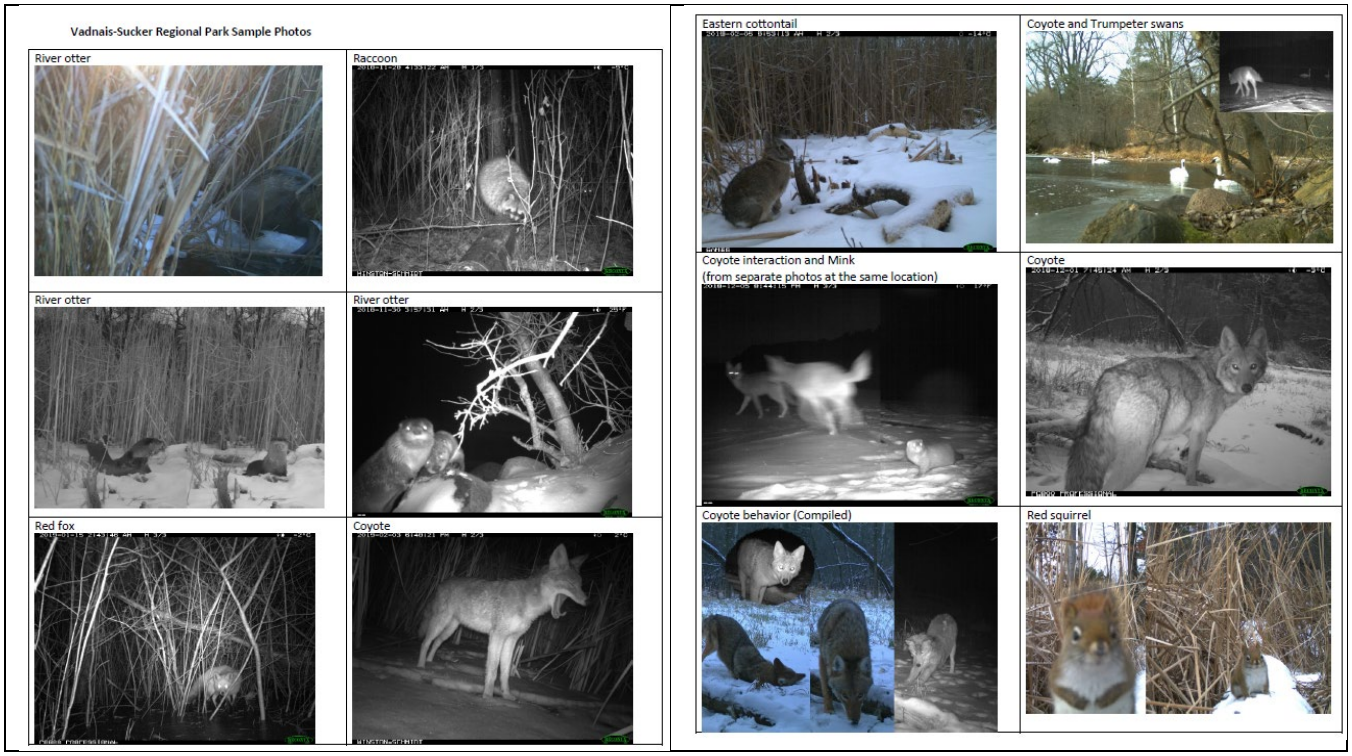


Figure 27: Photos excerpted from the full remote-camera monitoring report with highlights from Vadnais-Sucker Lake Regional Park



3. Trumpeter Swan Summary and Data Collected

During the winter of 2019, local residents reported finding dead swans at Sucker Channel in Vadnais-Sucker Lake Regional Park. VLAWMO staff collected swan carcasses from 2019-2021 when possible and partnered with the MN DNR and UMN Veterinary Diagnostic Center to sample swans and identify the cause of death. Collected swan carcasses were analyzed through necropsy and lab testing and were confirmed to have died of lead poisoning. This led to an expanded partnership with a local Girl Scout Troop, Ramsey County Parks, and the MPCA. It also stimulated local House and Senate representatives to propose legislation that would phase out lead fishing tackle and sinkers in 2020 and 2021.

The location where the swans have died corresponds to a high-use fishing area. Lead sinkers and tackle are commonly found at this location. A small sediment sampling effort was undertaken by VLAWMO staff with UMN community-engaged learning students in 2019. Because of the limestone lining in the channel, it was difficult to obtain lake sediment uniformly. The easiest way to locate lead sinkers was to follow tangled fishing line to find the sinkers attached. Signage was installed by VLAWMO staff in 2020. In partnership with Ramsey County Parks and MPCA, a lead dropbox with educational materials was installed in 2021.

Figure 28: Photos of 1) sediment sampling for lead sinkers, 2) VLAWMO-installed signage, 3) MPCA lead dropbox

Table 3: A summary of dead Trumpeter swans and testing. Full lab reports are available upon request.

Year	Description	Total
Winter 2019	Feb/March: 11 swans died; 4 tested. All tested were confirmed to have died of lead poisoning. The location at the north end of Sucker Lake/Sucker Channel was the location where all swans were found.	11 dead swans
Winter 2020	5 dead swans in 3 locations; 3 tested. All 3 confirmed lead poisoning. One swan had a sinker in its gizzard that was found by the veterinarian performing the necropsy.	5 dead swans
Winter 2021	7 dead swans in 1 location; 6 tested (1 by WRC and 5 by VDL).	7 dead swans
		Total over 3 years: 23 dead swans; 13 tested.

Additional Photos

Residents often share photos of wildlife that they take on and near Sucker and East Vadnais Lakes. A few photos are included at the end of this section. Trumpeter swans have been the focus of a lot of photography. Photos from residents and VLAWMO staff have accompanied articles about lead poisoning at Sucker Channel.

4. Fish Surveys

Sucker Lake

The Minnesota Department of Natural Resources (MN DNR) has conducted fish surveys in Sucker Lake in 1979, 1984, 1990, 1995, 2000, and most recently on July 25, 2005, using seines, gill nets, and trap nets. Full details are available on the MN DNR Lake Finder website. Species sampled included: Black crappie, Bluegill, Bowfin (Dogfish), Brown bullhead, Common carp, Green sunfish, Hybrid sunfish, Largemouth bass, Northern pike, Pumpkinseed, Walleye, Yellow bullhead, and Yellow perch. According to the MN DNR:

> **Status of the Fishery**
>
> *Sucker Lake is a small lake in Ramsey County. It lies entirely within the Grass - Vadnais (Snail Lake) Regional Park. Anglers can gain access to the lake shore through the park. Boats are not allowed on the lake. Bluegill were the most abundant species sampled during the survey. Their numbers are considered to be average for this type of lake. The average size bluegill was 5.33 inches in length. Pumpkinseed sunfish were also found in average abundance. Their average length was 4.78 inches. Black crappies were found to be in low abundance. The northern pike population is at the highest level since 1979. The average size sampled was 21.7 inches in length. Walleyes are not very abundant in Sucker Lake. Only 2/gill net were sampled. These are most likely fish that have swam upstream from East Vadnais Lake. Largemouth bass were found in low numbers however this species is not effectively sampled in trap nets or gill nets. Yellow perch were found in higher abundance than past surveys. The average size was smaller than what anglers prefer. Yellow bullhead were sampled in the highest rate since the 1984 survey. Individuals exceeding 13 inches were found. Carp, bowfin, and brown bullhead were also caught during the survey but in low numbers.*

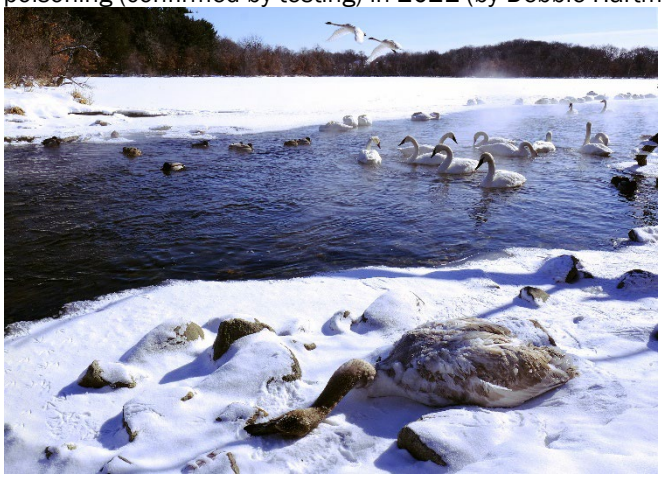
East Vadnais Lake

The Minnesota Department of Natural Resources (MN DNR) has conducted fish surveys in Sucker Lake in 1954, 1976, 1981, 1986, 1991, 1996, 2001, 2008, and most recently on July 7, 2014, using gill nets, and trap nets. Full details are available on the MN DNR Lake Finder website. Species sampled included: Black bullhead, Black crappie, Bluegill, Brown bullhead, Channel catfish, Green sunfish, Hybrid sunfish, Largemouth bass, Northern pike, Pumpkinseed, Rock bass, Smallmouth bass, Walleye, White bass, White crappie, Yellow bullhead, Yellow perch, Bowfin (dogfish), Common carp, White sucker, and Golden shiner. According to the MN DNR:

> **Status of the Fishery**
>
> *East Vadnais Lake is an integral part of the St. Paul water system and falls within the boundaries of the Snail Lake Regional Park. The St. Paul Water Utility controls the access and surface use of all bodies of water within it. There is no surface use permitted on East Vadnais Lake, though shorefishing is allowed between 7AM and 10PM at the discretion of the St. Paul Water Utility. All angling is done from shore on the west side of the lake where there is an abundance of aquatic vegetation.*
>
> *Walleyes and Northern Pike were abundant in this survey. Walleyes averaged 17 inches in total length and over 2 pounds for average weight. The average size of Northern Pike was over 22 inches. Other sought after species present were Smallmouth Bass, Largemouth Bass, Black Crappie and Bluegill. Bluegills were small in size and Black Crappies were captured in low abundance.*
>
> *Other species present were Rock Bass, White Bass, Yellow Bullhead, Yellow Perch, Black Bullhead and Bowfin.*

Figure 29: Submitted photos of wildlife from residents

Trumpeter swans at Sucker Channel with one that recently died of lead poisoning (confirmed by testing) in 2021 (by Debbie Hartmann)



Muskrats at East Vadanais Lake in 2021 (by Debbie Hartmann)

Trumpeter swans at Sucker Channel in 2020 (by Greg Karp)

Sandhill crane at Sucker Lake (by Rick and Kathy Schlosser)

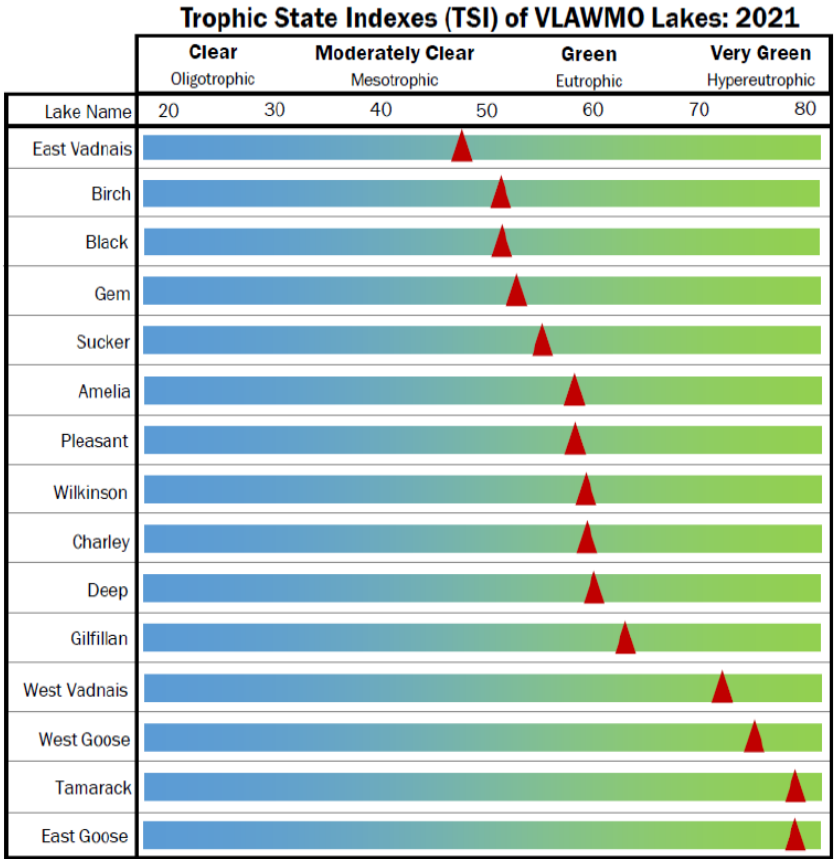
Wild turkey chicks at East Vadnais Lake (June 2020 by WC and MC)

Green heron at Sucker Lake (July 2020 by WC and MC)

3.4 WATER QUALITY SUMMARY

Sucker Lake (undetermined shallow vs. deep lake as stated in the Introduction to this SLMR) falls between moderately clear and green on the Trophic State Index (TSI) (shown below). Sucker Lake had a score of 55 in 2021, up from 53 in 2020. East Vadnais Lake is a deep lake that falls close to moderately clear on the TSI scale. East Vadnais Lake had a score of 47, down from 48 in 2020. Note: A lower number corresponds to higher water quality, but trends are not detectable from a small sample of only a couple to a few years. Trends should be based on a larger, continuous dataset of approximately 10 years, as recommended by the MPCA. More information can be found in the annual VLAWMO Monitoring Report.

Figure 30: TSI Scores for VLAWMO Lakes



VLAWMO has collected water quality (WQ) data on Sucker Lake only since 2019 and on East Vadnais Lake since 2020. SPRWS has more long-term monitoring for these lakes. VLAWMO staff collects WQ data and water samples biweekly, May-September, for water clarity (secchi disk), nutrients (TP, Chl-a, SRP, nitrogens), and chemistry (temperature, conductivity, dissolved oxygen, and potential hydrogen [pH]). Total Phosphorus (TP) and Chlorophyll A (Chl-a) analyses are conducted by a contracted lab.

- TP is the primary cause of excessive plant and algae growth in lake systems. Phosphorus originates from a variety of sources, many of which are human related. Major sources include human and animal waste, soil erosion, detergents, septic systems, and stormwater runoff. Internal loading can also be present in a lake. Internal loading can result from P becoming re-suspended into the water

column from the sediment. High amounts of P in sediments may occur as a result of historical land uses including, but not limited to, waste disposal into the lake.

- Chl-a is a green pigment in algae. Measuring Chl-a concentration gives an indication of algae abundance.

- The MN Pollution Control Agency (MPCA) has impairment standards for the levels of TP and Chl-a. For shallow lakes in Minnesota, the impaired water quality standard levels are: <60µg/L for TP, <20µg/L for Chl-a, and <230 mg/L for Chloride.

- Red numbers indicate values that exceed MN State Standards.

Table 4: Sucker and East Vadnais Lakes Monitoring Data 2019-2021

Sucker and East Vadnais Avg TP/Chl A/SDT			
Year	**TP (µg/L)**	**Chl A (mg/ m^3)**	**Secchi (m)**
	Sucker Lake		
2019	49	14	1.3
2020	41	8	2.0
2021	44	17	2.2
	East Vadnais Lake		
2020	25	3	
2021	24	4	2.7

.

Figure 31: Water Quality Trends in Sucker Lake

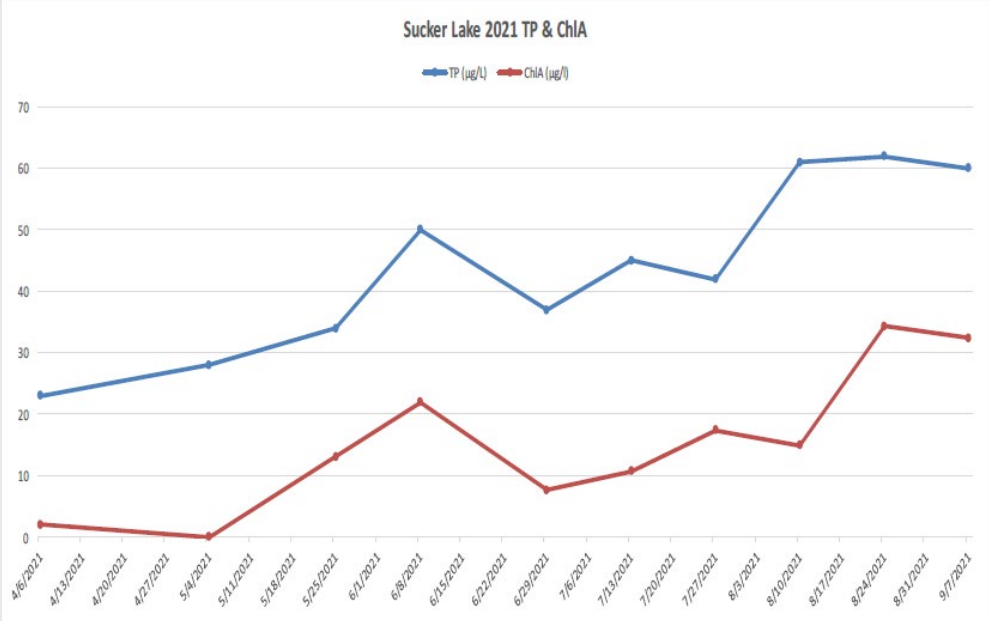
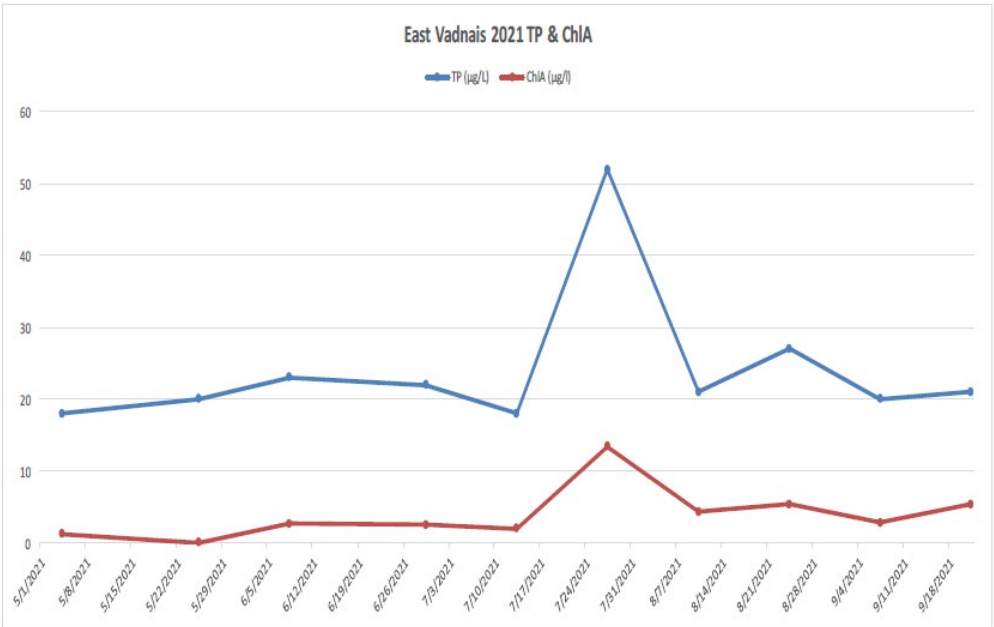


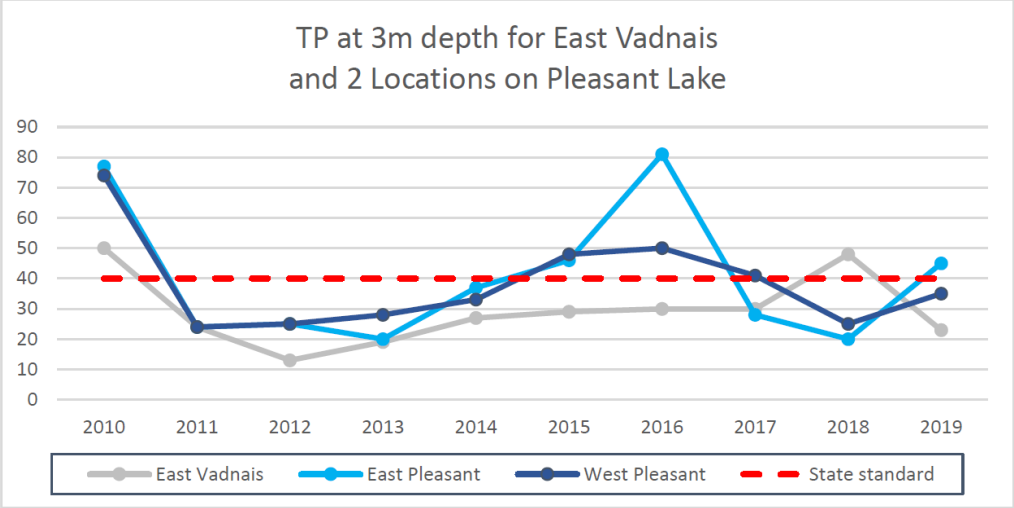
Figure 32: Water Quality Trends in East Vadnais Lake



An additional analysis was prepared by VLAWMO staff in 2019 to respond to questions from residents comparing two deep lakes in the drinking water chain: Pleasant Lake and East Vadnais Lake. An article and supplemental white paper were prepared from that work. Both are linked on the VLAWMO website. A synopsis is included here to bring together some of the longer-term monitoring data that have been collected over the years by SPRWS, Ramsey County, and the MPCA.

Data were collected by SPRWS from 2008-2019; complete season datasets were not always collected. Sampling at varying depths (3 m and 13 m) was begun in 2010. Chlorophyll-a was collected at 0 m. Results at these depths are comparable to mean results collected during 2010-2011 by MPCA (Pleasant Lake) and by MPCA/Ramsey County (East Vadnais Lake). When data were collected by MPCA and Ramsey County for East Vadnais Lake in 2010-2011 for possible TMDL consideration; it was not listed as impaired (TP = 27 µg/L and Chl-a = 7 µg/L).

Figure 33: Total Phosphorus Comparison between East Vadnais Lake and Pleasant Lake

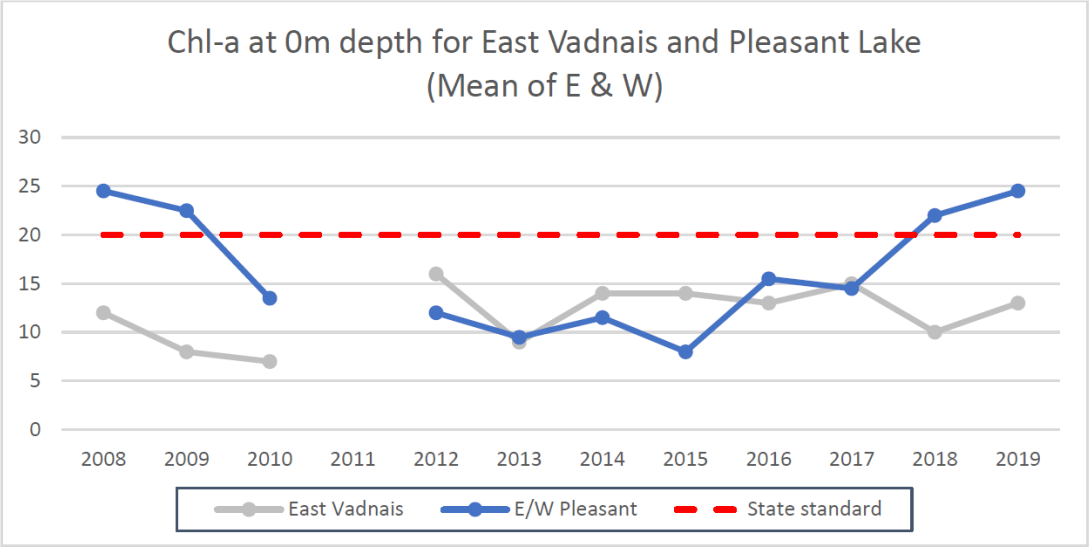


East, West Pleasant, and East Vadnais all exceeded the TP standard in 2010. In 2011, all 3 were below the standard. During 2015-2016, Pleasant Lake exceeded the standard. It was below the standard in 2017-2018, but appears to be approaching if not exceeding the standard as of 2019. East Vadnais has remained below the standard since 2010 except for 2018.

The spikes in 2016 at East Pleasant Lake and 2018 in East Vadnais are at first curious. Data are shown at 3 m. Data are also available at 13m. To decide if these data points might be outliers, we checked the TP level at 13 m. In both cases, that measurement was also high and provides evidence that these were not data-collection or lab-analysis errors but are accurate data points.

These spikes are likely due to treatment at the Fridley SPRWS facility. These show the results in the lake that occur when insufficient ferric chloride was being added to treat the Mississippi River and Vadnais Lake to maintain the permeable reactive barrier of Fe(OH)3 that keeps the nutrients in lake sediment. There was also a change in the ferric chloride feed system following the oxygenation system upgrade (installed in East Vadnais Lake in 2011 and in Pleasant Lake in 2013) that likely affected this process. SPRWS lost the permeable reactive barrier of Fe(OH)3 with extended ferric chloride feed issue at Fridley pumping station in those periods; which may have impacted the iron boundary layer formation at Pleasant Lake.

Figure 34: Chl-a in East Vadnais and Pleasant Lake



SPRWS treatment techniques changed over the course of the monitoring time period (2008-2019). Aeration systems (Hypolimnetic Aeration/HA) were in place on East Vadnais Lake from 1987-2010. There was a 1-year gap between when the HA system was stopped and the liquid oxygenation system (Hypolimnetic oxygenation/HO) began. The HO system has been running continuously at 2 locations on East Vadnais since it was installed. The 1-year gap on East Vadnais was 2010-2011. On Pleasant Lake, the gap was longer. It was 7 years, from 2006-2013. Pleasant Lake had HA in place from 1994-2006. HO began in 2 locations on the lake in 2013 and has been running continuously since, except for several days in Jan. and Feb. of 2019 when ice built up on the vaporizer.

4 MANAGEMENT

4.1 MANAGEMENT PLAN FOR SUCKER AND EAST VADNAIS LAKES: RETROFIT, BMPS, PROJECT PARTNERSHIPS

Retrofit Report (2013)

In 2013, the Ramsey Conservation District (RCD), now Ramsey County Soil and Water Conservation Division (RCSWCD), completed a Retrofit Report for the Sucker, East Vadnais, and West Vadnais Lake subwatershed area. This was part of a larger effort to assess the full watershed and subwatershed scales and identify optimal locations for BMPs. For these retrofit reports, 3 types of bioretention were considered for implementation. These included: simple bioretention, moderately complex bioretention, and complex biorention. The full report is available on the VLAWMO website -> Vadnais Lake.

Three subcatchment areas were delineated and used in the analysis. Two of the subcatchments contribute to Sucker Lake, and one contributes to East Vadnais Lake. In the list provided below, all of the retrofit opportunities are ranked from lowest to highest costs. Maps of locations are shown below (Figure 31). A more detailed explanation and description is provided in the full report. The figures here are provided for reference and quick review.

Figure 35: Locations of Biorentention BMPs Identified by RCSWCD for Sucker and East Vadnais Lakes

BMPs located in subcatchment 1 that flows into Sucker Lake	BMPs located in subcatchment 2 that flows into Sucker Lake	BMPs located in subcatchment 3 that flowers into East Vadnais Lake
		

In the report, a conclusions was made that:

> *In the list provided below are all of the retrofit opportunities ranked from lowest to highest term cost for every catchment within the West Vadnais Lake Subwatershed. While the highest ranking projects are in Catchment 1, activities should be focused on Catchment 2. The higher density land use with storm sewers directly connecting the water resources, makes this catchment more desirable for retrofitting. Catchment 3 has lower density land use and is more disconnected from the water resource versus Catchment 2, but is higher priority*

than Catchment 1. All of the located BMP's will help with the removal to TP, but an added benefit is the reduction in stormwater rate and volume..

4.1 Completed BPMs and project Partnerships in the subwatershed

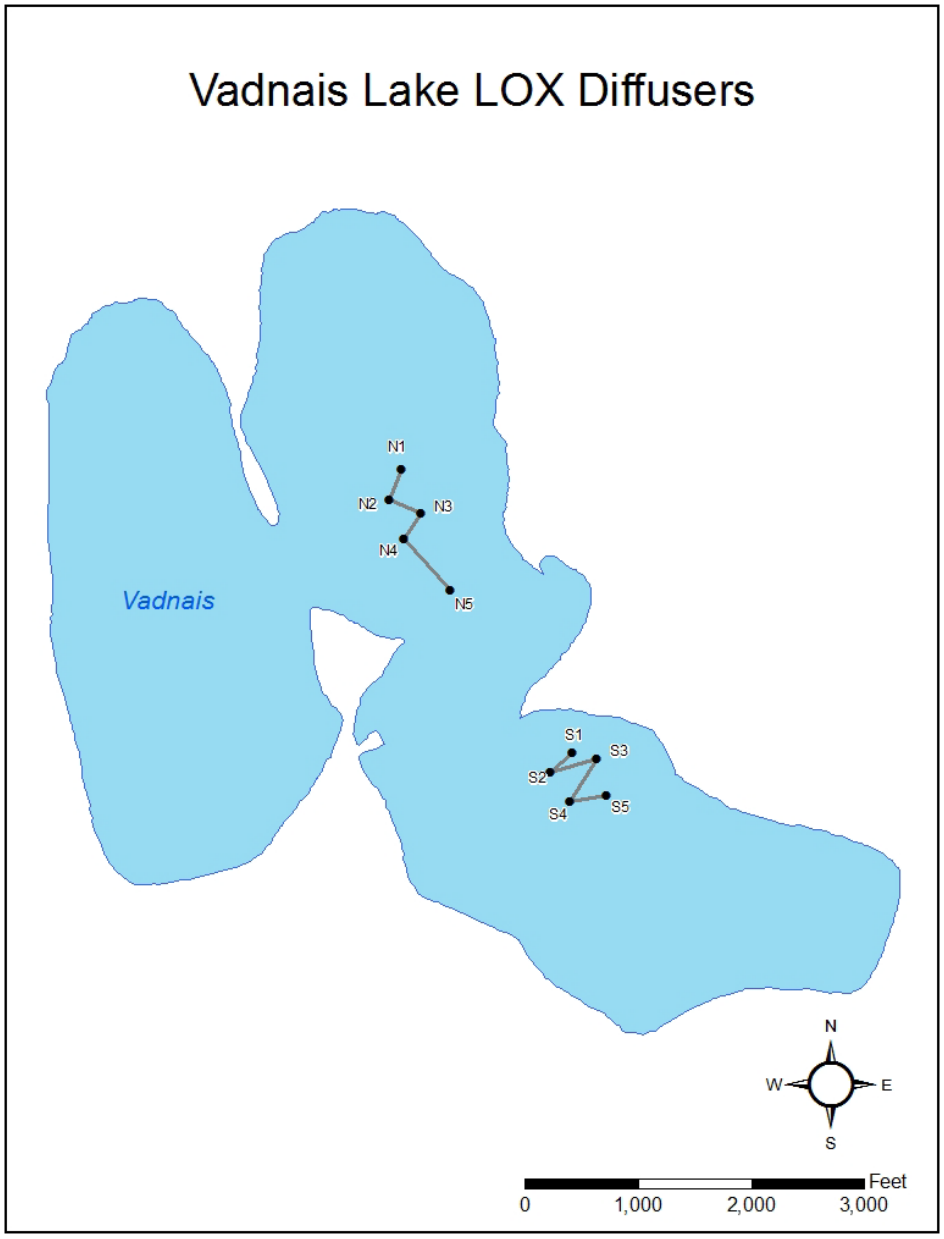
Best Management Practices (BMPs) are implemented to improve and protect water quality. Common small-scale examples of BMPs include raingardens, infiltration basins, shoreline restorations, rain barrels, and native restorations and plantings. Larger BMPs include stormwater retention basins, iron-enhanced sand filters, weirs and stormwater conveyance retrofits, and in-lake treatments such an alum treatment, rough fish management, or aquatic vegetation management.

Completed BMPs for Sucker and East Vadnais Lakes include: the addition of a liquid oxygenation system in East Vadnais Lake by SPRWS; shoreline and channel restoration in Vadnais-Sucker Lake Regional Park by Ramsey County Parks, SPRWS, and VLAWMO; and smaller residential cost-share projects through VLAWMO's internal grant program. A smaller (~2 acre) restoration is underway at Vadnais Park, which is managed by Ramsey County Parks, and located on the south side of East Vadnais Lake. An upcoming 45-acre restoration project in partnership with Great River Greening, Ramsey County Parks, SPRWS, and VLAWMO is planned to begin in 2022 near Sucker Lake in Vadnais-Sucker Lake Regional Park.

Liquid Oxygenation System

A major contribution to water quality in East Vadnais Lake was undertaken by SPRWS in the form of an upgrade in the aeration system to switch to a liquid oxygen system. Aeration (Hypolimnetic Aeration/HA) was in place on East Vadnais Lake from 1987-2010. There was a 1-year gap between when the HA system was stopped and the liquid oxygenation system (Hypolimnetic oxygenation/HO) began in 2011. The HO system has been running continuously at 2 locations on East Vadnais since it was installed. The 1-year gap on East Vadnais was 2010-2011. The locations of the liquid oxygen inputs are shown below (Figure 36).

Figure 36: Liquid Oxygen Lines and Input Locations in East Vadnais Lake (contributed by SPRWS)



Shoreline and Channel Restoration in Vadnais-Sucker Lake Regional Park

A restoration was completed in 2018 to upgrade and stabilize Sucker Channel at Sucker Lake. The project was a joint restoration effort between VLAWMO, Ramsey County Parks, Ramsey Soil and Water Conservation Division, and SPRWS. The channel between Pleasant and Sucker Lakes, south of Co. Hwy. 96 is highly visible and in a well-used section of the Vadnais-Sucker Regional Park. It was in poor condition and in need of restoration.

The project included reconstruction of the channel wall, creating new fishing platforms (fishing nodes), and incorporating native plants to form a natural, stabilized bank. The restoration project has been in maintenance phases since construction was completed. The native plants are thriving, and this project was recognized in the Legacy Fund Restoration Evaluation Report in 2020.

Figure 37: Highlight from Legacy Fund Restoration Legacy Report (MN DNR)

Parks and Trails Fund Stories

+ Hayes Lake State Park – Jack Pine Restoration

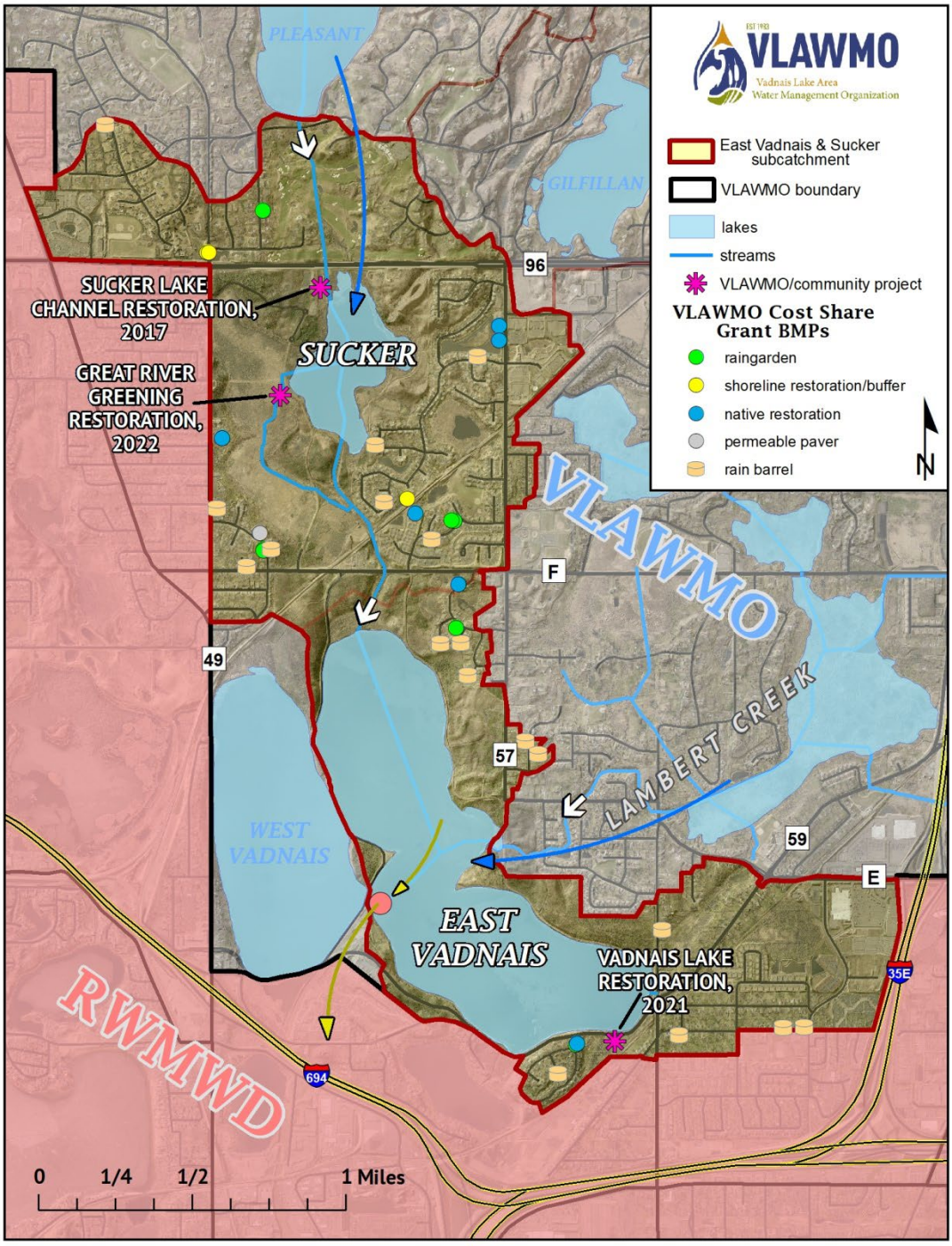
– Ramsey County – Restoring Sucker Channel

The shoreline of the Sucker Channel in northern Ramsey County is a heavily used fishing area. After decades of wear, the paved paths that lined the banks of the Channel were falling into the water and rainfall was washing pollutants into the Channel that serves as the City of St. Paul's drinking water supply. Ramsey County Parks Soil and Water Conservation Division worked with the Vadnais Lakes Area Watershed Management Organization to stabilize the shoreline, provide a vegetated buffer for rainwater, and create pollinator habitat with flowering native plants. Ongoing monitoring and maintenance will ensure the continued success of this project's multiple benefits.

Residential Cost-share Projects

As one of VLAWMO's core programs, the Cost Share grant program works to implement in-ground Best Management Practices (BMPs) within VLAWMO's boundaries, for the improvement and preservation of surface water quality. For more information, visit www.vlawmo.org/grants/. Within the Sucker and East Vadnais Lakes subcatchment areas, 35 VLAWMO Cost Share landscape grant projects have been implemented since 2007.

Figure 38: Sucker and East Vadnais Lakes Subwatershed Implemented Projects and BMPs



Smaller Current Restoration in Vadnais Park and Upcoming 45-acre Restoration in Vadnais-Sucker Lake Regional Park

A smaller restoration project (~2 acres) was begun in 2020 at the south end of East Vadnais Lake at Vadnais Park (Ramsey County Park/parking area and green space) due to the initiative of a local resident. VLAWMO has been working with volunteers and the UMN community-engaged learning students in partnership with Ramsey County Parks on this smaller buckthorn removal and vegetation restoration.

4 MANAGEMENT

Buckthorn removal was conducted during 2020 and 2021. During the growing season of 2021, a smothering plot was set up. Following smothering, that plot was seeded with native vegetation in the fall of 2021. This smaller park area runoff flows into an adjacent wetland and through a culvert into East Vadnais Lake.

Figure 39: Restoration area in Vadnais Park to the south of East Vadnais Lake in Vadnais Heights. Photos of the restoration process included below.

Smothering site (summer 2021)	Students and volunteers cleaning up smothering site prior to seed (fall 2021)
	

Buckthorn removal (fall 2021)

Upcoming 45-acre Restoration in Vadnais-Sucker Lake Regional Park

During 2019, VLAWMO submitted a letter of interest to Great River Greening for inclusion in their suite of restoration projects for the upcoming round of restoration-focused grant-based projects. Great River Greening included VLAWMO in their proposal to the Environment and Natural Resources Trust Fund (ENRTF) and Outdoor Heritage Fund. During 2020, the Legislature failed to vote on ENRTF projects. During 2021, VLAWMO was notified by Great River Greening that the Vadnais-Sucker Lake Regional Park, 45-acre restoration was approved in the suite of projects submitted for Outdoor Heritage funding. VLAWMO staff worked with SPRWS and Ramsey County to establish a landowner agreement between Great River Greening and SPRWS for the restoration. A maintenance agreement was also outlined and is in progress at the time of this report preparation. Great River Greening will be managing the restoration project. VLAWMO, Ramsey County Parks, and SPRWS will partner is maintenance following completion of the project.

Figure 40: 45-acre Restoration Area in Vadnais-Sucker Lake Regional Park

Summary of Projects and BMPs:

- Liquid oxygenation system upgrade by SPRWS in 2011.
- East Vadnais Shoreline and fishing node installation, and Sucker Channel stabilization, fishing node installation, and vegetation restoration, in partnership with SPRWS and Ramsey County Parks, completed in 2018.
- VLAWMO Cost Share grant BMPs (35 total): 6 native restorations, 7 residential rain gardens, 1 Permeable paver project, 3 shoreline buffer/restorations, and 18 rain barrel grants.
- Lambert Creek stormwater pond infrastructure upgrade and meander construction, completed in 2021, and upcoming biochar filter construction (detailed on the VLAWMO website).
- Current restoration project in Vadnais Park and upcoming restoration in Vadnais-Sucker Lake Regional Park with Great River Greening, SPRWS, and Ramsey County Parks, initiating in 2022.

APPENDIX

Vadnais Sucker Lake Wetland Assessment and Updated Invasive Species Checks (2020 by SEH)
Sucker and East Vadnais Lake Aquatic and Shoreline Vegetation and Contour (Bathymetry) Surveys (2020 by RCSWCD)
Frog and Toad Call Survey Report (2019-2020)
Remote Camera Survey Report (2018-2020)
Retrofit Analysis/Report (2013)