

Technical Memorandum

To: Commissioners, Black Dog Watershed Management Organization (BDWMO)
From: Barr Engineering Co.
Subject: 2021 Kingsley Lake Habitat Monitoring
Date: April 13, 2022
Project: 23190457

This memorandum presents the results of the BDWMO's 2021 habitat monitoring of Kingsley Lake.

1.0 Introduction and Background to the BDWMO Habitat Monitoring Program and Executive Summary

The BDWMO lies south of the Minnesota River in the northwest portion of Dakota County. **Figure 1** shows the subwatersheds to the BDWMO's strategic water bodies. From 2003-2009 Barr staff annually evaluated the habitat quality of all of the strategic water bodies. Beginning in 2011, the BDWMO revised the program to monitor the habitat quality at one strategic water body per year, such that the BDWMO monitors all five strategic water bodies over a five-year cycle. The 2011 through 2015 reports provided a new baseline for the strategic water bodies. The lakes and their monitoring dates are listed below:

1. **Kingsley Lake: 2011, 2016, and 2021**
2. Orchard Lake: 2012 and 2017
3. Crystal Lake: 2013 and 2018
4. Lac Lavon: 2014 and 2019
5. Keller Lake: 2015 and 2020

This report provides the results of the Kingsley Lake 2021 habitat monitoring.

Habitat quality was evaluated within three vegetation zones:

- Submergent zone refers to the areas of the water body where water depths are typically 2 to 20 feet and the vegetation is typically submerged or has floating leaves.
- Emergent zone typically refers to the areas of the water body where water depths are less than 2 feet and vegetation grows out of the water.
- Upland buffer is characterized as the upland area immediately surrounding the water body.

Wildlife habitat characteristics were evaluated based on diversity of native plant communities present within each vegetation zone and an assessment of wetland functions and values. The lake was also evaluated for sedimentation and shoreline erosion problems. **Table 1** shows the 2012, 2016 and 2021 habitat quality ratings for Kingsley Lake. **Table 2** provides a summary of identified problems,

recommended management activities, and past actions. Section 3.2 of this memorandum describes five recommendations which include:

1. Continue to monitor for curly-leaf pondweed and consider control measures if densities and locations increase to an extent of concern.
2. Continue to control and manage non-native and invasive vegetation along the shoreline and in the upland buffer including, but not limited to purple loosestrife, hybrid cattail, yellow iris, common buckthorn, Russian olive, Chinese silver grass, and Siberian elm. Based on increases of purple loosestrife observed in 2021, we recommend requesting a status update from the MN DNR.
3. Install a pre-treatment system such as a rain garden, pervious pavement, or sediment trap to collect sediment from the restaurant parking lot prior to discharge into the lake.
4. Improve the shoreline by increasing the width and continuity of naturalized upland buffer.
5. Re-vegetate bare areas to prevent soil erosion into Kingsley Lake.

Additional detail describing the habitat assessment is provided in the technical reference section following this memorandum, which includes

- Kingsley Lake aquatic plant survey results and assessments (**Appendix A**),
- floristic quality assessment data and methods (**Appendix B**),
- previous habitat assessment monitoring results from 2003 through 2020 (**Appendix C**),
- previous recommended and completed management actions from 2003 through 2020 (**Appendix D**),
- 2016 Kingsley Lake Minnesota Routine Assessment Method (MNRAM 3.4) wetland functional assessment results (**Appendix E**),
- descriptions of the MNRAM wetland functions (**Appendix F**),
- examples of shoreline and buffer restoration projects (**Appendix G**),
- buckthorn management guidelines (**Appendix H**), and
- example pollinator brochure (**Appendix I**).

2.0 Kingsley Lake Habitat Monitoring

Kingsley Lake is a 51-acre lake with an additional 33-acres of deep and shallow marsh backwater located in Lakeville. The lake is used primarily as an aesthetic resource. There is no public beach or boat access on Kingsley Lake, but the lake provides boating, kayaking, and canoeing opportunities. A YMCA camp uses the lake for recreational activities. Kingsley Lake flows to Orchard Lake, which discharges to the Credit River and ultimately to the Minnesota River. The outlet from Kingsley Lake that was installed in 1993 had become damaged and in Fall 2020, the City of Lakeville replaced the damaged outlet with a new outlet of the same size and at the same elevation. The city also cleared downstream outlets to alleviate flooding issues. **Figure 2** shows the 2020 aerial imagery of Kingsley Lake.

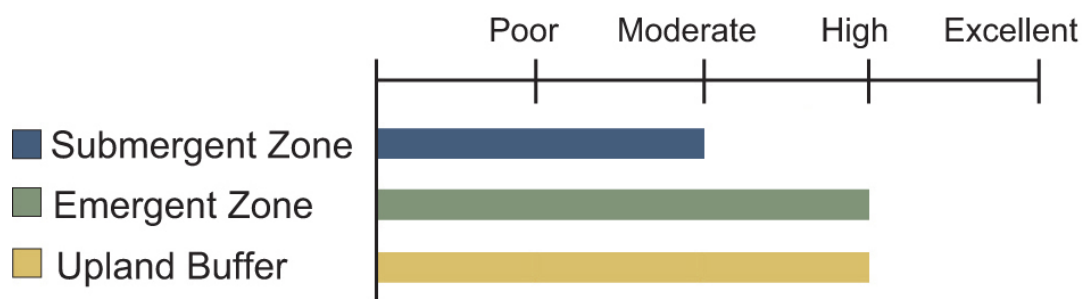
2.1 Kingsley Lake 2021 Habitat Monitoring Results

Habitat monitoring for Kingsley Lake was conducted from 2003 through 2009, 2011, 2016, and 2021. The 2021 field monitoring of Kingsley Lake was performed on June 3, and July 29, 2021. Vegetation data were collected in, within, and along the fringe of Kingsley Lake's three vegetation zones: (1) submergent, (2) emergent, and (3) upland.

The 2021 Kingsley Lake monitoring included plot and meandering surveys. Plot locations were designated in 2003 based on representative characteristics for each vegetation zone. Returning to the same plot locations allows for consistent comparisons over time. In addition, the 2011 revised program provides evaluation and documentation of vegetation zones along the entire shoreline. Photographs were taken to document conditions and are included at the end of this memorandum. Analysis and reporting of the monitoring data includes a floristic quality assessment and a four-tiered rating system (poor, moderate, high, and excellent). The current rating system is detailed in footnotes on **Table 1**. Private versus public ownership was identified along the entire shoreline. The survey results, along with parcel data, were used to identify possible locations for restoration and preservation.

On June 3, Barr conducted an aquatic vegetation survey within the submergent and emergent zones (**Appendix A**). On July 29, Barr staff and City of Lakeville Environmental Resource Specialist Ann Messerschmidt, conducted emergent vegetation and upland buffer zone surveys by kayaking in the lake and walking along the shoreline. In addition, the discrete plots (shown in **Figure 2**) were monitored in the emergent zone and upland buffer, as done in 2003-2009, 2011, and 2016. **Figure 3** shows the shoreline parcels identifying private versus public ownership. An overall quality rating for each vegetation zone was computed using the field variables evaluated in each zone. **Table 1** shows the 2011, 2016 and 2021 habitat quality ratings for Kingsley Lake and **Table 2** shows the recommended management action items. (Note: previous monitoring reports provide the sampling methodology for monitoring conducted before 2011.)

The following schematic diagram shows the overall ratings in 2021 for each vegetation zone within and adjacent to Kingsley Lake:



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2.1.1 Kingsley Lake Overall Vegetation Zone Ratings

Table 1 shows the 2011, 2016 and 2021 Kingsley Lake habitat monitoring results. **Appendix C** provides habitat ratings for the Kingsley Lake monitoring conducted prior to 2011.

Submergent Zone

The total number of native species in the submergent zone is **excellent** (19), the average native plant density rating is **moderate** (1.7), the average exotic species density is rated **moderate** (1.5) and the Mean Coefficient of Conservatism Value (C-Value) Rating is **moderate** (5.5). Averaging these four criteria results in a **moderate** rating overall for the submergent zone of Kingsley Lake. This has decreased from the overall rating (high) in 2016 primarily due to a slight increase in both native and exotic species aquatic vegetation density ratings. The overall submergent zone rating changed from 0.69 (at the low end of the high rating) in 2016 to 0.63 (at the high end of the moderate rating) in 2021. The overall submergent zone rating fluctuated between moderate and high (previously identified as excellent) over the years from 2003 to 2021 (**Appendix C**). Therefore, the 2021 moderate rating does not necessarily indicate a decrease in quality.

Curly-leaf pondweed (*Potamogeton crispus*) was found in Kingsley Lake in 2003, 2005, 2006, 2007, 2009, 2016, and 2021. However, only one plant was documented in 2003, 2005, and 2016, while numerous plants were found in 2006 and 2007 in the western portion of Kingsley Lake. The extent of curly-leaf pondweed expanded in 2007. Yet, curly-leaf pondweed was not found during 2008 or 2011. In 2016 and 2021, it was present only in one specific location in the western portion of the lake. Both the density and the area of growth slightly increased from 2016 to 2021. This invasive plant often out-competes native vegetation early in the growing season and dies off in early to mid-summer, which creates a sudden loss of habitat and releases nutrients into the water that can produce algal blooms and create turbid water conditions. On March 6, 2008, ten soil sediment samples were collected on Kingsley Lake by Blue Water Science and City of Lakeville staff. The samples were later analyzed. Based on the results of the analysis, the Blue Water Science report stated that "Curly-leaf pondweed is not expected to produce heavy growth conditions (where plants top out in a solid canopy) in Kingsley Lake."

Dense coverage of native submergent vegetation in Kingsley Lake helps prevent the spread of non-native curly-leaf pondweed. The dominant native species present in the submergent zone include Robbin's pondweed (*Potamogeton robbinsi*), largeleaf pondweed (*Potamogeton amplifolius*), coontail (*Ceratophyllum demersum*), water stargrass (*Heteranthera dubia*), and Canadian waterweed (*Elodea canadensis*). Filamentous and nostoc algae were also present on the lake in 2021 with dense growth in the southeast lobe. A full list of submergent species is provided in **Appendix B**.

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The Mean C-Value Rating was added to the analysis in 2011 to provide an additional assessment of floristic quality. The C-value is a numerical rating of an individual species' conservatism and habitat fidelity in relation to disturbance. C-values range from 0 to 10. Species that are least conservative, or show the least fidelity to specific natural habitats are often opportunistic invaders of natural communities, or are native species typical of disturbed communities, and are assigned a low value. For example, coontail (*Ceratophyllum demersum*) has a C-value of 2 and curly-leaf pondweed has a C-value of 0. High values indicate the species is found in undisturbed communities and has a narrow range of ecological tolerances. For example, humped bladderwort (*Utricularia gibba*), has a C-value of 9 and Robbin's pondweed has a C-value of 8. The mean C-value for vegetation found in the submergent zone of Kingsley Lake in 2021 was 5.5. For purposes of this habitat assessment, the mean C-value and the number of species are given separate ratings, and are averaged along with the density ratings to provide an overall rating for the submergent zone. The ratings used in this assessment are based on Minnesota Pollution Control Agency (MPCA) C-value guidelines (Floristic Quality Assessment for Minnesota Wetlands, MPCA, May 2007, [Floristic quality assessment/evaluating wetland vegetation | Minnesota Pollution Control Agency \(state.mn.us\)](https://www.mn.gov/Portals/0/Minnesota%20Pollution%20Control%20Agency/2007%20Floristic%20Quality%20Assessment%20for%20Minnesota%20Wetlands.pdf)).

Another method for assessing vegetation quality is the Floristic Quality Index (FQI). The Minnesota Department of Natural Resources (MNDNR) uses the FQI, along with the number of plant species to calculate the Lake Plant Eutrophication Index of Biological Integrity (IBI). Currently, the MPCA uses this IBI as supporting information in assessing the lake fish IBI. The number of plant species must be at least 11 and the FQI must be at least 17.8 to meet the IBI standard. The FQI is calculated by multiplying the mean C-value by the square root of the number of species; the FQI for Kingsley Lake is 24.48 (see **Appendix B** for more details).

In December of 2012, the MPCA published the Rapid Floristic Quality Assessment (Rapid FQA) Method, which is another method that can be used to evaluate and rate vegetation quality. The Rapid FQA method also uses the C-value, though the rating is weighted based on percent coverage and percent of each community type. However, the Rapid FQA method uses only select species in the rating. This means that many of the species found during a plant survey will not be included in the rating calculation. Because of this significant drawback, we do not recommend changing the BDWMO's assessment method to use the Rapid FQA. For information purposes only, we calculated the Rapid FQA for Kingsley Lake in 2021; the results are provided in **Appendix B**.

The mean C-value was rated as **moderate** in the submergent zone, and the Rapid Floristic Quality Assessment rating was **good** condition for floristic quality in the shallow open water community.

Emergent Zone

The overall emergent vegetation zone quality is rated **high** for Kingsley Lake; this is the same as the overall 2016 rating. The emergent zone includes 45 native wetland plant species resulting in an **excellent** rating and percent cover of exotic species (26-50%), which is a **high** rating. The approximate percent cover of vegetation (51-75%) is a **high** rating. The emergent zone represents thirty percent total areal coverage. The mean C-value rating is **moderate** (4.0) and the Rapid Floristic Quality assessment calculation rates the deep marsh community as **good** condition (**Appendix B**).

Non-native species, such as hybrid cattail (*Typha glauca*) and narrowleaf cattail (*Typha angustifolia*), are present within the vegetated emergent zone, however they are growing with many native species primarily in floating mats. These floating mats contain diverse native vegetation including sundew (*Drosera rotundifolia*), sedges (*Carex spp.*, *Dulichium*), rushes (*Juncus spp.*), burr-reed (*Scirpus* and *Schoenoplectus spp.*), purple marshlocks (*Comarum palustre*), iris (*Iris versicolor*), and marsh fern (*Thelypteris palustris*). The mats are also substantial enough to support native shrubs including bog birch (*Betula pumila*) and willow (*Salix spp.*). See **Appendix B** for a full vegetation list. Green frog calls were heard during the monitoring event. Painted turtles were seen on the water lilies and logs. Egrets, green herons, geese, wood ducks, loons, and great blue herons were observed on the water and there is documentation of nesting loons on the lake.

Purple loosestrife (*Lythrum salicaria*) was found in several locations along the shoreline in 2011 through 2021 (**Appendix A** and **Figure 4**). Purple loosestrife is an invasive non-native species that has been managed for years through the release of beetles which eat the purple loosestrife plants. This management strategy has been relatively successful within the Twin Cities metropolitan area. MN DNR monitoring of the purple loosestrife beetles previously indicated that populations are sufficient within the Twin Cities metropolitan area to keep purple loosestrife from becoming a significant problem. However, based on increases observed in 2021, we recommend requesting a status update from the MNDNR.

Non-native invasive yellow iris (*Iris pseudacorus*) is also present in several locations along the shoreline (**Appendix A**). Though treatment of yellow iris has been conducted in some areas, it should be eliminated to prevent further spread. The MNDNR may require a permit for treatment or removal of non-native species that are below the Ordinary High Water (OHW) elevation.

Upland Buffer

The overall upland buffer quality is rated **high** for Kingsley Lake. A total of 67 native species and 28 exotic plant species were observed in the upland buffer area in 2021. Exotic plants make up greater than 15 to 40 percent of the vegetative cover. The mean C-value rating (2.1) in the upland buffer is poor (**Appendix B**).

Common buckthorn (*Rhamnus cathartica*) is an extremely aggressive exotic shrub that dominates the shrub layer in portions of the wooded upland buffer areas around the lake and on islands. This shrub can form dense thickets that shade out native species. Buckthorn is growing back into areas where it was previously cut, increasing the density of buckthorn in portions of the upland buffer. Without the continuation of control measures, common buckthorn could quickly invade more of the upland buffer, further degrading the woodland understory. Additional non-native invasive species documented in the upland buffer include Russian olive (*Elaeagnus angustifolia*), Chinese silver grass (*Miscanthus sinensis*), and Siberian elm (*Ulmus pumila*). We recommend controlling these species.

Native trees within the forested upland buffer areas include red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), white spruce (*Picea glauca*), pin cherry (*Prunus pensylvanica*), several oak species (*Quercus spp.*), basswood (*Tilia americana*), quaking aspen (*Populus tremuloides*), and cottonwood (*Populus deltoides*). See **Appendix B** for a full vegetation list.

No significant erosion or sedimentation problems were noted within the lake or on the shoreline, but some areas with direct stormwater drainage from impervious surfaces into wetland and bare soil areas could be improved.

Buffer width recommendations vary according to the intended goal, such as bank stabilization, water quality protection (e.g., sediment and nutrient removal), and wildlife habitat. Even within these categories, an adequate buffer width can depend on shoreline slopes, species of wildlife to be protected, and publicized study results. For this report, the Kingsley Lake shoreline buffers were evaluated against the following buffer width criteria:

- 50-foot average buffer width to protect water quality and prevent erosion
- 25-foot average buffer width (i.e., 50% of the recommended buffer width) to identify areas providing some level of benefit
- 100-foot average buffer width to protect wildlife habitat

The shoreline property ownership around Kingsley Lake is about 30% residential, 20% YMCA, 30% commercial, and 20% city ownership.

For Kingsley Lake residential shoreline properties:

- The average buffer width is approximately 100 feet.
- Approximately 63% have an adequate buffer width to protect water quality and prevent erosion (≥ 50 feet).
- Approximately 81% have at least half of the recommended buffer width to protect water quality and prevent erosion (≥ 25 feet).
- One residential property along the shoreline of Kingsley Lake has a 500-foot wide naturalized buffer, which is adequate for wildlife protection (≥ 100 feet).

All but one of the residential shoreline properties on Kingsley Lake have the potential for at least a 50-foot naturalized buffer without altering any structures.

For Kingsley Lake city-owned public property:

- The average buffer width is approximately 40 feet.
- The buffers on portions of the city-owned property cannot be expanded due to the location of Klamath Trail Road.

For the YMCA-owned property:

- The average buffer width is approximately 100 feet.
- The YMCA property has adequate buffer width to protect water quality and prevent erosion (≥50 feet).

For the commercially owned property:

- The average buffer width is approximately 10 feet.
- The property does not have adequate buffer width to protect water quality or prevent erosion.

Minnesota Routine Assessment Method (MNRAM) for Wetlands

In 2016, based on the MNRAM, Kingsley Lake rated **high** for overall vegetative diversity and integrity. The Kingsley Lake shoreline wetland community rated **moderate** for shoreline protection. Maintenance of characteristic wildlife habitat was rated **high**, amphibian habitat was rated **low**, and fish habitat was rated as **high**. According to City of Lakeville staff, the high fish habitat rating is inaccurate, given the low dissolved oxygen levels typical each winter. The low winter oxygen level contributes to fish winterkill. Aesthetics/recreation/education rated **moderate**. The MNRAM assessment also indicates that many of the integral hydrologic and land use processes that affect the lake are intact and in relatively good condition with a **high** rating for maintenance of hydrologic regime, a **moderate** rating for downstream water quality, a **moderate** rating for flood stormwater attenuation, a **high** rating for maintenance of wetland water quality, and a **high** rating for wetland sensitivity to stormwater and urban development. The wetland management classification is **Preserve** due to the **high** ratings for maintenance of wetland water quality and vegetative diversity. The 2016 Kingsley Lake MNRAM summary is provided in **Appendix E**. The MNRAM assessment was not repeated in 2021, as it would likely not result in significant changes from the 2016 assessment.

3.0 Kingsley Lake Management Recommendations

3.1 Past and Current Actions

During 2005 through 2008, the City of Lakeville and members of the Kingsley Lake Association removed purple loosestrife plants and common buckthorn from portions of the lake and the surrounding upland buffer. As noted earlier, buckthorn is growing back into these previously cut areas. Continued

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management of the vegetation communities will help prevent common buckthorn from invading and further degrading the woodland understory, and will help to maintain and improve wildlife habitat, vegetation diversity, aesthetics, and recreation.

The City of Lakeville has provided lakeshore owners with shoreline restoration information since 2004 and continually promotes and encourages lakeshore property owners each year to take advantage of the Dakota County SWCD Landscaping for Clean Water shoreline restoration program. The City of Lakeville has invited residents to attend educational workshops and view demonstration projects to show how a native upland buffer can improve functions and values of the lake and improve aesthetics. In 2008, because of these programs, one resident began a shoreline stabilization project that included adding native plants. Future shoreline restoration projects (especially contiguous) on residential properties will help improve upland buffer habitat.

3.2 Recommendations

The 2021 habitat assessment results suggest several recommended management activities that could help maintain and improve the overall wildlife habitat, vegetation diversity, aesthetics, and water quality of the lake. **Table 2** provides a summary of identified problems, recommended management activities, and past actions. The management recommendations are presented below:

1. Continue to monitor for curly-leaf pondweed to document changes in density and locations and consider control measures if densities and locations increase to an extent of concern. See **Appendix A** for the location of this species found in 2016 and 2021.
2. Continue to control and manage non-native invasive vegetation along the shoreline and in the upland buffer including, but not limited to purple loosestrife, hybrid cattail, yellow iris, common buckthorn, Russian olive, Chinese silver grass, and Siberian elm. This work could be organized by the YMCA, City of Lakeville, Kingsley Lake Association, Chart House Restaurant and/or volunteers involved in programs such as the Minnesota Water Stewards, Minnesota Master Naturalists, or Master Gardeners and could recruit student assistance through schools, 4H, JROTC, National Honor Society, or scouting programs (see **Potential Restoration Areas #1, 3, 5, 8, and 9, as shown in Figure 4, Appendix A, and photos**). Remove non-native invasive yellow iris (see **Appendix A** for yellow iris and purple loosestrife locations). Based on increases of purple loosestrife observed in 2021, we recommend requesting a status update from the MN DNR. Remove common buckthorn (see **Potential Restoration Areas #1**). Remove Russian olive and Siberian elm (see **Potential Restoration Area #9**). Remove Chinese silver grass (**Potential Restoration Area #3**). Consider control of non-native invasive cattail (see **Potential Restoration Area #8**) and reed canary grass (see **Potential Restoration Area #5**).

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3. Install a pre-treatment system such as a rain garden, pervious pavement, or sediment trap to collect sediment from the Chart House Restaurant parking lot prior to discharge into the lake. A pre-treatment system combined with routine maintenance of sediment clean-out could help to improve lake water quality and prevent algae blooms and degradation of the vegetation community in this area. This project could potentially receive funding assistance from the Dakota County SWCD's Community Conservation Partnership Incentives program (see **Potential Restoration Area #2, as shown in Figure 4 and photos**).
4. Improve the shoreline by increasing the width and continuity of the naturalized upland buffer. Rather than manicured turf grass, gravel, and managed plantings with bare soil, the shoreline and adjacent upland buffer could be vegetated with native grasses and wildflowers. Adjust mowing distance further away from the shoreline on the City of Lakeville properties next to Klamath Trail and Kenwood Trail. Providing a wider buffer of native vegetation could help protect water quality, prevent erosion, and improve wildlife habitat, vegetative diversity, and aesthetics, potentially through funding assistance from the Dakota County SWCD Conservation Initiative Funding Program Guidance, assistance and potential funding may be available through the Xerces Society ([Pollinator Conservation Program | Xerces Society](#)) and the Minnesota Board of Water and Soil Resources Pollinator Initiative and Lawns to Legumes Program ([Pollinator Habitat | MN Board of Water, Soil Resources \(state.mn.us\)](#)) (see **Figure 4, Potential Restoration Areas #4, 6, 8, and 9 and site photos**. See **Appendix G** for examples of improvements.
5. Re-vegetate bare areas by establishing native vegetation to prevent soil erosion on steep slopes and to protect water quality, prevent erosion, and improve wildlife habitat, vegetative diversity, and aesthetics. Commercial property owners could potentially receive assistance for erosion and slope stabilization through funding from the Dakota County SWCD's Community Conservation Partnership Incentives program. See **Figure 4, Potential Restoration Areas #3, 7, 10, 11, and 12 (YMCA islands), and site photos (restaurant property)**.

Tables

Table 1: Kingsley Lake 2011 - 2021 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

Monitoring Year	Submergent Zone								
	Approximate Proportion of the Water Body Which is Deep Water Habitat (~ > 20 ft. depth)	Overall Submergent Zone Quality ¹	Approximate Proportion of Water Body Typically Dominated By Submergent Vegetation (~ 2 - 20 ft. depth)	Native Species		Mean Coefficient of Conservatism Value	Exotic Species		
				Average Native Plant Density Rating ^{2,3}	Total Number of Native Species ⁵		Total Number of Species	Average Exotic Plant Density Rating ^{2,3}	Maximum Exotic Plant Density Rating ⁴
2011	0%	High	70%	1.4 (Moderate)	18 (Excellent)	5.8 (Moderate)	0	0.0 (Excellent)	0.0 (Excellent)
2016	0%	High	70%	1.4 (Moderate)	20 (Excellent)	5.7 (Moderate)	1	<1.0 (High)	<1.0 (High)
2021	0%	Moderate	70%	1.7 (Moderate)	19 (Excellent)	5.5 (Moderate)	1	1.5 (Moderate)	1.5 (Moderate)

Monitoring Year	Emergent Zone						
	Overall Emergent Zone Quality ⁶	Approximate Proportion of Emergent Zone (0 - 2 ft. depth) Within The Water Body	Approximate Total Percent Vegetative Cover Within The Entire Emergent Zone ⁷	Total Number of Native Wetland Plant Species ⁸	Mean Coefficient of Conservatism Value	Exotic Species	
						Number of Species	Total Exotic Emergent Percent Coverage ⁹
2011	High	30%	51-75% (High)	22 (Excellent)	3.3 (Moderate)	4	26-50% (High)
2016	High	30%	51-75% (High)	31 (Excellent)	3.8 (Moderate)	4	26-50% (High)
2021	High	30%	51-75% (High)	45 (Excellent)	4.0 (Moderate)	6	26-50% (High)

Monitoring Year	Upland Buffer								Erosion/Sedimentation	
	Overall Upland Buffer Quality ¹⁰	Unmanicured Buffer Width ¹¹	Estimated Total Vegetative Cover (Percent Range) ¹²	Total Number of Native Plant Species ¹³	Mean Coefficient of Conservatism Value	Buffer Continuity (Percent Surrounding Water Body) ¹⁴	Exotic Species		Shoreline Erosion (Percent of Shoreline) ¹⁶	Sediment Deltas (Yes/No)
							Number of Species	Percent of Total Coverage ¹⁵		
2011	High	25-50 ft. (High)	>95% (High)	45 (Excellent)	2.2 (Poor)	76-100% (Excellent)	25	15-40% (Moderate)	0-10%	No
2016	High	25-50 ft. (High)	>95% (High)	59 (Excellent)	2.2 (Poor)	76-100% (Excellent)	26	15-40% (Moderate)	0-10%	No
2021	High	25-50 ft. (High)	>95% (High)	67 (Excellent)	2.1 (Poor)	76-100% (Excellent)	28	15-40% (Moderate)	0-10%	No

Table 1: Kingsley Lake 2021 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

The following changes were made to the 2011 - 2021 monitoring and analysis:

- Monitor one water body per year. Kingsley Lake in 2011, 2016, and 2021, Orchard Lake in 2012 and 2017, Crystal Lake in 2013 and 2018, Lac Lavon in 2014 and 2019, Keller Lake in 2015 and 2020 - Conduct a meandering survey of submergent, emergent, and upland buffer zones. In addition, the emergent and upland buffer plot locations were evaluated.
- Changes were made in 2011 through 2021 to the calculations to include floristic quality as part of the assessment. These changes include adding a rating of "High" to the categories to accommodate MPCA ratings for floristic quality. These changes included adding a Rating Code:

Poor	Moderate	High or Excellent
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The following footnotes pertain to 2011 through 2021 data:

¹**Overall Submergent Zone Quality** rating is the average of the rating scores for the following parameters: average exotic plant density, average native plant density, total number of native species, and C-value rating: >0.80 = Excellent, 0.67-0.80 = High, 0.33-0.66 = Moderate, <0.33 = Poor.

Overall Submergent Zone Quality	Avg. Exotic Plant Density	Exotic Plant Density Rating Score	Avg. Native Plant Density	Avg. Native Plant Density Rating Score	Total Number of Native Species In Submergent Zone	Species Richness Rating Score	Mean Coefficient of Conservatism Value (C-Value)	C-Value Rating (using MPCA values, 2007)	Total Overall Submergent Zone Quality Score
Poor	>2.0	0.1	> 1.75	0.1	<7	0.1	0 - <3	0.10	< 0.33
Moderate	>1.0 - 2.0	0.5	1.25 - 1.75	0.5	>7 - <9	0.5	>3 - <6	0.50	0.33 - 0.66
High	>0 - 1.0	0.75			>9 - <14	0.75	>6 - <9	0.75	0.67 - 0.80
Excellent	0	1.0	1.0 to 1.25	1.0	>14	1.0	>9 - 10	1.00	> 0.80

²Plant density ratings are a relative measure of the total amount of submergent vegetation covering the submergent zone, with a scale from 1 to 3.

³Density data for Kingsley Lake were collected by Barr using a meander survey throughout the lake.

⁴Maximum exotic plant density ratings represent the worst case scenario of curlyleaf pondweed density early in the growing season and/or Eurasian watermilfoil when it is most prolific later in the growing season.

⁵The Total Number of Native Species within the submergent zone for Kingsley Lake was collected by Barr using a meander survey.

The additional category of "High" was added in 2011 through 2021 and values were adjusted to: <7 = Poor, 7-9 = Moderate, 9-14 = High, >14 = Excellent.

⁶**Overall Emergent Zone Quality** is the average of the rating scores for the following parameters within the emergent zone: the total percent coverage, the total number of native wetland plant species, the percent coverage of exotic species, and the C-Value Rating: >0.80 = Excellent, 0.67-0.80 = High, 0.33-0.66 = Moderate, <0.33 = Poor.

Overall Emergent Zone Quality	Percent Cover	Percent Cover Rating Score	Total Number of Native Wetland Plant Species	Number of Native Wetland Plant Species Rating Score	Percent Cover of Exotics	Percent Cover of Exotics Rating Score	Mean Coefficient of Conservatism Value (C-Value)	C-Value Rating (using MPCA values, 2007)	Overall Emergent Zone Quality Score
Poor	0-25%	0.1	< or= 5	0.1	76-100%	0.1	0 - <3	0.10	< 0.33
Moderate	76-100% or 26-50%	0.5	6 - 10	0.33	51-75%	0.33	>3 - <6	0.50	0.33 - 0.66
High	51-75%	1.0	11 - 15	0.66	26-50%	0.66	>6 - <9	0.75	0.67 - 0.80
Excellent	51-75%	1.0	> 15	1.0	0-25%	1.0	>9 - 10	1.00	> 0.80

Table 1: Kingsley Lake 2021 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

⁷Approximate Total Percent Vegetative Cover Within the Entire Emergent Zone (0-2 ft. depth) is estimated based on the two plot locations and a visual survey walking and kayaking along the shoreline. Estimates are broken into the following categories: 0-25%=Poor, 26-50%=Moderate, 51-75%=High and Excellent, 76-100%=Moderate.

⁸The Total Number of Native Wetland Plant Species within the emergent zone is based on 2 plot locations and a visual survey walking along the shoreline: 0-5 = Poor, 6-10 = Moderate, 11-15 = High, and >15 = Excellent.

⁹Total Exotic Emergent Percent Coverage, out of the entire emergent zone area, is estimated based on two plot locations, a visual survey walking along the shoreline. Estimates are broken into four categories: 0-25%=Excellent (1.0), 26-50%=High (0.66), 51-75%=Moderate (0.33), 76-100%=Poor (0.1)

¹⁰**Overall Upland Buffer Quality** is determined based on the average of the six upland buffer quality parameter rating scores: >0.80 = Excellent, 0.67-0.80 = High, 0.33-0.66 = Moderate, <0.33 = Poor.

Overall Upland Buffer Quality	Percent Cover	Percent Cover Rating Score	Exotics Percent Cover Range	Exotics Percent Cover Rating Score	Buffer Width Range	Buffer Width Rating Score	Buffer Continuity Percent Range	Buffer Continuity Rating Score	Mean Coefficient of Conservatism Value (C-Value)	C-Value Rating (using MPCA values, 2007)	Number of Native Species	Number of Native Species Rating Score	Overall Upland Buffer Quality Score
Poor	<75%	0.1	>40%	0.1	<10 ft.	0.1	0-25%	0.1	0 - <3	0.10	<5	0.1	< 0.33
Moderate	75-95%	0.5	15-40%	0.5	10-25 ft.	0.4	25-50%	0.4	>3 - <6	0.50	5-20	0.33	0.33 - 0.66
High	>95%	1.0	<15%	1.0	25-50 ft.	0.7	51-75%	0.7	>6 - <9	0.75	20-30	0.66	0.67 - 0.80
Excellent	>95%	1.0	<15%	1.0	>50 ft.	1.0	76-100%	1.0	>9 - 10	1.00	>30	1.0	> 0.80

¹¹Unmanicured (upland) Buffer Width is divided into four categories: Excellent (1.0) = >50 ft, High (0.7) = 25-50 ft, Moderate (0.4) = 10-25 ft, and Low (0.1) = <10 ft.

¹²Estimated Total Vegetative Cover (Percent Range) for upland buffer is the proportion of the ground covered by vegetation within 50 feet of the wetland/upland transition zone. The percent cover is divided into three categories: High and Excellent (1.0) = >95%, Moderate (0.5) = 75 - 95%, and Poor (0.1) = <75%.

¹³The Total Number of Native Plant Species within the unmanicured upland buffer zone is based on two plot locations and a meandering visual survey along the shoreline.

¹⁴(Upland) Buffer Continuity is a measure of the proportion of the water body surrounded by the unmanicured, native upland buffer. This measure is divided into four categories: Excellent (1.0) = 76 - 100%, High (0.7) = 51 - 75%, Medium (0.4) = 26 - 50%, and Low (0.1) = 0 - 25%.

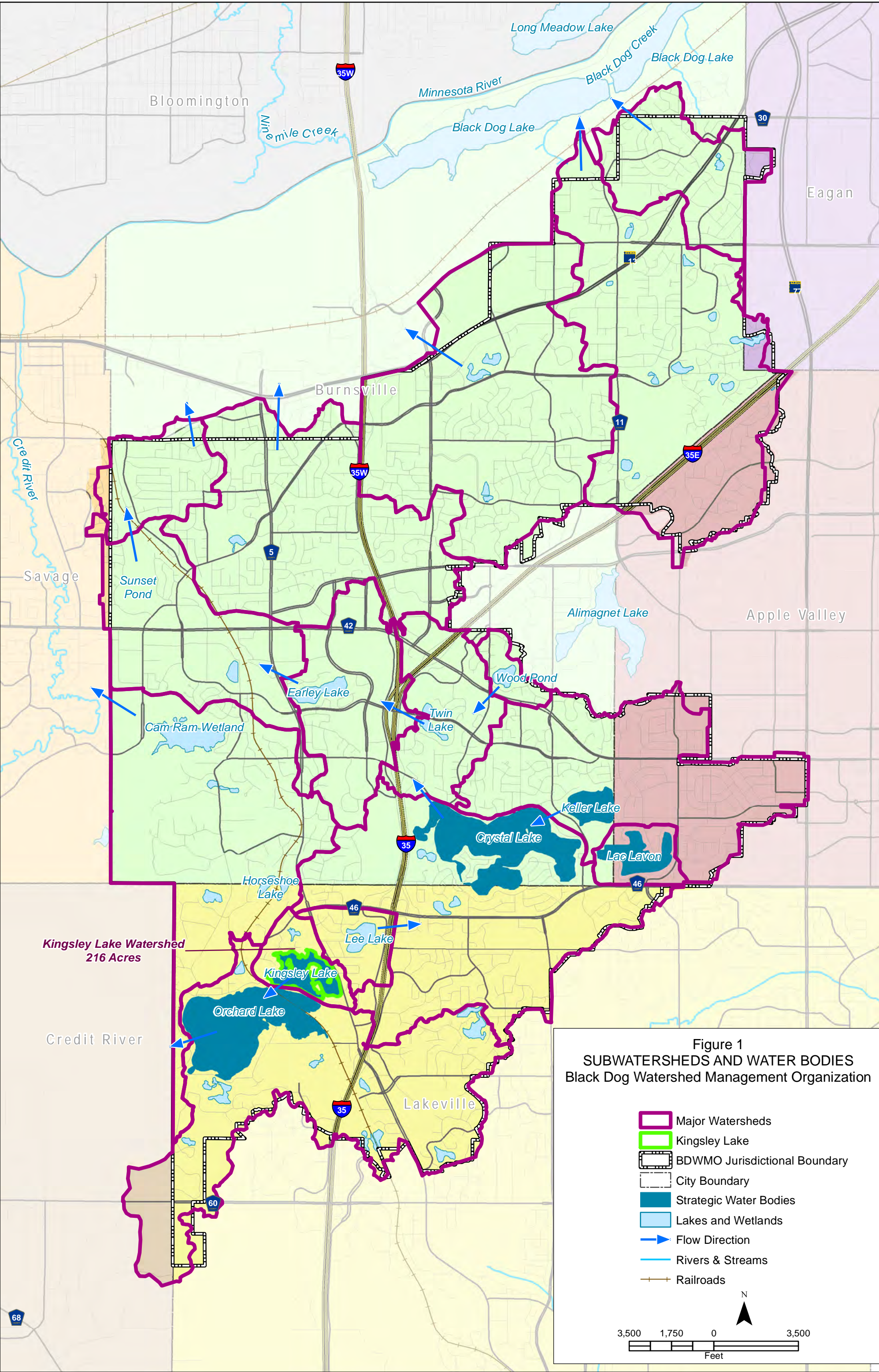
¹⁵Upland buffer exotic species "Percent of Total Coverage" is the percent cover of exotic species within the unmanicured upland buffer, which is divided into three categories: High and Excellent (1.0) = <15%, Moderate (0.5) = 15 - 40%, and Poor (0.1) = >40%.

¹⁶The presence of shoreline erosion is determined by the approximate percentage of the shoreline affected and is divided into the following three categories: 0 - 10%, 11 - 25%, 26 - 100%.

Table 2 2021 Recommended and Completed Management Actions for Kingsley Lake – Black Dog Watershed Management Organization Habitat Monitoring



Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Completed Actions Which May Improve Wildlife Habitat and/or Water Quality
Curly-leaf pondweed is present in in some years at one location of the lake.	Continue to monitor the extent and density of curly-leaf pondweed.	Consider control measures if densities and locations increase to an extent of concern. See Appendix A for location of curly-leaf pondweed.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	On March 6, 2008, soil sediment samples were collected on Kingsley Lake by Blue Water Science (BWS) and the City of Lakeville. Based on the results of the soil analysis, the BWS report stated that “curly-leaf pondweed is not expected to produce heavy growth conditions (where plants top out in a solid canopy) in Kingsley Lake.”.
Emergent zone and upland buffer areas contain non-native and invasive vegetation.	Continue to control and manage non-native and invasive vegetation, including, but not limited to purple loosestrife, reed canary grass, hybrid cattail, yellow iris, common buckthorn, Russian olive, Chinese silver grass, and Siberian elm.	Continue to control and manage non-native and invasive vegetation. Remove buckthorn. Volunteer groups and contractors can effectively remove buckthorn by pulling, cutting, and treating stumps with herbicide. See Figure 4, Potential Restoration Area #1. Small colonies of purple loosestrife can be hand pulled or dug before plants go to seed. See Figure 4 and Appendix A for purple loosestrife locations. Remove yellow iris (See Appendix A for locations of yellow iris). The MN DNR may require a permit for cattail treatment, purple loosestrife, and yellow iris removal if below the OHW. Dense reed canary grass is located Potential Restoration Area #5 . Dense invasive cattail is located at Potential Restoration Area #8 . Treat or remove non-native invasive vegetation and then seed with an appropriate native seed mix. See Figure 4, Potential Restoration Areas #8 and 9.	Increase wildlife habitat, improve vegetative diversity and aesthetics.	Spring-Fall	 From 2005-2008, the City of Lakeville and members of the Kingsley Lake Association removed common buckthorn from portions of the lake and the upland buffer surrounding the lake. From 2005-2008, the City of Lakeville and members of the Kingsley Lake Association removed purple loosestrife plants from portions of the lake and the upland buffer surrounding the lake. Purple loosestrife beetles were released by the MnDNR prior to 2002. Follow up with MnDNR to verify whether beetles are still present at a population that the MnDNR feels is appropriate for biological control. The City of Lakeville continues to monitor for invasive species.
Stormwater drainage from impervious surfaces is directed into the lake.	Pre-treat or redirect stormwater for infiltration prior to discharge.	Install a rainwater garden, pervious pavement, or other suitable method for infiltration. See Figure 4, Potential Restoration Area #2.	Improve water quality	Open	
Upland buffer areas lacking naturalized vegetation.	Increase width and continuity of native upland buffer.	Rather than manicured turf grass, gravel, and managed plantings with bare soil, the shoreline could be vegetated with native grasses and wildflowers. See Figure 4, Potential Restoration Areas #4, 6, and 7. Adjust mowing distance further away from shoreline on City properties (See Figure 4, Potential Restoration Areas #8 and 9 and photos). See Appendix G for examples of improvements.	Improve water quality, increase wildlife habitat. Improve vegetative diversity and aesthetics.	Spring – Fall	In 2008, a Kingsley Lake lakeshore resident, inspired by the Blue Thumb program, commenced shoreline stabilization utilizing native plants.
Bare soil on steep slope could cause erosion and sedimentation into lake.	Re-vegetate bare areas to prevent soil erosion and sedimentation into Kingsley Lake.	Plant vegetation suited for steep slopes along hillside to prevent erosion. See Figure 4, Potential Restoration Area #3 on restaurant property. See also island and shoreline areas becoming bare from YMCA camper overuse (Figure 4, Potential Restoration Areas 10, 11, and 12).	Improve water quality	Spring - Fall	

Figures





2020 Dakota County Imagery

-  Plot Location
-  Kingsley Lake

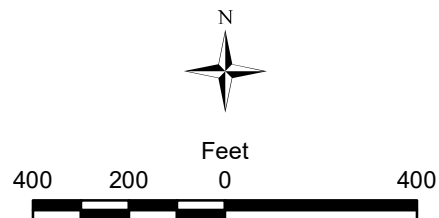



Figure 2

**KINGSLEY LAKE
Black Dog WMO
Lakeville, MN**




 Kingsley Lake

 Plot Location

Parcel Ownership

 Commercial

 Public or Tax Exempt

 Residential

 Apartment

2020 7-county Imagery

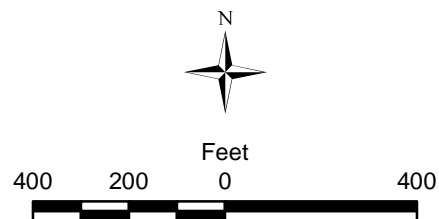
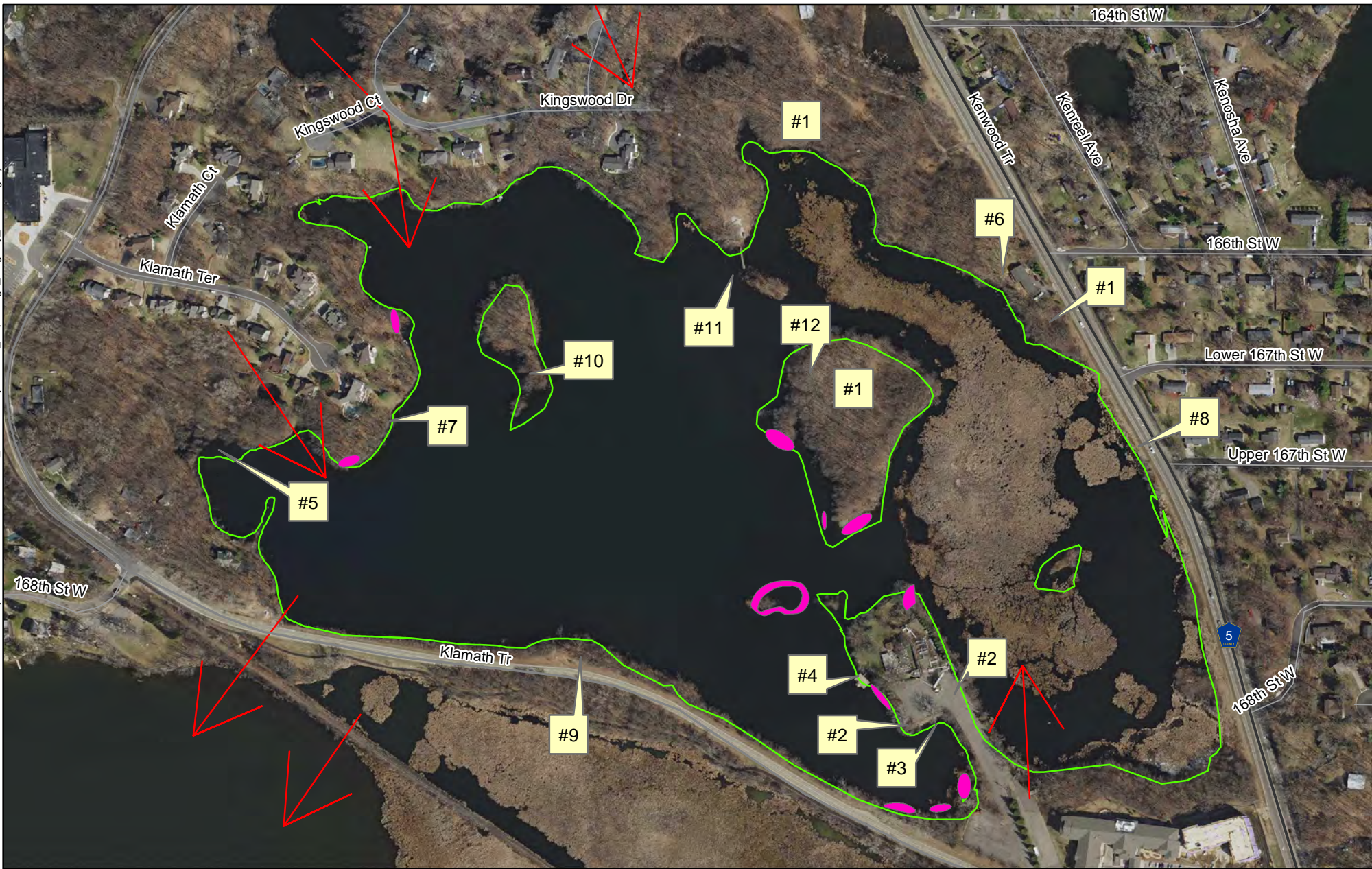


Figure 3

**PLOT LOCATIONS AND PARCEL OWNERSHIP
KINGSLEY LAKE
Black Dog WMO
Lakeville, MN**



2020 7-county Imagery

- Flow Direction
- Purple loosestrife Location
- Kingsley Lake

Potential Restoration Areas

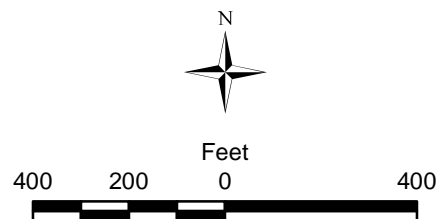


Figure 4
RESTORATION POTENTIAL
KINGSLEY LAKE
Black Dog WMO
Lakeville, MN

Photos

Kingsley Lake and Shoreline June 3 and July 29, 2021

Site Photos June 3, 2021



Site Photos July 29, 2021



Deep marsh northeast area with floating mats, which support diverse native vegetation



Floating mats in northeast portion of lake supporting diverse native vegetation including sundew



Loons observed during monitoring event, known to nest on Kingsley Lake



Floating leaved vegetation in northwest portion of the lake



Submergent vegetation and algae in southeast bay



Submergent vegetation in western portion of lake

Recommendation #1 – Continue to monitor for curly-leaf pondweed and consider control measures if densities and locations increase to an extent of concern. See Appendix A for curly-leaf pondweed location and locations of other submergent vegetation.



Plot 1B – emergent zone



Plot 1C – upland buffer



Plot 2B – emergent zone



Plot 2C – upland buffer



Upland buffer adjacent to Kenwood Trail dominated by non-native and invasive species and invasive cattail in emergent zone. Consider control of invasive cattail to prevent degradation of deep marsh floating mat areas with diverse native emergent species (Figure 4 Potential Restoration Area #8). Additional areas with non-native and invasive species in the emergent zone and upland buffer include purple loosestrife and yellow iris (locations shown in Appendix A), Figure 4 Potential Restoration Areas #1 (common buckthorn), #3 (Chinese silver grass), #5 (reed canary grass), #9 (Russian olive and Siberian elm).

Recommendation #2 – Continue to control and manage non-native invasive vegetation along the shoreline and in the upland buffer.



Potential Restoration Area #2 – Prevent direct drainage from impervious surfaces into the lake
Recommendation #3 – Install a pre-treatment system such as a rain garden, pervious pavement, or sediment trap to collect sediment from the restaurant parking lot prior to discharge into the lake.



Recommendation #4 - Adjust mowing distance further away from the shoreline in the City of Lakeville properties next to Klamath Trail and Kenwood Trail to increase the width of the naturalized upland buffer (Potential Restoration Areas #8 and 9). Note of caution that the upland buffer along Klamath Trail includes poison ivy.

A wider naturalized upland buffer is also recommended on restaurant property (Potential Restoration Area #4).



Recommendation #5 – Re-vegetate bare areas to prevent soil erosion on steep slopes (Photo shows Potential Restoration Area #3. Additional bare areas identified at Potential Restoration Areas #7, 10, 11, and 12).

Technical Reference
(Provided in separate report)