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## BALD EAGLE LAKE, RAMSEY COUNTY: 2023 AQUATIC VEGETATION REPORT

Report by the Invasive Species Program – Division of Ecological and Water Resources  
Minnesota Department of Natural Resources

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**Lake:** Bald Eagle (DOW# 62000200)

**Lake Surface Area:** 1097 acres

**Littoral Area:** 589 acres

**County:** Ramsey

**Survey Type:** Point-intercept

**Date of Survey (most recent):** August 9, 2023

**Observer[s]:** April Londo (MNDNR)

Jenna Nelson (MNDNR)

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**Report updated:** January 2, 2024

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### 2023 Summary:

The most recent aquatic vegetation point intercept survey of Bald Eagle Lake (DOW #62000200) was completed on August 9, 2023. Submersed plants were present throughout the lake to a depth of 2.7 meters (9 feet). Within the littoral zone (area in the lake from the 0 – 15-foot depth range [0 – 4.5 meters]), 62% of the sampled points contained native submersed taxa. The average number of native submersed taxa per sample point was 2.0, and a total of 19 submersed plant species were documented during the survey (see **Summary Table** below for historic data). Three invasive species have been managed in Bald Eagle (curly-leaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*) and flowering rush (*Butomus umbellatus*) with improvement efforts being organized by Rice Creek Watershed District.

**Summary Table.** Summary of aquatic submersed plants in Bald Eagle Lake, Ramsey County, Minnesota (DOW# 62000200) as indicated by the results of point-intercept surveys. Values were calculated from the littoral depth range (0 – 15 feet).

YEAR	Treatment Date	CLP* Acres Treated	PI Survey Date	Max Depth of Growth in feet [95%] <sup>†</sup>	% Points w/ Native Submersed Taxa	Mean Native Submersed Taxa/ Point	# Submersed Taxa	AVG Secchi Depth [m]
2010	APR	241	AUG 10	11	74	1.6	11	1.6
2011	MAY	125	AUG 16	13	71	1.4	13	2.0
2012	MAY	97	AUG 1	11	54	0.9	13	1.3
2013	MAY	62.5	-	-	-	-	-	2.0
2014	MAY	92	SEPT 16	10	59	1.5	15	2.0
2015	MAY	92	SEPT 9	13	50	1.3	16	3.1
2016	APR	14	AUG 24	14	77	2.1	16	2.7
2017	APR	28.5	SEPT 7	12	67	1.9	18	-
2018	MAY	19.6	AUG 22	12	71	1.4	16	2.6
2019	MAY	68.9	SEPT 6	9	55	1.5	19	2.5
2020	MAY	75.5	AUG 13	10	65	1.7	16	2.6
2021	MAY	86.9	SEPT 13	9	57	1.6	16	2.5
2022	MAY	26.5	AUG 29	9	70	2.0	18	1.8
2023	MAY	68.9	AUG 9	9	62	2.0	19	1.8

\* CLP is short for curly-leaf pondweed

† 95th percentile calculated based on all vegetated sampling points

Taxa refers to groups of submersed aquatic plant species or genera

AVG – average Secchi depth (water clarity measurement) from May – September

## Lake Description:

Bald Eagle Lake is a 1097-acre lake located near White Bear Lake, Minnesota. It has four invasive aquatic plant species which include submersed plants: Eurasian watermilfoil (*Myriophyllum spicatum* abbreviated as EWM), curly-leaf pondweed (*Potamogeton crispus*, abbreviated as CLP), and emergent plants: Flowering rush (*Butomus umbellatus*) and purple loosestrife (*Lythrum salicaria*). The maximum depth of water is 11 meters (37 feet). Approximately 54% of the lake is littoral (water depth zone from 0 – 15 feet where aquatic plants are likely to be found). In the spring of 2014 and 2016, the lake was treated with aluminum sulfate (alum) – organized by the Rice Creek Watershed District – to reduce internal phosphorus, increase water clarity (see **Table 1 – Secchi Averages** below for historic Secchi disk observations), and improve submersed aquatic vegetation growth. For additional water quality information: <https://webapp.pca.state.mn.us/surface-water/impairment/62-0002-00> and <https://arcgis.dnr.state.mn.us/ewr/whaflakes/scale/major/id/20>.

**Table 1 – Secchi Averages.** Average Secchi disk observations in meters for Bald Eagle Lake, Ramsey County, Minnesota (DOW #62000200). Data collected by Ramsey County unless otherwise noted.

YEAR	MAY	JUNE	JULY	AUG	SEPT	Secchi Depth Average [May – Sept]
2010	3.2	1.4	1.3	0.9	1.2	1.6
2011	2.9	2.5	2.2	1.2	1.1	2.0
2012	2.6	1.7	1.0	0.6	0.5	1.3
2013	1.9	2.1	1.6	-	1.1	1.7
2014 <sup>A</sup>	2.6	2.7	1.9	1.4	1.6	2.0
2015	4.9	3.2	2.8	-	1.7	3.2
2016 <sup>A</sup>	3.2	3.4	3.0	1.9	2.1	2.7
2017	3.7	3.2	2.8	1.7	1.6	2.6
2018	1.8	3.7	2.0	2.1	2.4	2.6
2019	3.9	3.9	2.0	1.2	1.6	2.5
2020	6.0	3.4	2.0	1.0	1.6	2.6
2021*	4.6	3.2	2.0	1.4	1.4	2.5
2022*	2.8	2.2	1.7	1.2	1.3	1.8
2023	2.7	2.0	1.6	1.5	1.2	1.8

\* Denotes data gathered from MPCA station # 62-0002-00-207

<sup>A</sup> Denotes alum treatment years

## Management History:

Historically, Bald Eagle Lake was a Minnesota Department of Natural Resources (MNDNR) pilot project lake from 2010 – 2012 and received a variance to treat more than 15% of the littoral area for lake-wide curly leaf pondweed (CLP) control. Since then, only partial-lake CLP treatments have been requested and treatment acreage has varied but remained under the littoral limit. Curly-leaf pondweed treatments for Bald Eagle Lake have historically been organized by the Rice Creek Watershed District (RCWD). In the most recent five years the RCWD has used diquat to target CLP growth through spot treatments (see **Table 2 – Invasive Plant Management Summary** for a recent history of herbicide treatments).

In 2014, the RCWD applied aluminum sulfate (alum) to Bald Eagle Lake to reduce internal phosphorus levels and improve water clarity. The second dose of alum occurred in 2016. Overall submersed plants including Eurasian watermilfoil (EWM) responded positively to the alum. As a result, in 2017 and 2018, the Bald Eagle Area Association managed nuisance EWM through small spot treatments using auxin mimic herbicides (2,4-D). The Bald Eagle Area Association hasn't applied herbicides for EWM in the last five years.

Flowering rush is an emergent invasive plant that has been managed in Bald Eagle Lake since 2013 by the MNDNR and the RCWD. Flowering rush plants have been removed by hand on the west-central shoreline annually (August – September; see **Photos 1 & 2** below). Since the discovery of the plant in August 2013, management efforts have reduced the density and distribution of flowering rush in Bald Eagle Lake (from roughly 200 wet weight pounds of flowering rush to a few single plants pulled in 2021), no plants have been observed since 2021.

**Table 2 – Invasive Plant Management Summary.** Characteristics and history of herbicide treatments for Bald Eagle Lake, Ramsey County, Minnesota (DOW# 62000200, total acres: 1097, littoral acres: 589, 15% littoral acres: 88).

Date	Treatment [W, P, N]	Target Species	Total Acres Treated	Herbicide	Licensed Commercial Applicator
2010 APR	W*	CLP	241	Endothall	Lake Restoration Inc.
2011 MAY	W*	CLP	125	Endothall	Lake Restoration Inc.
2012 MAY	P	CLP	97	Endothall	Lake Restoration Inc.
2013 MAY	P	CLP	62.5	Endothall	Lake Restoration Inc.
2014 MAY	P	CLP	92	Endothall	PLM Lake and Land Mgmt Corp.
2015 MAY	P	CLP	92	Endothall	Lake Restoration Inc.
2016 APR	P	CLP	14	Endothall	Lake Restoration Inc.
2017 APR	P	CLP	28.5	Endothall	PLM Lake and Land Mgmt Corp.
2017 JUL	P	EWM	19.4	2,4-D	Lake Restoration Inc.
2018 MAY	P	CLP	19.6	Endothall	Lake Restoration Inc.
2018 JUL	P	EWM	42.2	2,4-D	Lake Restoration Inc.
2019 MAY	P	CLP	68.9	Diquat	Lake Restoration Inc.
2020 MAY	P	CLP	75.5	Diquat	Lake Management
2021 MAY	P	CLP	86.9	Diquat	PLM Lake and Land Mgmt Corp.
2022 MAY	P	CLP	26.5	Diquat	Lake Management
2023 MAY	P	CLP	68.9	Diquat	Lake Management

\* Indicates variance year

Treatment: W (whole lake), P (partial lake), N (no treatment)

CLP is an abbreviation for curly-leaf pondweed

EWM is an abbreviation for Eurasian watermilfoil

## Survey Objectives:

Point-intercept surveys were used to assess the distribution of aquatic plants in Bald Eagle Lake. The primary purpose for this type of survey is to 1) develop baseline knowledge of the current plant community in a lake, and over time, 2) compare year to year plant variation (in plant presence and spatial location). Moreover, this survey will help the Minnesota Department of Natural Resources and our partners monitor native plant communities and evaluate possible responses to invasive aquatic plant management efforts. It is important to note that distributions of aquatic plants may vary from year to year due to effects such as differences in weather, as well as the effects from plant and water quality management.

## Survey Methods:

We used a point intercept survey method developed by John Madsen in [“Aquatic Plant Control Technical Note MI-02, 1999”](#). Survey points were placed 125-200 meters apart using a Geographic Information System (GIS). This spacing allowed for placement of 108-268 points. Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. Plant samples were assessed on the boat to determine species and rake fullness as a surrogate for abundance (scale of zero [no plants] to 4 [dense, matted on the surface] was used in 2012-2017 and a zero to 3 scale in 2018 and subsequent years). Frequencies of occurrence percentages (i.e., how often a plant species was found in the lake) were calculated based on the littoral zone (the portion of the lake is less than 15 feet in depth).



## Survey Observations:

Nineteen aquatic plant species were observed in 2023 and 2019, which have been the highest recorded during all submersed plant surveys completed on Bald Eagle Lake (lowest number of plants observed was in 2010: 11 species, **Summary Table**). The mean submersed native taxa per sampling point was 2.0, a number that has been increasing since 2018 (see **Table 3 – Point Intercept Metrics**).

Native plant species whose presence dominates the system (i.e., water stargrass, coontail, Illinois pondweed and water celery), have stayed consistent following the initial aluminum sulfate (alum) treatment in 2014; although frequencies have increased in the past four years. Other native submersed plant taxa that have increased recently include Northern watermilfoil, variable pondweed, flat-stem pondweed, and clasping-leaf pondweed. Frequencies of white-water crowfoot and common bladderwort have not recovered to historical numbers as seen in the mid-2010s (see **Table 4 – Plant Frequency of Occurrence**), while leafy pondweed was observed for the first time in the 2023 survey. Native populations will continue to be monitored in the future to document temporal variability coinciding with on-going invasive plant management.

In 2019, Eurasian watermilfoil frequency and density were observed at their lowest levels since 2012 while more recent surveys (2020 – 2023) densities are comparable to earlier years. Low occurrences of curly leaf pondweed are typically observed late season (August-September) since most curly-leaf pondweed senesce in early summer (see **Table 4 – Plant Frequency of Occurrence**). Early season surveys focusing on curly leaf pondweed management reductions – conducted by Blue Water Science – are not presented in this report but are available upon request.



**Photos 1 & 2.** Left (1): Point intercept survey rake full of native plants in 2022. Right (2): Sparse flowering rush plants found in the 2019 aquatic plant survey of Bald Eagle Lake, Ramsey County, Minnesota (DOW # 62000200).



**Table 3 – Point Intercept Metrics.** Summary of point intercepts metrics for Bald Eagle Lake, Ramsey County (DOW# 62000200). Blue highlighted values were calculated from the littoral depth range (0 – 15 ft).

Survey Metrics	SEPT 2015	AUG 2016	SEPT 2017	AUG 2018	SEPT 2019	AUG 2020	SEP 2021	AUG 2022	AUG 2023
Treated (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Surveyor	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR & RCWD
Total # Points Sampled	262	267	266	265	265	258	252	188	172
Max Depth of Growth (95%) in feet	13	14	12	12	9	10	9	9	9
# Points in Max Depth Range	128	139	149	147	94	119	101	108	115
# Points in Littoral (0-15 feet)	150	158	174	171	172	171	166	148	168
% Points w/ Submersed Native Taxa	50	77	67	71	55	65	57	70	62
Mean Submersed Native Taxa/ Point	1.3	2.1	1.9	1.4	1.5	1.7	1.6	2.0	2.0
# Submersed Native Taxa	15	16	16	14	17	14	14	16	17
# Submersed Non-Native Taxa	1	2	2	2	2	2	2	2	2

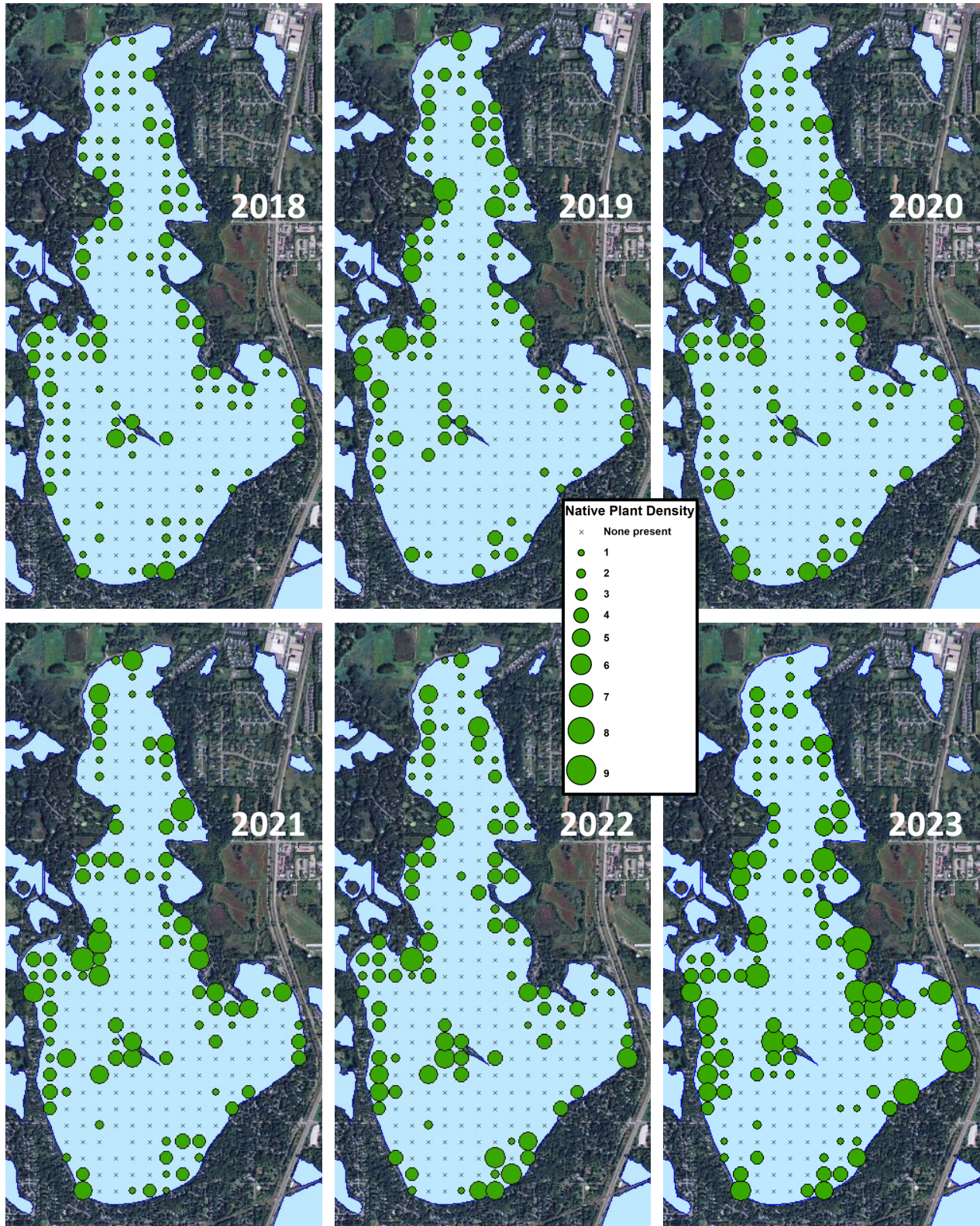
**Table 4 – Plant Frequency of Occurrence.** Historic percent frequency of occurrence for submersed vegetation within the littoral zone (0 – 15 feet) in Bald Eagle Lake, Ramsey County, Minnesota (DOW# 62000200).

Taxonomic Name	Common Name	SEPT 2015	AUG 2016	SEPT 2017	AUG 2018	SEPT 2019	AUG 2020	SEP 2021	AUG 2022	AUG 2023
<b>SUBMERSED PLANTS</b>										
<i>Myriophyllum spicatum</i> *	Eurasian watermilfoil*	29	37	41	11	4	22	20	20	33
<i>Ceratophyllum demersum</i>	Coontail	23	26	22	28	22	37	31	38	38
<i>Macroalgae</i>	Muskgrass and Stonewort	17	12	19	8					
<i>Chara spp.</i>	Muskgrass					7	16	14	11	21
<i>Nitella spp.</i>	Stonewort					-	1	1	-	-
<i>Heteranthera dubia</i>	Water stargrass	18	15	17	15	15	29	29	30	26
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	23	23	13	5	5	6	4	18	11
<i>Potamogeton gramineus</i>	Variable pondweed	1	2	14	-	-	2	4	1	9
<i>Potamogeton illinoensis</i>	Illinois pondweed	11	8	6	19	17	28	27	32	28
<i>Potamogeton praelongus</i>	White-stem pondweed	3	6	5	6	7	5	8	5	1
<i>Potamogeton richardsonii</i>	Clasping-leaf pondweed	3	2	2	3	2	5	2	7	5
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	-	-	-	2	-	5	3	8	14
<i>Ranunculus aquatilis</i>	White-water crowfoot	5	12	9	2	1	-	-	1	1
<i>Utricularia macrorhiza</i>	Common bladderwort	1	6	2	1	1	-	-	1	-
<i>Vallisneria americana</i>	Water celery	20	15	18	15	18	26	31	30	23

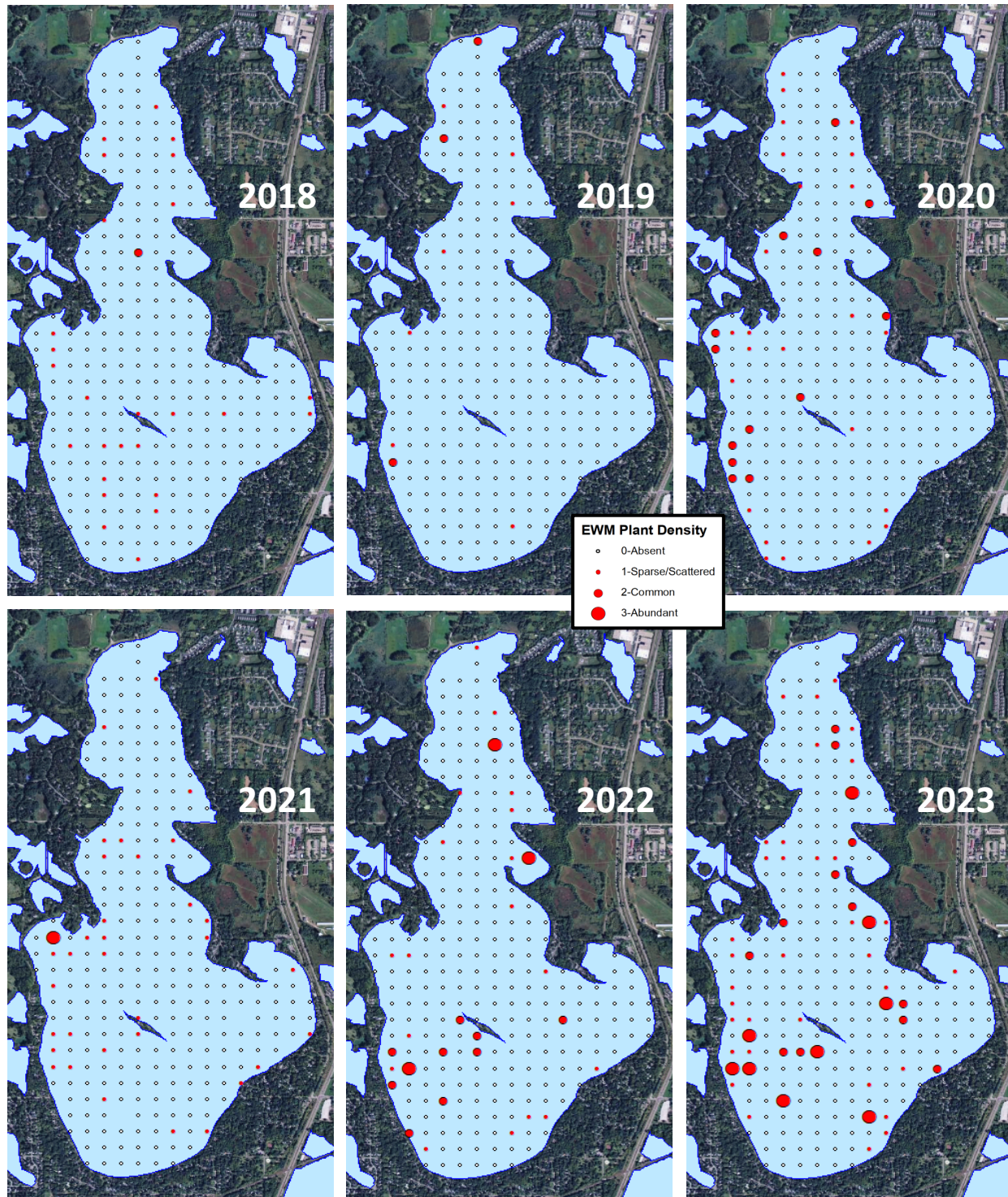
**Floating, free-floating & emergent plants observed:** *Nuphar advena* (yellow pond lily), *Nymphaea odorata* (white water lily), *Nuphar variegata* (bullhead pond lily), *Lemna trisulca* (star duckweed), *Drepanocladus spp.* (aquatic mosses), *Schoenoplectus spp.* (bulrushes), *Typha sp.* (cattail species).

**Less common (< 5% frequency) submersed vegetation observed:** *Potamogeton crispus* (curly leaf pondweed)\* in 2010, 2011, 2014, 2016-2022, *Bidens beckii* (water marigold) 2010, 2015-2017, and 2022, *Stuckenia pectinata* (sago pondweed) in 2011-2022, *Potamogeton nodosus* (long-leaf pondweed) in 2012 and 2021, *Elodea canadensis* (canadian waterweed) in 2014, 2016-2017, and 2022, *Potamogeton friesii* (fries' pondweed) in 2015 and 2020, *Utricularia minor* (small bladderwort) in 2016 and 2017, *Eleocharis acicularis* (needle spikerush) in 2017, *Potamogeton natans* (floating-leaf pondweed) in 2018, *Najas spp.* (naiad) 2015-2016, 2018, and 2020-2022.

\* Denotes invasive aquatic plant



**Figure 1 – Native Species Taxa Density.** Spatial distribution and species richness (# of native species per sample point) of all submersed plant species from Minnesota Department of Natural Resources point intercept surveys (2018-2022). Bald Eagle Lake, Ramsey County, Minnesota (DOW# 62000200).



**Figure 2 – Eurasian Watermilfoil Density.** Spatial distribution and rake density per sample point of Eurasian watermilfoil from Minnesota Department of Natural Resources point intercept surveys (2018-2022). Bald Eagle Lake, Ramsey County (DOW# 62000200).

*This information can be made available in alternative formats such as large print, braille or audio tape by emailing [info.dnr@state.mn.us](mailto:info.dnr@state.mn.us) or by calling 651-259-5016.*