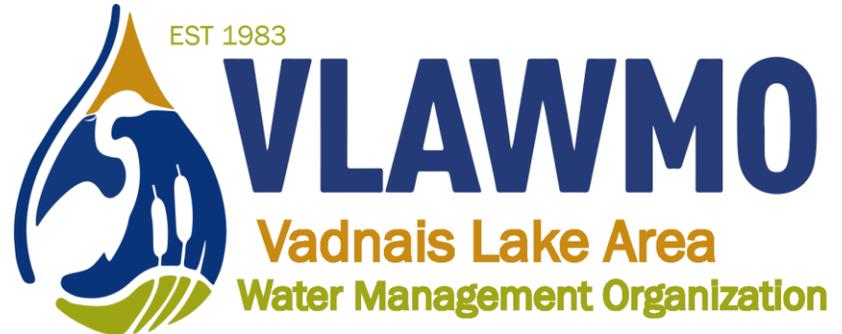


East Vadnais Lake



Shoreline Vegetation Survey 8/31/2020

This document contains data collected on East Vadnais Lake shoreline vegetation. Details of this report include the methods and findings of a quadrat-transect survey of shoreline vegetation.

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Shoreline Vegetation Survey

August 31, 2020

Background:

East Vadnais Lake is located in Vadnais Heights, MN, nearly in the center of Ramsey County and in the Vadnais Lake Area Watershed Management Organization (VLAWMO) (Figure 1). The lake has a surface area of approximately 393 acres and a shoreline length of 4.9 miles (MNDNR, 2020). The lake serves as a drinking water reservoir for the City of Saint Paul and is managed by St. Paul Regional Water Service (SPRWS). As a result, boat use of any kind is prohibited unless authorized by SPRWS (MNDNR, 2020; VLAWMO, 2020).

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 any 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, a much smaller body of water approximately half a mile to the north. 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 one classification. The shoreline consists of or is surrounded by a diverse class of wetlands (Figure 2). 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 (Cowardin et. al, 1979). 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 (Cowardin et. al, 1979).

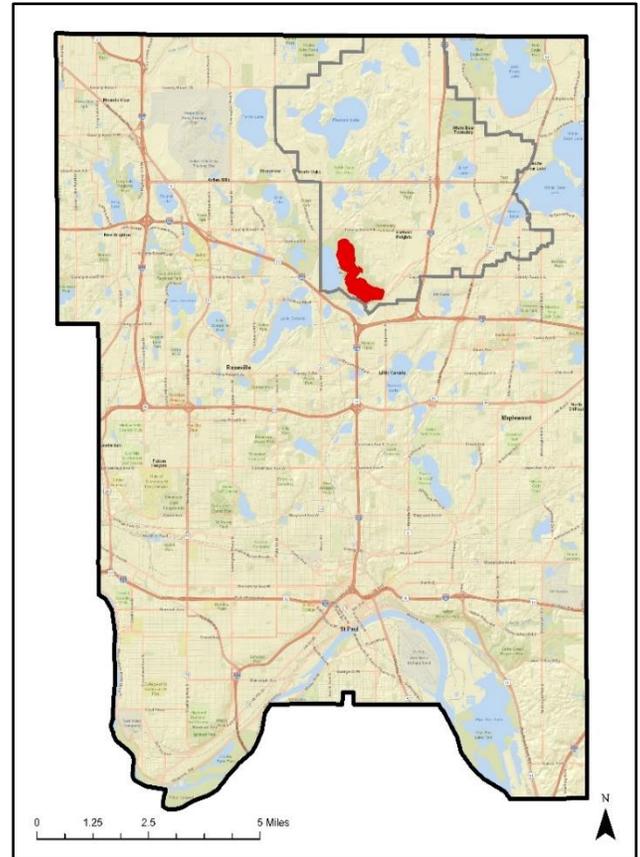


Figure 1. Location of East Vadnais Lake shown in red within Vadnais Lake Area Water Management Organization and Ramsey County boundaries.

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

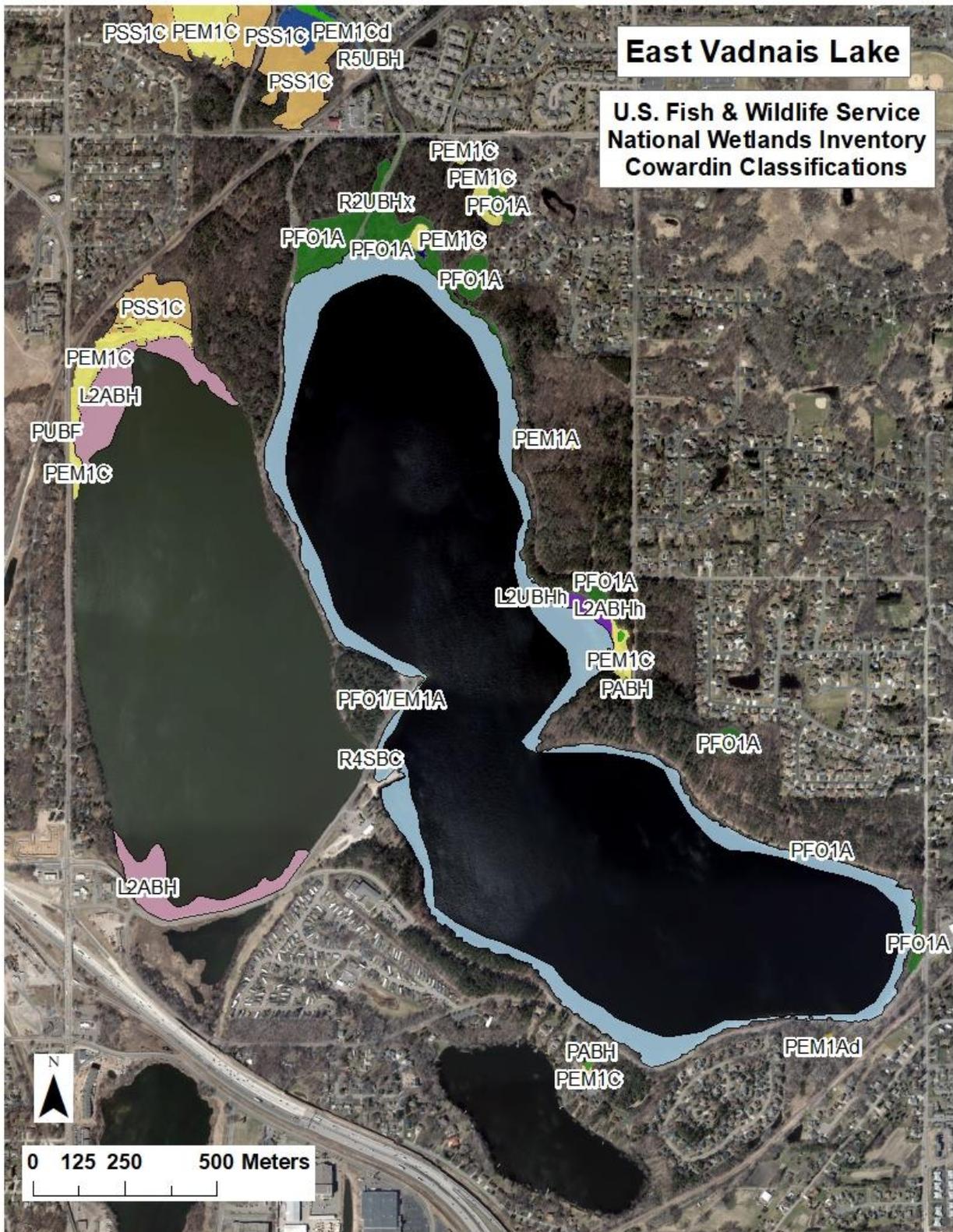


Figure 2. Cowardin classifications of wetlands surrounding West (left) and East (right) Vadnais Lakes (U.S. Fish & Wildlife Service's National Wetland Inventory).

Methods:

The sampling method chosen for this shoreline vegetation survey was a quadrat-transect method, as first developed by Curtis and McIntosh (1950). Around the perimeter of East Vadnais Lake, six transect lines perpendicular to shore were pre-drawn in Google's My Maps with the objective of documenting environmental variations across the areas of study (Figure 3). To best account for vegetation present within dense herbaceous habitats, a one-square-meter quadrat was used in this survey (Goldsmith et al., 1986). Systematic sampling, using defined intervals for transect and quadrat placement, was chosen to best investigate spatial patterns in plant species and abundance along the lakeshore (Barbour et al., 1987).

In the field, individual plants lying within a one-square-meter quadrat (Appendix B) were identified and counted at each of four locations along each transect line: at the interface with the lake (0 m), 5 m from shore, 10 m from shore, and 15 m from shore for a total of 24 quadrat sample sites. A My Maps application with a GPS tracker was used in the field to verify and locate each transect. A tape measure was then used from the lake-shore interface to measure quadrat locations at 0 m, 5 m, 10 m, and 15 m. The number of individual plants of each species per quadrat was recorded in the field (Appendix A). When a total count of 50 or more individual species occurred per quadrat, the count was denoted with an "A" (for Abundant), where a count of 50 was added to each occurrence of A for statistical purposes. The quadrat-transect plant sampling method allowed for the computation of *cover*, *density*, and *frequency* of each species recorded, as calculated using the equations below (Cox, 1990). All vegetation observed and collected along the transects were identified to the lowest taxonomic level possible. Invasive species identification was guided by the status listings on the Minnesota Wildflowers website (MENR, 2006). All survey data were recorded in the field, except for species that were collected, labeled, and brought to the office for further identification.

$$\text{Relative Coverage} = \frac{\text{Total \# of individual species}}{\text{Total \# of all species}}$$

$$\text{Density} = \frac{\text{Total \# of individual species}}{\text{Total \# of quadrats sampled}}$$

$$\text{Relative Density} = \frac{\text{Species density}}{\text{Total density for all species}}$$

$$\text{Frequency} = \frac{\text{\# of quadrats species occurred in}}{\text{Total \# of quadrats}}$$

$$\text{Relative Frequency} = \frac{\text{Species frequency}}{\text{Total frequency of all species}}$$



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.

Results:

Tables 2 and 3 display shoreline plant species, coverage, density and frequency data as observed within square-meter quadrats (N=24) sampled along six, 15-meter long transects. A total of 52 species was observed (Table 2). The three most abundant species (100 or more total plant count) with highest average densities included Fescue (*Festuca sp.*), Reed Canary (*Phalaris arundinacea*), and Kentucky Bluegrass (*Poa pratensis*). Species with 75-100 individuals observed included Glossy Buckthorn (*Frangula alnus*) and Common Buckthorn (*Rhamnus cathartica*). With a moderate count of 50 individuals were Smooth Crab Grass (*Digitaria ischaemum*), Creeping Charlie (*Glechoma hederacea*), and Alsike Clover (*Trifolium hybridum*). Fescue was, by far, the most widespread species – found in 12 quadrats at a frequency of 50%. Common Buckthorn, Reed Canary, and Glossy Buckthorn were the next three most frequently observed species found at a frequency of 29.2%, 25%, and 25%, respectively (Table 3). There were 44 species, each with fewer than 50 total individuals observed (relative density less than 4%) and are listed in Table 3. Species that were concentrated – occurring only in one or two quadrats with a total count of 10 or more individuals – included Kentucky Bluegrass, Pennsylvania Smartweed (*Persicaria pensylvanica*), Smooth Crab Grass, Creeping Charlie, Alsike Clover, and Dwarf Clearweed (*Pilea pumila*). There were two individuals of an unknown Aster (*Asteraceae sp.*), listed in Table 3 and pictured in Appendix B. There was a total of 12 invasive species observed (Table 1). By a large margin, the most abundant invasive species (exceeding 200 individual plants) was Reed Canary. The next two most abundant were Glossy Buckthorn and Common Buckthorn.

Some general observations were made outside the surveyed areas and in vicinity of transects. Throughout Transect 1, there was a notable presence of White Sweet Clover (*Melilotus alba*), Ironwood (*Ostrya virginiana*), American Basswood (*Tilia americana*), and Rue (*Thalictrum sp.*). Near Transect 1 along the roadside were dense colonies of Poison Ivy (*Toxicodendron rydbergii*), some Goldenrod (*Solidago sp.*), and few individuals of American Bittersweet (*Celastrus scandens*). At Transect 3 just beyond Quadrat 15, dense mats of Garlic Mustard (*Alliaria petioloata*) were present. Common Buckthorn and Glossy Buckthorn were abundantly present throughout Transect 6.

Other observations included a notable presence of the following species in vicinity of the specified locations (outside the surveyed quadrats):

	QUADRAT VICINITY			
	Q0	Q5	Q10	Q15
Transect 1	<u>Overstory:</u> Birch (<i>Betula sp.</i>) Red Oak (<i>Quercus rubra</i>)		Common Plantain (<i>Plantago major</i>)	Virginia Creeper (<i>Parthenocissus quinquefolia</i>)
Transect 2		Canada Goldenrod (<i>Solidago canadensis</i>)	Lady Fern (<i>Athyrium filix-femina</i>) Common Burdock (<i>Arctium minus</i>)	Smartweed (<i>Persicaria sp.</i>) Common Burdock Wild Grape (<i>Vitis riparia</i>)
Transect 3		<u>Overstory:</u> Red Oak Cottonwood (<i>Populus deltoides</i>) Green Ash (<i>Fraxinus pennsylvanica</i>) Cherry (<i>Prunus sp.</i>)	Glossy Buckthorn (<i>Frangula alnus</i>) Goldenrod (<i>Solidago sp.</i>) False Solomon's Seal (<i>Maianthemum racemosum</i>)	Cherry <u>Overstory:</u> Common Buckthorn (<i>Rhamnus cathartica</i>) White Pine (<i>Pinus strobus</i>) Red Oak Green Ash

Transect 4		Smartweed Stinging Nettle (<i>Urtica dioica</i>)		
Transect 5	Gooseberry (<i>Ribes sp.</i>) <u>Overstory:</u> Red Oak Ironwood (<i>Ostrya virginiana</i>)	Garlic Mustard (<i>Alliaria petiolata</i>)		
Transect 6	Jewelweed (<i>Impatiens sp.</i>) Common Evening Primrose (<i>Oenothera biennis</i>) Garden Asparagus (<i>Asparagus officinalis</i>)		<u>Overstory:</u> Red Oak Red Pine (<i>Pinus resinosa</i>) White Oak (<i>Quercus alba</i>) Common Buckthorn	<u>Overstory:</u> Common Buckthorn

Table 1. *Invasive species (12) that occurred in survey results. Invasiveness was defined as being non-native to Minnesota, an aggressive native, and/or listed as an invasive species on the MN Wildflowers website.*

Common Name	Scientific Name	Total Plant Count (Coverage)
Reed Canary	<i>Phalaris arundinacea</i>	201
Glossy Buckthorn	<i>Frangula alnus</i>	79
Common Buckthorn	<i>Rhamnus cathartica</i>	77
Alsike Clover	<i>Trifolium hybridum</i>	50
Creeping Charlie	<i>Glechoma hederacea</i>	50
Smooth Crab Grass	<i>Digitaria ischaemum</i>	50
Narrowleaf Cattail	<i>Typha angustifolia</i>	31
Common Plantain	<i>Plantago major</i>	29
White Sweet Clover	<i>Melilotus alba</i>	15
Common Dandelion	<i>Taraxacum officinale</i>	7
Garlic Mustard	<i>Alliaria petiolata</i>	5
Bush Honeysuckle	<i>Diervilla lonicera</i>	3

Table 2. East Vadnais Lake Shoreline Vegetation Survey Species List (*red* = invasive).

	Common Name	Scientific Name
1	Garlic Mustard	<i>Alliaria petiolata</i>
2	Hog Peanut	<i>Amphicarpaea bracteata</i>
3	Groundnut	<i>Apios americana</i>
4	Common Milkweed	<i>Asclepias syriaca</i>
5	Unknown Aster	<i>Asteraceae sp.</i>
6	Lady Fern	<i>Athyrium filix-femina</i>
7	Paper Birch	<i>Betula papyrifera</i>
8	Nodding Bur-marigold	<i>Bidens cernua</i>
9	Discoïd Beggarticks	<i>Bidens discoidea</i>
10	Devil's Beggarticks	<i>Bidens frondosa</i>
11	False Brome	<i>Brachypodium sylvaticum</i>
12	Enchanter's Nightshade	<i>Circaea lutetiana</i>
13	Red-osier Dogwood	<i>Cornus sericea</i>
14	Straw-colored Flatsedge	<i>Cyperus strigosus</i>
15	Bush Honeysuckle	<i>Diervilla lonicera</i>
16	Smooth Crab Grass	<i>Digitaria ischaemum</i>
17	Fescue	<i>Festuca sp.</i>
18	Glossy Buckthorn	<i>Frangula alnus</i>
19	Northern Bedstraw	<i>Galium boreale</i>
20	Wild Geranium	<i>Geranium maculatum</i>
21	Creeping Charlie	<i>Glechoma hederacea</i>
22	Jewelweed	<i>Impatiens capensis</i>
23	Iris	<i>Iris sp.</i>
24	Honeysuckle	<i>Lonicera sp.</i>
25	American Water Horehound	<i>Lycopus americana</i>
26	Northern Bugleweed	<i>Lycopus uniflorus</i>
27	Canada Mayflower	<i>Maianthemum canadense</i>
28	Canada Mayflower	<i>Maianthemum candense</i>
29	False Solomon's Seal	<i>Maianthemum racemosum</i>
30	White Sweet Clover	<i>Melilotus alba</i>
31	Ironwood	<i>Ostrya virginiana</i>
32	Southern Wood Sorrel	<i>Oxalis dillenii</i>
33	Virginia Creeper	<i>Parthenocissus quinquefolia</i>
34	Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>
35	Dotted Smartweed	<i>Persicaria punctata</i>
36	Reed Canary	<i>Phalaris arundinacea</i>
37	Dwarf Clearweed	<i>Pilea pumila</i>
38	Common Plantain	<i>Plantago major</i>
39	Kentucky Bluegrass	<i>Poa pratensis</i>
40	Cherry	<i>Prunus sp.</i>
41	Red Oak	<i>Quercus rubra</i>

	Common Name	Scientific Name
42	Common Buckthorn	<i>Rhamnus cathartica</i>
43	Mad-dog Skullcap	<i>Scutellaria lateriflora</i>
44	Canada Goldenrod	<i>Solidago canadensis</i>
45	Zigzag Goldenrod	<i>Solidago flexicaulis</i>
46	Hairy Goldenrod	<i>Solidago hispida</i>
47	Common Dandelion	<i>Taraxacum officinale</i>
48	American Basswood	<i>Tilia americana</i>
49	Poison Ivy	<i>Toxicodendron rydbergii</i>
50	Alsike Clover	<i>Trifolium hybridum</i>
51	Narrowleaf Cattail	<i>Typha angustifolia</i>
52	Wild Grape	<i>Vitis riparia</i>

Table 3. Species listed by total plant count (coverage), number of quadrats occurred, density, frequency, and relative data for each statistic (*red* = invasive).

Common Name	Scientific Name	Total Plant Count (Coverage)	Relative Coverage	Quadrats Occurred	Density	Relative Density	Frequency	Relative Frequency
Fescue	<i>Festuca sp.</i>	258	21.81%	12	10.75	21.81%	50.00%	10.81%
Reed Canary	<i>Phalaris arundinacea</i>	201	16.99%	6	8.38	16.99%	25.00%	5.41%
Kentucky Bluegrass	<i>Poa pratensis</i>	100	8.45%	2	4.17	8.45%	8.33%	1.80%
Glossy Buckthorn	<i>Frangula alnus</i>	79	6.68%	6	3.29	6.68%	25.00%	5.41%
Common Buckthorn	<i>Rhamnus cathartica</i>	77	6.51%	7	3.21	6.51%	29.17%	6.31%
Smooth Crab Grass	<i>Digitaria ischaemum</i>	50	4.23%	1	2.08	4.23%	4.17%	0.90%
Creeping Charlie	<i>Glechoma hederacea</i>	50	4.23%	1	2.08	4.23%	4.17%	0.90%
Alsike Clover	<i>Trifolium hybridum</i>	50	4.23%	1	2.08	4.23%	4.17%	0.90%
Poison Ivy	<i>Toxicodendron rydbergii</i>	46	3.89%	5	1.92	3.89%	20.83%	4.50%
Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>	33	2.79%	2	1.38	2.79%	8.33%	1.80%
Narrowleaf Cattail	<i>Typha angustifolia</i>	31	2.62%	5	1.29	2.62%	20.83%	4.50%
Common Plantain	<i>Plantago major</i>	29	2.45%	3	1.21	2.45%	12.50%	2.70%
Paper Birch	<i>Betula papyrifera</i>	22	1.86%	4	0.92	1.86%	16.67%	3.60%
Dwarf Clearweed	<i>Pilea pumila</i>	19	1.61%	1	0.79	1.61%	4.17%	0.90%
Hog Peanut	<i>Amphicarpaea bracteata</i>	15	1.27%	3	0.63	1.27%	12.50%	2.70%
White Sweet Clover	<i>Melilotus alba</i>	15	1.27%	3	0.63	1.27%	12.50%	2.70%
Canada Mayflower	<i>Maianthemum canadense</i>	14	1.18%	3	0.58	1.18%	12.50%	2.70%
Enchanter's Nightshade	<i>Circaea lutetiana</i>	8	0.68%	1	0.33	0.68%	4.17%	0.90%
Common Dandelion	<i>Taraxacum officinale</i>	7	0.59%	3	0.29	0.59%	12.50%	2.70%
Devil's Beggarticks	<i>Bidens frondosa</i>	6	0.51%	1	0.25	0.51%	4.17%	0.90%
Garlic Mustard	<i>Alliaria petiolata</i>	5	0.42%	2	0.21	0.42%	8.33%	1.80%
Lady Fern	<i>Athyrium filix-femina</i>	5	0.42%	2	0.21	0.42%	8.33%	1.80%
Northern Bedstraw	<i>Galium boreale</i>	5	0.42%	2	0.21	0.42%	8.33%	1.80%
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	5	0.42%	2	0.21	0.42%	8.33%	1.80%
Dotted Smartweed	<i>Persicaria punctata</i>	5	0.42%	1	0.21	0.42%	4.17%	0.90%
False Solomon's Seal	<i>Maianthemum racemosum</i>	4	0.34%	2	0.17	0.34%	8.33%	1.80%
Hairy Goldenrod	<i>Solidago hispida</i>	4	0.34%	1	0.17	0.34%	4.17%	0.90%
Bush Honeysuckle	<i>Diervilla lonicera</i>	3	0.25%	2	0.13	0.25%	8.33%	1.80%
Jewelweed	<i>Impatiens capensis</i>	3	0.25%	2	0.13	0.25%	8.33%	1.80%
Northern Bugleweed	<i>Lycopus uniflorus</i>	3	0.25%	1	0.13	0.25%	4.17%	0.90%
Zigzag Goldenrod	<i>Solidago flexicaulis</i>	3	0.25%	2	0.13	0.25%	8.33%	1.80%
Unknown Aster	<i>Asteraceae sp.</i>	2	0.17%	1	0.08	0.17%	4.17%	0.90%

Common Name	Scientific Name	Total Plant Count (Coverage)	Relative Coverage	Quadrats Occurred	Density	Relative Density	Frequency	Relative Frequency
Nodding Bur-marigold	<i>Bidens cernua</i>	2	0.17%	1	0.08	0.17%	4.17%	0.90%
Straw-colored Flatsedge	<i>Cyperus strigosus</i>	2	0.17%	1	0.08	0.17%	4.17%	0.90%
Iris	<i>Iris sp.</i>	2	0.17%	1	0.08	0.17%	4.17%	0.90%
Canada Mayflower	<i>Maianthemum canadense</i>	2	0.17%	1	0.08	0.17%	4.17%	0.90%
Red Oak	<i>Quercus rubra</i>	2	0.17%	2	0.08	0.17%	8.33%	1.80%
Canada Goldenrod	<i>Solidago canadensis</i>	2	0.17%	1	0.08	0.17%	4.17%	0.90%
Groundnut	<i>Apios americana</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Common Milkweed	<i>Asclepias syriaca</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Discoid Beggarticks	<i>Bidens discoidea</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
False Brome	<i>Brachypodium sylvaticum</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Red-osier Dogwood	<i>Cornus sericea</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Wild Geranium	<i>Geranium maculatum</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Honeysuckle	<i>Lonicera sp.</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
American Water Horehound	<i>Lycopus americana</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Ironwood	<i>Ostrya virginiana</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Southern Wood Sorrel	<i>Oxalis dillenii</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Cherry	<i>Prunus sp.</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Mad-dog Skullcap	<i>Scutellaria lateriflora</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
American Basswood	<i>Tilia americana</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
Wild Grape	<i>Vitis riparia</i>	1	0.08%	1	0.04	0.08%	4.17%	0.90%
	Total	1183	100%	111	49.29	100%	463%	100%

References

- Barbour, M.G., J.H. Burk, and W.D. Pitts. (1987). *Terrestrial Plant Ecology*. Chapter 9: Method of sampling the plant community. Menlo Park, CA: Benjamin/Cummings Publishing Co.
- Cowardin, L., V. Carter, F. Golet, and E. LaRoe. (1979). *Classification of wetlands and deepwater habitats of the United States*. U.S. Department of the Interior, Fish and Wildlife Service. December 1979.
- Cox, G. (1990). *Laboratory manual of general ecology* 6th Ed. Dubuque, Iowa: William C. Brown.
- Curtis, J. & McIntosh, R. (1950). The interrelations of certain analytic and synthetic phytosociological characteristics. *Ecology* 31:434-455.
- Goldsmith, F.B., C.M. Harrison, and A.J. Morton. (1986). Description and analysis of vegetation. Pages 437-524 in P.D. Moore and S.B. Chapman, editors. *Methods in plant ecology*. Blackwell Scientific Publications, Oxford, England.
- Minnesota Department of Natural Resources (MN DNR). (2009). *National Wetland Inventory for Minnesota – Historical (1980 – 1986)*. Shapefile published 2009 and retrieved from Minnesota Geospatial Commons in November 2020.
- Minnesota Department of Natural Resources (MN DNR). (2014). *MNDNR Native Plant Communities*. Shapefile published 7/11/2014 and retrieved from Minnesota Geospatial Commons in November 2020.
- Minnesota Department of Natural Resources (MN DNR). (2020). *Fishing lakes: Vadnais lake (east)*. <https://www.dnr.state.mn.us/areas/fisheries/eastmetro/lakes/vadnais-east.html>. Date accessed: Nov 2020.
- Minnesota Environment and Natural Resources (MENR). (2006). *Minnesota wildflowers: a field guide to the flora of Minnesota*. <https://www.minnesotawildflowers.info/>. Date accessed: Sept 2020-Nov 2020.
- Vadnais Lake Area Water Management Organization (VLAWMO). (2020). *Waterbodies: Vadnais lake*. <https://www.vlawmo.org/waterbodies/vadnais-lake/>. Date accessed: Nov 2020.

Appendix A: Field Data Results by Quadrat

East Vadnais Lake Shoreline Survey Field Data

8/31/2020

Red = Invasive, A = 50+ individuals

Transect 1						
	Common Name	Scientific Name	Q0	Q5	Q10	Q15
1	Red Oak	<i>Quercus rubra</i>	1			
2	Fescue	<i>Festuca sp.</i>	18		20	3
3	Canada Mayflower	<i>Maianthemum canadense</i>	11	2	1	
4	Paper Birch	<i>Betula papyrifera</i>	1	3	11	7
5	Lady Fern	<i>Athyrium filix-femina</i>	1	4		
6	Common Plantain	<i>Plantago major</i>	6	2		
7	Wild Geranium	<i>Geranium maculatum</i>		1		
8	Hairy Goldenrod	<i>Solidago hispida</i>		4		
9	Poison Ivy	<i>Toxicodendron rydbergii</i>			3	3
10	Northern Bedstraw	<i>Galium boreale</i>			4	
11	False Solomon's Seal	<i>Maianthemum racemosum</i>				2
12	Zigzag Goldenrod	<i>Solidago flexicaulis</i>				2
13	Common Buckthorn	<i>Rhamnus cathartica</i>				4
	% Invasive Species	15%	38	16	39	21

Transect 2						
	Common Name	Scientific Name	Q0	Q5	Q10	Q15
1	Glossy Buckthorn	<i>Frangula alnus</i>	9			5
2	Wild Grape	<i>Vitis riparia</i>	1			
3	Red-osier Dogwood	<i>Cornus sericea</i>	1			
4	White Sweet Clover	<i>Melilotus alba</i>	1			
5	Virginia Creeper	<i>Parthenocissus quinquefolia</i>	1			
6	Narrowleaf Cattail	<i>Typha angustifolia</i>	1			
7	Jewelweed	<i>Impatiens capensis</i>	1			
8	Discoïd Beggarticks	<i>Bidens discoïdea</i>	1			
9	False Brome	<i>Brachypodium sylvaticum</i>	1			
10	American Water Horehound	<i>Lycopus americana</i>	1			
11	Common Milkweed	<i>Asclepias syriaca</i>	1			
12	Common Plantain	<i>Plantago major</i>		21		
13	Common Dandelion	<i>Taraxacum officinale</i>		1	5	
14	Alsike Clover	<i>Trifolium hybridum</i>		A		
15	Kentucky Bluegrass	<i>Poa pratensis</i>		A	A	
16	Smooth Crab Grass	<i>Digitaria ischaemum</i>		A		
17	Creeping Charlie	<i>Glechoma hederacea</i>			A	
18	Groundnut	<i>Apios americana</i>			1	
19	Zigzag Goldenrod	<i>Solidago flexicaulis</i>			1	
20	Canada Goldenrod	<i>Solidago canadensis</i>			2	
21	Southern Wood Sorrel	<i>Oxalis dillenii</i>			1	

22	Garlic Mustard	<i>Alliaria petiolata</i>				3	
23	Enchanter's Nightshade	<i>Circaea lutetiana</i>				8	
% Invasive Species			39%	19	172	110	16

Transect 3							
	Common Name	Scientific Name	Q0	Q5	Q10	Q15	
1	White Sweet Clover	<i>Melilotus alba</i>	6				
2	Poison Ivy	<i>Toxicodendron rydbergii</i>	19	14		7	
3	Glossy Buckthorn	<i>Frangula alnus</i>	14	6	7	38	
4	Fescue	<i>Festuca sp.</i>	22	23	38		
5	Cherry	<i>Prunus sp.</i>			1		
6	Garlic Mustard	<i>Alliaria petiolata</i>				2	
7	Bush Honeysuckle	<i>Diervilla lonicera</i>				1	
% Invasive Species			57%	61	43	46	48

Transect 4							
	Common Name	Scientific Name	Q0	Q5	Q10	Q15	
1	Devil's Beggarticks	<i>Bidens frondosa</i>	6				
2	Nodding Bur-marigold	<i>Bidens cernua</i>	2				
3	Reed Canary	<i>Phalaris arundinacea</i>	A	23	39	32	
4	Dwarf Clearweed	<i>Pilea pumila</i>	19				
5	Northern Bugleweed	<i>Lycopus uniflorus</i>	3				
6	Narrowleaf Cattail	<i>Typha angustifolia</i>	5	7	6	12	
7	Mad-dog Skullcap	<i>Scutellaria lateriflora</i>	1				
8	Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>		23	10		
9	Straw-colored Flatsedge	<i>Cyperus strigosus</i>			2		
% Invasive Species			22%	86	53	57	44

Transect 5							
	Common Name	Scientific Name	Q0	Q5	Q10	Q15	
1	Iris	<i>Iris sp.</i>	2				
2	Jewelweed	<i>Impatiens capensis</i>	2				
3	Hog Peanut	<i>Amphicarpaea bracteata</i>	9	5		1	
4	Northern Bedstraw	<i>Galium boreale</i>		1			
5	Common Buckthorn	<i>Rhamnus cathartica</i>		1	3	11	
6	Virginia Creeper	<i>Parthenocissus quinquefolia</i>		4			
7	Fescue	<i>Festuca sp.</i>		45	42	1	
8	Canada Mayflower	<i>Maianthemum canadense</i>				2	
9	False Solomon's Seal	<i>Maianthemum racemosum</i>				2	
10	Bush Honeysuckle	<i>Diervilla lonicera</i>				2	
11	Red Oak	<i>Quercus rubra</i>				1	
12	Ironwood	<i>Ostrya virginiana</i>				1	
% Invasive Species			17%	13	56	45	21

Transect 6							
	Common Name	Scientific Name	Q0	Q5	Q10	Q15	
1	White Sweet Clover	<i>Melilotus alba</i>	8				
2	Common Dandelion	<i>Taraxacum officinale</i>	1				
3	American Basswood	<i>Tilia americana</i>	1				
4	Common Buckthorn	<i>Rhamnus cathartica</i>	1		36	21	
5	Reed Canary	<i>Phalaris arundinacea</i>	25	32			
6	Dotted Smartweed	<i>Persicaria punctata</i>	5				
7	Fescue	<i>Festuca sp.</i>	11	4	31		
8	Unknown Aster	<i>Asteraceae sp.</i>	2				
9	Honeysuckle	<i>Lonicera sp.</i>		1			
% Invasive Species			44%	54	37	67	21

Appendix B: One-square-meter Quadrat Examples and Other Plant Photos



















Poison Ivy (*T. rydbergii*) colonies and Goldenrod (*Solidago sp.*) along the roadside near Transect 1.



American Bittersweet (*C. scandens*) near Transect 1.



Unknown Aster (*Asteraceae* sp.) observed in Quadrat 0 at Transect 6.