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## BALD EAGLE LAKE, RAMSEY COUNTY: 2019 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):** Sept 6, 2019

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### **2019 Summary:**

*The most recent aquatic vegetation point intercept survey of Bald Eagle Lake (DOW #62000200) was completed on September 6, 2019. Plants were present throughout the lake to a depth of 2.7 meters (9 feet). Within the littoral zone (zone in lake from the 0-15 foot depth range (0-4.5 meters), 55% contained native submersed taxa. The average number of native submersed taxa per sample point was 1.5.*

*Nineteen submersed taxa were observed during the 2019 survey (see **Summary Table** below for historic data summary). In spring of 2014 and 2016, the lake was treated with alum (organized by Rice Creek Watershed District) to reduce internal phosphorus, increase water clarity and improve submersed aquatic vegetation growth and has achieved these goals. More information is available here:*

*[https://www.researchgate.net/publication/323322726\\_Restoring\\_Water\\_Quality\\_in\\_Bald\\_Eagle\\_Lake\\_Minnesota](https://www.researchgate.net/publication/323322726_Restoring_Water_Quality_in_Bald_Eagle_Lake_Minnesota)*

**Summary Table.** Summary of aquatic submersed plants in Bald Eagle Lake, Ramsey County (DOW# 62000200) as indicated by results of point-intercept surveys. Values were calculated from 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	11	74	1.6	11	1.6
2011	MAY	125	AUG	13	71	1.4	13	2.0
2012	MAY	97	AUG	11	54	0.9	13	1.3
2013	MAY	62.5	-	-	-	-	-	2.0
2014	MAY	92	SEPT	10	59	1.5	15	2.0
2015	MAY	92	SEPT	13	50	1.3	16	3.1
2016	APR	14	AUG	14	77	2.1	16	2.7
2017	APR	28.5	SEPT	12	67	1.9	18	-
2018	MAY	19.6	AUG	12	71	1.4	16	2.6
2019	MAY	68.9	AUG	9	55	1.5	19	2.5

\*CLP is short for Curly-leaf pondweed

<sup>†</sup>95<sup>th</sup> 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 in Minnesota. It has four invasive aquatic plant species which includes; 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 clarity has historically fluctuated in May through September but has observably improved since the recent alum treatments (see **Table 1-Secchi Averages** below for historic Secchi disk observations). For more information concerning Bald Eagle Lake water quality see

<http://cf.pca.state.mn.us/water/watershedweb/wdip/waterunit.cfm?wid=62-0002-00>.

**Table 1-Secchi Averages.** Average Secchi disk observations in meters for Bald Eagle Lake, Ramsey County (DOW# 62000200). Data gathered from the Rice Creek Watershed District (RCWD).

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	2.6	2.7	1.9	1.4	1.6	2.0
2015	4.9	3.2	2.8	-	1.7	3.2
2016	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

## Management History:

Invasive aquatic plant management in Bald Eagle Lake has historically targeted curly-leaf pondweed (CLP) using an endothall formulated herbicide. Treatments have been organized by the Rice Creek Watershed District (RCWD) and Bald Eagle Area Association (BEAA). The most recent herbicide treatment of 68.9 surface acres occurred in 2019 using diquat for the first time (see **Table 2-Invasive Plant Management Summary** for a recent history of herbicide treatments). Bald Eagle Lake was historically a DNR pilot project lake from 2010-2012 and received a variance to treat more than 15% littoral area for lakewide CLP control. Since then, only partial-lake treatments to control the invasive plant have been requested and treated acreage has decreased. In 2014, RCWD applied aluminum sulfate (alum) to Bald Eagle Lake in order to reduce internal phosphorus levels and improve water clarity. The second dose of alum occurred in 2016. Overall submersed plants including EWM responded positively to the alum. As a result, in 2017, the BEAA began managing nuisance EWM through small spot treatments.

Flowering rush is an emergent invasive plant that has been managed in Bald Eagle Lake since 2013 by the DNR and the RCWD. Flowering rush plants have been removed by hand on the central west shoreline annually (August-September; see photos 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.

**Table 2-Invasive Plant Management Summary.** Characteristics and history of herbicide treatment for Bald Eagle Lake (DOW# 62000200, Total acres: 1097, Littoral acres: 589, 15% Littoral acres: 88).

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



Rice Creek Watershed District staff removing flowering rush from Bald Eagle Lake, Ramsey County in 2016 (Left). Flowering rush plant showing root mass and stems in Bald Eagle Lake, DOW # 62000200 (Right).



## 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 DNR 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 density (scale of zero [no plants] to 3 [abundant or matted on the surface]). 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:

In the most recent 2019 survey, nineteen submersed plants were observed. Native plant species that dominate the system (i.e. water stargrass, coontail, Illinois pondweed and water celery) have stayed consistent since the initial alum treatment in 2014. In 2019, macroalgae, northern watermilfoil and white-water crowfoot were less abundant compared to previous survey years. Native populations will continue to be monitored in the future to document such temporal variability coinciding with on-going management.

In 2019, EWM frequency and density were observed at their lowest levels since 2012. This could be attributed to the CLP diquat treatment that occurred in early spring which can also impact EWM populations. Low occurrences of CLP are typically observed late season (August-September) since the majority of CLP plants dies off in early summer. Early season surveys focusing on CLP management reductions have been conducted by Blue Water Science but are not presented in this report.



Photos of healthy native plants, including native pondweeds and Canadian waterweed in Bald Eagle Lake in 2016 (Left). Rake sample with a high density of Eurasian watermilfoil from the 2016 survey (Right).



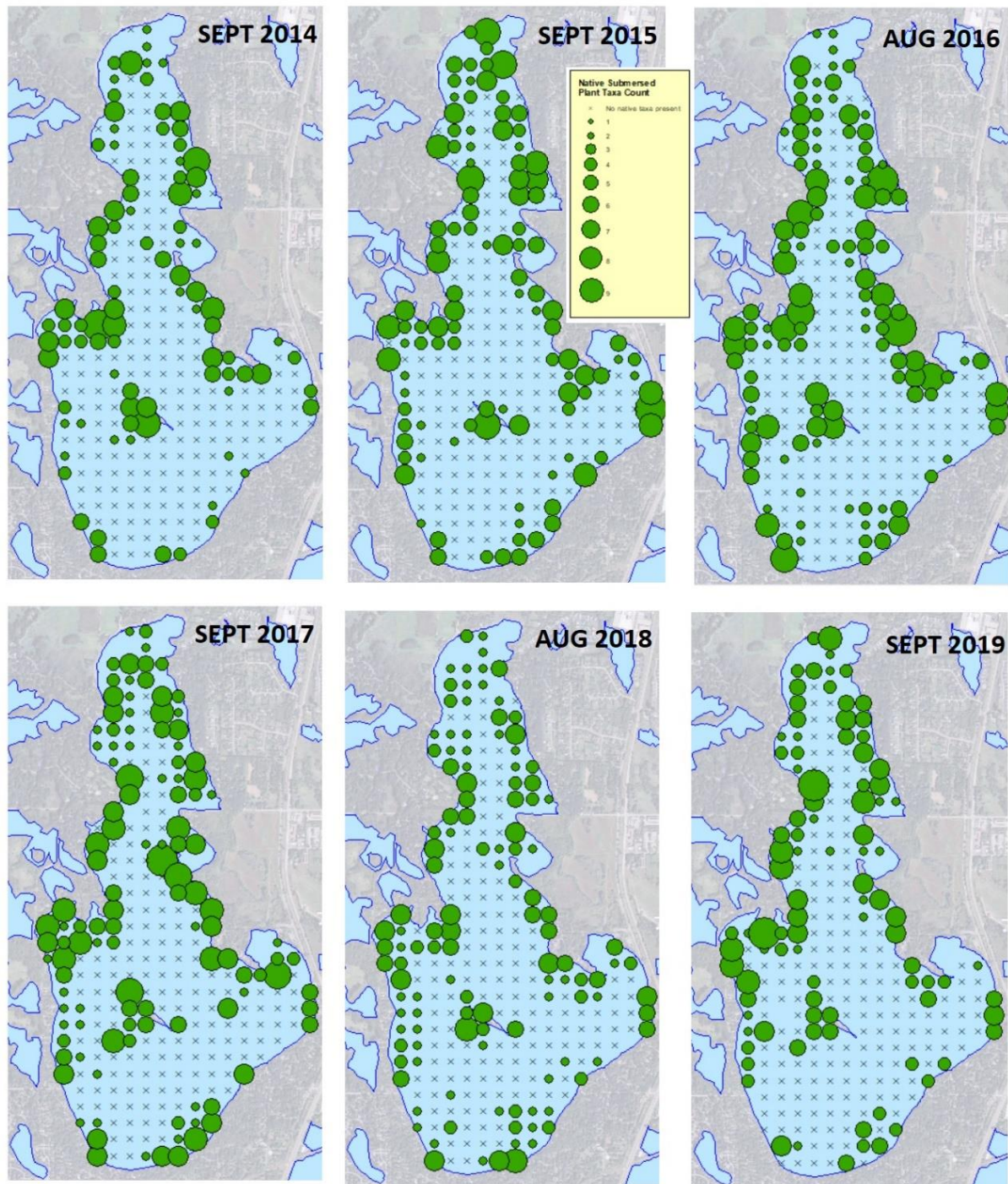
**Table 3- Point Intercept Metrics.** Summary of point intercepts metrics for Bald Eagle Lake, Ramsey County (DOW# 62000200). Shaded values were calculated from littoral depth range.

<b>Surveyor Metrics</b>	<b>AUG 2010</b>	<b>AUG 2011</b>	<b>AUG 2012</b>	<b>SEPT 2014</b>	<b>SEPT 2015</b>	<b>AUG 2016</b>	<b>SEPT 2017</b>	<b>AUG 2018</b>	<b>AUG 2019</b>
Treated (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Surveyor	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR	MNDNR
Total # Points Sampled	58	251	268	261	262	267	266	265	265
Max Depth of Growth (95%) in feet	11	13	11	10	13	14	12	12	9
# Point in Max Depth Range	43	106	101	105	128	139	149	147	94
# Points in Littoral (0-15 feet)	57	137	154	157	150	158	174	171	172
% Points w/ Submersed Native Taxa	74	71	54	57	50	77	67	71	55
Mean Submersed Native Taxa/ Point	1.6	1.4	0.9	1.5	1.3	2.1	1.9	1.4	1.5
# Submersed Native Taxa	9	11	12	13	15	16	16	14	17
# Submersed Non-Native Taxa	2	2	1	2	1	2	2	2	2

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

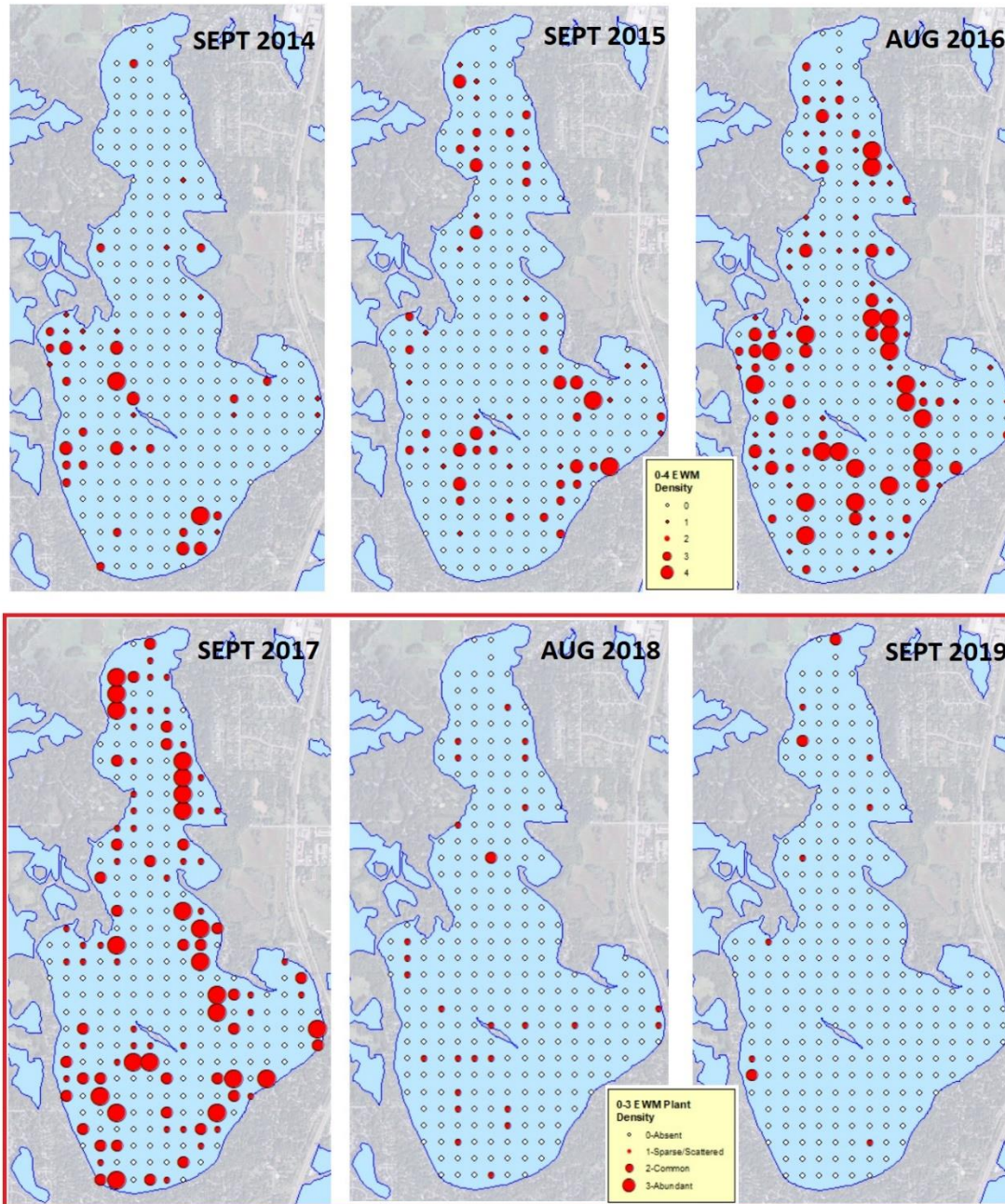
Taxonomic Name	Common Name	AUG 2010	AUG 2011	AUG 2012	SEPT 2014	SEPT 2015	AUG 2016	SEPT 2017	AUG 2018	AUG 2019
<b>SUBMERSED PLANTS</b>										
<i>Myriophyllum spicatum</i> *	Eurasian watermilfoil*	16	9	2	27	29	37	41	11	4
<i>Ceratophyllum demersum</i>	Coontail	42	36	6	29	23	26	22	28	22
<i>Macroalgae</i>	Muskgrass and Stonewort	26	0	13	11	17	12	19	8	7
<i>Heteranthera dubia</i>	Water stargrass	19	15	9	26	18	15	17	15	15
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	33	9	4	24	23	23	13	5	5
<i>Najas spp.</i>	Naiad	4	10	2	3	1	1	0	1	0
<i>Potamogeton gramineus</i>	Variable pondweed	0	0	0	0	1	2	14	0	0
<i>Potamogeton illinoensis</i>	Illinois pondweed	4	7	5	13	11	8	6	19	17
<i>Potamogeton praelongus</i>	White-stem pondweed	5	1	2	4	3	6	5	6	7
<i>Ranunculus aquatilis</i>	White-water crowfoot	0	0	3	4	5	12	9	2	1
<i>Utricularia macrorhiza</i>	Common bladderwort	0	0	0	3	1	6	2	1	1
<i>Vallisneria americana</i>	Water celery	21	26	12	22	20	15	18	15	18
Floating, Free-floating & Emergent plants observed: <i>Nuphar advena</i> (Yellow pond lily), <i>Nymphaea odorata</i> (White water lily), <i>Nuphar variegata</i> (Bullhead pond lily), <i>Lemna trisulca</i> (Forked duckweed), <i>Drepanocladus spp.</i> (Aquatic mosses), <i>Typha sp.</i> (Cattail species)										
Less common (< 5% frequency) submersed vegetation observed: <i>POTAMOGETON CRISPUS</i> (CURLY-LEAF PONDWEED)* in 2010, 2011, 2014, 2016-2019, <i>Bidens beckii</i> (Water marigold) 2010, 2015-2017, <i>Potamogeton zosteriformis</i> (Flat-stem pondweed) in 2011 and 2018, <i>Potamogeton richardsonii</i> (Clasping-leaf pondweed) and <i>Stuckenia pectinata</i> (Sago pondweed) in 2011-2109, <i>Potamogeton nodosus</i> (Long-leaf pondweed) in 2012, <i>Elodea canadensis</i> (Canadian waterweed) in 2014, 2016 and 2017, <i>Potamogeton friesii</i> (Fries' pondweed) in 2015, <i>Utricularia minor</i> (Small bladderwort) in 2016 and 2017, <i>Eleocharis acicularis</i> (Needle spikerush) in 2017, <i>Potamogeton natans</i> (Floating-leaf pondweed) in 2018.										

\* denotes invasive aquatic plant



**Figure 1.** Spatial distribution and species richness (# of native submersed taxa per sample point) for 2012, 2014-2019. Dates correspond to month of point intercept survey. Bald Eagle Lake, Ramsey County (DOW# 62000200).





**Figure 2.** Spatial distribution and rake density rating of Eurasian watermilfoil for 2012, 2014- 2019. Dates correspond to month of point intercept survey. Years 2012, 2014-2016 were surveyed on a 1-4 density rake rating scale while 2017 and 2019 were rated on a 1-3 density rake rating. 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.