Technical Reference

Black Dog Watershed Management Organization Habitat Monitoring Background Summary

In 2002, the Black Dog Watershed Management Organization (BDWMO) created a program for monitoring the habitat quality of strategic water resources in the watershed. 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. The BDWMO began implementing the habitat monitoring program in 2003 and continued the program through 2009. In 2004, based on feedback from the participating cities and to better define the vegetative quality, several improvements were made to the rating system. The BDWMO used this system for the annual habitat monitoring of each strategic water body through 2009. From 2003-2009 Barr staff annually evaluated the habitat quality of each of the following strategic water bodies:

- Crystal Lake (Burnsville)
- Keller Lake (Burnsville)
- Kingsley Lake (Lakeville)
- Lac Lavon (Apple Valley and Burnsville)
- Orchard Lake (Lakeville)
- Sunset Pond (Burnsville)

In 2010, the BDWMO suspended the habitat monitoring program and re-evaluated the program for its effectiveness. Based on feedback obtained from city staff, the BDWMO revised the habitat monitoring program to provide more effective monitoring, more useful and holistic results, and to reduce the monitoring costs. The BDWMO began implementing the revised habitat monitoring program in 2011. Also in 2011, the BDWMO removed Sunset Pond from its list of strategic water bodies.

The revised program includes monitoring 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—Kingsley Lake (2011), Orchard Lake (2012), Crystal Lake (2013), Lac Lavon (2014), and Keller Lake (2015). This report provides the results of the Orchard Lake 2022 habitat monitoring.

The 2022 Orchard Lake monitoring included plot and meandering surveys. Supplemental photographs were taken to document conditions. 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. Table 1 of the Technical Memo summarizes the 2022 Orchard Lake monitoring results.

Habitat Quality

The BDWMO's assessment of the BDWMO strategic water bodies provides baseline and ongoing information regarding the habitat quality of the water bodies and a method for detecting change. Habitat quality was evaluated within the following four general zones:

- Submergent vegetation zone—The submergent zone refers to the areas of the water body where water depths are typically 2 to 20 feet (normal maximum rooting depth) and the vegetation is typically submerged or has floating leaves. The vegetation quality within the submergent zone is normally rated as "excellent" when there are: (a) a diverse assemblage of native plant species (more than 14), (b) a moderate plant density or plant occurrence rating, and (c) no exotic species present.
- Emergent vegetation zone—The 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. The vegetation quality within the emergent zone is typically rated as "excellent" when there are more than 15 species of native and non-invasive plants present, with few exotic plants present.
- 3. **Condition of the upland buffer area**—The upland buffer is characterized as the upland area immediately surrounding the water body. An excellent quality buffer should extend upslope at least 25 feet from the wetland edge, consist of native vegetation that is not routinely mowed, and be present continuously around the perimeter of the water body.
- 4. **Sedimentation and shoreline erosion problems**—The presence of sedimentation may come from erosion on slopes, from storm sewer outfalls, or from other sources. The presence of a regular sediment load to the water body can cause a significant reduction in water quality. Shoreline erosion can be caused by natural forces such as ice and wave action, but can also be human induced (e.g., vegetation removal, grading, runoff, structures, etc.). Identifying and correcting these problems early can prevent habitat degradation.



Vegetation Zones

Appendix C summarizes the overall ratings from 2003 through 2021. Appendix D includes the previous management recommendations for water bodies assessed from 2003 through 2021. Table 2 of the Technical Memo provides the 2022 management recommendations for Orchard Lake.

Wildlife Habitat Characteristics

The strategic water bodies within the BDWMO range from shallow wetland systems to deeper lake systems. Some of them support sustainable fisheries, while others may only periodically support fish. All of the water bodies have some potential for supporting waterfowl and shorebirds. To evaluate the wildlife value of these water bodies, it is important to understand the characteristics that will benefit wildlife.

In general, a more diverse assemblage of native plant species will provide a source of food and protective cover for a wider range of wildlife species. Typically, although not always, native plant species do not become established as monocultures to the detriment of other species, as is often the case with many exotic species. As vegetation diversity increases, so does the likelihood that the water body will support a more diverse assemblage of wildlife.

A diverse interspersion of various plant communities also leads to the potential for attracting a wider range of wildlife. For instance, some waterfowl prefer deeper, open water areas while others tend to inhabit the shallow emergent zones. Some furbearers rely heavily on the shallow, emergent zone and upland areas around the water body while others spend most of their time in the deep marsh areas. Amphibians will typically need a permanently inundated water body but rely on diverse vegetative structure in the upland areas surrounding the water body for critical components of their life cycle. Fish also require permanent inundation to a depth that will not result in freeze-out and where oxygen will not become depleted. A diverse habitat structure is also important for fish.

The upland buffer surrounding these water bodies is important for several reasons. A high-quality upland buffer will have a diverse vegetative structure dominated by self-sustaining native vegetation. A high-quality upland buffer is used by wildlife for shelter, feeding, resting, nesting, and reproduction. In contrast, adjacent upland areas that are maintained in turf grass or paved trails provide little value to wildlife or water quality improvement. Turf grass and trails typically provide feeding and resting grounds only for geese and some species of ducks. Wide and contiguous natural buffers are important as they provide feeding, nesting and safe travel corridors. Upland buffers also help protect the water quality of the water body. Diverse native vegetation helps maintain an open soil structure that promotes infiltration, reduces surface runoff, and increases nutrient uptake.

Wetland Functions and Values Assessment—MNRAM

In addition to the specific habitat parameters described above, the Minnesota Routine Assessment Method for Evaluating Wetland Functions (MNRAM) Version 3.0 was used to evaluate the hydrologic system and ecosystem making up each water resource, first in 2003 and then again in 2006. The results of the 2003 and 2006 MNRAM 3.0 assessments were provided in previous year's reports. Orchard Lake was re-assessed in 2012, Crystal Lake was re-assessed in 2013, Lac Lavon was re-assessed in 2014, Keller Lake was re-assessed in 2015, and Kinsley was re-assessed in 2016 with the more updated MNRAM version 3.4. The results of the 2012 Orchard Lake MNRAM are provided in **Appendix E**. Evaluating each ecosystem with MNRAM is a way to get a detailed picture of the overall health of the watershed and the water resource itself. Instead of just looking at specific parameters that are direct indicators of habitat quality, the MNRAM evaluates many different parameters of the water body and its watershed that contribute to sustaining the wetland functions, which are described in **Appendix F**. In general, the MNRAM assessments compare favorably with the BDWMO habitat vegetation assessment results. This method identifies land use or ecological changes, which might affect the water body in the long term. In addition, the MNRAM assessment provides an independent evaluation of the overall wildlife habitat of the water body.

Appendices

- Orchard Lake aquatic plant survey results (Appendix A),
- Orchard Lake floristic quality assessment data and methods (Appendix B),
- previous habitat assessment monitoring results from 2003 through 2021 (Appendix C),
- previous recommended and completed management actions from 2003 through 2021 (Appendix D),
- 2012 Orchard 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).

Appendix A

Orchard Lake Aquatic Plant Survey Results



Illinois Pondweed in Orchard Lake, June 2022

Aquatic Plant Surveys for Orchard Lake, Lakeville, Minnesota, 2022

Curlyleaf Pondweed (CLP) Delineation: April 28, 2022 Treatment of CLP: May 19, 2022 (3.29 acres) CLP Post-Treatment Assessment: June 6, 2022 Eurasian Watermilfoil (EWM) Delineation: June 6, 2022 Treatment of EWM: 14.5 ac

EWM Assessment: July 20, 2022

Prepared for: City of Lakeville Lakeville, Minnesota



Prepared by: Steve McComas Jo Stuckert Blue Water Science

December 30, 2022

Aquatic Plant Surveys for Orchard Lake, Lakeville, Minnesota, 2022

A curlyleaf pondweed delineation (conducted on April 28, 2022) and two aquatic plant surveys were conducted by Blue Water Science on Orchard Lake (234 acres) in 2022. After the curlyleaf delineation on April 28, 2021, an early season stratified line transect survey was conducted to evaluate curlyleaf pondweed as well as to delineate Eurasian watermilfoil (EWM) on June 6, 2022. The late summer survey on July 20 (also a stratified line transect survey conducted by Blue Water Science) characterized changes in the plant community and checked for Eurasian watermilfoil.

Curlyleaf Pondweed

Curlyleaf Pondweed Delineation and Treatment: On April 28, 2022, a curlyleaf delineation was conducted to determine where curlyleaf pondweed growth could be a problem in 2022. There were 2 areas where curlyleaf could have produced moderate to heavy growth. A total of 3.29 acres were treated with a diquat herbicide on May 19, 2022 (Figure 1).

Curlyleaf Pondweed Assessment on the June 6, 2022 Survey: The area that was treated for curlyleaf pondweed in May 2022 had good control although light growth of curlyleaf was observed at a number of scattered locations around the lake (Figure 1).

Eurasian Watermilfoil

EWM Delineation: On June 6, 2022, a meander survey was conducted in addition to the line transect survey to delineate EWM. Mostly light growth of EWM was found at a total of 49 locations with 21 sites in the line transect survey and 28 sites in the meandered survey. EWM treatment of 14.5 acres occurred in 2022 (Figure 2).

EWM Assessment on the July 20, 2022 Survey: Eurasian watermilfoil was found at a total of 88 locations with 26 sites in the line transect survey and 62 sites in the meandered survey in late summer. Some EWM growth was moderate to heavy (Figure 2). Overall, aquatic plants grew out to a depth of about 12 feet around much of the lake.

Aquatic Plant Distribution and Abundance in 2022

Early Season Plant Survey: On the June 6, 2022 transect survey, the most abundant native submerged plant in Orchard Lake was coontail and was found at 41% of the stations (16 out of 39 sites). Growth was mostly light with some moderate densities (Table 1).

Late Summer Plant Survey: The dominant plant on the July 20, 2022 transect survey in Orchard Lake were EWM and coontail, EWM was found at 67% of the sites (26 out of 39 sites) and coontail was found at 62% of the sites (24 out of 39 sites)(Figure 4 and Table 1).

Curlyleaf Pondweed in Orchard Lake in 2022

April 28, 2022 Orchard Lake **CLP** Delineation . No Growth . Light Potential Growth • Moderate Potential Growth ld Acres Heavy Potential Growth . 1 1.67 . Heaviest Potential Growth 2 1.62 2022 Orchard Lake 150ft Buffer Total Acres: 3.29 2022 Orchard Lake CLP Treatme Orchard Lake ID: 19003100 UTM NAD 1983 Blue Water Science Data collected: April 28, 2022 0 75 150 300 Meters +

Orchard Lake Curlyleaf Pondweed Delineation and Treatment





Figure 1. [top] Curlyleaf delineation on April 28, 2022.

A total of 3.29 acres were treated on May 19, 2022.

[bottom] Curlyleaf distribution and density on June 6, 2022. Treatment location for curlyleaf is also shown.

Eurasian Watermilfoil in Orchard Lake in 2022

Orchard Lake Eurasian Watermilfoil Treatment June 6, 2022 ld Acres **Orchard Lake** 1 6.14 Eurasian Watermilfoil 2 2.05 No Growth . 3 4.38 Light Growth ٠ 4 1.93 0 Moderate Growth Total Acres: 14.5 Heavy Growth 2022 Orchard EWM Treatment Area Orchard Lake ID: 19003100 UTM NAD 1983 Blue Water Science Data collected: June 6, 2022 Map Made June 13, 2022 75 150 300 Meters 0 + + ++++

> Orchard Lake Eurasian Watermilfoil July 20, 2022



UTM NAD 1983 Blue Water Science Figure 2. [top-left] EWM presence on June 6, 2022.

Four areas were delineated for EWM treatment in 2022.

[bottom] EWM distribution and density on July 20, 2022.

Key: black dot = no growth, green dot = light growth, yellow dot = moderate growth, red dot = heavy growth. **Comparing Aquatic Plants in June and July, 2022:** Two stratified line transect aquatic plant surveys were conducted on June 6 and July 20, 2022. In June, coontail was the dominant native plant. In July, coontail again was the most common plants in the lake (Table 1). Aquatic plant growth was denser in July then in June (Table 1).

Table 1. Summary of early summer aquatic plants surveys for Orchard Lake in 2022. Percent frequency of occurrence is calculated based on the number of times a plant species occurs at a sampling station on transects divided into the number of total stations for the survey. For example, if coontail was found in 25 out of 50 stations, its percent occurrence would be 50%. Density ratings for plants range from 1 to 3 with 3 being the most dense.

	June 6, 2022		July 20, 2022	
	Line Transect with depth ranges (% frequency of occurrence) (39 points)	Density	Line Transect with depth ranges (% frequency of occurrence) (39 points)	Density
Coontail (Ceratophyllum demersum)	41% (16)	1.1	62% (24)	1.2
Chara (<i>Chara sp</i> .)	28% (11)	1.6	21% (8)	1.8
Moss (Drepanocladus sp)	3% (1)	1.0		
Star duckweed (<i>Lemna trisulca</i>)			5% (2)	1.0
Northern watermilfoil (Myriophyllum sibiricum)	8% (3)	1.0	8% (3)	1.0
Eurasian watermilfoil (<i>M. spicatum</i>)	54% (21)	1.3	67% (26)	1.5
Cabbage (Potamogeton amplifolius)	15% (6)	1.2	21% (8)	1.4
Curlyleaf pondweed (<i>P. crispus</i>)	44% (17)	1.1		
Fries pondweed (<i>P. Friesii</i>)			3% (1)	1.0
Illinois pondweed (<i>P. illinoensis</i>)			5% (2)	1.0
Whitestem pondweed (<i>P. praelongus</i>)	3% (1)	2.0		
Claspingleaf pondweed (<i>P. Richardsonii</i>)	15% (6)	1.2	8% (3)	1.3
Stringy pondweed (P. sp)	10% (4)	1.0		
Flatstem pondweed (<i>P. zosteriformis</i>)	31% (12)	1.3	44% (17)	1.3
Water celery (Vallisneria americana)	8% (3)	1.0		
Water stargrass (Zosterella dubia)	3% (1)	1.0		
Filamentous algae	21% (8)	1.6	21% (8)	1.8
Number of Submerged Species	13		10	

Details of the June 6, 2022 Aquatic Plant Transect Survey: On the June 6, 2022 transect survey, the most abundant native submerged plant in Orchard Lake was coontail and was found at 41% of the stations (16 out of 39 sites). Overall, aquatic plant growth was mostly light with some moderate densities (Figure 3 and Table 1).

Additional aquatic plant maps are shown in Figure 4.



Figure 3. [left] Native Plant distribution and abundance on June 6, 2022. [right] Species Richness on June 6, 2022. Key: Green = light growth, yellow = moderate growth, red = heavy growth, and black = no growth.

June 6, 2022 Aquatic Plant Maps



Figure 4. Aquatic plant distribution and abundance on June 6, 2022. Key: Green = light growth, yellow = moderate growth, red = heavy growth, and black = no growth.

Details of the July 20, 2022 Aquatic Plant Transect Survey: Native plants were well distributed on Orchard Lake on July 20, 2022 (Figure 5). The dominant plant on the July 20, 2022 transect survey in Orchard Lake was coontail and was found at 62% of the sites (24 out of 39 sites) (Figure 6 and Table 1).

Additional aquatic plant maps are shown in Figure 6.



Figure 5. [left] Native Plant distribution and abundance on July 20, 2022. [right] Species Richness on July 20, 2022. Key: Green = light growth, yellow = moderate growth, red = heavy growth, and black = no growth.

July 20, 2022 Aquatic Plant Maps



Figure 6. Aquatic plant distribution and abundance on July 20, 2022. Key: Green = light growth, yellow = moderate growth, red = heavy growth, and black = no growth.

Details of the September 23, 2021 Aquatic Plant Meander Survey: By the end of the summer milfoil had produced heavy growth in several areas around Orchard Lake.



Figure 7. [left] Eurasian watermilfoil was topping out in some areas in September 2021. [right] Eurasian watermilfoil stems on September 23, 2021.

Appendix B

Orchard Lake Floristic Quality Assessment Data

Snecies	Common Name	Coefficient of Conservatism Value
Corotophyllum domoroum		
Chara an	muskaraaa	7
		7
Lemna trisuica	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton richardsonii	clasping-leaf pondweed	5
Potamogeton zosteriformis	flatstem pondweed	6
Ranunculus sp. **	crowfoot	5.5
Stuckenia pectinatus	sago pondweed	3
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.1
S (Number of Species of Subme	rgent/Floating-leaf Plants in the Lake)	14
Floristic Quality Index (FQI) = (M	ean C-value)* (Square Root of S)	19.11

Species	Common Name	Coefficient of Conservatism Value (C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Lemna minor	common duckweed	5
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Najas flexilis	flexuous naiad	5
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton zosteriformis	flatstem pondweed	6
Ranunculus sp. **	crowfoot	5.5
Stuckenia pectinatus	sago pondweed	3
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.1
S (Number of Species of Subme	rgent/Floating-leaf Plants in the Lake)	15
Floristic Quality Index (FQI) = (M	lean C-value)* (Square Root of S)	19.75

		Coefficient of Conservatism Value
Species	Common Name	(C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Lemna minor	common duckweed	5
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Najas flexilis	flexuous naiad	5
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton richardsonii	clasping-leaf pondweed	5
Potamogeton zosteriformis	flatstem pondweed	6
Ranunculus sp. **	crowfoot	5.5
Stuckenia pectinatus	sago pondweed	3
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.1
S (Number of Species of Subme	rgent/Floating-leaf Plants in the Lake)	16
Floristic Quality Index (FQI) = (N	lean C-value)* (Square Root of S)	20.38

		Coefficient of Conservatism
Species	Common Name	(C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton richardsonii	clasping-leaf pondweed	5
Ranunculus sp. **	crowfoot	5.5
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.2
S (Number of Species of Subme	rgent/Floating-leaf Plants in the Lake)	12
Floristic Quality Index (FQI) = (M	ean C-value)* (Square Root of S)	18.04

Species	Common Name	Coefficient of Conservatism Value (C-value)
Bidens beckii	Beck's water marigold	8
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Lemna sp. **	duckweed	5
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Najas flexilis	flexuous naiad	5
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton pusillus	leafy pondweed	7
Potamogeton richardsonii	clasping-leaf pondweed	5
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.5
S (Number of Species of Subme	ergent/Floating-leaf Plants in the Lake)	15
Floristic Quality Index (FQI) = (N	lean C-value)* (Square Root of S)	21.17

		Coefficient of Conservatism
Species	Common Name	(C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Lemna sp.	duckweed	5
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton pusillus	leafy pondweed	7
Ranunculus sp.	crowfoot	5
Zosterella dubia	water stargrass	6
Mean C-value		5.3
S (Number of Species of Subme	ergent/Floating-leaf Plants in the Lake)	12
Floristic Quality Index (FQI) = (N	lean C-value)* (Square Root of S)	18.19

Species	Common Name	Coefficient of Conservatism Value (C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Elodea canadensis	elodea	4
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton pusillus	leafy pondweed	7
Potamogeton richardsonii	clasping-leaf pondweed	5
Potamogeton zosteriformis	flatstem pondweed	6
Ranunculus longirostris	white water crowfoot	7
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.4
S (Number of Species of Subme	rgent/Floating-leaf Plants in the Lake)	14
Floristic Quality Index (FQI) = (M	lean C-value)* (Square Root of S)	20.31



Number	Scientific Name	Common Name	C-value
1	Ceratophyllum demersum	coontail	2
2	Chara sp.	muskgrass	7
3	Elodea canadensis	elodea	4
4	Myriophyllum sibiricum	Siberian Water-Milfoil	7
5	Nuphar lutea	yellow pond-lily	6
6	Nymphaea odorata	white waterlily	6
7	Potamogeton amplifolius	largeleaf pondweed	7
8	Potamogeton crispus	curlyleaf pondweed	0
9	Potamogeton richardsonii	clasping-leaf pondweed	5
10	Potamogeton pusillus	leafy pondweed	7
11	Potamogeton zosteriformis	flatstem pondweed	6
12	Ranunculus longirostris	white water crowfoot	7
13	Vallisneria americana	wild celery	6
14	Zosterella dubia	water stargrass	6

		Coefficient of Conservatism Value
Species	Common Name	(C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Elodea canadensis	elodea	4
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Myriophyllum spicatum	Eurasian watermilfoil	0
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton praelongus	white stemmed pondweed	7
Potamogeton pusillus	leafy pondweed	7
Potamogeton richardsonii	clasping-leaf pondweed	5
Potamogeton zosteriformis	flatstem pondweed	6
Ranunculus longirostris	white water crowfoot	7
Utricularia macrorhiza	common bladderwort	5
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.2
S (Number of Species of Subme	ergent/Floating-leaf Plants in the Lake)	18
Floristic Quality Index (FQI) = (M	lean C-value)* (Square Root of S)	21.92



Species Number	Scientific Name	Common Name	C-value
1	Ceratophyllum demersum	coontail	2
2	Chara sp.	muskgrass	7
3	Elodea canadensis	elodea	4
4	Lemna trisulca	star duckweed	5
5	Myriophyllum sibiricum	Siberian Water-Milfoil	7
6	Myriophyllum spicatum	Eurasian watermilfoil	0
7	Nuphar lutea	yellow pond-lily	6
8	Nymphaea odorata	white waterlily	6
9	Potamogeton amplifolius	largeleaf pondweed	7
10	Potamogeton crispus	curlyleaf pondweed	0
11	Potamogeton praelongus	white stemmed pondweed	7
12	Potamogeton pusillus	leafy pondweed	7
13	Potamogeton richardsonii	clasping-leaf pondweed	5
14	Potamogeton zosteriformis	flatstem pondweed	6
15	Ranunculus longirostris	white water crowfoot	7
16	Utricularia macrorhiza	common bladderwort	5
17	Vallisneria americana	wild celery	6
18	Zosterella dubia	water stargrass	6

Species	Common Name	Coefficient of Conservatism Value (C-value)
Ceratophyllum demersum	coontail	2
Chara sp.	muskgrass	7
Lemna minor	common duckweed	5
Lemna trisulca	star duckweed	5
Myriophyllum sibiricum	Siberian Water-Milfoil	7
Myriophyllum spicatum	Eurasian watermilfoil	0
Nymphaea odorata	white waterlily	6
Potamogeton amplifolius	largeleaf pondweed	7
Potamogeton crispus	curlyleaf pondweed	0
Potamogeton friesii	Fries pondweed	8
Potamogeton illinoensis	Illinois pondweed	6
Potamogeton praelongus	white stemmed pondweed	7
Potamogeton pusillus	leafy pondweed	7
Potamogeton richardsonii	clasping-leaf pondweed	5
Potamogeton zosteriformis	flatstem pondweed	6
Utricularia macrorhiza	common bladderwort	5
Vallisneria americana	wild celery	6
Zosterella dubia	water stargrass	6
Mean C-value		5.3
S (Number of Species of Subme	ergent/Floating-leaf Plants in the Lake)	18
Floristic Quality Index (FQI) = (N	lean C-value)* (Square Root of S)	22.39



Species Number	Scientific Name	Common Name	C-value
1	Ceratophyllum demersum	coontail	2
2	Chara sp.	muskgrass	7
3	Lemna minor	common duckweed	5
4	Lemna trisulca	star duckweed	5
5	Myriophyllum sibiricum	Siberian Water-Milfoil	7
6	Myriophyllum spicatum	Eurasian watermilfoil	0
7	Nymphaea odorata	white waterlily	6
8	Potamogeton amplifolius	largeleaf pondweed	7
9	Potamogeton crispus	curlyleaf pondweed	0
10	Potamogeton friesii	Fries pondweed	8
11	Potamogeton illinoensis	Illinois pondweed	6
12	Potamogeton praelongus	white stemmed pondweed	7
13	Potamogeton pusillus	leafy pondweed	7
14	Potamogeton richardsonii	clasping-leaf pondweed	5
15	Potamogeton zosteriformis	flatstem pondweed	6
16	Utricularia macrorhiza	common bladderwort	5
17	Vallisneria americana	wild celery	6
18	Zosterella dubia	water stargrass	6

		Coefficient of
		Conservatism
Species	Common Name	Value
Acer negundo	boxelder	1
Ambrosia trifida	great ragweed	0
Anemone canadensis	Canadian anemone	3
Asclepias incarnata	swamp milkweed	4
Calamagrostis canadensis	Bluejoint	4
Carex comosa	Bearded Sedge	4
Carex scoparia	broom sedge	4
Carex stipata	Stalk-Grain Sedge	3
Carex stricta	Uptight Sedge	5
Cornus racemosa	gray dogwood	2
Eleocharis obtusa	blunt spikerush	3
Equisetum hyemale	scouringrush horsetail	2
Fraxinus pennsylvanica	green ash	2
Glyceria canadensis	Rattlesnake Manna Grass	7
Impatiens capensis	jewelweed	2
Iris versicolor	harlequin blueflag	4
Lemna minor	common duckweed	5
Lycopus uniflorus	northern bugleweed	5
Lythrum salicaria	purple loosestrife	0
Persicaria sagittata	Arrow-Leaf Tearthumb	4
Phalaris arundinacea	reed canarygrass	0
Polygonum lapathifolium	curlytop knotweed	2
Populus deltoides	eastern cottonwood	1
Populus tremuloides	quaking aspen	2
Quercus bicolor	Swamp White Oak	8
Rhamnus cathartica	common buckthorn	0
Rumex crispus ssp. Crispus	curly dock	0
Sagittaria latifolia	Duck-Potato	3
Salix nigra	black willow	4
Schoenoplectus fluviatilis	river bulrush	4
Schoenoplectus tabernaemontani	softstem bulrush	4
Scirpus atrovirens	green bulrush	4
Sium suave	hemlock waterparsnip	5
Solidago gigantea	Late Goldenrod	3
Streptopus lanceoloatus	Rose Twistedstalk	7
Thelypteris palustris	marsh fern	7
Toxicodendron radicans	eastern poison ivy	7
Typha angustifolia	narrowleaf cattail	0
Typha X glauca	hybrid cattail	0
Ulmus americana	American elm	3
Urtica dioica	Stinging Nettle	1
Vitis riparia	riverbank grape	2
Mean C-value	3.1	
S (Number of Species of Emergent Plan	42	
Floristic Quality Index (FQI) = (Mean C-v	20.21	



umber	Scientific Name	Common Name	C-value
1	Acer negundo	boxelder	1
2	Ambrosia trifida var. trifida	great ragweed	0
3	Anemone canadensis	Canadian anemone	3
4	Asclepias incarnata ssp. Incarnata	swamp milkweed	4
5	Calamagrostis canadensis	Bluejoint	4
6	Carex comosa	Bearded Sedge	4
7	Carex scoparia var. scoparia	broom sedge	4
8	Carex stipata	Stalk-Grain Sedge	3
9	Carex stricta	Uptight Sedge	5
10	Cornus racemosa	gray dogwood	2
11	Eleocharis obtusa	blunt spikerush	3
12	Equisetum hyemale var. affine	scouringrush horsetail	2
13	Fraxinus pennsylvanica	green ash	2
14	Glyceria canadensis	Rattlesnake Manna Grass	7

jewelweed

harlequin blueflag

common duckweed

northern bugleweed

Arrow-Leaf Tearthumb

purple loosestrife

reed canarygrass

curlytop knotweed

quaking aspen

curly dock

Duck-Potato

black willow

river bulrush

softstem bulrush

Late Goldenrod

marsh fern

hybrid cattail

American elm

Stinging Nettle

riverbank grape

Rose Twistedstalk

eastern poison ivy

narrowleaf cattail

hemlock waterparsnip

green bulrush

eastern cottonwood

Swamp White Oak

common buckthorn

2

4

5

5

0

4

0

2

1

2

8

0

0

3

4

4

4

4

5

3

7

7

7

0

0

3

1

2

		Coefficient of
		Conservatism
Species	Common Name	Value
Acer negundo	boxelder	1
Alnus incana	speckled alder	3
Ambrosia trifida	great ragweed	0
Anemone canadensis	Canadian anemone	3
Asclepias incarnata	swamp milkweed	4
Asclepias syriaca *	common milkweed	1
Brasenia schreberi	watershield	7
Calamagrostis canadensis	Bluejoint	4
Carex comosa	Bearded Sedge	4
Carex scoparia	broom sedge	4
Carex stipata	Stalk-Grain Sedge	3
Carex stricta	Uptight Sedge	5
Cirsium arvense	Canada thistle	0
Cornus alba	red-osier dogwood	3
Cornus racemosa	gray dogwood	2
Eleocharis obtusa	blunt spikerush	3
Equisetum hyemale	scouringrush horsetail	2
Fraxinus pennsylvanica	green ash	2
Gleditsia triacanthos	Honey-Locust	0
Glyceria canadensis	Rattlesnake Manna Grass	7
Impatiens capensis	jewelweed	2
Iris versicolor	harlequin blueflag	4
Lemna minor	common duckweed	5
Lotus corniculatus	bird's-foot trefoil	0
Lycopus uniflorus	northern bugleweed	5
Lythrum salicaria	purple loosestrife	0
Melilotus officinalis	yellow sweetclover	0
Miscanthus sacchariflorus	amur silver grass	0
Nuphar lutea	yellow pond-lily	6
Nymphaea odorata	white waterlily	6
Parthenocissus vitacea	woodbine	2
Persicaria lapathifolium	curlytop knotweed	2
Persicaria sagittata	Arrow-Leaf Tearthumb	4
Phalaris arundinacea	reed canarygrass	0
Phleum pratense	Common Timothy	0
Phragmites australis	common reed grass	1
Populus deltoides	eastern cottonwood	1
Populus tremuloides	quaking aspen	2
Quercus bicolor	Swamp White Oak	8
Rhamnus cathartica	common buckthorn	0
Rubus idaeus	Common Red Raspberry	3
Sagittaria latifolia	Duck-Potato	3
Salix amygdaloides	peach leaved willow	5
Salix interior	sandbar willow	2
Salix nigra	black willow	4
-		

Schoenoplectus fluviatilis	river bulrush	4
Schoenoplectus tabernaemontani	softstem bulrush	4
Scirpus atrovirens	green bulrush	4
Sium suave	hemlock waterparsnip	5
Solanum dulcamara	nightshade	0
Solidago canadensis	Canada goldenrod	1
Solidago gigantea	Late Goldenrod	3
Sonchus arvensis	sow thistle	0
Streptopus lanceoloatus	Rose Twistedstalk	7
Thelypteris palustris	marsh fern	7
Toxicodendron rydbergii	western poison ivy	1
Typha angustifolia	narrowleaf cattail	0
Typha latifolia	broad leaf cattail	2
Typha X glauca	hybrid cattail	0
Ulmus americana	American elm	3
Urtica dioica	Stinging Nettle	1
Vitis riparia	riverbank grape	2
Zizia aurea	golden alexanders	6
Mean C-value	2.7	
S (Number of Species of Emergent	63	
Floristic Quality Index (FQI) = (Mea	21.80	



Number	Scientific Name	Common Name	C-value
1	Acer negundo	boxelder	1
2	Alnus incana	speckled alder	3
3	Ambrosia trifida	great ragweed	0
4	Anemone canadensis	Canadian anemone	3
5	Asclepias incarnata	swamp milkweed	4
6	Asclepias syriaca *	common milkweed	1
7	Brasenia schreberi	watershield	7
8	Calamagrostis canadensis	Bluejoint	4
9	Carex comosa	Bearded Sedge	4
10	Carex scoparia	broom sedge	4
11	Carex stipata	Stalk-Grain Sedge	3
12	Carex stricta	Uptight Sedge	5
13	Cirsium arvense	Canada thistle	0
14	Cornus alba	red-osier dogwood	3
15	Cornus racemosa	gray dogwood	2
16	Eleocharis obtusa	blunt spikerush	3
17	Equisetum hyemale	scouringrush horsetail	2
18	Fraxinus pennsylvanica	green ash	2
19	Gleditsia triacanthos	Honey-Locust	0
20	Glyceria canadensis	Rattlesnake Manna Grass	7
21	Impatiens capensis	jewelweed	2
22	Iris versicolor	harleguin blueflag	4
23	Lemna minor	common duckweed	5
24	Lotus corniculatus	bird's-foot trefoil	0
25	Lycopus uniflorus	northern bugleweed	5
26	Lytopue diministue		0
27	Melilotus officinalis	vellow sweetclover	0
28	Miscanthus sacchariflorus	amur silver grass	0
29	Nunbar lutoa		6
30		yellow polid-lify	6
31	Nymphaea odorata	woodhine	0
32	Paninenocissus vilacea		2
32	Persicaria iapatnifolium	Currytop knotweed	2
33	Persicaria sagittata	Arrow-Lear Teartnumb	4
34	Phalaris arundinacea		0
30	Phieum pratense		0
30	Phragmites australis	common reed grass	1
37	Populus deltoides	eastern cottonwood	1
38	Populus tremuloides	quaking aspen	2
39	Quercus bicolor	Swamp White Oak	8
40	Rhamnus cathartica	common buckthorn	0
41	Rubus idaeus	Common Red Raspberry	3
42	Sagittaria latifolia	Duck-Potato	3
43	Salix amygdaloides	peach leaved willow	5
44	Salix interior	sandbar willow	2
45	Salix nigra	black willow	4
46	Schoenoplectus fluviatilis	river bulrush	4
47	Schoenoplectus tabernaemontani	softstem bulrush	4
48	Scirpus atrovirens	green bulrush	4
49	Sium suave	hemlock waterparsnip	5
50	Solanum dulcamara	nightshade	0
51	Solidago canadensis	Canada goldenrod	1
52	Solidago gigantea	Late Goldenrod	3
53	Sonchus arvensis	sow thistle	0
54	Streptopus lanceoloatus	Rose Twistedstalk	7
55	Thelypteris palustris	marsh fern	7
56	Toxicodendron rvdberaii	western poison ivv	1
57	Typha angustifolia	narrowleaf cattail	0
58	Typha latifolia	broad leaf cattail	2
59	Typha X dauca	bybrid cattail	0
60	Illmus americana		2
50	onnus antericalia	American eini	3



		Coefficient of	
Omeniae	Common Name	Conservatism	
Species		Value	
Acer negundo	boxelder	1	
Alnus incana	speckled alder	3	
Ambrosia artemisiifolia	common ragweed	0	
Ambrosia trifida	great ragweed	0	
Amorpha fruticosa	false indigo	4	
Anemone canadensis	Canadian anemone	3	
Asclepias incarnata	swamp milkweed	4	
Asclepias syriaca *	common milkweed	1	
Bidens tripartita	three-lobed beggarticks	4	
Brasenia schreberi	watershield	7	
Calamagrostis canadensis	bluejoint	4	
Carex comosa	bearded sedge	4	
Carex scoparia	broom sedge	4	
Carex stipata	stalk-grain sedge	3	
Carex stricta	uptight sedge	5	
Cirsium arvense	Canada thistle	0	
Cornus alba	red-osier dogwood	3	
Cornus racemosa	gray dogwood	2	
Cyperus erythrorhizos	red rooted cyperus	2	
Dactylis glomerata	orchard grass	0	
Echinochloa crus-galli	barnyard grass	0	
Eleocharis obtusa	blunt spikerush	3	
Equisetum hyemale	scouringrush horsetail	2	
Eupatorium perfoliatum	boneset	4	
Eutrochium maculatum	Joe-pye weed	4	
Fraxinus pennsylvanica	green ash	2	
Glyceria canadensis	rattlesnake manna grass	7	
Helenium autumnale	sneezeweed	4	
Impatiens capensis	jewelweed	2	
Iris versicolor	harlequin blueflag	4	
Juncus effusus	soft rush	4	
Lemna minor	common duckweed	5	
Lobelia cardinalis	cardinal flower	7	
Lycopus uniflorus	northern bugleweed	5	
Lythrum salicaria	purple loosestrife	0	
Melilotus officinalis	yellow sweetclover	0	
Miscanthus sacchariflorus	amur silver grass	0	
Nuphar variegata	yellow pond-lily	6	
Nymphaea odorata	white waterlily	6	
Parthenocissus inserta	woodbine	2	
Persicaria amphibia	water smartweed	4	
Persicaria lapathifolium	curlytop knotweed	2	
Persicaria sagittata	arrow-leaf tearthumb	4	
Phalaris arundinacea	reed canarygrass	0	
Phleum pratense	common timothy	0	
	······································	Ť	
Phragmites australis	common reed grass	1	
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Pilea pumila	clearweed	3	
Populus deltoides	eastern cottonwood	1	
Populus tremuloides	quaking aspen	2	
Quercus bicolor	swamp white oak	8	
Rhamnus cathartica	common buckthorn	0	
Rubus idaeus	common red raspberry	3	
Sagittaria latifolia	duck-potato	3	
Salix amygdaloides	peach leaved willow	5	
Salix discolor	pussy willow	3	
Salix interior	sandbar willow	2	
Salix nigra	black willow	4	
Schoenoplectus fluviatilis	river bulrush	4	
Schoenoplectus tabernaemontani	softstem bulrush	4	
Scirpus atrovirens	green bulrush	4	
Sium suave	hemlock waterparsnip	5	
Solanum dulcamara	nightshade	0	
Solidago canadensis	Canada goldenrod	1	
Solidago gigantea	late goldenrod	3	
Sonchus arvensis	sow thistle	0	
Sparganium emersum	unbranched bur-reed	7	
Sparganium eurycarpum	giant bur-reed	5	
Thelypteris palustris marsh fern		7	
Toxicodendron rydbergii	western poison ivy	1	
Typha angustifolia	narrowleaf cattail	0	
Typha latifolia	broad leaf cattail	2	
Typha X glauca	hybrid cattail	0	
Ulmus americana	American elm	3	
Ulmus pumila	Siberian elm	0	
Urtica dioica	stinging nettle	1	
Verbena hastata	blue vervain	6	
Vitis riparia	riverbank grape	2	
Zizia aurea	golden alexanders	6	
Mean C-value		2.9	
S (Number of Species of Emergent Plants	s in the Lake)	78	
Floristic Quality Index (FQI) = (Mean C-va	25.70		



Species			C vielus
Number	Scientific Name	Common Name	C-value
1	Acer negundo	boxelder	1
2	Alhus Incana Ambrosia artemisiifolia	speckled alder	3
4	Ambrosia trifida	areat raqweed	0
5	Amorpha fruticosa	false indigo	4
6	Anemone canadensis	Canadian anemone	3
7	Asclepias incarnata	swamp milkweed	4
8	Asclepias syriaca *	common milkweed	1
9	Bidens tripartita	three-lobed beggarticks	4
10	Brasenia schreberi	watershield	1
12	Carex comosa	bluejoint bearded sedge	4
13	Carex scoparia	broom sedge	4
14	Carex stipata	stalk-grain sedge	3
15	Carex stricta	uptight sedge	5
16	Cirsium arvense	Canada thistle	0
17	Cornus alba	red-osier dogwood	3
18	Cornus racemosa	gray dogwood	2
19	Cyperus erythrorhizos	red rooted cyperus	2
20	Dactylis glomerata Echinochloa crus-galli	orchard grass	0
21	Eleocharis obtusa	blunt spikerush	3
23	Equisetum hyemale	scouringrush horsetail	2
24	Eupatorium perfoliatum	boneset	4
25	Eutrochium maculatum	Joe-pye weed	4
26	Fraxinus pennsylvanica	green ash	2
27	Glyceria canadensis	rattlesnake manna grass	7
28	Helenium autumnale	sneezeweed	4
29	Impatiens capensis	jewelweed	2
30	Iris versicolor	harlequin blueflag	4
32	Juncus enusus Lemna minor	common duckweed	4
33	Lobelia cardinalis	cardinal flower	7
34	Lycopus uniflorus	northern bugleweed	5
35	Lythrum salicaria	purple loosestrife	0
36	Melilotus officinalis	yellow sweetclover	0
37	Miscanthus sacchariflorus	amur silver grass	0
38	Nuphar variegata	yellow pond-lily	6
39	Nymphaea odorata	white waterlily	6
40	Parthenocissus inserta	woodbine	2
42	Persicaria ampinibia Persicaria lapathifolium		4
43	Persicaria sagittata	arrow-leaf tearthumb	4
44	Phalaris arundinacea	reed canarygrass	0
45	Phleum pratense	common timothy	0
46	Phragmites australis	common reed grass	1
47	Pilea pumila	clearweed	3
48	Populus deltoides	eastern cottonwood	1
49	Populus tremuloides	quaking aspen	2
50	Quercus bicolor	swamp white oak	8
52	Rhamhus cathartica	common buckthorn	0
53	Sagittaria latifolia	duck-potato	3
54	Salix amvadaloides	peach leaved willow	5
55	Salix discolor	pussy willow	3
56	Salix interior	sandbar willow	2
57	Salix nigra	black willow	4
58	Schoenoplectus fluviatilis	river bulrush	4
59	Schoenoplectus tabernaemontani	softstem bulrush	4
61	Scirpus atrovirens	green bulrush	4
62	Sulm suave Solanum dulcamara	nemiock waterparsnip	5
63	Solidado canadensis	Canada goldenrod	1
64	Solidago gigantea	late goldenrod	3
65	Sonchus arvensis	sow thistle	0
66	Sparganium emersum	unbranched bur-reed	7
67	Sparganium eurycarpum	giant bur-reed	5
68	Thelypteris palustris	marsh fern	7
69	Toxicodendron rydbergii	western poison ivy	1
70	i ypna angustifolla	narrowleat cattail	0
72	rypha laulolla Typha X alauca	bioau lear cattall	2
73	i ypria A giauca I llmus americana	American elm	3
74	Ullmus pumila	Siberian elm	0
75	Urtica dioica	stinging nettle	1
76	Verbena hastata	blue vervain	6
77	Vitis riparia	riverbank grape	2
78	Zizia aurea	golden alexanders	6

2012 Orchard Lake Upland Buffer Vegetation Floristic Quality Index

		Coefficient of	
		Conservatism	
		Value	
Species	Common Name	(C-value)	
Acer saccharinum	Silver Maple	3	
Arctium minus	burrdock	0	
Asclepias syriaca *	common milkweed	1	
Carex pensylvanica *	Pennsylvania sedge	3	
Centaurea biebersteinii	Spotted Knapweed	0	
Cirsium arvense	Canada thistle	0	
Cornus racemosa	gray dogwood	2	
Dactylis glomerata	Orchard Grass	0	
Erigeron strigosus	Prairie Fleabane	2	
Geranium maculatum	Spotted Crane's-Bill	4	
Gleditsia triacanthos	Honey-Locust	0	
Hemerocallis fulva	orange day lily	0	
Lactuca serriola	prickly lettuce	0	
Lonicera tatarica	Tatarian honeysuckle	0	
Lotus corniculatus	bird's-foot trefoil	0	
Medicago lupulina	black medick	0	
Melilotus officinalis	yellow sweetclover	0	
Monarda fistulosa	Oswego-Tea	3	
Oxalis stricta	Upright Yellow Wood-Sorrel	0	
Parthenocissus vitacea	woodbine	2	
Persicaria pensylvanica	Pinkweed	1	
Phleum pratense	Common Timothy	0	
Plantago major	common plantain	0	
Poa pratensis	Kentucky bluegrass	0	
Polygonatum biflorum	Solomon's seal	4	
Quercus ellipsoidalis *	pin oak	5	
Quercus rubra	northern red oak	5	
Rhus spp. * **	sumac	4	
Rubus idaeus	Common Red Raspberry	3	
Sedum sp.	stonecrop	0	
Solidago canadensis	Canada goldenrod	1	
Streptopus lanceolatus	Lance-Leaf Twistedstalk	7	
Taraxacum officinale	common dandelion	0	
Tilia americana	American basswood	5	
Trifolium pratense	red clover	0	
Ulmus americana	American elm	3	
Mean C-value		1.6	
S (Number of Species of Upland Buffer P	lants)	36	
Floristic Quality Index (FQI) = (Mean C-va	alue)* (Square Root of S)	9.67	

* A C-value for this species has not been determined in Minnesota.

The C-value used is from the Wisconsin Floristic Quality Assessment.

** An average C-value was used for this genus, since the species were not verified.



Species		, j	
Number	Scientific Name	Common Name	C-value
1	Acer saccharinum	Silver Maple	3
2	Arctium minus	burrdock	0
3	Asclepias syriaca	common milkweed	0
4	Carex pensylvanica *	Pennsylvania sedge	3
5	Centaurea biebersteinii	Spotted Knapweed	0
6	Cirsium arvense	Canada thistle	0
7	Cornus racemosa	gray dogwood	2
8	Dactylis glomerata	Orchard Grass	0
9	Erigeron strigosus	Prairie Fleabane	2
10	Geranium maculatum	Spotted Crane's-Bill	4
11	Gleditsia triacanthos	Honey-Locust	0
12	Hemerocallis fulva	orange day lily	0
13	Lactuca serriola	prickly lettuce	0
14	Lonicera tatarica	Tatarian honeysuckle	0
15	Lotus corniculatus	bird's-foot trefoil	0
16	Medicago lupulina	black medick	0
17	Melilotus officinalis	yellow sweetclover	0
18	Monarda fistulosa	Oswego-Tea	3
19	Oxalis stricta	Upright Yellow Wood-Sorrel	0
20	Parthenocissus vitacea	woodbine	2
21	Persicaria pensylvanica	Pinkweed	1
22	Phleum pratense	Common Timothy	0
23	Plantago major	common plantain	0
24	Poa pratensis	Kentucky bluegrass	0
25	Polygonatum biflorum	Solomon's seal	4
26	Quercus ellipsoidalis *	pin oak	5
27	Quercus rubra	northern red oak	5
28	Rhus spp. * **	sumac	4
29	Rubus idaeus	Common Red Raspberry	3
30	Sedum sp.	stonecrop	0
31	Solidago canadensis	Canada goldenrod	1
32	Streptopus lanceolatus	Lance-Leaf Twistedstalk	7
33	Taraxacum officinale	common dandelion	0
34	Tilia americana	American basswood	5
35	Trifolium pratense	red clover	0
36	Ulmus americana	American elm	3

Orchard Lake 2012 Upland Buffer Vegetation Survey

2017 Orchard Lake Upland Buffer Vegetation Floristic Quality Index

		Coefficient of
		Conservatism
Spacias	Common Nomo	
Species		(C-value)
Acer saccharinum	Silver Maple	3
Apocynum cannabinum	dogbane	3
Arctium minus	burrdock	0
Asclepias syriaca *	common milkweed	1
Carex pensylvanica *	Pennsylvania sedge	3
Centaurea biebersteinii	Spotted Knapweed	0
Cirsium arvense	Canada thistle	0
Cornus racemosa	gray dogwood	2
Dactylis glomerata	Orchard Grass	0
Dalea purpurea *	purple prairie clover	7
Equisetum hyemale	scouringrush horsetail	2
Erigeron strigosus	Prairie Fleabane	2
Euphorbia esula	leafy spurge	0
Geranium maculatum	Spotted Crane's-Bill	4
Gleditsia triacanthos	Honey-Locust	0
Hemerocallis fulva	orange day lily	0
Juglans nigra	black walnut	4
Lactuca serriola	prickly lettuce	0
Lonicera tatarica	Tatarian honeysuckle	0
Lotus corniculatus	bird's-foot trefoil	0
Medicago lupulina	black medick	0
Melilotus officinalis	yellow sweetclover	0
Monarda fistulosa	Oswego-Tea	3
Oxalis stricta	Upright Yellow Wood-Sorrel	0
Parthenocissus vitacea	woodbine	2
Persicaria pensylvanica	Pinkweed	1
Phleum pratense	Common Timothy	0
Plantago major	common plantain	0
Poa pratensis	Kentucky bluegrass	0
Polygonatum biflorum	Solomon's seal	4
Quercus ellipsoidalis *	pin oak	5
Quercus rubra	northern red oak	5
Rhus spp. * **	sumac	4
Rubus idaeus	Common Red Raspberry	3
Rubus occidentalis *	black raspberry	2
Sambucus racemosa	red-berried elder	5
Securigera varia	crown vetch	0
Sedum sp.	stonecrop	0
Solidago canadensis	Canada goldenrod	1
Streptopus lanceolatus	Lance-Leaf Twistedstalk	7
Taraxacum officinale	common dandelion	0
Thalictrum dioicum	early meadow-rue	5
Tilia americana	American basswood	5
Trifolium pratense	red clover	0
· /· · · ·		-

2017 Orchard Lake Upland Buffer Vegetation Floristic Quality Index

Species	Common Name	Coefficient of Conservatism Value (C-value)
Ulmus americana	American elm	3
Verbascum thapsus	common mullein	0
Mean C-value	1.9	
S (Number of Species of Upland Buffer P	46	
Floristic Quality Index (FQI) = (Mean C-va	alue)* (Square Root of S)	12.68

* A C-value for this species has not been determined in Minnesota. The C-value used is from the Wisconsin Floristic Quality Assessment.

** An average C-value was used for this genus, since the species were not verified.



C-value Number Scientific Name **Common Name** Acer saccharinum Silver Maple 3 Apocynum cannabinum dogbane 3 burrdock 0 Arctium minus Asclepias syriaca * common milkweed 1 Pennsylvania sedge 3 Carex pensylvanica * Spotted Knapweed Centaurea biebersteinii 0 Cirsium arvense Canada thistle 0 Cornus racemosa gray dogwood 2 Dactylis glomerata **Orchard Grass** 0 Dalea purpurea * purple prairie clover 7 Equisetum hyemale scouringrush horsetail 2 2 Prairie Fleabane Erigeron strigosus 0 Euphorbia esula leafy spurge Spotted Crane's-Bill 4 Geranium maculatum Gleditsia triacanthos Honey-Locust 0 Hemerocallis fulva orange day lily 0 black walnut 4 prickly lettuce Lactuca serriola 0 Lonicera tatarica 0 Tatarian honeysuckle bird's-foot trefoil 0 Lotus corniculatus Medicago lupulina black medick 0 Melilotus officinalis yellow sweetclover 0 Monarda fistulosa Oswego-Tea 3 Upright Yellow Wood-Sorrel 0 woodbine Parthenocissus vitacea 2 Pinkweed Persicaria pensylvanica 1 Common Timothy Phleum pratense 0 0 Plantago major common plantain Kentucky bluegrass 0 4 Polygonatum biflorum Solomon's seal 5 Quercus ellipsoidalis * pin oak Quercus rubra northern red oak 5 Rhus spp. * ** sumac 4 Common Red Raspberry 3 Rubus occidentalis 2 black raspberry 5 Sambucus racemosa red-berried elder Securigera varia crown vetch 0 stonecrop 0 Solidago canadensis Canada goldenrod 1 Lance-Leaf Twistedstalk Streptopus lanceolatus 7 Taraxacum officinale common dandelion 0 Thalictrum dioicum 5 early meadow-rue Tilia americana 5 American basswood Trifolium pratense red clover 0 3 Ulmus americana American elm 46 Verbascum thapsus 0 common mullein

2022 Orchard Lake Upland Buffer Vegetation Floristic Quality Index

	Coefficient of	
		Conservatism
		Value
Species	Common Name	(C-value)
Acer saccharinum	silver maple	3
Ageratina altissima	white snakeroot	2
Amorpha fruticosa	false indigo	4
Andropogon gerardii	big bluestem	4
Apocynum cannabinum	dogbane	3
Arctium minus	burrdock	0
Asclepias syriaca *	common milkweed	1
Asclepias tuberosa *	butterfly weed	6
Bromus inermis	smooth brome	0
Carex pensylvanica *	Pennsylvania sedge	3
Centaurea biebersteinii	spotted knapweed	0
Circaea lutetiana	broadleaf nightshade	2
Cirsium arvense	Canada thistle	0
Cornus racemosa	gray dogwood	2
Dactylis glomerata	orchard grass	0
Dalea purpurea *	purple prairie clover	7
Daucus carota	Queen Anne's lace	0
Equisetum hyemale	scouringrush horsetail	2
Erigeron strigosus	prairie fleabane	2
Euphorbia esula	leafy spurge	0
Fraxinus pennsylvanica	green ash	2
Geranium maculatum	wild geranium	4
Glechoma hederacea	ground ivy	0
Hackelia virginiana	sticktight	1
Juglans nigra	black walnut	4
Lactuca serriola	prickly lettuce	0
Liatris ligulistylis *	meadow blazing star	7
Lobelia siphilitica	blue lobelia	5
Lonicera tatarica	tatarian honeysuckle	0
Lotus corniculatus	bird's-foot trefoil	0
Medicago lupulina	black medick	0
Melilotus officinalis	yellow sweetclover	0
Miscanthus sinensis	Chinese silvergrass	0
Monarda fistulosa	oswego-tea	3
Oxalis stricta	upright yellow wood-sorrel	0
Parthenocissus inserta	woodbine	2
Persicaria pensylvanica	pinkweed	1
Phleum pratense	common Timothy	0
Plantago major	common plantain	0
Poa pratensis	Kentucky bluegrass	0
Polvaonatum biflorum	Solomon's seal	4
Prunus virginiana	chokecherry	3
Quercus alba	white oak	7
Quercus ellipsoidalis *	pin oak	5
	F	-

2022 Orchard Lake Upland Buffer Vegetation Floristic Quality Index

	Coefficient of	
		Conservatism
		Value
Species	Common Name	(C-value)
Quercus macrocarpa	bur oak	5
Quercus rubra	northern red oak	5
Rhamnus cathartica	common buckthorn	0
Rhus typhina *	staghorn sumac	2
Rubus idaeus	common red raspberry	3
Rubus occidentalis *	black raspberry	2
Rudbeckia hirta	black-eyed Susan	3
Rudbeckia laciniata	tall coneflower	4
Sambucus racemosa	red-berried elder	5
Securigera varia	crown vetch	0
Solidago canadensis	Canada goldenrod	1
Taraxacum officinale	common dandelion	0
Thalictrum dioicum	early meadow-rue	5
Tilia americana	American basswood	5
Toxicodendron rydbergii	western poison ivy	1
Trifolium pratense	red clover	0
Ulmus americana	American elm	3
Ulmus pumila	Siberian elm	0
Verbascum thapsus	common mullein	0
Verbena stricta *	hoary vervain	3
Vicia americana *	purple vetch	4
Mean C-value		2.2
S (Number of Species of Upland	Buffer Plants)	65
Floristic Quality Index (FQI) = (M	ean C-value)* (Square Root of S)	17.36

* A C-value for this species has not been determined in Minnesota.

The C-value used is from the Wisconsin Floristic Quality Assessment.

** An average C-value was used for this genus, since the species were not verified.



Species	s a company		
Number	Scientific Name	Common Name	C-value
1	Acer saccharinum	silver maple	3
2	Ageratina altissima	white snakeroot	2
3	Amorpha fruticosa	false indigo	4
4	Andropogon gerardii	big bluestem	4
5	Apocynum cannabinum	dogbane	3
6	Arctium minus	burrdock	0
7	Asclepias syriaca *	common milkweed	1
8	Asclepias tuberosa *	butterfly weed	6
9	Bromus inermis	smooth brome	0
10	Carex pensylvanica *	Pennsylvania sedge	3
11	Centaurea biebersteinii	spotted knapweed	0
12	Circaea lutetiana	broadleaf nightshade	2
13	Cirsium arvense	Canada thistle	0
14	Cornus racemosa	gray dogwood	2
15	Dactylis glomerata	orchard grass	0
16	Dalea purpurea *	purple prairie clover	7
17	Daucus carota	Queen Anne's lace	0
18	Equisetum hyemale	scouringrush horsetail	2
19	Erigeron strigosus	prairie fleabane	2
20	Euphorbia esula	leafy spurge	0
21	Fraxinus pennsylvanica	green ash	2
22	Geranium maculatum	wild geranium	4
23	Glechoma hederacea	ground ivy	0
24	Hackelia virginiana	sticktight	1
25	Jualans nigra	black walnut	4
26	Lactuca serriola	prickly lettuce	0
27	Liatris ligulistylis *	meadow blazing star	7
28	l obelia siphilitica	blue lobelia	5
29	Lonicera tatarica	tatarian honeysuckle	0
30	Lotus corniculatus	bird's-foot trefoil	0
31	Medicago lupulina	black medick	0
32	Medicago lapanna Melilotus officinalis	vellow sweetclover	0
33	Miscanthus sinensis	Chinese silvergrass	0
34	Monarda fistulosa	oswego-tea	3
35	Oxalis stricta	upright vellow wood-sorrel	0
36	Parthenocissus inserta	woodbine	2
37	Persicaria pensylvanica	pinkweed	1
38	Phleum pratense	common Timothy	
39	Plantago major	common plantain	0
40	Poa pratensis	Kentucky bluegrass	0
41	Polygonatum biflorum	Solomon's seal	4
42	Prunus virainiana	chokecherry	7
43	Auercus alba	white oak	7
44		nin oak	5
45		pin oak	5
46		northern red oak	5
47	Rhamnus cathartica		0
48	Rhus typhina *	stadhorn sumac	2
40			2
50	Rubus accidentalia *	black raspborny	3
51	Rubus occidentalis	black raspberry	2
52	Rudbeckia nirta	black-eyed Susan	3
52	KUODECKIA IACINIAta	tall coneflower	4
55	Sampucus racemosa	red-berried elder	5
55	Securigera varia	crown vetch	0
56	Solidago canadensis	Canada goldenrod	1
57	raraxacum officinale		0
58	Trialictrum aloicum	early meadow-rue	5
50	rilla americana	American passwood	5

Orchard Lake 2022 Upland Buffer Vegetation Survey

59	Toxicodendron rydbergii	western poison ivy	1
60	Trifolium pratense	red clover	0
61	Ulmus americana	American elm	3
62	Ulmus pumila	Siberian elm	0
63	Verbascum thapsus	common mullein	0
64	Verbena stricta *	hoary vervain	3
65	Vicia americana *	purple vetch	4

Community #1

Eggers & Reed Plant Community Type: Shallow Open Water Percent of AA Occupied by Type: 75

Spp.		Cover			Rapid FQA						
# Scientific Name	Common Name	Class CC Range	Midpoint C	C Native Statu	is Stratum	NWI-GP	NWI-MW	NWI-NCNE C	:	n	nC
1 Carataphyllum damaraum	Coopia Tail	E > E0 7E%	61	E Notivo	Aquatia				<u> </u>	0 5 7 9 7	1 1574
	Courts-Tall	3 > 50 - 75 %	02		Aquatic		OBL		<u> </u>	0.0707	1.1574
2 Lemna minor	Common Duckweed	3 > 5 - 25%		15 Native	Aquatic	OBL	OBL	OBL	<u> </u>	0.1389	0.6944
3 Lemna trisulca	Ivy-Leaf Duckweed	3 > 5 - 25%		15 Native	Aquatic	OBL	OBL	OBL	5	0.1389	0.6944
4 Nymphaea odorata	American White Water-Lily	2 > 1 - 5%		3 Native	Aquatic	OBL	OBL	OBL	6	0.0278	0.1667
5 Potamogeton amplifolius	Large-Leaf Pondweed	2 > 1 - 5%		3 Native	Aquatic	OBL	OBL	OBL	7	0.0278	0.1944
6 Potamogeton crispus	Curly Pondweed	2 > 1 - 5%		3 Introduced	Aquatic	OBL	OBL	OBL	0	0.0278	0
7 Potamogeton zosteriformis	Flat-Stem Pondweed	2 > 1 - 5%		3 Native	Aquatic	OBL	OBL	OBL	6	0.0278	0.1667
8 Utricularia macrorhiza	Greater Bladderwort	2 > 1 - 5%		3 Native	Aquatic	OBL	OBL	OBL	5	0.0278	0.1389
9 Vallisperia americana	American Fel-Grass	1 > 0 - 1%	() 5 Native	Aquatic			OBL	6	0.0046	0.0278
		#NI/A	#NI/A	#NI/A	#NI/A	#NI/A	#NI/A	#NI/A	#NI/A	#NI/A	#NI/A
11	#N/A	#N/A	#N/A	#IN/A	#N/A	#N/A	#N/A	#IN/A	#N/A	#IN/A	#IN/A
11	#IN/A	#N/A	#IN/A	#IN/A	#N/A	#N/A	#IN/A	#IN/A	#N/A	#N/A	#N/A
12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	#Ν/Α	#N/A	#N/Δ	#N/Δ	#N/Δ	#N/Δ	#N/Δ	#N/Δ	#N/Δ	#N/Δ	#N/Δ
20	#Ν/Δ	#N/A	#NI/Δ	#NI/Δ	#NI/Δ	<u>#ΝΙ/Δ</u>	<u>#NI/Δ</u>	<u>#Ν/Δ</u>	<u>#Ν/Δ</u>	<u>#ΝΙ/Δ</u>	<u>#ΝΙ/Δ</u>
20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N//A	#N//A	#N//\ #NI/A
21	#N/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A
22	#IN/A	#N/A	#IN/A	#IN/A	#N/A	#N/A	#IN/A	#IN/A	#N/A	#N/A	#N/A
23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	#Ν/Δ	#N/A	#N/A	#N/A	#N/A	#N/Δ	#N/A	#N/A	<u>#Ν/Δ</u>	#N/Δ	#N/Δ
35	#NI/A	#NI/A	#NI/A	#NI/Λ	#NI/A	#NI/A	#NI/A	#ΝΙ/Λ	#ΝΙ/Λ	#NI/Δ	#ΝΙ/Δ
26	#N/A	#N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A	#N/A	#N/A
	#N/A	#N/A	#N/A	#IN/A	#N/A	#N/A	#N/A	#N/A	#IN/A	#IN/A	#IN/A
37	#IN/A	#IN/A	#IN/A	#IN/A	#N/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A
38	#IN/A	#N/A	#IN/A	#IN/A	#N/A	#N/A	#IN/A	#IN/A	#N/A	#N/A	#N/A
39	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	#N/Δ	#N/A	#N/A	#N/A	#N/A	#N/Δ	#N/A	#N/A	#N/Δ	#N/Δ	#N/Δ
50	#N/A	#N/A	#N/A #N/A	#N/A #N/A	#N/A	#N/A	#N/A #N/A	#N/A #N/A	#N/A	#N/A	#N/A
50	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
51	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A
52	#N/A	#N/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A	#IN/A
53	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#IN/A	#N/A	#N/A
54	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
55	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
56	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
57	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
58	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
59	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Community #2

Eggers & Reed Plant Community Type: Deep Marsh Percent of AA Occupied by Type: 15

Spp.		Cover		Rapid FQA						
# Scientific Name	Common Name	Class CC Range	Midpoint CC Native Stat	us Stratum	NWI-GP	NWI-MW	NWI-NCNE C	р	, ,	рC
1 Asclepias incarnata	Swamp Milkweed	2 > 1 - 5%	3 Native	Herb	FACW	OBL	OBL	4	0.0248	0.0992
2 Calamagrostis canadensis	Bluejoint	1 > 0 - 1%	0.5 Native	Herb	FACW	OBL	OBL	4	0.0041	0.0165
3 Carex comosa	Bearded Sedge	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	4	0.0041	0.0165
4 Carex stipata	Stalk-Grain Sedge	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	3	0.0041	0.0124
5 Carex stricta	Uptight Sedge	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	5	0.0041	0.0207
6 Alnus incana	Speckled Alder	1 > 0 - 1%	0.5 Native	Shrub	FACW	FACW	FACW	3	0.0041	0.0124
7 Brasenia schreberi	Watershield	3 > 5 - 25%	15 Native	Aquatic	OBL	OBL	OBL	7	0.124	0.8678
8 Eleocharis obtusa	Blunt Spike-Rush	2 > 1 - 5%	3 Native	Herb	OBL	OBL	OBL	3	0.0248	0.0744
9 Glyceria canadensis	Rattlesnake Manna Grass	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	7	0.0041	0.0289
10 Impatiens capensis	Spotted Touch-Me-Not	2 > 1 - 5%	3 Native	Herb	FACW	FACW	FACW	2	0.0248	0.0496
11 Iris versicolor	Harlequin Blueflag	2 > 1 - 5%	3 Native	Herb	OBL	OBL	OBL	4	0.0248	0.0992
12 Lemna minor	Common Duckweed	2 > 1 - 5%	3 Native	Aquatic	OBL	OBL	OBL	5	0.0248	0.124
13 Lycopus uniflorus	Northern Water-Horehound	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	5	0.0041	0.0207
14 Lythrum salicaria	Purple Loosestrife	2 > 1 - 5%	3 Introduced	Herb	OBL	OBL	OBL	0	0.0248	0
15 Nuphar variegata		0 2 > 1 - 5%	3 Native	Aquatic	OBL	OBL	OBL	6	0.0248	0.1488
16 Nymphaea odorata	American White Water-Lily	2 > 1 - 5%	3 Native	Aquatic	OBL	OBL	OBL	6	0.0248	0.1488
17 Phragmites australis	Common Reed	1 > 0 - 1%	0.5 Native	Herb	FACW	FACW	FACW	1	0.0041	0.0041
18 Sagittaria latifolia	Duck-Potato	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	3	0.0041	0.0124
19 Schoenoplectus fluviatilis	River Club-Rush	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	4	0.0041	0.0165
20 Schoenoplectus tabernaemontani	Soft-Stem Club-Rush	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	4	0.0041	0.0165
21 Sium suave	Hemlock Water-Parsnip	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	5	0.0041	0.0207
22 Thelypteris palustris	Eastern Marsh Fern	2 > 1 - 5%	3 Native	Herb	OBL	OBL	FACW	7	0.0248	0.1736
23 Typha angustifolia	Narrow-Leaf Cat-Tail	5 > 50 - 75%	62.5 Introduced	Herb	OBL	OBL	OBL	0	0.5165	0
24 Typha latifolia	Broad-Leaf Cat-Tail	2 > 1 - 5%	3 Native	Herb	OBL	OBL	OBL	2	0.0248	0.0496
25 Typha X glauca		0 2 > 1 - 5%	3 Introduced	Herb	OBL	OBL	OBL	0	0.0248	0
26 Persicaria amphibia	Water Smartweed	1 > 0 - 1%	0.5 Native	Aquatic, Herb	OBL	OBL	OBL	4	0.0041	0.0165
27 Pilea pumila	Canadian Clearweed	1 > 0 - 1%	0.5 Native	Herb	FAC	FACW	FACW	3	0.0041	0.0124
28 Sium suave	Hemlock Water-Parsnip	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	5	0.0041	0.0207
29 Sparganium eurycarpum	Broad-Fruit Burr-Reed	2 > 1 - 5%	3 Native	Herb	OBL	OBL	OBL	5	0.0248	0.124
30	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	<u>#N/A</u>	#N/A	#N/A
31	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#IN/A	7N/A	#N/A	#N/A
22	#N/A #N/A	#N/A #N/A	#N/A #N/A #N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	+IN/A #NI/A	#IN/A #NI/A	#IN/A #NI/A
24	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	+IN/A #NI/Λ	#IN/A #NI/A	#N/A #N/A
35	#N/A #N/A	#N/A #N/A	#N/A #N/A	#Ν/Α #Ν/Α	#N/A #N/A	#N/A #N/A	#N/A #N/A		#Ν/Λ #Ν/Λ	#N/A
36	#N/Α #N/Δ	#N/A #N/A	#N/A #N/A #N/A #N/A	#N/A #N/Δ	#Ν/Α #Ν/Δ	#N/A #N/Δ	#Ν/Α #Ν/Δ	<u>#Ν/Α</u>	$\frac{\# N/A}{\# N/A}$	#N/Δ
37	#Ν/Λ #Ν/Δ	#N/Δ	#N/Δ #N/Δ	#N/Δ	#Ν/Δ	#N/Δ	#Ν/Λ #Ν/Δ	<u>#Ν/Δ</u>	#N/Δ	#N/Δ
38	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
51	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
52	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
53	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
54	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
55	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
56	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
57	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
58	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
59	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	#N/A	#N/A	#N/A #N/A	#N/A	#N/A	#N/A	#N/A	7N/A	#N/A	#N/A

Community #3

Eggers & Reed Plant Community Type: Floodplain Forest Percent of AA Occupied by Type: 10

Spp.		Cover		Rapid FQA						
# Scientific Name	Common Name	Class CC Range	Midpoint CC Native S	Status Stratum	NWI-GP	NWI-MW	NWI-NCNE C	; I	α	Da
1 Acer negundo	Ash-Leaf Manle	2 > 1 - 5%	3 Native	Tree	FAC	FAC	FAC	<u> </u>	0.0168	0.0168
2 Ambrosia trifida	Great Ragweed	1 > 0 - 1%		Herb	FAC	FAC	FAC		0.0100	0.0100
3 Anemone canadensis	Round-Lest Thimbleweed	1 > 0 - 1%	0.5 Native	Herb	FACW	FACW	FACW	3	0.0020	0.0084
	Canadian Thistle	1 > 0 - 1%		ad Harb	FACIL	FACIL	FACIL	0	0.0020	0.000
5 Corpus alba	Red Osier	2 > 1 - 5%	3 Native	Shruh	FACU	FACU	FACW	3	0.0020	0.0504
6 Corpus resembles	Crev Degwood	2 > 1 - 5 /0		Shrub	FACIN	FACIO	FACIO	2	0.0100	0.0004
	Graen Ash	2 5 250/		Troo	FAC		FAC	2	0.0020	0.0000
Praxinus perinsylvanica Porthonogiagua ingorta	Thicket Crooper	3 > 3 - 23%	2 Notive	Meedy Vine	FAC	FACI		<u> </u>	0.004	0.1001
Partinenocissus inserta	Deals Leaf Streature ad	2 > 1 - 3%		VVOOdy Vine		FACU	FACU	<u> </u>	0.0108	0.0336
9 Persicaria iapathilolia	Dock-Leaf Smartweed	1 > 0 - 1%		Herb	OBL	FACW		<u> </u>	0.0028	0.0056
10 Persicaria sagittata	Arrow-Lear Tearthumb	1 > 0 - 1%		Herb	OBL	OBL	UBL	4	0.0028	0.0112
11 Phalaris arundinacea	Reed Canary Grass	4 > 25 - 50%	37.5 Introduc	ed Herb	FACW	FACW	FACW		0.2101	0
12 Populus deltoides	Eastern Cottonwood	3 > 5 - 25%	15 Native	Iree	FAC	FAC	FAC	1	0.084	0.084
13 Populus tremuloides	Quaking Aspen	2 > 1 - 5%	3 Native	Iree	FAC	FAC	FAC*	2	0.0168	0.0336
14 Rhamnus cathartica	European Buckthorn	3 > 5 - 25%	15 Introduc	ed Shrub	FACU	FAC	FAC	0	0.084	0
15 Rubus idaeus	Common Red Raspberry	2 > 1 - 5%	3 Native	Shrub	FACU	FACU	FAC*	3	0.0168	0.0504
16 Salix amygdaloides	Peach-Leaf Willow	2 > 1 - 5%	3 Native	Tree	FACW	FACW	FACW	5	0.0168	0.084
17 Salix interior	Sandbar Willow	2 > 1 - 5%	3 Native	Shrub	FACW	FACW	FACW	2	0.0168	0.0336
18 Salix nigra	Black Willow	2 > 1 - 5%	3 Native	Tree	FACW	OBL	OBL	4	0.0168	0.0672
19 Solanum dulcamara	Climbing Nightshade	2 > 1 - 5%	3 Introduc	ed Woody Vine	FACU	FAC	FAC	0	0.0168	0
20 Solidago canadensis	Canadian Goldenrod	3 > 5 - 25%	15 Native	Herb	FACU	FACU	FACU	1	0.084	0.084
21 Solidago gigantea	Late Goldenrod	3 > 5 - 25%	15 Native	Herb	FAC	FACW	FACW	3	0.084	0.2521
22 Sonchus arvensis	Field Sow-Thistle	1 > 0 - 1%	0.5 Introduc	ed Herb	FAC	FACU	FACU	0	0.0028	0
23 Streptopus lanceolatus	Lance-Leaf Twistedstalk	1 > 0 - 1%	0.5 Native	Herb	FAC	FAC	FACU	7	0.0028	0.0196
24 Toxicodendron rydbergii	Western Poison Ivy	2 > 1 - 5%	3 Native	Herb	FACU	FAC	FAC	1	0.0168	0.0168
25 Ulmus americana	American Elm	2 > 1 - 5%	3 Native	Tree	FAC	FACW	FACW	3	0.0168	0.0504
26 Urtica dioica	Stinging Nettle	2 > 1 - 5%	3 Native	Herb	FAC	FACW	FAC	1	0.0168	0.0168
27 Vitis riparia	River-Bank Grape	3 > 5 - 25%	15 Native	Woody Vine	FAC	FACW	FAC	2	0.084	0.1681
28 Zizia aurea	Golden Alexanders	1 > 0 - 1%	0.5 Native	Herb	FAC	FAC	FAC	6	0.0028	0.0168
29 Alnus incana	Speckled Alder	1 > 0 - 1%	0.5 Native	Shrub	FACW	FACW	FACW	3	0.0028	0.0084
30 Ambrosia artemisiifolia	Annual Ragweed	1 > 0 - 1%	0.5 Native	Herb	FACU	FACU	FACU	0	0.0028	0
31 Amorpha fruticosa	False Indigo-Bush	2 > 1 - 5%	3 Native	Shrub	FACW	FACW	FACW	4	0.0168	0.0672
32 Echinochloa crus-galli	Large Barnvard Grass	1 > 0 - 1%	0.5 Introduc	ed Herb	FAC	FACW	FAC	0	0.0028	0
33 Eupatorium perfoliatum	Common Boneset	1 > 0 - 1%	0.5 Native	Herb	FACW	OBL	FACW	4	0.0028	0.0112
34 Eutrochium maculatum	Spotted Trumpetweed	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	4	0.0028	0.0112
35 Glyceria canadensis	Rattlesnake Manna Grass	1 > 0 - 1%	0.5 Native	Herb	OBL	OBI	OBL	7	0.0028	0.0196
36 Helenium autumnale	Fall Sneezeweed	1 > 0 - 1%	0.5 Native	Herb	FACW	FACW	FACW	4	0.0028	0.0112
37 Lycopus uniflorus	Northern Water-Horehound	1 > 0 - 1%	0.5 Native	Herb	OBL	OBL	OBL	5	0.0028	0.014
38 Salix discolor	Pussy Willow	2 > 1 - 5%	3 Native	Shrub	FACW	FACW	FACW	3	0.0168	0.0504
39 Verbena hastata	Simpler's-lov	1 > 0 - 1%	0.5 Native	Herb	FACW	FACW	FACW	6	0.0028	0.0168
	±N/Δ	±N/Δ	#N/A #N/	/Δ #N/Δ	±Ν/Δ	#N/A	#N/Δ	#N/Δ	<u>#N/Δ</u>	#N/Δ
40	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12	#Ν/Δ	#Ν/Λ #Ν/Δ	#N/A #N/	/Δ #N/Δ	#Ν/Λ #Ν/Δ	#Ν/Δ	#Ν/Δ	#N/Δ	#N/Δ	#N/Δ
13	#Ν/Δ	#Ν/Λ #Ν/Δ	#N/A #N/	/Δ #N/Δ	#Ν/Λ #Ν/Δ	#Ν/Δ	#Ν/Λ #Ν/Δ	#N/Δ	#N/Δ	#N/Δ
	#Ν/Δ	#Ν/Α #Ν/Δ	#N/A #N/	Δ #N/Δ	#Ν/Α #Ν/Δ	#N/Δ	#N/A #N/Δ	$\frac{\pi N}{\Delta}$	$\frac{\pi N/\Lambda}{4N/\Lambda}$	#N/Δ
45	#N/A	#N/A	#N/A #N/	Α #N/Α /Δ #N/Δ	#N/A #N/A	#N/A	#N/A #N/A	#Ν/Λ #ΝΙ/Λ	#N/A	#N/A
45	#N/A	#IN/A #N/A	#IN/A #IN/ #NI/A #NI/	Α #IN/Α /Δ #NI/Δ	#IN/A #NI/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#N/A #N/A	#IN/A #NI/A
40	#N/A	#N/A #N/A	#IN/A #IN/ #NI/A #NI/	A #N/A	#N/A #N/A	#N/A	#N/A #N/A	#IN/A #NI/A	#N/A	#IN/A
47	#N/A	#IN/A	#IN/A #IN/	A #N/A	#IN/A	#N/A	#N/A	#IN/A	#N/A	#IN/A
40	#N/A	#N/A	#N/A #N/	A #N/A	#IN/A	#IN/A	#IN/A	#N/A	#IN/A	#IN/A
49	#N/A	#N/A	#N/A #N/	A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	#N/A	#N/A	#N/A #N/	A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
51	#N/A	#N/A	#N/A #N/	A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
52	#N/A	#N/A	#IN/A #N/	A #N/A	#N/A	#N/A	#N/A	#IN/A	#IN/A	#N/A
53	#N/A	#N/A	#N/A #N/	A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
54	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
55	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
56	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
57	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
58	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
59	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	#N/A	#N/A	#N/A #N/	/A #N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Shallow Open Water	Deep Marsh	Floodplain Forest
wC	3.2	2.2	1.5
Numerical Condition Category	3	3	4
Condition Category	Fair	Fair	Poor
Additional Metrics			
Native Species Richness	8	26	33
Introduced Species Richness	1	3	6
Mean C	4.7	3.8	2.6
FQI	13.2	19.5	14.7
Total Midpoint % Cover	108	121	178.5
Total Introduced Spp. Cover	3	68.5	57
Proportion of Introduced Cover	0.03	0.57	0.32

Overall Assessment

Community #	Community Type	wC	Condition Category	Numerical Category	Proportion of AA	Proportion x Numerical Category
1	Shallow Open Water	3.2	Fair	3	0.75	2.25
2	Deep Marsh	2.2	Fair	3	0.15	0.45
3	Floodplain Forest	1.5	Poor	4	0.1	0.4

Weighted Average Numerical Category for AA Overall AA Condition Fair

3

Appendix C

2003-2021 Habitat Assessment Monitoring Results

Appendix C: 2003-2009 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

1								Vege	tation Quality - We	at Areas		_	_		Vegetation Quality - Upland									
					Subr	mergent Zone Sa	mpling	vege	aation Quality - We	Areas	Ve	getated Emerger	nt Zone Sampling					Upla	and Buffer Samp	lina			Erosion/Sedir	mentation
		Approximate Proportion of		Anneningto	Cub							gotatoù Emorgoi												
	Monitoring	the Water Body Which	o "	Proportion of	Average Native			Exotic Species			Approximate	Approximate Total Percent	T (1)	Exotic	Species					5 " 0 " "	Exoti	c Species		
Water Body	Year	is Deep	Submergent	Water Body Typically	Plant Occurrence or	Total Number		Average Exotic	Maximum Exotic	Emergent Zone	Proportion of Emergent Zone	Vegetative	of Native			Overall Upland	Unmanicured	Estimated Total	Total Number	(Percent			Erosion	Sediment
		Habitat (~ >	Vegetative Quality ¹	Dominated By Submergent	Density	Species ⁵	Total Number	Plant Occurrence	Plant Occurrence	Quality ⁶	(0 - 2 ft. depth) Within The Water	The Entire	Wetland Plant Species ⁸	Number of	Total Exotic Emergent	Quality ¹⁰	Buffer Width ¹¹	(Percent Range) ¹²	Species ¹³	Surrounding Water Body) ¹⁴	Number of	Percent of Total	(Percent of Shoreline) ¹⁶	(Yes/No)
		20 ft. depth)	Quanty	Vegetation (~ 2 -	Rating ^{2,3}		of Species	Rating or Average Density	Rating or Maximum		Body	Emergent Zone ⁷	Openies	Species	Percent					Dody)	Species	Coverage ¹⁵	Ghorenne)	
				20 II. deptri)				Rating ^{2, 3}	Density Rating ⁴						Coverage									
	2003		Moderate		15	15	2	1 1	1 1	Moderate		26-50%	18	4	26-50%	Moderate	<10 ft	>95%	16	26-50%	2	15-40%	0-10%	No
	2003		Moderate		1.5	15	2	1.1	1.1	Woderate		20=30 %	10	4	20-30 %	Woderate	<1011.	>557/6	10	20-30 %	2	13-40 %	0-10%	
	2004		Excellent		1.2	14	2	1.1	2.9	Excellent	-	26-50%	16	6	26-50%	Moderate	<10 ft.	>95%	16	26-50%	4	15-40%	0-10%	No
	2005		Moderate		1.2	13	2	1.1	2.7	Excellent		26-50%	16	6	26-50%	Moderate	<10 ft.	>95%	17	26-50%	3	15-40%	0-10%	No
Crystal	2006	15%	Excellent	80%	1.0	17	2	1.5	3.2	Excellent	5%	26-50%	18	8	26-50%	Moderate	<10 ft.	>95%	17	26-50%	3	15-40%	0-10%	No
	2007		Excellent		15	16	2	16	34	Excellent		26-50%	22	10	26-50%	Moderate	<10 ft	>95%	15	26-50%	5	15-40%	0-10%	No
					1.0	10		1.0	0.1			20 500/0		10	20 00 //		40.0			20 50%		45.400/	0.400/	
	2008		Moderate		1.3	15	2	1.6	2.5	Excellent		26-50%	21	12	26-50%	Moderate	<10 ft.	>95%	15	26-50%	5	15-40%	0-10%	NO
	2009		Moderate		1.3	14	2	1.6	2.8	Excellent		26-50%	20	11	26-50%	Moderate	<10 ft.	>95%	15	26-50%	7	15-40%	0-10%	No
	2003		Moderate		1.9	4	1	3.2	3.2	Poor		51-75%	5	2	51-75%	Moderate	<10 ft.	>95%	7	76-100%	6	>40%	0-10%	No
	2004		Moderate		1.7	5	1	1.8	2.5	Moderate		51-75%	6	2	51-75%	Moderate	<10 ft.	>95%	7	76-100%	6	>40%	0-10%	No
	2005		Moderate		1.3	5	2	1.0	1.1	Moderate		51-75%	7	2	26-50%	Moderate	<10 ft.	>95%	8	76-100%	7	>40%	0-10%	No
Keller	2006	0%	Madarata	90%	2.0	-	2	1.0	2.5	Madarata	10%	E1 7E0/		2	26 50%	Madarata	-10.4	. 05%	0	76 100%		- 409/	0.10%	No
	2006		Moderate		2.0	5	2	1.8	2.5	Moderate		51-75%	8	2	26-50%		<10 π.	>95%	8	76-100%	8	>40%	0-10%	INO
	2007		Moderate		2.1	3	2	2.4	3.8	Moderate		51-75%	9	3	26-50%	Moderate	<10 ft.	>95%	5	76-100%	9	>40%	0-10%	No
	2008		Moderate		2.2	3	2	2.2	2.9	Moderate		51-75%	9	3	26-50%	Moderate	<10 ft.	>95%	6	76-100%	12	>40%	0-10%	No
	2009		Poor		3.0	2	2	2.7	3.3	Moderate		51-75%	9	4	26-50%	Moderate	<10 ft.	>95%	4	76-100%	11	>40%	0-10%	No
	2003		Moderate		2.7	7	0	0.0	0.0	Excellent		51-75%	11	2	0-25%	Excellent	25-50 ft.	>95%	15	51-75%	4	15-40%	0-10%	No
	0004		Madanta		0.7			0.0	0.0	E		54 750/			0.05%	E	05 50 4	05%	45	54 759/		45 400/	0.40%	
	2004		Moderate		2.7	1	0	0.0	0.0	Excellent		51-75%	11	2	0-25%	Excellent	25-50 ft.	>95%	15	51-75%	4	15-40%	0-10%	NO
	2005		Moderate		2.6	7	1	1.0	1.0	Excellent		51-75%	15	6	0-25%	Excellent	25-50 ft.	>95%	19	76-100%	2	15-40%	0-10%	No
Kingsley	2006	0%	Excellent	95%	1.8 ¹⁷	13 ¹⁸	1	1.0	1.0	Excellent	5%	51-75%	15	6	0-25%	Excellent	25-50 ft.	>95%	19	76-100%	3	15-40%	0-10%	No
	2007		Excellent		1.6	13	1	1.0	1.0	Excellent		51-75%	19	6	0-25%	Excellent	25-50 ft.	>95%	21	76-100%	4	15-40%	0-10%	No
	2008		Moderate		29	5	0	0.0	0.0	Excellent		51-75%	18	5	0-25%	Excellent	25-50 ft	>95%	25	76-100%	4	15-40%	0-10%	No
	2000				2.0			0.0	0.0	Execution in		54 750/	10	-	0.25%	Execution (20 00 11.	20070	20	70 100%	-	15 40%	0 10%	
	2009		Excellent		2.0	11	1	1.0	1.0	Excellent		51-75%	16	5	0-25%	Excellent	25-50 ft.	>95%	23	76-100%	5	15-40%	0-10%	No
	2003		Poor		2.0	7	1	1.0	1.0	Poor		0-25%	14	5	0-25%	Poor	<10 ft.	<75%	12	0-25%	17	>40%	0-10%	No
	2004		Moderate		0.9	9	2	1.6	1.9	Moderate		0-25%	15	5	0-25%	Poor	<10 ft.	<75%	12	0-25%	17	>40%	0-10%	No
	2005		Moderate		2.3	5	1	2.0	2.0	Excellent		0-25%	20	10	0-25%	Poor	<10 ft.	<75%	12	0-25%	16	>40%	0-10%	No
Lac Lavon	2006	25%	Moderate	70%	16	10 ¹⁹	2	2.5	4.0	Excellent	5%	0-25%	16	13	0-25%	Poor	<10 ft	<75%	11	0-25%	19	>40%	0-10%	No
	2000		moderate		1.0	20	2	2.0	4.0	Execution		0 20 %	10	10	0 20 /0		CTO IL.	(10/0		0 20 /0	10	24070	0 10/0	110
	2007		Excellent		1.8	10-*	3	1.8	4.0	Excellent		0-25%	16	12	0-25%	Poor	<10 ft.	<75%	12	0-25%	18	>40%	0-10%	No
	2008		Poor		1.0	5	2	1.0	1.0	Moderate		0-25%	14	9	0-25%	Poor	<10 ft.	<75%	9	0-25%	13	>40%	0-10%	No
	2009		Moderate		1.6	10	2	2.5	4.0	Moderate		0-25%	13	8	0-25%	Poor	<10 ft.	<75%	9	0-25%	11	>40%	0-10%	No
	2003		Poor		1.2	13	1	2.3	3.4	Moderate		26-50%	16	5	26-50%	Moderate	<10 ft.	>95%	5	26-50%	5	>40%	0-10%	No
	2004		Moderate		1.2	13	1	2.3	2.3	Excellent		26-50%	17	5	26-50%	Moderate	<10 ft.	>95%	5	26-50%	5	>40%	0-10%	No
	2005		Madarata		10	14		1.0	2.6	Madarata		26 50%	14	6	26 50%	Madarata	.10.4	. 05%	E	26 50%	F	. 409/	0.10%	No
Orchard	2005	20%	woderate	75%	1.3	14	1	1.8	2.6	Moderate	5%	26-50%	14	6	26-50%	Moderate	<10 π.	>95%	5	26-50%	5	>40%	0-10%	INO
oronard	2006	2070	Moderate	10%	1.2	13	1	1.7	3.4	Excellent	070	26-50%	18	9	26-50%	Moderate	<10 ft.	>95%	5	26-50%	5	>40%	0-10%	No
	2007		Moderate		1.3	11	1	1.9	3.3	Excellent		26-50%	18	9	26-50%	Moderate	<10 ft.	>95%	3	26-50%	5	>40%	0-10%	No
	2008		Moderate		1.3	14	1	1.6	2.8	Excellent		26-50%	16	8	26-50%	Moderate	<10 ft.	>95%	3	26-50%	7	>40%	0-10%	No
	2009		Moderate		1.6	11	1	1.7	2.5	Excellent		26-50%	16	8	26-50%	Moderate	<10 ft.	>95%	3	26-50%	6	>40%	0-10%	No
	2002		Moderate		2.0		4	4.0	4.0			76 4000/	F	E	76 4000/	Madaut	10.05.4	75.050/	10	E4 750/	45	15 400/	0.40%	Ve-
	2003		woderate		3.0		1	1.0	1.0	Poor		10-100%	5	5	10-100%	woderate	10-20 II.	10-90%	10	31-75%	61	13-40%	0-10%	TES
	2004		Excellent		2.2	11	0	0.0	0.0	Poor		76 - 100%	4	3	76-100%	Moderate	10-25 ft.	75-95%	10	51-75%	18	15-40%	0-10%	Yes
	2005		Excellent		2.1	10	1	1.0	1.0	Poor		76 - 100%	6	4	76-100%	Moderate	10-25 ft.	75-95%	9	76-100%	20	>40%	0-10%	Yes
Sunset Pond	2006	0%	Moderate	75%	2.6	11	1	1.0	1.0	Poor	25%	76 - 100%	7	4	76-100%	Moderate	10-25 ft.	75-95%	9	76-100%	19	>40%	0-10%	No
	2007		Excellent		1.9	12	1	1.0	1.0	Moderate		76-100%	11	6	76-100%	Moderate	10-25 ft.	75-95%	8	76-100%	19	>40%	0-10%	No
	2000	1	Excellent		1 8	10	1	20	3.0	Poor		76-100%	10	5	76-100%	Moderate	10-25 #	75-05%	5	76-100%	15	~10%	0-10%	No
	2000		Excenent		1.0	10		2.0	3.0	Puol		70-100%	10	5	10-100%	moderate	10=20 IL.	10-90%		10-100%	10	24070	0-10%	
L	2009		Moderate		2.2	11	1	3.0	3.0	Poor	<u> </u>	76-100%	10	5	76-100%	Moderate	10-25 ft.	75-95%	6	76-100%	17	>40%	0-10%	Yes

Appendix C: 2003-2009 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

The following footnotes pertain to 2003-2009 data.

¹Overall Submergent Vegetative Quality rating is the average of the exotic species density, macrophyte density, and total number of native: >0.66 = Excellent, 0.33-0.66 = Moderate, <0.33 = Poor.

Overall Submergent Vegetative Quality	Avg. Exotic Species Density	Exotic Species Density/ Occurrence Rating Score	Avg. Macrophyte Density	Avg. Macrophyte Density Rating Score	Total Number of Native Species In Submergent Zone	Species Richness Rating	Total Overall Diversity Score
Poor	>2.0	0.1	0.0 - 1.0 and >3.0	0.1	<9	0.1	< 0.33
Moderate	>0 - 2.0	0.5	1.0 - 1.5 and > 2.5 to 3.0	0.5	9-14	.2575	0.33 - 0.66
Excellent	0	1.0	1.5 to 2.5	1.0	>14	1.0	> 0.66

²Plant occurrence ratings are a relative measure of the amount of native submergent vegetation with a scale from 1 to 5; 1 = lowest density (present on only 1 of 4 casts), 5 = highest density (hook full of vegetation on 4 of 4 casts).

³Density data for Crystal, Keller, and Orchard Lakes were collected by Blue Water Science. Numerous sample plots were conducted over the entire water body. A density scale of 1 to 4 was utilized (max = 4) by estimating the amount of vegetation obtained by rake casts and also transforming visual observations. ⁴Maximum exotic plant occurrence 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 Crystal, Keller and Orchard Lakes is based on a detailed survey conducted by Blue Water Science; and for Kingsley Lake, Lac Lavon, and Sunset Pond, based on a survey by Barr Engineering and volunteers. The survey of the 3 water bodies conducted by Blue Water Science involved the sampling of numerous sample plots or stations. The survey for Lac Lavon, Kingsley, and Sunset Pond is based on 3 sampling locations and a visual survey during travels on the water body: <7 = Poor, 7-14 = Moderate, >14 = Excellent.

⁶Emergent Zone Vegetative Quality is the average of the following parameters within the emergent zone: the approximate total percent coverage, the total number of native wetland species, and the percent coverage of exotic species: >0.66 = Excellent, 0.33-0.66 = Moderate, <0.33 = Poor.

Emergent Zone Vegetative Quality	Percent Cover	Percent Cover Rating Score	Total Number of Native Wetland Plants	Number of Native Wetland Plants Rating Score	Percent Cover of Exotics	Percent Cover of Exotics Rating Score	Overall Emergent Zone Quality Score
Poor	0-25%	0.1	<or= 5<="" td=""><td>0.1</td><td>76-100%</td><td>0.1</td><td>< 0.33</td></or=>	0.1	76-100%	0.1	< 0.33
Moderate	76-100% or 26-50%	0.5	>5 - 15	0.66 - 0.33	26-75%	.3366	0.33 - 0.66
Excellent	51-75%	1.0	> 15	1.0	0-25%	1.0	> 0.66

⁷Approximate Total Percent Vegetative Cover Within the Entire Emergent Zone (0-2 ft. depth) is estimated based on the three sampling locations and a visual survey during travels around the water body. Estimates are broken into four categories: 0-25%=Poor, 26-50%=Moderate, 51-75%=Excellent, 76-100%=Moderate. ⁸The Total Number of Native Wetland Plant Species within the emergent zone is based on 3 sampling locations and a visual survey during travels on the water body: 0-5 = Poor, 6-15 = Moderate, >15 = Excellent.

⁹Total Exotic Emergent Percent Coverage, out of the entire emergent zone area, is estimated based on the three sampling locations and a visual survey during travels around the water body. Estimates are broken into four categories: 0-25%=Excellen(1.0), 26-50%=Moderate(0.5), 51-75%=Poor(0.0), 76-100%=Poor(0.1) ¹⁰Overall Upland Buffer Quality is determined based on the average of the four upland buffer quality parameters, with the exception of the number of exotic species present and the number of native plant species: >0.66 = Excellent, 0.33-0.66 = Moderate, <0.66 = Poor.

					Buffer Width		Buffer Continuity Percent		
Overall Upland Buffer Quality	Percent Cover	Percent Cover Rating Score	Exotics Percent Cover Range	Exotics Percent Cover Rating Score	Range	Buffer Width Rating Score	Range	Buffer Continuity Rating Score	Overall Upland Buffer QualityScore
Poor	<75%	0.1	>40%	0.1	<10 ft.	0.1	0-25%	0.1	< 0.33
Moderate	75-95%	0.5	15-40%	0.5	10-50 ft.	0.4 - 0.7	25-75%	.47	0.33 - 0.66
Excellent	>95%	1.0	<15%	1.0	>50 ft.	1.0	76-100%	1.0	> 0.66

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: 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 3 sampling locations and a visual survey.

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: 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%.

¹⁷The 2006 plant occurrence rating is lower (has improved), when compared to past assessment years primarily due to the low occurrence of additional plants found during a more detailed survey of the lake. The more detailed plant survey was conducted to better understand the extent of curlyleaf pondweed. ¹⁸The number of plant species documented in 2006, when compared to past assessment years, increased primarily due to additional plants found during a more detailed survey of the lake. The more detailed plant survey was conducted to better understand the extent of curlyleaf pondweed.

¹⁹The number of native submergent plant species documented in 2006, was incorrectly represented as 11 in the 2006 annual report. The actual number of native submergent plant species documented in 2006 was 10.

²⁰Native plant species were noted by the Minnesota Department of Natural Resouces during an October 25, 2007 macropyte survey and used in the 2007 annual report.

Rating Code: Poor Moderate Excellent

Table 1: Orchard Lake 2012 and 2017 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

		Submergent Zone												
Monitoring Year	Approximate Proportion of the	Queen	Approximate Proportion of Water Body	Native	Species			Exotic Species						
Year	Water Body Which is Deep Water Habitat (~ > 20 ft. depth)	Overall Submergent Zone Quality ¹	Typically Dominated By Submergent Vegetation (~ 2 - 20 ft. depth)	Average Native Plant Density Rating ^{2,3}	Total Number of Native Species ⁵	Mean Coefficient of Conservatism Value	Total Number of Species	Average Exotic Plant Density Rating ^{2, 3}	Maximum Exotic Plant Density Rating ⁴					
2012	20%	Moderate	75%	2.0 (Moderate)	13 (High)	5.4 (Moderate)	1	1.7 (Moderate)	3.0 (Poor)					
2017	20%	High	75%	1.2 (Excellent)	16 (Excellent)	5.2 (Moderate)	2	1.1 (Moderate)	1.5 (Moderate)					

	Emergent Zone												
Monitoring Year	Overall Emergent	Approximate Proportion of Emergent Zone	Approximate Total Percent Vegetative	Total Number of Native	Mean Coefficient of	Exotic Species							
	Zone Quality ⁶	(0 - 2 ft. depth) Within The Water Body	Cover Within The Entire Emergent Zone ⁷	Wetland Plant Species ⁸	Conservatism Value	Number of Species	Total Exotic Emergent Percent Coverage ⁹						
2012	Moderate	5%	26-50% (Moderate)	43 (Excellent)	3.1 (Moderate)	12	51-75% (Moderate)						
2017	Moderate	15%	51-75% (High)	50 (Excellent)	2.7 (Poor)	13	51-75% (Moderate)						

				Erosion/Se	dimentation					
Monitoring Year	Overall Upland	Unmanicured	Estimated Total Vegetative Cover	Total Number of Native Plant	Mean Coefficient of	Buffer Continuity (Percent Surrounding	Exotic	Species	cies Shoreline Erosion (Percent Percent of Total	Sediment Deltas
	Buffer Quality ¹⁰	Buffer Width''	(Percent Range) ¹²	Species ¹³	Conservatism Value	Water Body) ¹⁴	Number of Species	Percent of Total Coverage ¹⁵	of Shoreline) ¹⁶	(Yes/No)
2012	Poor	<10 ft. (Poor)	>95% (High)	19 (Moderate)	1.6 (Poor)	0-25% (Poor)	20	>40% (Poor)	0-10%	No
2017	Moderate	<10 ft. (Poor)	>95% (High)	25 (High)	1.9 (Poor)	0-25% (Poor)	21	>40% (Poor)	0-10%	No

P:\Mpls\23 MN\19\2319457\WorkFiles\hab\2017 Orchard\working documents\BDWMO_hab_ind_tables_2017.xls\Table1 Orchard 2012+2017

Table 1: Orchard Lake 2017 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

The following changes were made to the 2011 - 2017 monitoring and analysis:

- Monitor one or two water bodies per year. Kingsley Lake in 2011 Conduct a meandering survey of submergent, emergent, and upland buffer zones rather than monitoring of plot locations. Orchard Lake in 2012, Crystal Lake in 2013, Lac Lavon in 2014, Keller Lake in 2015, Kingsley Lake in 2016, Orchard Lake in 2017 - 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 2017 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

The following footnotes pertain to 2011 through 2017 data:

¹Overall 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.

								C-Value	
					Total Number		Mean	Rating	
					of Native	Species	Coefficient of	(using	Total Overall
Overall	Avg. Exotic	Exotic Plant	Avg. Native	Avg. Native	Species In	Richness	Conservatism	MPCA	Submergent
Submergent	Plant	Density Rating	Plant	Plant Density	Submergent	Rating	Value (C-	values,	Zone Quality
Zone Quality	Density	Score	Density	Rating Score	Zone	Score	Value)	2007)	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 4 according to MN DNR methodology. The rating system is based on a 1 to 3 scale. Therefore the density results were converted to match the rating system.

³Density data for Orchard Lake were collected by Blue Water Science using a stratified line transect 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 Orchard Lake was collected by Blue Water Science using a stratified line transect survey. The additional category of "High" was added in 2011 through 2017 and values were adjusted to: <7 = Poor, 7-9 = Moderate, 9-14 = High, >14 = Excellent. ⁶Overall 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.

						Percent	Mean		
Overall		Percent	Total Number	Number of		Cover of	Coefficient of	C-Value	Overall
Emergent		Cover	of Native	Native Wetland	Percent	Exotics	Conservatism	Rating (using	Emergent
Zone	Percent	Rating	Wetland Plant	Plant Species	Cover of	Rating	Value (C-	MPCA	Zone Quality
Quality	Cover	Score	Species	Rating Score	Exotics	Score	Value)	values, 2007)	Score
Poor	0-25%	0.1	< or= 5	0.1	76-100%	0.1	0 - <3	0.10	< 0.33
	76-100% or								
Moderate	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: Orchard Lake 2017 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 three sampling locations and a visual survey during travels around the water body. 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 3 sampling locations, a meandering visual survey during travels on the water body, and 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 meandering visual survey during travels on the water body, and 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)

¹⁰Overall 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.

										C-Value		Number	
				Exotics					Mean	Rating		of	Overall
Overall		Percent	Exotics	Percent		Buffer	Buffer	Buffer	Coefficient of	(using	Number	Native	Upland
Upland		Cover	Percent	Cover	Buffer	Width	Continuity	Continuity	Conservatism	MPCA	of	Species	Buffer
Buffer	Percent	Rating	Cover	Rating	Width	Rating	Percent	Rating	Value (C-	values,	Native	Rating	Quality
Quality	Cover	Score	Range	Score	Range	Score	Range	Score	Value)	2007)	Species	Score	Score
Deer	.750/	0.1	. 400/	0.4	.40.4	0.4	0.050/	0.1	00	0.10		0.1	. 0. 00
Poor	<75%	0.1	>40%	0.1	<10 ft.	0.1	0-25%	0.1	0 - <3	0.10	<5	0.1	< 0.33
													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	0.66
													0.67 -
High	>95%	1.0	<15%	1.0	25-50 ft.	0.7	51-75%	0.7	>6 - <9	0.75	20-30	0.66	0.80
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 upmanicured upland buffer zone is based on two plot locations and a meandering visual survey along the

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 1: Crystal Lake 2013 and 2018 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

		Submergent Zone Sampling												
Monitoring	Approximate Proportion of the	Overall	Approximate Proportion of Water	Native	Species		Exotic Species							
Monitoring Year	Water Body Which is Deep Water Habitat (~ > 20 ft. depth)	Submergent Zone Quality ¹	Body Typically Dominated By Submergent Vegetation (~ 2 - 20 ft. depth)	Average Native Plant Density Rating ^{2,3}	Total Number of Native Species ⁵	Mean Coefficient of Conservatism Value	Total Number of Species	Average Exotic Plant Density Rating ^{2, 3}	Maximum Exotic Plant Density Rating ⁴					
2013	15%	High	80%	1.2 (Excellent)	18 (Excellent)	4.9 (Moderate)	2	1.8 (Moderate)	2.2 (Poor)					
2018	18 15% High 80%			1.2 (Excellent)	15 (Excellent)	5.0 (Moderate)	2	1.2 (Moderate)	1.4 (Moderate)					

		Vegetated Emergent Zone Sampling											
Monitoring Year	Overall Emergent	Approximate Proportion of Emergent	Approximate Total Percent Vegetative	Total Number of Native	Mean Coefficient of	Exotic Sp	ecies						
	Zone Quality ⁶	Zone (0 - 2 ft. depth) Within The Water Body	Cover Within The Entire Emergent Zone ⁷	Wetland Plant Species ⁸	Conservatism Value	Number of Species	Total Exotic Emergent Percent Coverage ⁹						
2013	High	5%	26-50% (Moderate)	36 (Excellent)	3.0 (Moderate)	10	26-50% (High)						
2018	High	5%	26-50% (Moderate)	50 (Excellent)	3.3 (Moderate)	9	26-50% (High)						

				Upland Bu	Iffer Sampling				Erosion/Sedimentation	
Monitoring Year	Overall Upland	Unmanicured Buffer	Estimated Total Vegetative Cover	Total Number of Native Plant	Mean Coefficient of	Buffer Continuity (Percent	Exotic	c Species	Shoreline Erosion	Sediment Deltas
	Buffer Quality ¹⁰	Width ¹¹	(Percent Range) ¹²	Species ¹³	Conservatism Value	Surrounding Water Body) ¹⁴	Number of Species	Percent of Total Coverage ¹⁵	(Percent of Shoreline) ¹⁶	(Yes/No)
2013	Moderate	<10 ft. (Poor)	>95% (High)	39 (Excellent)	2.6 (Poor)	26-50% (Moderate)	16	15-40% (Moderate)	0-10%	No
2018	Moderate	<10 ft. (Poor)	>95% (High)	54 (Excellent)	2.7 (Poor)	26-50% (Moderate)	20	15-40% (Moderate)	0-10%	No

P:\Mpls\23 MN\19\2319457\WorkFiles\hab\2018_Crystal\working documents\BDWMO_hab_ind_tables_2018.xls\Table1 Crystal 2013+2018

Table 1: Crystal Lake 2018 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

The following changes were made to the 2011 - 2018 monitoring and analysis:

- Monitor one or two water bodies per year. Kingsley Lake in 2011 and 2016, Orchard Lake in 2012 and 2017, Crystal Lake in 2013 and 2018, Lac Lavon in 2014, Keller Lake in 2015 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 2018 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

The following footnotes pertain to 2011 through 2018 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.

								C-Value	
					Total Number		Mean	Rating	
					of Native	Species	Coefficient of	(using	Total Overall
Overall	Avg. Exotic	Exotic Plant	Avg. Native	Avg. Native	Species In	Richness	Conservatism	MPCĂ	Submergent
Submergent	Plant	Density Rating	Plant	Plant Density	Submergent	Rating	Value (C-	values,	Zone Quality
Zone Quality	Density	Score	Density	Rating Score	Zone	Score	Value)	2007)	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 Orchard Lake were collected by Blue Water Science using a stratified line transect 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 Orchard Lake was collected by Blue Water Science using a stratified line transect survey. The additional category of "High" was added in 2011 through 2018 and values were adjusted to: <7 = Poor, 7-9 = Moderate, 9-14 = High, >14 = Excellent. ⁶Overall 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.

						Percent	Mean		
Overall		Percent	Total Number	Number of		Cover of	Coefficient of	C-Value	Overall
Emergent		Cover	of Native	Native Wetland	Percent	Exotics	Conservatism	Rating (using	Emergent
Zone	Percent	Rating	Wetland Plant	Plant Species	Cover of	Rating	Value (C-	MPCA	Zone Quality
Quality	Cover	Score	Species	Rating Score	Exotics	Score	Value)	values, 2007)	Score
Poor	0-25%	0.1	< or= 5	0.1	76-100%	0.1	0 - <3	0.10	< 0.33
	76-100% or								
Moderate	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: Crystal Lake 2018 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 three sampling locations and a visual survey during travels around the water body. 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 3 sampling locations, a meandering visual survey during travels on the water body, and 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 meandering visual survey during travels on the water body, and 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)

¹⁰Overall 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.

										C-Value		Number	
				Exotics					Mean	Rating		of	Overall
Overall		Percent	Exotics	Percent		Buffer	Buffer	Buffer	Coefficient of	(using	Number	Native	Upland
Upland		Cover	Percent	Cover	Buffer	Width	Continuity	Continuity	Conservatism	MPCA	of	Species	Buffer
Buffer	Percent	Rating	Cover	Rating	Width	Rating	Percent	Rating	Value (C-	values,	Native	Rating	Quality
Quality	Cover	Score	Range	Score	Range	Score	Range	Score	Value)	2007)	Species	Score	Score
Deer	.750/	0.1	. 400/	0.4	.40.4	0.4	0.050/	0.1	00	0.10		0.1	. 0. 00
Poor	<75%	0.1	>40%	0.1	<10 ft.	0.1	0-25%	0.1	0 - <3	0.10	<5	0.1	< 0.33
													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	0.66
													0.67 -
High	>95%	1.0	<15%	1.0	25-50 ft.	0.7	51-75%	0.7	>6 - <9	0.75	20-30	0.66	0.80
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 upmanicured upland buffer zone is based on two plot locations and a meandering visual survey along the

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 1: Lac Lavon 2014 and 2019 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

		Submergent Zone Sampling												
Monitoring	Approximate Proportion of the	0 "	Approximate Proportion of Water	Native	Species		Exotic Species							
Monitoring Year V	Proportion of the Water Body Which is Deep Water Habitat (~ > 20 ft. depth)		Body Typically Dominated By Submergent Vegetation (~ 2 - 20 ft. depth)	Average Native Plant Density Rating ^{2,3}	Total Number of Native Species ⁵	Mean Coefficient of Conservatism Value	Total Number of Species	Average Exotic Plant Density Rating ^{2, 3}	Maximum Exotic Plant Density Rating ⁴					
2014	25%	Moderate	70%	1.4 (Moderate)	12 (Hlgh)	4.6 (Moderate)	2	2.0 (Moderate)	3.0 (Poor)					
2019	25%	Moderate	70%	1.5 (Moderate)	12 (Hlgh)	4.5 (Moderate)	2	1.7 (Moderate)	3.0 (Poor)					

	Vegetated Emergent Zone Sampling											
Monitoring Year	Overall Emergent	Approximate Proportion of Emergent	Approximate Total Percent Vegetative	Total Number of	Mean Coefficient	Exotic Sp	ecies					
	Zone Quality ⁶	Zone (0 - 2 ft. depth) Within The Water Body	Cover Within The Entire Emergent Zone ⁷	Native Wetland Plant Species ⁸	of Conservatism Value	Number of Species	Total Exotic Emergent Percent Coverage ⁹					
2014	Moderate	5%	0-25% (Poor)	32 (Excellent)	2.3 (Poor)	15	26-50% (High)					
2019	Moderate	5%	0-25% (Poor)	38 (Excellent)	2.4 (Poor)	17	26-50% (High)					

				Upland B	uffer Sampling				Erosion/Sedimentation		
Monitoring Year	Overall Upland	Unmanicured Buffer	Estimated Total Vegetative Cover	Total Number of Native Plant	Mean Coefficient	Buffer Continuity (Percent	Exotic	Exotic Species		Sediment Deltas	
	Buffer Quality ¹⁰	Width ¹¹	(Percent Range) ¹²	Species ¹³	Value	Surrounding Water Body) ¹⁴	Number of Species	Percent of Total Coverage ¹⁵	of Shoreline) ¹⁶	(Yes/No)	
2014	Poor	<10 ft. (Poor)	>95% (High)	32 (Excellent)	1.3 (Poor)	0-25% (Poor)	31	>40% (Poor)	0-10%	No	
2019	Poor	<10 ft. (Poor)	75-95% (Moderate)	56 (Excellent)	2.0 (Poor)	0-25% (Poor)	41	>40% (Poor)	0-10%	No	

Table 1: Lac Lavon 2019 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

The following changes were made to the 2011 - 2019 monitoring and analysis:

- Monitor one or two water bodies per year. Kingsley Lake in 2011 and 2016, Orchard Lake in 2012 and 2017, Crystal Lake in 2013 and 2018, Lac Lavon in 2014 and 2019, Keller Lake in 2015 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 2019 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

The following footnotes pertain to 2011 through 2019 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.

								C-Value	
					Total Number		Mean	Rating	
					of Native	Species	Coefficient of	(using	Total Overall
Overall	Avg. Exotic	Exotic Plant	Avg. Native	Avg. Native	Species In	Richness	Conservatism	MPCA	Submergent
Submergent	Plant	Density Rating	Plant	Plant Density	Submergent	Rating	Value (C-	values,	Zone Quality
Zone Quality	Density	Score	Density	Rating Score	Zone	Score	Value)	2007)	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 Lac Lavon were collected by Matt Berg using a point intercept 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 Lac Lavon was collected by Matt Berg using a point intercept survey.

The additional category of "High" was added in 2011 through 2019 and values were adjusted to: <7 = Poor, 7-9 = Moderate, 9-14 = High, >14 = Excellent.⁶Overall 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.

						Percent	Mean		
Overall		Percent	Total Number	Number of		Cover of	Coefficient of	C-Value	Overall
Emergent		Cover	of Native	Native Wetland	Percent	Exotics	Conservatism	Rating (using	Emergent
Zone	Percent	Rating	Wetland Plant	Plant Species	Cover of	Rating	Value (C-	MPCA	Zone Quality
Quality	Cover	Score	Species	Rating Score	Exotics	Score	Value)	values, 2007)	Score
Poor	0-25%	0.1	< or= 5	0.1	76-100%	0.1	0 - <3	0.10	< 0.33
	76-100% or								
Moderate	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: Lac Lavon 2019 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 three sampling locations and a visual survey during travels around the water body. 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 3 sampling locations, a meandering visual survey during travels on the water body, and 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 meandering visual survey during travels on the water body, and 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)

¹⁰Overall 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.

										C-Value		Number	
				Exotics					Mean	Rating		of	Overall
Overall		Percent	Exotics	Percent		Buffer	Buffer	Buffer	Coefficient of	(using	Number	Native	Upland
Upland		Cover	Percent	Cover	Buffer	Width	Continuity	Continuity	Conservatism	MPCA	of	Species	Buffer
Buffer	Percent	Rating	Cover	Rating	Width	Rating	Percent	Rating	Value (C-	values,	Native	Rating	Quality
Quality	Cover	Score	Range	Score	Range	Score	Range	Score	Value)	2007)	Species	Score	Score
Deer	.750/	0.1	× 400/	0.1	-10.#	0.1	0.059/	0.1	0 .2	0.10	Æ	0.1	. 0. 22
Poor	5%</th <th>0.1</th> <th>>40%</th> <th>0.1</th> <th><10 II.</th> <th>0.1</th> <th>0-25%</th> <th>0.1</th> <th>0 - <3</th> <th>0.10</th> <th><5</th> <th>0.1</th> <th>< 0.33</th>	0.1	>40%	0.1	<10 II.	0.1	0-25%	0.1	0 - <3	0.10	<5	0.1	< 0.33
													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	0.66
													0.67 -
High	>95%	1.0	<15%	1.0	25-50 ft.	0.7	51-75%	0.7	>6 - <9	0.75	20-30	0.66	0.80
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 1: Keller Lake 2015 and 2020 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

		Submergent Zone											
Monitor	Approximate	e	Approximate Proportion of Water	Native	Native Species		Exotic Species						
Year	Water Body Whi is Deep Water Habitat (~ > 20 depth)	t. Overall Submergent Zone Quality ¹	Body Typically Dominated By Submergent Vegetation (~ 2 - 20 ft. depth)	Average Native Plant Density Rating ^{2,3}	Total Number of Native Species ⁵	Mean Coefficient of Conservatism Value	Total Number of Species	Average Exotic Plant Density Rating ^{2, 3}	Maximum Exotic Plant Density Rating ⁴				
2015	0%	Poor	90%	1.3 (Moderate)	2 (Poor)	1.5 (Poor)	2	1.8 (Moderate)	2.2 (Poor)				
2020	0%	Moderate	90%	1.2 (Excellent)	2 (Poor)	1.5 (Poor)	2	1.8 (Moderate)	2.3 (Poor)				

		Vegetated Emergent Zone											
Monitoring Year	Overall Emergent	Approximate Proportion of	Approximate Total Percent Vegetative	Total Number of Native	Mean Coefficient	Exotic Sp	ecies						
	Zone Quality ⁶	(0 - 2 ft. depth) Within The Water Body	Cover Within The Entire Emergent Zone ⁷	Wetland Plant Species ⁸	of Conservatism Value	Number of Species	Total Exotic Emergent Percent Coverage ⁹						
2015	High	10%	51-75% (High)	28 (Excellent)	2.3 (Poor)	8	26-50% (High)						
2020	High	10%	51-75% (High)	36 (Excellent)	2.4 (Poor)	10	26-50% (High)						

				Uplar	nd Buffer				Erosion/Sedimentation	
Monitoring Year	Overall Upland	Unmanicured	Estimated Total Vegetative Cover	Total Number of Native Plant	Mean Coefficient	Buffer Continuity (Percent	Exotic	c Species	Shoreline Erosion (Percent	Sediment Deltas
	Buffer Quality ¹⁰	Buffer Width ¹¹	(Percent Range) ¹²	Species ¹³	Value	Surrounding Water Body) ¹⁴	Number of Species	Percent of Total Coverage ¹⁵	of Shoreline) ¹⁶	(Yes/No)
2015	Moderate	25-50 ft. (High)	>95% (High)	20 (Moderate)	1.6 (Poor)	76-100% (Excellent)	10	>40% (Poor)	0-10%	No
2020	Moderate	25-50 ft. (High)	>95% (High)	42 (Excellent)	1.8 (Poor)	51-75% (High)	29	>40% (Poor)	0-10%	No

Table 1: Keller Lake 2020 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

The following changes were made to the 2011 - 2020 monitoring and analysis:

- Monitor one or two water bodies per year. Kingsley Lake in 2011 and 2016, 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 2020 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

The following footnotes pertain to 2011 through 2020 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.

								C-Value	
					Total Number		Mean	Rating	
					of Native	Species	Coefficient of	(using	Total Overall
Overall	Avg. Exotic	Exotic Plant	Avg. Native	Avg. Native	Species In	Richness	Conservatism	MPCA	Submergent
Submergent	Plant	Density Rating	Plant	Plant Density	Submergent	Rating	Value (C-	values,	Zone Quality
Zone Quality	Density	Score	Density	Rating Score	Zone	Score	Value)	2007)	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 Keller Lake were collected by Blue Water Science using a point intercept 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 Keller Lake was collected by Blue Water Science using a point intercept survey. The additional category of "High" was added in 2011 through 2020 and values were adjusted to: <7 = Poor, 7-9 = Moderate, 9-14 = High, >14 = Excellent. ⁶Overall 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.

0		Dennet				Percent	Mean		
Overall		Percent	Total Number	Number of	D	Cover of	Coefficient of	C-value	Overall
Emergent		Cover	of Native	Native Wetland	Percent	EXOTICS	Conservatism	Rating (using	Emergent
Zone	Percent	Rating	Wetland Plant	Plant Species	Cover of	Rating	Value (C-	MPCA	Zone Quality
Quality	Cover	Score	Species	Rating Score	Exotics	Score	Value)	values, 2007)	Score
Poor	0-25%	0.1	< or= 5	0.1	76-100%	0.1	0 - <3	0.10	< 0.33
	76-100% or								
Moderate	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: Keller Lake 2020 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 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)

¹⁰Overall 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.

										C-Value		Number	
				Exotics					Mean	Rating		of	Overall
Overall		Percent	Exotics	Percent		Buffer	Buffer	Buffer	Coefficient of	(using	Number	Native	Upland
Upland		Cover	Percent	Cover	Buffer	Width	Continuity	Continuity	Conservatism	MPCA	of	Species	Buffer
Buffer	Percent	Rating	Cover	Rating	Width	Rating	Percent	Rating	Value (C-	values,	Native	Rating	Quality
Quality	Cover	Score	Range	Score	Range	Score	Range	Score	Value)	2007)	Species	Score	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
													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	0.66
													0.67 -
High	>95%	1.0	<15%	1.0	25-50 ft.	0.7	51-75%	0.7	>6 - <9	0.75	20-30	0.66	0.80
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 1: Kingsley Lake 2011 - 2021 Habitat Assessment Monitoring Results Black Dog Watershed Management Organization

					Submergent	Zone			
Monitoring	Approximate Proportion of the	0	Approximate Proportion of Water Body	Native	Species			Exotic Species	
Year	Water Body Which is Deep Water Habitat (~ > 20 ft. depth)	Overall Submergent Zone Quality ¹	Typically Dominated By Submergent Vegetation (~ 2 - 20 ft. depth)	Average Native Plant Density Rating ^{2,3}	Total Number of Native Species ⁵	Mean Coefficient of Conservatism Value	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)

				Emergent Zor	ne		
Monitoring Year	Overall Emergent	Approximate Proportion of Emergent Zone	Approximate Total Percent Vegetative	Total Number of	Mean Coefficient of	Exotic Spe	ecies
	Zone Quality ⁶	Emergent Zone (0 - 2 ft. depth) Within The Water Body Zone ⁷		Native Wetland Plant Species ⁸	Conservatism Value	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)

				Ur	bland Buffer				Erosion/Sedimentation	
Monitoring Year	Overall Upland	Unmanicured	Unmanicured Cover (Percent		Mean Coefficient of	Buffer Continuity (Percent Surrounding	Exo	tic Species	Shoreline Erosion (Percent	Sediment Deltas
	Buffer Quality ¹⁰	Buffer Width ¹¹	Cover (Percent Range) ¹²	Species ¹³	Conservatism Value	Water Body) ¹⁴	Number of Species	Percent of Total Coverage ¹⁵	 Erosion/S Shoreline Erosion (Percer of Shoreline)¹⁶ 0-10% 0-10% 	(Yes/No)
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

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.

								C-Value	
					Total Number		Mean	Rating	
					of Native	Species	Coefficient of	(using	Total Overall
Overall	Avg. Exotic	Exotic Plant	Avg. Native	Avg. Native	Species In	Richness	Conservatism	MPCA	Submergent
Submergent	Plant	Density Rating	Plant	Plant Density	Submergent	Rating	Value (C-	values,	Zone Quality
Zone Quality	Density	Score	Density	Rating Score	Zone	Score	Value)	2007)	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.⁶Overall 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.

						Percent	Mean		
Overall		Percent	Total Number	Number of		Cover of	Coefficient of	C-Value	Overall
Emergent		Cover	of Native	Native Wetland	Percent	Exotics	Conservatism	Rating (using	Emergent
Zone	Percent	Rating	Wetland Plant	Plant Species	Cover of	Rating	Value (C-	MPCA	Zone Quality
Quality	Cover	Score	Species	Rating Score	Exotics	Score	Value)	values, 2007)	Score
Poor	0-25%	0.1	< or= 5	0.1	76-100%	0.1	0 - <3	0.10	< 0.33
	76-100% or								
Moderate	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)

¹⁰Overall 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.

										C-Value		Number	
				Exotics					Mean	Rating		of	Overall
Overall		Percent	Exotics	Percent		Buffer	Buffer	Buffer	Coefficient of	(using	Number	Native	Upland
Upland		Cover	Percent	Cover	Buffer	Width	Continuity	Continuity	Conservatism	MPCA	of	Species	Buffer
Buffer	Percent	Rating	Cover	Rating	Width	Rating	Percent	Rating	Value (C-	values,	Native	Rating	Quality
Quality	Cover	Score	Range	Score	Range	Score	Range	Score	Value)	2007)	Species	Score	Score
Deer	750/	0.4	100/	0.4	40.0	0.4	0.05%	0.4		0.40	_	0.4	0.00
Poor	5%</th <th>0.1</th> <th>>40%</th> <th>0.1</th> <th><10 ft.</th> <th>0.1</th> <th>0-25%</th> <th>0.1</th> <th>0 - <3</th> <th>0.10</th> <th><5</th> <th>0.1</th> <th>< 0.33</th>	0.1	>40%	0.1	<10 ft.	0.1	0-25%	0.1	0 - <3	0.10	<5	0.1	< 0.33
													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	0.66
													0.67 -
High	>95%	1.0	<15%	1.0	25-50 ft.	0.7	51-75%	0.7	>6 - <9	0.75	20-30	0.66	0.80
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%.

Appendix D

2003–2021 Recommended and Completed Management Actions

Table D-1: 2009 Recommended and Completed Management Actions Black Dog Watershed Management Organization Habitat Monitoring

Strategic Water Body	Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Completed 2004-2009 Actions Which May Improve Wildlife Habitat and/or Water Quality		
	Unmanicured, native vegetation in adjacent upland and emergent zone is narrow and not continuous. limiting wildlife benefits.	 Increase width and continuity of native upland buffer and emergent zone. 	Conduct an educational workshop and lakescaping demonstration project. Assist lakeshore owners with funding and obtaining any needed MnDNR permits for potential upland buffer and emergent zone enhancements.	Inform/show lakeshore property owners how a native upland buffer and native emergent zone can improve functions and values of the lake and improve aesthetics.	Spring - Fall	2009: Operation of the ferric chloride treatment system halted due to low water levels. The City of Burnsville harvested curtyleaf pondweed. In late 2009, the City of Burnsville treated 14 acres of buckthorn within Crystal West		
Crystal			Restore sustainable native communities	Increase wildlife habitat.	Spring - Fall	Park. In 2009 and 2008, garlic mustard within the upland buffer was		
	Purple loosestrife is present.	2. Continue to control and manage purple loosestrife.	Control and manage. For large stands of purple loosestrife, contact the MnDNR to request a release of purple loosestrife-controlling beetles. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed.	Increase/maintain wildlife habitat.	Spring - Fall	conducted and contraction of the ferric chloride treatment system. The City of Burnsville: 1) excavated/enhanced four stormwater treatment ponds (including West Buck Hill Park), which reduced the phosphorus loading into the lake, and 2) conducted annual harvesting of Eurasian watermilfoil and curlyleaf		
	Curlyleaf pondweed is present.	3. Control curlyleaf pondweed	Control by harvesting or chemical treatment.	Maintain wildlife habitat.	Late Spring	pondweed. The City of Lakeville excavated/enhanced the Bluebill stormwater		
	Eurasian watermilfoil is present.	4. Control Eurasian watermilfoil.	Control by chemical treatment.	Maintain wildlife habitat.	Summer	aeament pond.		
	Unmanicured, native vegetation in adjacent upland is narrow and not continuous, limiting wildlife hearofite	1. Increase width and continuity of native upland buffer.	Conduct an educational workshop and lakescaping demonstration project. Assist lakeshore owners with funding of potential upland buffer enhancements.	Inform/show lakeshore property owners how a native upland buffer can improve functions and values of the lake and improve aesthetics.	Spring - Fall	In 2010 the City of Apple Valley may construct Whitney Pond for stormw.		
	widne benefits.		Restore sustainable native communities	Increase wildlife habitat.	Spring - Fall	operation of the ferric chloride treatment system halted and no harvesting of		
Keller Lake	Purple loosestrife is present.	2. Continue to control and manage purple loosestrife.	Control and manage. For large stands of purple loosestrife, contact the MnDNR to request a release of purple loosestrife-controlling beetles. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed.	Increase/maintain wildlife habitat.	Spring - Fall	curlyleaf pondweed was conducted. The City of Burnsville stabilized approximately one hundred feet of shoreline on the southeast edge of the lake. Logs were interfaced and secured along the shoreline and red-osier dogwood live stakes were installed along the eroding banks. 2004 - 2008:		
	Curlyleaf pondweed dominates the lake in late spring-early summer.	3. Continue control of curlyleaf pondweed.	Control as recommended by the MnDNR. Since the MnDNR designates Keller Lake as a "Natural Environment", a special permit is needed to chemically treat the lake.	s Maintain wildlife habitat.	Summer	The Cities of Apple Valley and Burnsville partnered to conduct annual harvesting of curtyleaf pondweed. 2005: The City of Apple Valley excava and enhanced Redwood Pond, which will decrease phosphorus loading		
	Eurasian watermilfoil is present.	4. Control Eurasian watermilfoil.	Control as recommended by the MnDNR. Since the MnDNR designates Keller Lake as a "Natural Environment", a special permit is needed to chemically treat the lake.	Maintain wildlife habitat.	Summer	Relier Lake. Also, in 2010 the City of Apple Valley may construct whitney Pond for stormwater treatment within the Keller Lake watershed.		
	Curlyleaf pondweed is present.	 Conduct a detailed late spring macrophyte survey to ascertain densities and extent of coverage. 	Consider control measures, dependent on results of an detailed early growing season survey.	Maintain wildlife habitat.	Late Spring	2005 - 2008: Annually, the City of Lakeville and members of the Kingsley Lake Homeowner's Association removed purple loosestrife plants and common buckthorn from portions of the lake and the upland buffer		
Kingsley Lake	Common buckthorn dominates portions of the upland buffer.	 Conduct an evaluation of common buckthorn, followed by removal. 	Remove buckthorn. Volunteer groups and contractors can effectively remove buckthorn by pulling, cutting, and treating stumps with herbicide.	Increase wildlife habitat.	Open	surrounding the lake. On March 6, 2008, soil sediment samples were collected on Kingsley Lake by Blue Water Science (BWS) and the City of Lake the Dard de the result of the part is parking the DI/C super trated		
	Purple loosestrife is present.	 Continue to control and manage purple loosestrife. 	Control and manage. For large stands of purple loosestrife, contact the MnDNR to request a release of purple loosestrife-controlling beetles. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed.	Increase/maintain wildlife habitat.	Spring - Fall	Lakewine: based on the results of the soli analysis, the bw'S report stated that "curlylesi pondweed is not expected to produce heavy growth condition: (where plants top out in a solid canopy) in Kingsley Lake." However, since curlyleaf pondweed may typically die-off prior to the early-lume habitat assessment, the peak density and percent total coverage of curlyleaf pondweed is uncertain. To date, it is unclear if curlyleaf pondweed densities and percent coverage have been relatively consistent or increasing within the lake over the last few years. In 2008, a Kingsley lakeshore resident, inspired by the Blue Thumb program, commenced shoreline stabilization utilizing native plants.		
	Hybrid cattail and reed canary grass are present.	4. Control hybrid cattail and reed canary grass.	Control hybrid cattail and reed canary grass now before colonies become more abundant. The herbicide Rodeo TM can be used to effectively control both invasive emergent species.	Increase/maintain wildlife habitat.	Spring-Summer			
	Eurasian watermilfoil dominates portions of the lake.	1. Continue to manage Eurasian watermilfoil.	Control by chemical treatment as recommended by MnDNR.	Increase/maintain wildlife habitat and water quality	Spring-Summer	2006: The Cities of Burnsville and Apple Valley and the lake homeowners		
Lac Lavon	Curlyleaf pondweed is present.	2. Monitor presence of curlyleaf pondweed.	Control if increased occurrence and subsequent midsummer die off threatens water quality)	Identify the problem before it becomes difficult to treat.	Spring	preview of unit a municule reaument for control of Eurasian Watermillor The treatment is expected to provide control of Eurasian watermilloil for years, while allowing native plant species to rebound. The cities have continued to inform the MnDNR of the ongoing treatments and the MnE		
	Unmanicured, native vegetation in adjacent upland is narrow and not continuous, limiting wildlife benefits	3. Increase width/creation of native upland buffer.	Conduct an educational workshop and lakescaping demonstration project. Assist lakeshore owners with funding of potential upland buffer enhancements.	Inform/show lakeshore property owners of how a native upland buffer can improve functions and values of the lake and improve aesthetics.	Spring - Fall	proposes to continue aquatic plant surveys to study the effects of whole-lake fluridone treatments. However, no MnDNR macrophyte survey was conducted in 2008.		
			Restore sustainable native communities	Increase wildlife habitat.	Spring - Fall			
	Curlyleaf pondweed dominates the lake in late spring-early summer.	 Continue curlyleaf pondweed control measures. 	Control and manage	Increase/maintain wildlife habitat and water quality.	Late Spring - Early summer	2009: The City of Lakeville conducted herbicide treatment for curlyleaf		
Orchard Lake	Unmanicured, native vegetation in adjacent upland is narrow and not continuous, limiting	2. Increase width and continuity of native upland buffer.	Conduct an educational workshop and lakescaping demonstration project. Assist lakeshore owners with funding of potential upland buffer enhancements.	Inform/show lakeshore property owners how a native upland buffer can improve functions and values of the lake and improve aesthetics.	Spring - Fall	pondweed within the northeast bay (~20 acres). The herbicide treatment resulted in lake-wide control of curlyleaf pondweed. 2004-2008: The City of Lakeville provided lakeshore owners with shoreline restoration information. However, to date, no plans have been made for potential future shoreline		
	wildlife benefits.		Restore sustainable native communities	Increase wildlife habitat. Spring - Fall		restoration projects. Annually, the City of Lakeville harvested approximately		
	Purple loosestrife is present.	 Conduct a detailed evaluation of purple loosestrife, followed by removal/control. 	Control and manage by hand-pulling if only a few plants are present or introduce beetles if numerous plants are present.	Increase/maintain wildlife habitat.	Spring - Summer	boat launch, was restored using native plants.		
Sunset Pond	Extensive algal bloom	1. Reduce phosphorus loading into the pond.	Construct/install: catch basin sumps, prefabricated treatment devices (e.g. Stormceptor), infiltration facilities within the watershed, or other more conventional methods. Conduct more frequent street sweepings.	Improve wildlife habitat, fishery habitat, and aesthetics/recreation.	Open			
	Maintained turf grass remains within portions of the upland buffer.	2. Enhance/maintain upland buffer.	Continue restoring sustainable native communities	Improve wildlife habitat and water quality.	Spring - Fall	In 2009, as in past years, the City of Burnsville actively managed the restored native buffer adjacent to the pond, the surrounding prairie restoration area.		
	Exotic species are dominant in emergent zone, and include narrow-leaf cattail, hybrid cattail, and reed canary grass.	3. Manage exotic species within emergent zone.	Selective herbicide treatments to reduce presence of exotic species	Allow for the establishment of more diverse native species that provide better wildlife values.	Spring - Fall	native obmet adjacent to the point, in the sufformating praine resubration area and portions of the emergent zone. Specifically, in 2007 through 2009 the City of Burnsville conducted spot spraying of invasive vegetation, such as reed canary grass, thistle, and purple loosestiffe. A prescription burn, inter- seeding of prairie species, and buckthorn removal were conducted in 2008 increase the plant diversity in the upland area.		
	Presence of curlyleaf pondweed observed in 2003 and 2005 through 2008.	 Conduct a late spring macrophyte survey to ascertain densities and extent of coverage. 	consider control measures dependent on the results of an early growing season survey.	Maintain wildlife habitat. Reduce down-stream phosphorus loading.	Late Spring			
	The southern portion of the pond is shallow (1 to 2 foot doop)	5. Create a "navigation channel".	Excavate and remove sediment.	Improve wildlife habitat, fishery habitat, and	Winter	1		

Table 2: 2011 Recommended and Completed Management Actions for Kingsley Lake Black Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Completed 2004-2009 Actions Which May Improve Wildlife Habitat and/or Water Quality	
Curlyleaf pondweed is present in some years.	Conduct a detailed late spring macrophyte survey to ascertain densities and extent of coverage.	Consider control measures, dependent on results of a detailed early growing season survey.	Maintain wildlife habitat.	Late Spring		
Common buckthorn dominates portions of the upland buffer.	Conduct an evaluation of common buckthorn, followed by removal.	Remove buckthorn. Volunteer groups and contractors can effectively remove buckthorn by pulling, cutting, and treating stumps with herbicide.	Increase wildlife habitat.	Open	2005 - 2008: Annually, the City of Lakeville and members of the Kingsley Lake Homeowner's	
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Control and manage. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed. Continue to request monitoring from the MnDNR to assure beetles are present and at appropriate populations for biological control.	Increase/maintain wildlife habitat.	Spring - Fall	Association removed purple loosestrife plants and common buckthorn 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 monitoring by the MnDNR indicates that beetles are present at a population that the MnDNR feels is	
Hybrid cattail and reed canary grass are present.	Control hybrid cattail and reed canary grass.	Control hybrid cattail and reed canary grass now before colonies become more abundant. The herbicide Rodeo [™] can be used to effectively control both invasive emergent species.	Increase/maintain wildlife habitat.	Spring-Summer	appropriate for biological control. 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	
Stormwater drainage from impervious surfaces is directed into the lake.	Redirect stormwater for infiltration prior to discharge.	Install a rainwater garden or other suitable method for infiltration.	Improve water quality	Open	heavy growth conditions (where plants top out in a solid canopy) in Kingsley Lake." However, since curlyleaf pondweed may typically die-off prior to the early-June habitat assessment, the peak density and percent total coverage of	
Bare soil on steep slope could cause erosion and sedimentation into lake.	Vegetate hillslope.	Plant vegetation suited for steep slopes along hillside to prevent erosion.	Improve water quality	Open	curlyleaf pondweed is uncertain. To date, it is unclear if curlyleaf pondweed densities and percent coverage have been relatively consistent or increasing within the lake over the last few years. In 2008, a Kingsley Lake	
Upland buffer areas lacking naturalized vegetation.	Improve the shoreline with a naturalized upland buffer.	Rather than manicured turf grass, gravel, and managed plantings with bare soil, the shoreline could be vegetated with native grasses and wildflowers. A landscape architect could create inviting spaces and views for restaurant customers to enjoy.	Increase wildlife habitat and Improve water quality	Open	Takeshore resident, inspired by the Blue Thumb program, commenced shoreline stabilization utilizing native plants.	
Emergent and upland buffer areas contain non-native invasive vegetation. Replace non-native invasive vegetation with native vegetation.		Treat non-native invasive vegeation and then seed with an appropriate BWSR seed mix.	Increase/maintain wildlife habitat.	Spring-Summer		
Table 2: 2012 Recommended and Completed Management Actions for Orchard Lake Black Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Completed 2004-2012 Actions Which May Improve Wildlife Habitat and/or Water Quality
Curlyleaf pondweed dominates the lake in late spring-early summer.	Continue curlyleaf pondweed control measures.	Continue to control and manage. See Figure 3 for locations of curlyleaf pondweed.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	
Upland buffer areas lacking naturalized vegetation within publicly owned properties.	Increase width and continuity of native upland buffer.	To expand on the shoreline restoration that was done near the boat launch in 2007, the adjacent upland buffer could also be restored to naturalized native vegetation and not mowed (Potential Restoration Area #1 as shown in Appendix A and Figure 5). In the Wayside Park Area, non-native invasive vegetation including common buckthorn, vetch, spotted knapweed, and cattails could be removed and replaced with native vegetation. The naturalized upland buffer could be widened (Potential Restoration Area #2 as shown in Appendix A and Figure 5). At the beach area, there is a timber wall which is currently being used for fishing. A shoreline restoration could be done in this area (Potential Resotration Area #3 as shown in Appendix A and Figure 5). On the northwest side of the lake, one property owned by the City of Lakeville (adjacent to residential shoreline properties) could be restored to naturalized vegetation and provide an example for adjacent residential landowners for shoreline and upland buffer restoration (Potential Restoration Area #4 as shown in Appendix A and Figure 5).	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	 1999 through 2012: The City of Lakeville conducts aquatic vegetation monitoring twice/year. 2009 through 2012: The City of Lakeville conducted annual herbicide treatment for curlyleaf pondweed. 2004 through 2008: Annually, the City of Lakeville harvested approximately 70 acres of curlyleaf pondweed. 2010: Adjacent to the southwest end of the lake, an aeration system was installed in Orchard Pond to precipitate out phosphorus and improve water quality flowing into Orchard Lake. 2004 through 2012: The City of Lakeville annually provides lakeshore owners with shoreline restoration information and encourages homeowners to take advantage of the Blue Thumb restoration program.
Upland buffer areas lacking naturalized vegetation. Most of the residential properties have turf grass up the the lakeshore edge.	Increase width and continuity of native upland buffer.	Restore sustainable native communities. Rather than manicured turf grass, sand, and bare soil, the shoreline could be vegetated with native grasses and wildflowers. A native upland buffer can improve functions and values of the lake and improve aesthetics (Potential Restoration Area #5 as shown in Appendix A and Figure 5).	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	One shoreline resident started a restoration project in 2012. 2007: A small area of lakeshore, near the boat launch, was restored using native plants. 2002: Purple loosestrife beetles were released by the MNDNR. Follow up monitoring indicates that beetles are present at a population that the MNDNR feels is appropriate for biological control of purple loosestrife plants.
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Control and manage. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed. Continue to request monitoring from the MNDNR to assure beetles are present and at appropriate populations for biological control (See Figures 3 and 5 for location of purple loosestrife).	Increase wildlife habitat. Improve vegetative diversity.	Spring - Fall	

Table 2: 2013 Recommended and Completed Management Actions for Crystal LakeBlack Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementa Period
Curlyleaf pondweed dominates the lake in late spring-early summer.	Continue curlyleaf pondweed control measures.	Continue to control and manage. See Blue Water Science report for locations of curlyleaf pondweed.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - E
Upland buffer areas lacking naturalized vegetation within publicly owned properties.	Increase width and continuity of native upland buffer.	The width and density of naturalized shoreline buffer at the location of Emergent Plot #1 near the swimming area has improved significantly since 2009. The adjacent upland buffer could also be restored to naturalized native vegetation and not mowed (Potential Restoration Areas #1 through 4 as shown in Figure 4 and photos).	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall
Upland buffer areas lacking naturalized vegetation. Most of the residential properties have turf grass up the the lakeshore edge.	Increase width and continuity of native upland buffer.	Restore sustainable native communities. Rather than manicured turf grass, sand, and bare soil, the shoreline could be vegetated with native grasses and wildflowers. A native upland buffer can improve functions and values of the lake and improve aesthetics (Potential Restoration Area #5 as shown in Figure 4 and photos).	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Continue to control. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed.	Increase wildlife habitat. Improve vegetative diversity.	Spring - Fall
Eurasian watermilfoil is present.	Control Eurasian watermilfoil.	Control by chemical treatment.	Maintain wildlife habitat.	Summer

tion	Completed Actions Which May Improve Wildlife Habitat and/or Water Quality
arly	
	1999 through 2013: The City of Burnsville conducts aquatic vegetation monitoring twice/year.
	2003 through 2013 : The City of Burnsville conducted annual harvesting of curlyleaf pondweed.
	2004-2008 : -The BDWMO operated the ferric chloride treatment system.
	-The City of Burnsville: 1) excavated/enhanced four stormwater treatment ponds (including West Buck Hill Park), which reduced the phosphorus loading into the lake, and 2) conducted annual harvesting of Eurasian watermilfoil and curlyleaf pondweed.
	-The City of Lakeville excavated/enhanced the Bluebill stormwater treatment pond.
	In 2009 and 2008 , garlic mustard within the upland buffer was removed/pulled.
	In late 2009 , the City of Burnsville treated 14 acres of buckthorn within Crystal West Park.

Table 2: 2014 Recommended and Completed Management Actions for Lac LavonBlack Dog Watershed Management Organization Habitat Monitoring

				Implementation	
Problem Identified	Recommendation	Proposed Action	Benefits	Period	Completed Actions W
Curlyleaf pondweed dominates the lake in late spring-early summer.	Continue curlyleaf pondweed control measures.	Continue to control and manage. See Macrophyte Survey Results for locations of curlyleaf pondweed.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	Aquatic plant surveys wer
Eurasian watermilfoil is present.	Control Eurasian watermilfoil.	Control by chemical treatment. See Macrophyte Survey Results for locations of Eurasian watermilfoil	Maintain wildlife habitat.	Summer	In 2006, the cities of Burn to fund a fluridone treatme Aquatic plant surveys wer
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Continue to control. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed. See Macrophyte Survey Results for locations of purple loosestrife	Increase wildlife habitat. Improve vegetative diversity.	Spring - Fall	Purple loosestrife remova Apple Valley and Burnsvil
Upland buffer areas lacking naturalized vegetation within publicly owned properties.	Increase width and continuity of native upland buffer.	Expand native prairie planting to include area to the east, which is dominated by knapweed. This could become a tall grass prairie. Potential Restoration Area #1	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	In 2013, the city of Burnsv beach and turf grass to pr
Upland buffer areas in city parks contain non-native invasive vegetation such as buckthorn, Siberian elm, leafy spurge, and spotted kanpweed.	Continue to control and manage non- native invasive vegetation	Continue to control and manage non-native invasive vegetation Potential Restoration Area #2	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Spring - Fall	Some invasive species co the new native planting ar In 2010, the city of Apple boring weevils in Lac Lav Continued management of activities will help to main aesthetics, and recreation
Impervious surfaces and turf grass in the Apple Valley park near the fishing pier can collect pollutants in stormwater and flow directly into the lake, decreasing water quality.	Increase areas of naturalized vegetation to slow down and pretreat stormwater prior to entering the lake.	Strategically create buffer strips with naturalized vegetation adjacent to impervious surfaces to slow down and pretreat stormwater prior to entering the lake. Potential Restoration Area #3	Improve water quality	Spring - Fall	
Upland buffer areas lacking naturalized vegetation. Most of the residential properties have turf grass or sand up to the lakeshore edge.	Increase width and continuity of native upland buffer.	Restore sustainable native communities. Rather than manicured turf grass, sand, and bare soil, the shoreline could be vegetated with native grasses and wildflowers. A native upland buffer can improve functions and values of the lake and improve aesthetics. Potential Restoration Area #4	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	One raingarden was insta Highview Drive in Apple V The establishment of sho residential properties in th buffer habitat between cit

hich May Improve Wildlife Habitat and/or Water Quality
e conducted by Barr in 2013 and 2014.
sville and Apple Valley and the lake homeowners partnered ent for control of Eurasian watermilfoil.
e conducted by Barr in 2013 and 2014.
I on shallow island areas was completed by the cities of le in 2011.
ville installed a native prairie planting converting a sand rairie and wetland vegetation.
ontrol for Canada thistle and knapweed was conducted on rea in 2014.
Valley released about 150 spotted knapweed seedhead on Park in Apple Valley.
of the vegetation communities and shoreline restoration tain and improve wildlife habitat, vegetation diversity,
Iled in the backyard of a shoreline property owner on /alley through the Blue Thumb program.
reline restoration projects (especially contiguous) on le future will help balance out the differences in upland y owned property and residential property.

Table 2: 2015 Recommended and Completed Management Actions for Keller Lake Black Dog Watershed Management Organization Habitat Monitoring

					Completed Actions Which May Improve Wildlife Habitat and/or
Problem Identified	Recommendation	Proposed Action	Benefits	Period	Water Quality
Curlyleaf pondweed dominates the lake in late spring-early summer.	Continue curlyleaf pondweed control measures.	Continue to control and manage. See Appendix A Aquatic Plant Survey for locations of curlyleaf pondweed.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	Aquatic plant surveys have been conducted by Blue Water Science 1998-2015. Iron dosing occurred from 1999 through 2008. Mechanical harvesting is conducted each year since 2004.
Eurasian watermilfoil is present.	Control Eurasian watermilfoil.	Continue to monitor. Control as recommended by the MnDNR. Since the MnDNR designates Keller Lake as a "Natural Environment Lake", chemical treatment is not allowed.	Maintain wildlife habitat.	Summer	Aquatic plant surveys have been conducted by Blue Water Science 1998-2015.
The inlet coming from the stormwater pond at the south end of Keller Lake is surrounded by bare soil or sparse vegetation.	Re-vegetated bare areas to prevent soil erosion into Keller Lake.	Seed or plant bare areas with native vegetation. Potential Restoration Area #1	Improve water quality and vegetative diversity.	Spring or Fall	
Shoreline fishing traffic is causing bare soil areas along the shoreline.	Re-vegetated bare areas to prevent soil erosion into Keller Lake.	Create designated stone walkways for fishing access. Potential Restoration Area #2	Improve water quality, vegetative diversity, and aesthetics.	Spring - Fall	
The southern public park is littered with trash and other dumped items especially near the shoreline.	Clean up the litter.	Organize a neighborhood clean-up project to pick up trash and other dumped items along the south shoreline of the lake. Potential Restoration Area #3	Improve aesthetics. Potentially prevent harm to wildlife. Prevent migration of trash into lake.	Spring - Fall	
Upland buffer areas in city parks contain non-native invasive vegetation such as buckthorn and garlic mustard.	Continue to control and manage non-native invasive vegetation	Continue to control and manage non-native invasive vegetation. Pull garlic mustard within the City of Burnsville property at the north end of the lake. Continue to remove and treat new growth of buckthorn in city parks. Potential Restoration Area #4	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Spring - Fall	Buckthorn appears to have been previously removed in the park along the southern shoreline.
Upland buffer areas lacking naturalized vegetation. Some of the residential properties have narrow buffers with turf grass close to the lakeshore edge.	Increase width and continuity of native upland buffer.	Restore sustainable native communities. Manicured turf grass near the shoreline could be vegetated with native grasses and wildflowers. A native upland buffer can improve functions and values of the lake and improve aesthetics. Potential Restoration Area #5	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	Most residential properties allow a narrow width of naturalized vegetation to prevent soil erosion, however a wider buffer of native vegetation could help improve wildlife habitat, vegetative diversity, and aesthetics.

Table 2: 2016 Recommended and Completed Management Actions for Kingsley Lake Black Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Completed Act
Curlyleaf pondweed is present in some years.	Continue to monitor	Consider control measures, if densities and locations increase to an extent of concern. See Appendix A Aquatic Plant Survey for locations of curlyleaf pondweed .	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	On March 6, 2008 Kingsley Lake by Lakeville. Based report stated that produce heavy gro solid canopy) in K
Common buckthorn dominates portions of the upland buffer.	Conduct an evaluation of common buckthorn, followed by removal.	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	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Spring - Fall	From 2005-2008, Kingsley Lake Ass portions of the lak lake.
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Control and manage. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed. See Figure 4 for purple loosestrife locations.	Increase/maintain wildlife habitat.	Spring - Fall	From 2005-2008, Kingsley Lake Ass from portions of th lake. Purple loose prior to 2002. Follo that beetles are pu is appropriate for l
Stormwater drainage from impervious surfaces is directed into the lake.	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	
Bare soil on steep slope could cause erosion and sedimentation into lake.	Re-vegetate bare areas to prevent soil erosion into Kingsley Lake.	Plant vegetation suited for steep slopes along hillside to prevent erosion. See Figure 4, Potential Restoration Area #3	Improve water quality	Spring - Fall	
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 through 7 . See Appendix G for examples of improvements. See also island shoreline areas becoming bare from YMCA camper overuse (Figure 4, Potential Restoration Areas 10 and 11).	Improve water quality, increase wildlife habitat. Improve vegetative diversity and aesthetics.	Spring - Fall	In 2008, a Kingsle Blue Thumb progr utilizing native pla
Emergent zone and upland buffer areas contain non- native invasive vegetation.	Continue to control and manage non-native invasive vegetation, including, but not limited to reed canary grass, hybrid cattail, and yellow iris.	Treat non-native invasive vegeation and then seed with an appropriate BWSR seed mix. See Figure 4 , Potential Restoration Areas #8 and 9. Remove yellow iris (See Appendix A for locations of yellow iris). The MN DNR may require a permit for cattail treatment and yellow iris removal if below the OHW. Dense reed canary grass is located at Plot 2b as shown of Figure 3 . Dense hybrid cattail is located at Plot 1b as shown on Figure 3 .	Increase/maintain wildlife habitat.	Spring-Summer	

tions Which May Improve Wildlife Habitat and/or Water Quality

B, soil sediment samples were collected on Blue Water Science (BWS) and the City of on the results of the soil analysis, the BWS "curlyleaf pondweed is not expected to rowth conditions (where plants top out in a Kingsley Lake."

the City of Lakeville and members of the sociation removed common buckthorn from ke and the upland buffer surrounding the

the City of Lakeville and members of the sociation removed purple loosestrife plants he lake and the upland buffer surrounding the estrife beetles were released by the MnDNR low up monitoring by the MnDNR indicates present at a population that the MnDNR feels biological control.

ey Lake lakeshore resident, inspired by the ram, commenced shoreline stabilization ants.

Table 2: 2017 Recommended and Completed Management Actions for Orchard LakeBlack Dog Watershed Management Organization Habitat Monitoring

				Implementation	Completed Actions Which May Improve Wildlife Habitat
Problem Identified	Recommendation	Proposed Action	Benefits	Period	and/or Water Quality
Curlyleaf pondweed is common in early spring	Continue to monitor, control, and manage.	Continue to treat curlyleaf pondweed where growth is predicted to be heavy. See Appendix A Aquatic Plant Survey for more details.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	From 1999-2017, the City of Lakeville contracts Blue Water Science to conduct aquatic plant surveys twice per year. Curlyleaf pondweed was harvested annually from 2004-2009. Herbicide treatments were conducted annually from 2009-2012 and 2015-2017.
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Control and manage. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed. See Figure 4 for purple loosestrife locations.	Increase/maintain wildlife habitat.	Spring - Fall	Purple loosestrife beetles were released by the MnDNR prior to 2002. Follow up monitoring by the MnDNR indicates that beetles are present at a population that the MnDNR feels is appropriate for biological control.
Stormwater drainage from impervious surfaces is directed into the lake.	Redirect stormwater for infiltration prior to discharge.	Install a rainwater garden, pervious pavement, or other suitable method for infiltration and establish a naturalized upland buffer. See Figure 4 and Site Photos, Potential Restoration Area #6.	Improve water quality	Open	Two raingardens were completed on 175th St W. In 2010, adjacent to the southwest end of the lake, an aeration system was installed in Orchard Pond to precipitate out phosphorus and improve water quality flowing into Orchard Lake.
Bare soil along shoreline could cause erosion and sedimentation into lake.	Re-vegetate bare areas to prevent soil erosion into Orchard Lake.	Improve soil and plant vegetation along shoreline to prevent erosion. Establish a canoe and kayak access at Wayside Park. See Figure 4 and Site Photos, Potential Restoration Area #4 and #5.	Improve water quality	Spring - Fall	The City of Lakeville removed a dilapidated timber wall and attempted a shoreline restoration south of the beach, however, the soil was too poor for the plantings to become established. North of the beach, a concrete wall was built to prevent shoreline erosion.
Upland buffer areas lacking naturalized vegetation.	Increase width and continuity of native upland buffer.	Rather than manicured turf grass the shoreline could be vegetated with native grasses and wildflowers. See Figure 4 and Site Photos, Potential Restoration Areas #1-3, 7 and 8 . See Appendix G for examples of improvements.	Improve water quality, increase wildlife habitat. Improve vegetative diversity and aesthetics.	Spring - Fall	2004 through 2012: The City of Lakeville annually provides lakeshore owners with shoreline restoration information and encourages homeowners to take advantage of the Blue Thumb restoration program. Two residential shoreline restoration projects have been completed. One is located north of the beach area and one is on 175th St. W. 2007: A small area of lakeshore, near the boat launch, was restored using native plants.

Table 2: 2018 Recommended and Completed Management Actions for Crystal Lake Black Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Comple
Curlyleaf pondweed dominates the lake in late spring-early summer.	Continue curlyleaf pondweed control measures.	Continue to control and manage. See Appendix A Blue Water Science report for locations of curlyleaf pondweed.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	1999 throug vegetation 2003 throug harvesting
Eurasian watermilfoil is present.	Control Eurasian watermilfoil.	Control by chemical treatment. See Appdendix A Blue Water Science report for locations of Eurasian watermilfoil.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Summer	
Common and glossy buckthorn are present	Control common and glossy buckthorn	Remove buckthorn. Volunteer groups and contractors can effectively remove buckthorn by pulling, cutting, and treating stumps with herbicide. See Appendix H for buckthorn management guidelines. See Appendix I for locations of buckthorn.	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Fall	In 2009, the Crystal Lak
Garlic mustard is present	Control garlic mustard	Organize a volunteer neighborhood group to pull garlic mustard. See Appendix I for locations of garlic mustard.	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Spring	In 2008 and within the u
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Control and manage. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed. See Appendix I for locations of purple loosestrife.	Increase wildlife habitat. Improve vegetative diversity.	Spring - Fall	Purple loos 2002. Follo are present for biologica
Bare soil areas are present along shoreline in Crystal Lake West Park area.	Re-vegetate bare soil areas to prevent soil erosion into Crystal Lake and create designated stone walkways for fishing access.	Exposed soil along the shoreline of Crystal Lake West Park Area could be re-vegetated to prevent shoreline erosion. Strategically located stones could provide fishing access to prevent disturbance of vegetation after it is established. (Potential Restoration Area #1 as shown in Figure 4 and photos)	Improve water quality and prevent erosion.	Spring - Fall	
Timber retaining wall in Tyecke Park area is in poor condition.	Repair timber retaining wall to prevent soil erosion into Crystal Lake.	Steep slopes in the Tyecke Park area are well protected with mature naturalized vegetation, however a timber retaining wall along the shoreline may need to be repaired or replaced to prevent slope destabilization and erosion. (Potential Restoration Area #2 as shown in Figure 4 and photos)	Prevent erosion	Winter	
Shoreline areas lacking naturalized vegetation within publicly owned beach area. Some areas have mowed turf grass close to the lakeshore edge.	Increase width and continuity of native upland buffer.	The upland buffer near the location of Plot #1C and shoreline to the south, and north of the beach area could be restored to naturalized native vegetation and not mowed (Potential Restoration Areas #3 and 4 as shown in Figure 4 and photos).	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	The width a location of l significantly
Shoreline areas lacking naturalized vegetation within residential properties. Most of the residential properties have turf grass up the the lakeshore edge.	Increase width and continuity of native upland buffer.	Rather than manicured turf grass, the shoreline could be vegetated with native grasses and wildflowers. (Potential Restoration Area #5 as shown in Figure 4 and photos).	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	Six residen restortion p and Water

eted Actions Which May Improve Wildlife Habitat	
and/or Water Quality	

ugh 2018: The City of Burnsville conducts aquatic n monitoring twice/year. ugh 2018: The City of Burnsville conducted annual g of curlyleaf pondweed.

he City of Burnsville treated 14 acres of buckthorn within ake West Park (Appendix I).

nd 2009, the City of Burnsville removed garlic mustard upland buffer (Appendix I)

osestrife beetles were released by the MnDNR prior to low up monitoring by the MnDNR indicates that beetles nt at a population that the MnDNR feels is appropriate ical control.

and density of naturalized shoreline buffer at the f Emergent Plot #1B near the beach area has improved the since 2009.

ntial property owners have completed shoreline projects using either City of Burnsville or Dakota Soil r Conservation District grants.

Table 2 2019 Recommended and Completed Management Actions for Lac Lavon – Black Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Complet
Curly-leaf pondweed dominates the lake in late spring-early summer.	Continue curly-leaf pondweed control measures.	Continue to control and manage. Detailed results are available upon request.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	Aquatic pla
Eurasian watermilfoil is present.	Control Eurasian watermilfoil.	Control by chemical treatment. Detailed results are available upon request.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Summer	In 2006, the homeowner control of E Aquatic plan
Purple loosestrife is present.	Continue to control and manage purple loosestrife.	Continue to control. For a few small colonies of purple loosestrife, hand pull or dig the plants out before they go to seed.	Increase wildlife habitat. Improve vegetative diversity.	Spring - Fall	Purple loose cities of App Purple loose Follow up n a populatio
Shoreline areas lacking naturalized vegetation within publicly owned properties.	Increase width and continuity of native upland buffer.	Expand native prairie planting to include area to the east, which is dominated by knapweed. This could become a tall grass prairie. Potential Restoration Area #1	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	In 2013, the a sand beac
Shoreline areas in city parks contain non-native invasive vegetation such as buckthorn, Siberian elm, leafy spurge, and spotted knapweed.	Continue to control and manage non-native invasive vegetation	Continue to control and manage non-native invasive vegetation Potential Restoration Area #2	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Spring - Fall	Some invasi conducted of In 2010, the seedhead b Continued r restoration vegetation of
Impervious surfaces and turf grass in the Apple Valley park near the fishing pier can collect pollutants in stormwater and flow directly into the lake, decreasing water quality.	Increase areas of naturalized vegetation adjacent to impervious surfaces to slow down and pretreat stormwater prior to entering the lake.	Strategically create buffer strips of naturalized vegetation adjacent to the bituminous lake access pathway to slow down and pretreat stormwater prior to entering the lake. Potential Restoration Area #3	Improve water quality	Spring - Fall	
Upland buffer areas lacking naturalized vegetation. Most of the residential properties have turf grass or sand up to the lakeshore edge.	Increase width and continuity of native upland buffer.	Restore sustainable native communities. Rather than manicured turf grass, sand, and bare soil, the shoreline could be vegetated with native grasses and wildflowers. A native upland buffer can improve functions and values of the lake and improve aesthetics. Potential Restoration Area #4	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	One native shoreline pr Dakota Soil The establis contiguous) the differen residential p

ted Actions Which May Improve Wildlife Habitat and/or Water Quality

nt surveys were conducted in 2013, 2014, and 2019.

e cities of Burnsville and Apple Valley and the lake ers partnered to fund a one-time fluridone treatment for Eurasian watermilfoil.

ant surveys were conducted in 2013, 2014, and 2019.

estrife removal on shallow island areas was completed by the ple Valley and Burnsville in 2011.

estrife beetles were released by the MnDNR prior to 2002. nonitoring by the MnDNR indicates that beetles are present at n that the MnDNR feels is appropriate for biological control.

e city of Burnsville installed a native prairie planting converting ch and turf grass to prairie and wetland vegetation.

ive species control for Canada thistle and knapweed was on the new native planting area in 2014.

city of Apple Valley released about 150 spotted knapweed oring weevils in Lac Lavon Park in Apple Valley.

nanagement of the vegetation communities and shoreline activities will help to maintain and improve wildlife habitat, diversity, aesthetics, and recreation

prairie restoration project was installed in the backyard of a operty owner on Highview Drive in Apple Valley through the and Water Conservation District program.

hment of shoreline restoration projects (especially on residential properties in the future will help balance out ces in upland buffer habitat between city owned property and property.

Table 2 2020 Recommended and Completed Management Actions for Keller Lake – Black Dog Watershed Management Organization Habitat Monitoring

Problem Identified	Recommendation	Proposed Action	Benefits	Implementation Period	Completed Action
Curly-leaf pondweed dominates the lake in late spring-early summer.	Continue curly-leaf pondweed control measures.	Continue to control and manage. See Appendix A for details.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Late Spring - Early summer	Aquatic plant surveys h curly-leaf pondweed tu Iron dosing occurred d Mechanical harvesting Herbicide treatments v
Eurasian watermilfoil is present.	Control Eurasian watermilfoil.	Continue to control and manage. See Appendix A for details.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Summer	Aquatic plant surveys h
Low native aquatic vegetative diversity in the submergent zone.	Continue to increase native aquatic plant diversity.	Continue to monitor and assess. See Appendix A for details.	Increase wildlife habitat, improve water quality, vegetative diversity, aesthetics, and recreation.	Summer	A seedbank assessmen Native aquatic plant re
The inlet coming from the stormwater pond at the south end of Keller Lake is surrounded by bare soil or sparse vegetation.	Re-vegetate bare areas to prevent soil erosion into Keller Lake.	Seed or plant bare areas with native vegetation. Potential Restoration Area #1	Improve water quality and vegetative diversity.	Spring or Fall	
Shoreline pedestrian observation and fishing traffic is causing bare soil areas along the shoreline.	Re-vegetate bare areas to prevent soil erosion into Keller Lake.	Create designated stone walkways for observation and fishing access. Potential Restoration Area #2	Improve water quality, vegetative diversity, and aesthetics.	Spring-Fall	
The southern public park is littered with trash and other dumped items, especially near the shoreline.	Clean up the litter.	Organize a neighborhood clean-up project to pick up trash and other dumped items along the south shoreline of the lake. Potential Restoration Area #3	Improve aesthetics. Potentially prevent harm to wildlife. Prevent migration of trash into lake.	Spring - Fall	
Shoreline areas in city parks contain non-native invasive vegetation such as buckthorn, spotted knapweed, and garlic mustard.	Continue to control and manage non- native invasive vegetation	Continue to control and manage non-native invasive vegetation. Pull garlic mustard within the City of Burnsville property at the north end of the lake. Continue to remove and treat new growth of buckthorn in city parks. Potential Restoration Area #4	Increase wildlife habitat. Improve vegetative diversity and aesthetics	Spring - Fall	Buckthorn appears to I southern shoreline, ho Continued manageme activities will help to m aesthetics, and recreat
Upland buffer areas lacking naturalized vegetation. Many of the residential properties have narrow buffers with lawns mowed to the lakeshore edge.	Increase width and continuity of native upland buffer.	Restore sustainable native communities. Rather than manicured turf grass, the shoreline could be vegetated with native grasses and wildflowers. A native upland buffer can improve functions and values of the lake and improve aesthetics. Potential Restoration Area #5	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	The Dakota Soil and W with establishment of s projects (especially cor balance out the differe and residential proper
Shoreline areas lacking naturalized vegetation within publicly owned properties.	Increase width and continuity of native upland buffer.	Adjust mowing distance away from shoreline in Apple Valley's Keller Park. Potential Restoration Area #6	Increase wildlife habitat. Improve water quality. Improve vegetative diversity and aesthetics.	Spring - Fall	
A portion of Lac Lavon Park in Burnsville south of Keller Lake includes a large area of mowed turf grass with no apparent use.	Consider using this area for a native prairie restoration with meandering trails and educational signs.	Recruit volunteers through neighborhood or organizations to transform the lawn into a prairie. Potential Restoration Area #7	Improve vegetative diversity and aesthetics. Increase wildlife habitat and provide pollinator habitat. Provide recreational and educational opportunities.	Spring - Fall	
Sediment from the Lac Lavon Park parking lot is directed into the floodplain forest along the south shoreline of Keller Lake.	Prevent sediment from entering the floodplain forest area.	Install a pre-treatment system such as a rain garden or sediment trap to collect sediment from the parking lot. Follow up with routine maintenance of sediment clean- out. Potential Restoration Area #8	Protect floodplain forest from further degradation and prevent sediment from reaching Keller Lake, thereby improving water quality.	Winter	
Japanese hedge parsley is located along the edge of the path near the storm pond north of Keller Lake. This is a new non-native invasive species in Minnesota. Early detection and control will prevent infestations.	Eradicate- Pull, cut or mow before flowering. Monitor area for new seedlings. Spray rosettes or bolting plants in spring with 1-2% glyphosate or 1-2% triclopyr. In fall, use herbicides on rosettes.	A report of this species at this location was submitted through the Great Lakes Early Detection Network online application. Follow up with the Dakota County Cooperative Weed Management contact to verify action will be taken for eradication. Potential Restoration Area #9	Prevent spread and infestation.	Spring - Fall	

s Which May Improve Wildlife Habitat and/or Water Quality
nave been conducted by Blue Water Science since 1998. A urion survey was also conducted in 2020.
uring 1996 - 2008. was conducted from 2004 - 2015
vere conducted from 2017 – 2020.
nave been conducted by Blue Water Science since 1998.
it was conducted in 2020. -introduction began in 2020.
-
nave been previously removed in the park along the wever new seedlings are emerging.
nt of the vegetation communities and shoreline restoration
aintain and improve wildlife habitat, vegetation diversity, ion
ater Conservation District program assists homeowners
shoreline restoration projects. Additional restoration
nces in upland buffer habitat between city owned property
y.

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 Action
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 Water Science (BWS) a analysis, the BWS repo produce heavy growth 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 C Association removed c upland buffer surround From 2005-2008, the C Association removed p upland buffer surround the MnDNR prior to 20 still present at a popula control. The City of Lakeville co
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 Lak commenced shoreline
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	

s Which May Improve Wildlife Habitat and/or Water Quality

sediment samples were collected on Kingsley Lake by Blue nd the City of Lakeville. Based on the results of the soil rt stated that "curly-leaf pondweed is not expected to conditions (where plants top out in a solid canopy) in

City of Lakeville and members of the Kingsley Lake common buckthorn from portions of the lake and the ding the lake.

City of Lakeville and members of the Kingsley Lake purple loosestrife plants from portions of the lake and the iding the lake. Purple loosestrife beetles were released by 002. Follow up with MnDNR to verify whether beetles are lation that the MnDNR feels is appropriate for biological

ontinues to monitor for invasive species.

ke lakeshore resident, inspired by the Blue Thumb program, e stabilization utilizing native plants.

Appendix E

2012 Orchard Lake MNRAM Wetland Functional Assessment Results

Wetland Functional Assessment Summary				Maintenance of Flood, Hydrologic Stormwa		Downstream Water	Maintenance of Wetland Water	Shoreline		
Wetland Name	Hyarogeomor	onology				Regim	e Allenuation	Quality	Quality	Protection
Orchard Lake	Depressional/Flo inlet and outlet)	ow-through (apparent in	nlet and outlet), Depress	sional/Flow-through ((apparent	0.75	0.53	0.58	0.37	0.46
						High	Moderate	Moderate	Moderate	Moderate
								Ac	ditional Inform	nation
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commerc	cial Uses	Ground- Water Interaction	Wetland Restoration Potential	Wetland Sensitiv to Stormwater and Urban Development	ity Additional Stormwater Treatment Needs
Orchard Lake	0.37	0.49	0.05	0.76	0.0	00	Combination Discharge, Recharge	0.00	0.50	0.37
	Moderate	Moderate	Low	High	Not App	licable		Not Applicable	Moderate	Moderate

Wetland Community Summary

	,			Vege	etative Diversii	ty/Integrity			
Wetland Name	Location	Cowardin Classification	Cor Circular 39	nmunity Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating
Orchard Lake	19-114-21-11-001	L2UBGh	Type 5	Shallow, Open Water	95	0.1	0.50	0.30	0.12
				Communities			Moderate	Low	Low
		PEM1C	Туре 3	Shallow Marsh	5	0.5	0.50	0.30	0.12
							Moderate	Low	Low
					100		0.50	0.30	0.12

Denotes incomplete calculation data.

Appendix F

Descriptions of MNRAM Wetland Functions

GENERAL NOTE: Some questions are not applicable to particular wetlands and will be scored N/A. In these cases, rather than count N/A as zero, an alternate equation is provided that eliminates the question from the formula altogether. Because not every question has N/A as an option, formulas that do not include N/A-option questions have only one configuration.

Formulas with a "reverse rating" (marked as "R") take the actual response and "flip" its value for the calculation, so that a question response of "A" high (value of 1.0) will be calculated as low (value of 0.1). In such a formula, medium ratings stay medium.

6.1 VEGETATIVE DIVERSITY/INTEGRITY

Table 3: Vegetative Diversity/Integrity Summary

The functional rating is based primarily on the diversity of vegetation within the wetland in comparison to an undisturbed condition for that wetland type. An exceptional rating results from one of the following conditions: 1) highly diverse wetlands with virtually no non-native species, 2) rare or critically impaired wetland communities in the watershed, or 3) the presence or previous siting of rare, threatened, or endangered plant species. A high rating indicates the presence of diverse, native wetland species and a lack of nonnative or invasive species. Wetlands that rate low are primarily dominated by non-native and/or invasive species.

This table may be used when calculating Vegetative Diversity/Integrity Functional Index manually. It shows four options for calculating and presenting floristic data. If you are entering data directly into the MnRAM 3.0 database, this table does not apply.

	3A	3B	3 C	3D	3 E
	Proportion	Individual	Highest	Non-Weighted	Weighted
	of Wetland	Community	Quality	Average	Average
		Scores			
Community #1	Т	Α		Α	Α
Community #2	U	В		В	В
Community #3	V	С		C	С
Community #4	W	D		D	D
Community #5	X	Ε		E	Ε
Community #6	Y	F		F	F
Community #7	Z	G		G	G
Wetland	1.0		Highest	(A+B+C+D+E	(A*T)+(B*U
Rating Value			Value	+ F + G)/7 =)+(C*V)+(D
				Ave.	*W)+(E*X)+
					(F*Y)+(G*Z
) = Wt. Ave.

If any questions #4-6 are answered yes and/or if any of the Special Features b, d, or i have been selected, enter Exceptional for the functional index. If not, compute the contribution to vegetative diversity and integrity by each plant community by doing the following: multiply the ranking for each community (Question #3b) by its total proportion in Question 3a (percent of total). Then, the functional index for the entire wetland can be calculated four ways (as follows) and should be utilized according to the scope of the project:

- 3b) Individual Community Scores: maintain raw data as recorded.
- 3c) Highest Quality Community: report the highest-functioning community.
- 3d) Non-Weighted Average Quality of all Communities: straight average
- **3e) Weighted Average Quality Based on Percentage of Each Community:** multiply each community rating by its percentage, then add all together.

Vegetative Diversity/ Integrity							
	3a. Proportion of Wetland	3b. Individual Community Scores	3c. Highest Rated Community Quality	3d. Non- Weighted Average	3e. W Av	Veighted verage	
Community #1	Т	Α					
Community #2	U	В	If Sman Eastern	aab dania		d then wete	
Community #3	V	С	II Spec. Featur	Exceptional	(2)	ed then rate	
Community #4	\mathbf{W}	D	- if either question 4, 5, or 6 are Yes, then rate				
Community #5	X	Ε					
Community #6	Y	F		Acceptional (2), eise.		
Community #7	Z	G					
Overall	1.0		: Highest	: (A+B+C+	- :(4	A*T)+(B*	
Wetland Value			Value of A-G	D+E+F+G) /7 U))+(C*V)+	
Rating				= Ave.	(D)*W)+(E*	
					X)+(F*Y)+(
					G	*Z) = Wt.	
					A	ve.	

6.2 MAINTENANCE OF CHARACTERISTIC HYDROLOGIC REGIME

A wetland's hydrologic regime or hydroperiod is the seasonal pattern of the wetland water level that is like a hydrologic signature of each wetland type. It defines the rise and fall of a wetland's surface and subsurface water. The constancy of the seasonal patterns from year to year ensures a reasonable stability for the wetland²³. The ability of the wetland to maintain a hydrologic regime characteristic of the wetland type is evaluated based upon wetland soil and vegetation characteristics, land use within the wetland, land use within the upland watershed contributing to the wetland, and wetland outlet configuration. Maintenance of the hydrologic regime is important for maintaining a characteristic vegetative community, and is closely associated with other functions including flood attenuation, water quality and groundwater interaction.

Measures the degree of human alteration of the wetland hydrology, either by outlet control or by altering immediate watershed conditions. Each parameter is weighted equally.

MnRAM #	Excel #	Variable Description	Type of Interaction
13	E17	Outlet—natural hydrologic regime	Controlling
14	E18	Dominant upland land use	Compensatory
15	E19	Soil condition/wetland	Compensatory
20	F24	Stormwater runoff/pretreatment-Reverse	Compensatory

Hydrologic Regime Index = (13+14+15+20)/4

6.3 FLOOD AND STORMWATER STORAGE/ATTENUATION

A wetland's ability to provide flood storage and/or flood wave attenuation is dependent on many characteristics of the wetland and contributing watershed. Characteristics of the subwatershed that affect the wetlands ability to provide flood storage and attenuation include: soil types, land use and resulting stormwater runoff volume, sediment delivery from the subwatershed, and the abundance of wetlands and waterbodies in the subwatershed. Wetland characteristics which affect the wetland's ability to store and or attenuate stormwater include: condition of wetland soils; presence, extent, and type of wetland vegetation; presence and connectivity of channels; and most importantly outlet configuration. Higher rated wetlands will have an unaltered or restricted outlet, undisturbed wetland soils, dense emergent vegetation without channels, a high proportion of impervious surfaces in the subwatershed, large runoff volumes, clayey upland soils, and few wetlands present within the subwatershed.

This formula is based on the Surface Water Storage Functional Capacity Index scoring concept and equation²⁴. The formula was altered with the addition of three surface flow characteristics and two stormwater runoff parameters (Stormwater Runoff Quality/Quantity and Subwatershed Wetland Density) along with the removal of two parameters (Soil Porosity and Subsurface Outlet,

²³ Mitsch and Gosselink, 2000

²⁴ Lee et al., 1997

which is already characterized in another parameter). This index is comprised of 5 primary processes, which are weighted equally; included in each major process are one to three characteristics that equally contribute to that process.

- 1. **Outlet Characteristics**: Outlet characteristics
- 2. Upland Watershed: Upland land use, Upland soils,
- 3. Wetland Condition/Land Use: Wetland land use, sediment delivery
- 4. **Runoff Characteristics:** Stormwater runoff quality/quantity, subwatershed wetland density
- 5. **Surface Flow Characteristics**: Flow-through emergent vegetation density, surface flow characteristics

Flood and Stormwater Storage Index Computation:

Entire Formula: Outlet for flood retention {12} + (Dominant upland use-RR{14}+ Upland soils {19})/2 + (Soil condition {15} + Sediment delivery {18})/2 + Stormwater runoff pretreat&det{20} + Subwatershed wetland density {21})/2 + (Percent emergent vegetative cover {16} + Flow-through emergent vegetative roughness {17} + Channels/sheet flow {22})/3)/5.

1. If 12=0, then: ((14+19)/2+(15+18)/2+(20+21)/2+(16+17+22)/3)/4

2. If 12>0, then: (12+(14+19)/2+(15+18)/2+(20+21)/2+(16+17+22)/3)/5

No changes to the formula are necessary if 16=0.

MnRAM #	Excel #	Variable Description	Type of Interaction
12	E16	Outlet—flood attenuation	Controlling—optional
14	F18	Dominant upland land use-RR	Compensatory
19	E23	Upland soils	Compensatory
15	E19	Soil condition	Compensatory
18	E22	Sediment delivery	Compensatory
20	E24	Stormwater pretreatment & detention	Compensatory
21	E25	Subwatershed wetland density	Compensatory
16	F20	Emergent vegetation % cover	Comp.—optional
17	E21	Emergent vegetation flood resistance	Comp.—optional
22	E26	Channels/sheet flow	Compensatory

Flood and Stormwater Storage/Attenuation Variables

6.4 DOWNSTREAM WATER QUALITY PROTECTION

This rates the wetland's ability and opportunity to protect valuable downstream resources. Valuable downstream resources include recreational waters (i.e. lakes, streams, rivers, creeks, etc) and potable water supplies. The level of functioning is determined based on runoff characteristics, sedimentation processes, nutrient cycling, and the presence and location of significant downstream water resources. Runoff characteristics that are evaluated include: land use and soils in the upstream watershed, the stormwater delivery system to the wetland, and sediment delivery characteristics. The ability of the wetland to remove sediment from stormwater is determined by emergent vegetation and overland flow characteristics. A high nutrient removal rating indicates dense vegetation and sheet flow to maximize nutrient uptake and residence time within the wetland. The opportunity for a wetland to protect a valuable water resource diminishes with distance from the wetland so wetlands with valuable waters within 0.5 miles downstream have the greatest opportunity to provide protection.

Compute Functional Index for Downstream Water Quality Protection

This functional index computation was derived from a combination of Nutrient Cycling and Retention of Particulates functions in the HGM Prairie Pothole draft guidebook⁵⁴ with the downstream sensitivity concept from *The Minnesota Wetland Evaluation Methodology*. Three major processes make up equal portions of the Downstream Water Quality Protection function²⁵ with a measure of opportunity to protect downstream resources; each process is comprised of two to four observable parameters.

- 1. **Rate, Quantity, and Quality of Runoff to the Wetland**: this is characterized by the conditions in the upstream watershed; both land use and soils, that affect the sediment and nutrient loads to the wetland, and by the existing storm water delivery system to the wetland (Upland watershed conditions, storm water runoff, evidence of sediment delivery, and upland buffer each comprise 1/16 of the entire downstream water quality functional index based on their contribution to sediment removal).
- 2. Sedimentation: this is characterized by the presence of flow-through emergent vegetation density and by the overland flow characteristics within the wetland. A wetland with primarily sheet flow through the wetland and dense emergent vegetation density will allow sediment to drop out more effectively than a wetland with channel flow and no vegetation (When all parameters are applicable; emergent vegetative density and overland flow characteristics each make up 1/8 of the total downstream water quality functional index based on their contribution to sediment removal).
- 3. **Nutrient Uptake**: this is characterized by the outlet configuration and vegetative characteristics. A wetland with long water retention times has more capacity to remove nutrients from the water column via physical and biological processes. Vegetation slows floodwaters by creating frictional drag in proportion to stem density which allows sediment particles to settle out, thereby improving the water quality for downstream uses (Outlet characteristics and vegetative density each make up 1/8 of the total downstream water quality functional index based on their contribution to nutrient uptake).

²⁵ Derived from a combination of Nutrient Cycling and Retention of Particulates functions in the HGM Prairie Pothole draft guidebook (Lee et al., 1997) with the downstream sensitivity concept from *The Minnesota Wetland Evaluation Methodology*.

4. **Downstream Sensitivity**: if the wetland contributes to the maintenance of water quality within one-half mile of a recreational water body or potable water supply source downstream, it operates at a higher functioning level than a similar wetland farther from or without significant downstream water resources (This factor accounts for ¹/₄ of the total downstream water quality functional index).

Downstream Water Quality Functional Index Computations:

If 12=0, then: (14+20_{reversed}+18+(23+24+26)/3+(16+17)/2+27)/6
 If 12>0, then: (14+20_{reversed}+18+(23+24+26)/3+(16+17)/2+27+12)/7

No changes to the formula are necessary if 16=0.

Entire Formula:

(Dominant upland land use{14} + Stormwater runoff pretreatment & detention{ $20_{reversed}$ } + Sediment delivery {18} + (Upland buffer width{23}WQ + Upland buffer vegetative cover{24} + Upland buffer slope {26})/3 + (Flow-through %emergent vegetative cover{16} + Flow-through emergent vegetative roughness{17})/2 + Downstream sensitivity{27} + Outlet for flood{12})/7

Downstream water Quanty variables						
	Excel #	Variable Description	Type of			
			Interaction			
14	E18	Dominant upland land use	Controlling			
20	E24	Stormwater runoff pretreatment & detention	Controlling			
18	E22	Sediment delivery	Controlling			
23	G27	Upland buffer width	Comp.			
24	G28	Upland area management	Comp.			
26	G34	Upland area slope	Comp.			
16	F20	Emergent vegetation (% cover)	Comp.—optional			
17	E21	Emergent vegetation (roughness coefficient)	Comp.—optional			
27	E39	Downstream sensitivity	Comp.			
12	E16	Outlet for flood	Controllingoptional			

Downstream Water Quality Variables

6.5 MAINTENANCE OF WETLAND WATER QUALITY

The sustainability of a wetland is partially driven by the quality and quantity of stormwater runoff entering the wetland. The ability of the wetland to sustain its characteristics is evaluated based on characteristics of the contributing subwatershed and indicators within the wetland. Subwatershed conditions which affect the wetland's sustainability in relation to water quality impacts include: upland land use; sediment delivery characteristics to the wetland; stormwater runoff volumes and rates; and the extent, condition, and width of upland buffer. Indicators of nutrient loading to the wetland indicate that a diverse wetland may not be sustainable. Indicators that a wetland has been affected by nutrient loading include the presence of monotypic vegetation and/or algal blooms.

This functional index was derived from a combination of sources including MNRAM, HGM, WEM, WET, and experiences of the project team. The sustainability of a wetland

is partially driven by the quality and quantity of stormwater runoff entering the wetland. The ability of the wetland to sustain its characteristics is evaluated based on characteristics of the contributing subwatershed and indicators within the wetland. Subwatershed conditions which affect the wetland's sustainability in relation to water quality impacts include: upland land use; sediment delivery characteristics to the wetland; stormwater runoff volumes and rates; and the extent, condition, and width of upland buffer. Indicators of nutrient loading to the wetland indicate that a diverse wetland may not be sustainable. Indicators that a wetland has been affected by nutrient loading include the presence of monotypic vegetation and/or algal blooms.

Wetland Water Quality Functional Index Computation:

(3e*2+14+20_{reversed} +(**23**+**24**+**26**)/3+18+28)/7

Entire Formula:

 $(Vegetative Diversity/Integrity{3e*2} + Dominant upland land use{14} + Stormwater runoff pretreatment & detention{20_{reversed}} + (Upland buffer width{23}WQ + Upland buffer vegetative cover {24} + Upland buffer slope {26})/3 + Sediment delivery {18})/2 + Nutrient loading {28})/7$

MnRAM #	Excel #	Variable Description	Type of Interaction
3e	D6*2	Vegetative Diversity/Integrity	Contributing
14	E18	Dominant upland land use	Contributing
20	F24	Stormwater runoff pretreatment and detention-RR	Contributing
23	G27	Upland buffer width	Contributing
24	G28	Upland area management	Contributing
26	G34	Upland area slope	Contributing
18	E22	Sediment delivery	Contributing
28	E40	Nutrient loading	Contributing

Wetland Water Quality Variables

This functional index was derived from a combination of sources including MNRAM, HGM, WEM, WET, and experiences of the project team. The sustainability of a wetland is partially driven by the quality and quantity of stormwater runoff entering the wetland. The ability of the wetland to sustain its characteristics is evaluated based on characteristics of the contributing subwatershed and indicators within the wetland. Subwatershed conditions which affect the wetland's sustainability in relation to water quality impacts include: upland land use; sediment delivery characteristics to the wetland; stormwater runoff volumes and rates; and the extent, condition, and width of upland buffer. Indicators of nutrient loading to the wetland indicate that a diverse wetland may not be sustainable. Indicators that a wetland has been affected by nutrient loading include the presence of monotypic vegetation and/or algal blooms.

6.6 SHORELINE PROTECTION

Shoreline protection is evaluated only for those wetlands adjacent to lakes, streams, or deepwater habitats. The function is rated based on the wetlands opportunity to protect the shoreline; i.e. wetlands located in areas frequently experiencing large waves and high

currents have the best opportunity to protect the shore. In addition, shore areas composed of sands and loams with little vegetation or shallow-rooted vegetation will benefit the most from shoreline wetlands. The wetland width, vegetative cover, and resistance of the vegetation to erosive forces determine the wetland's ability to protect the shoreline.

Each of the five parameters contributes equally²⁶: based primarily on the characteristics presented in WEM with a simple, straightforward computation of the index assuming all characteristics contribute equally.

MnRAM #	Excel #	Variable Description	Type of Interaction
29	E41	Shoreline?	Controlling
30	E42	Rooted shoreline vegetation (% cover)	Contributing
31	E43	Wetland width (average)	Contributing
32	E44	Emergent vegetation erosion resistance	Contributing
33	E45	Shoreline erosion potential	Contributing
34	E46	Bank protection ability	Contributing

Shoreline Protection Functional Index Computation:

If 29=1, then: Shoreline Protection Index = (30+31+32+33+34)/5

Entire Formula:

(Rooted shoreline vegetation $\{30\}$ + Average shoreline wetland width $\{31\}$ + Emergent vegetation erosion resistance $\{32\}$ + (Shoreline erosion potential $\{33\}$ + Bank protection ability $\{34\}$)/5

6.7 MAINTENANCE OF CHARACTERISTIC WILDLIFE HABITAT STRUCTURE

The ability of a wetland to support various wildlife species is difficult to determine due to the specific requirements of the many wildlife species that utilize wetlands. This function determines the value of a wetland for wildlife in a more general sense, and not based on any specific species. The characteristics evaluated to determine the wildlife habitat function include: vegetative quality, outlet characteristics (which control hydrologic regime), upland land use, wetland soil type and conditions, water quality of storm water runoff entering the wetland, upland buffer extent, condition, and diversity; the interspersion of wetlands in the area; barriers to wildlife movement; wetland size; vegetative and community interspersion within the wetland; and amphibian breeding potential and overwintering habitat.

Thirteen parameters are weighed equally as described below; vegetative quality weighted double the other factors. The questions are borrowed or modified from MNRAM, WET, WEM, and HGM methodologies, combined to provide a measure of wildlife habitat in general, not focusing on any particular species.

If Rare Wildlife (35) or Rare Natural Community (36) are true, then this Index is Exceptional.

²⁶ Based primarily on the characteristics presented in WEM.

If Special Features d, g, or j are checked, then this Index is Exceptional, otherwise, follow conditions below:

If 37=0 and 38=0 and 39=0, then: (3e*2+40+41+(**23**+2**4**+2**5**)/3+13+ 20)/7

If 38=0 and 39=0, then: (3e*2+37+40+41+(**23**+2**4**+2**5**)/3+13+20)/8 If 37=0 and 39=0, then: (3e*2+38+40+41+(**23**+2**4**+2**5**)/3+13+20)/8 If 37=0 and 38=0, then: (3e*2+39+40+41+(**23**+2**4**+2**5**)/3+13+20)/8

If 39=0, then: (3e*2+37+38+40+41+(**23**+2**4**+2**5**)/3+13+20)/9

If 38=0, then: (3e*2+39+37+40+41+(**23**+**24**+**25**)/3+13+20)/9

If 37=0, then: (3e*2+39+38+40+41+(**23**+**24**+**25**)/3+13+20)/9

If 37>0 and 38>0 and 39>0, then: (3e*2+39+37+38+40+41+(**23+24+25**)/3+13+20)/10

Entire Equation:

(Vegetative Diversity/Integrity{3e*2} + Wetland Detritus {39} + Vegetation Interspersion {37} + Community Interspersion {38} + Wetland Interspersion {40} + Wildlife Barriers {41} + (Upland buffer width {23}WQ + Upland Area Management{24} + Upland area diversity {25})/3 + Outlet natural hydrologic regime {13}+ Stormwater runoff pretreatment and detention 20)/11

MnRAM #	Excel #	Variable Description	Type of Interaction
41	E53	Wildlife barriers	Controlling
3e	D6	Vegetative Ranking (communities' weighted average)	Compensatory
39	E51	Wetland detritus (n/a)	
23	I27	Upland buffer average width	
24	G28	Upland area management	
25	G31	Upland area diversity	
13	E17	Outlet natural hydrologic regime	
20	F24	Stormwater runoff pretreatment & detention-RR	
37	F49	Vegetation interspersion (n/a)	
38	F50	Community interspersion (n/a)	
40	E52	Wetland interspersion	

6.8 MAINTENANCE OF CHARACTERISTIC FISH HABITAT

The ability of the wetland to support native fish populations is determined by structural factors within the wetland as well as water quality contributions from upland factors. Wetlands rated High are lacustrine or riverine and provide spawning/nursery habitat, or

refuge for native species (included but not limited to game fish). Wetlands rated Low for fish habitat do not have a direct hydrologic connection to a waterbody with a native fishery or have poor water quality.

MnRAM #	Excel #	Variable Description	Type of Interaction
46	E58*2	Fish habitat quality	Controlling
29	D41	Fringe wetland?	Contributing
24	G28	Adjacent area management	Compensatory
18	E22	Sediment delivery	Compensatory
20 (R)	F24	Storm water runoff	Compensatory
28	E40	Nutrient load	Compensatory
30	E42	Percent cover	Compensatory
31	E43	Wetland shoreline width	Compensatory
33 (R)	F45	Shoreline erosion potential	Compensatory

Fish Habitat Functional Index Computation:

If Special Features a or g are checked, then Fishery Habitat Index = Exceptional.

If 46=0, then Fishery Habitat = N/A

If 29=0, Fishery Habitat Index = [(46*2)+24+18+20(R)+28]/6

If 29>0, Fishery Habitat Index = [(46*2)+24+18+20(R)+28+30+31+33(R)]/9

6.9 MAINTENANCE OF CHARACT. AMPHIBIAN HABITAT FOR BREEDING/OVERWINTERING

The ability of a wetland to support various amphibian species is difficult to determine due to the specific requirements of the many amphibian species that depend on wetlands. This function determines the value of a wetland for amphibians in general, not based on specific species. An adequate wetland hydroperiod and the presence or absence of predatory fish are considered to be limiting variables for this function. In general, wetlands must remain inundated until early to mid-June to allow the larval stages to metamorphose into adults. Because many amphibians are partly terrestrial, the characteristics evaluated to determine the amphibian habitat function include numerous hydrology and terrestrial measures. The characteristics evaluated include: upland land use, upland buffer width, water quality of storm water runoff entering the wetland, barriers to wildlife movement, and amphibian breeding potential and overwintering habitat.

An adequate wetland hydroperiod (Question 42) is considered to be the primary limiting variable for this functional index. If the hydroperiod is insufficient for breeding, the wetland rating for amphibian use will be Not Sufficient. The status of predatory fish in the wetland (Q.43) is a secondary limiting factor to the final rating; the lowest rating for this variable, however, is 0.1 (Low), rather than zero (Not Sufficient).

Amphibians' ability to use a particular wetland for over wintering is a contributing factor in rating the wetland's functional index (Q.44). Because most amphibians are partly terrestrial, the extent of upland buffer habitat surrounding the wetland (Q.23) is an

important habitat component²⁷ and is weighted by a factor of two. Question 14 (Upland Land Use) is also included as an indicator of the quality of the surrounding upland habitat⁵⁶. Unnatural fluctuations in water depth in wetlands from conducted storm water runoff can impair reproductive success in amphibians, which often attach their eggs to stems of wetland vegetation, e.g., salamanders, tree frogs, green frogs, and wood frogs²⁸. Extreme water level fluctuations during winter may also cause mortality in overwintering reptiles and amphibians²⁹. Thus, Question 20 is included in the formula, with a reverse rating. Question 41 (Barriers) is included because access to and from the wetland by amphibians is an important factor in habitat quality³⁰.

Amphibian Habitat Functional Index Computation:

If 42=0, then N/A

Otherwise: Amphibian Habitat Index = $(43) * [(44 + 2*23_{wildlife} + 14 + 41 + 20_{reversed})/6]$

Entire Formula:

If Amphibian Breeding Potential-Hydroperiod {42} is applicable, then: (Amphibian Breeding Potential-Predator Fish {43}) * {[(Amphibian Overwintering Habitat {44}+ 2*Upland Buffer Width $(23)_{Wildlife}$ + Dominant Upland Land Use {14} + Barriers {41} + Stormwater Input {20_{reverse}}]/6}

MnRAM	Excel #	Variable Description	Type of
#			Interaction
42	D54	Amphibian breeding potential—hydroperiod	Controlling
43	D55	Amphibian breeding potential—fish presence	Controlling
44	E56	Amphibian overwintering habitat	Compensatory
23	I27	Upland buffer width	Compensatory
41	E53	Wildlife barriers	Compensatory
14	E18	Dominant upland land use	Compensatory
20	F24	Stormwater runoff pretreatment & detention—RR	Compensatory

Amphibian Habitat Variables

6.10 Aesthetics/Recreation/Education/Cultural/Science

The aesthetics/recreation/education/cultural and science function and value of each wetland is evaluated based on the wetland's visibility, accessibility, evidence of recreational uses, evidence of human influences (e.g. noise and air pollution) and any known educational or cultural purposes. Accessibility of the wetland is key to its aesthetic or educational appreciation. While dependent on accessibility, a wetland's functional level could be evaluated by the view it provides observers. Distinct contrast

²⁷ Knutson et al., 2000

²⁸ Richter and Azous, 1995

²⁹ Hall and Cuthbert, 2000

³⁰ Knutson, et al., 1999; Findlay and Bourdages, 2000; Semlitsch, 2000.

between the wetland and surrounding upland may increase its perceived importance. Also, diversity of wetland types or vegetation communities may increase its functional level as compared to monotypic open water or vegetation. Excess negative human influence on the wetland is counted double in the formula.

MnRAM #	Excel #	Variable Description	Type of Interaction
48	E60	Rare educational opportunity	Controlling
49	E61	Wetland visibility	Compensatory
50	E62	Proximity to population	Compensatory
51	E63	Public ownership	Compensatory
52	E64	Public access	Compensatory
53	E65	Human influence—wetland	Compensatory
54	E66	Human influence-viewshed	Compensatory
55	E67	Spatial buffer	Compensatory
56	E68	Recreational activities in wetland	Compensatory

All questions contribute equally to the overall index.

Aesthetics/Recreation/Education/Cultural/Science Functional Index Computations:

If Special Features c, h, or u is checked³¹, or

If 48=1, then Index = Exceptional;

If 53=0.1 (Low), then = (50+51+52+2*53+54+55+56)/8

If 53 > 0.1, then = (49 + 50 + 51 + 52 + 53 + 54 + 55 + 56)/8

Entire Formula

(Wetland Visibility $\{49\}$ + Proximity to Population $\{50\}$ + Public Ownership $\{51\}$ + Public Access $\{52\}$ + Human Influence - Wetland $\{53\}$ + Human Influence - Viewshed $\{54\}$ + Spatial Buffer $\{55\}$ + Recreational Activities in Wetland $\{56\}$)/8

6.11 COMMERCIAL USES

This question considers the nature of any commercially-valuable use of the wetland and requires the assessor to consider how such use may be a detriment to the sustainability of the wetland. Some row crops can be planted in Type 1 wetlands after spring flooding has ceased and still have adequate time to grow to maturity. This nonwetland-dependent agricultural use of wetlands may include hay, pasture/grazing, or row crops such as soybeans or corn. Wetland-dependent crops include wild rice and cranberries, which rely on the wetland hydrology for part of their life cycle.

 $^{^{31}}$ c = Designated scientific and natural area; h = Archeologic or historic site designated by the State Historic Preservation Office; u = State or Federal designated wilderness area.

Sustainable uses of the wetland would not require modifying a natural wetland. Products in this category would include collection of botanical products, wet native grass seed, floral decorations, wild rice, black spruce, white cedar, and tamarack. Sustainable uses may require modification of the natural hydrology, such as for wetland-dependent crops (rice, cranberries). Haying and grazing can be less intrusive agricultural activities utilized more or less casually when hydrologic conditions permit; light pasture and occasional haying would be considered more or less sustainable. Like peat-mining, cropping is an unsustainable use of the wetland as it is results in severe alterations of wetland characteristics (soil, vegetation, hydrology).

MnRAM #	Excel #	Variable Description	Type of Interaction
57	E69	Commercial crop—hydrologic impact	Controlling

Commercial Uses Functional Index = 57

6.12 GROUND-WATER INTERACTION

The ground water interaction function is the most difficult to assess. Here the most likely type of ground water interaction is determined, i.e. recharge or discharge, or a combination. In many cases, a wetland will exhibit both recharge and discharge characteristics, however one is usually more dominant. Several wetland and watershed characteristics are evaluated to determine the likely interaction including: wetland soil type, upland land use, upland soil types and wetland size, wetland hydroperiod, wetland outlet characteristics, and topographic relief.

The purpose of this function is strictly to determine the likelihood of the appropriate ground-water interaction based on observable characteristics of the wetland and watershed. The significance of ground water as a component of the wetland water budget is the most difficult functional characteristic to determine without large quantities of detailed hydrologic and geologic information. The following methodology takes the most easily observable and distinct measures of recharge/discharge relationships from the *Wetland Evaluation Technique*³² and the *Hydrogeomorphic Assessment Methodology*³³. In many wetlands, surface water and ground water both make significant contributions to the water budget, but occasionally recharge or discharge is dominant. The goal here is to identify the dominant ground-water interaction (if there is one) to help guide future management and provide an indication when additional information may be warranted.

4/10/2006

³² Adamus, et al., 1987

³³ Magee and Hollands, 1998

- If 5 or 6 of questions 58-63 are answered the same, this indicates a strong likelihood that the most frequently stated interaction exerts the primary influence on the wetland.
- If 3-4 questions are answered the same, then the wetland is likely influenced by a combination of both recharge and discharge interactions (i.e. both types of ground water interaction are likely to be present at some point during most years).
- 58. Wetland Soils from HGM system functional assessments and Novitzki
- 59. Subwatershed Land Use/Imperviousness taken from WET Volume I
- 60. Wetland Size and Upland Soils taken from WET Volume I and HGM
- 61. Wetland Hydrologic Regime- taken from WET Volume I and HGM
- 62. Inlet/Outlet Configuration taken from WET Volume I and HGM
- 63. Upland Topographic Relief taken from WET Volume I

Special Concerns for Recharge Wetlands

Wherever ground water recharge is indicated as the **primary** interaction and the wetland lies within a sensitive ground water area (**Special Feature Question q**), a contribution area to a public water supply, or a wellhead protection area (**Special Feature Question r**), it should be recorded as Exceptional for the ground water/wetland function.

6.13 WETLAND RESTORATION POTENTIAL

The potential for wetland restoration is determined based on the ease with which the wetland could be restored, the number of landowners within the historic wetland basin, the size of the potential restoration area, the potential for establishing buffer areas or water quality ponding, and the extent and type of hydrologic alteration. Each variable uses the High, Medium, Low rating rather than raw numbers—see MnRAM for individual ranges.

MnRAM #	Excel #	Variable Description	Type of Interaction
64	D79	Wetland Restoration Potential	Controlling
65	F80	Number of Landowners Affected	Contributing
21	E25	Subwatershed Wetland Density	Contributing
66b	F82	Total Wetland Restored Size (Potential)	Contributing
66c	F83	Calculated potential new wetland area	Contributing
67	F84	Potential Buffer Width	Contributing
68	F85	Likelihood of Restoration Success	Contributing

If 64="Yes", then Wetland Restoration Potential = (65+21+66b+66c+67+68)/6,

Otherwise, if 64="No" then "N/A"

Entire Formula

(Landowners Affected by Restoration (65)+Subwatershed Wetland Density (21)+ Wetland Restoration Size (66b)+Proportion of Wetland Drained (66c)+Potential Buffer Width (67)+Likelihood of Restoration Success (68))/6

6.14 WETLAND SENSITIVITY TO STORMWATER INPUT AND URBAN DEVELOPMENT

The sensitivity of the wetland to stormwater and urban development is determined based on guidance within the *Storm-Water and Wetlands: Planning and Evaluation Guidelines for Addressing Potential Impacts of Urban Storm-Water and Snow-Melt Runoff on Wetlands*, State of Minnesota Storm-Water Advisory Group, June, 1997.

Use habitat proportions from Vegetative Integrity section and enter into a formula to compute answer according to the following criteria³⁴.

- Exceptional = Sedge meadows, open and coniferous bogs, calcareous fens, low prairies, wet to wet-mesic prairies, coniferous swamps, lowland hardwood swamps, or seasonally flooded basins.
- A = Shrub-carrs, alder thickets, diverse fresh wet meadows dominated by native species, diverse shallow and deep marshes, and diverse shallow, open water communities.
- B = Floodplain forests, fresh wet meadows dominated by reed canary grass, shallow and deep marshes dominated by cattail, reed canary grass, giant reed or purple loosestrife, and shallow, open water communities with low to moderate vegetative diversity.
- C = Gravel pits, cultivated hydric soils, or dredge/fill disposal sites.

6.15 Additional Stormwater Treatment Needs

This rates the sustainability of the wetland with regard to stormwater discharges to the wetland. The need for additional stormwater treatment prior to discharge to the wetland is rated based on the overall rating for Maintenance of Wetland Water Quality. If a wetland is severely degraded by stormwater inputs, the rating will be low, since a diverse, high quality wetland will not be sustainable.

Use functional rating for Maintenance of Wetland Water Quality (MWWQ) as follows (this index is rated strictly from the measure of the water quality in the wetland and the sustainability, i.e. if the water quality in the wetland is low, additional stormwater treatment is needed to protect the wetland and the rating is low):

Use Value for Maintenance of Wetland Water Quality Index (D76, Excel spreadsheet) and apply to criteria below.

- A = Maintenance of Wetland Water Quality Index >0.66 (no additional treatment needed)
- $B = 0.33 < Maintenance of Wetland Water Quality Index \le < 0.66 \text{ (sediment removal needed)}$

³⁴ Taken directly from State of Minnesota Storm-Water Advisory Group, 1997.

C = Maintenance of Wetland Water Quality Index < 0.33 (sediment and nutrient removal needed)

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Appendix G

Vegetation Shoreline Buffer Brochure Examples

HENNINGSON

RESIDENTIAL NATIVE PLANTING



- PROJECT: Installation of a 500 sq. ft. residential native garden.
- COST: Project materials cost estimated at \$2,360
- **FUNDING:** Landowners receive a \$250 Landscaping for Clean Water grant as well as technical assistance provided by the Dakota County Soil and Water Conservation District



LOCATION:

Kenosha Ave Burnsville





PRACTICE:

Native Planting

BENEFITS:

- Runoff volume reduction
- Slope stabilization
- Improved wildlife habitat
- Opportunity for public education and outreach
- Improved aesthetics

PARTNERS:

 Black Dog Watershed Management Organization

WATERSHED:

Black Dog

INSTALLATION:

Summer 2021

DILLMAN NATIVE SHORELINE PLANTING



- PROJECT: Installation of a 620 square foot Native Shoreline Planting
- COST: Project materials cost estimated at \$1,096
- FUNDING: Landowners receive a \$250 Landscaping for Clean Water grant as well as technical assistance provided by the Dakota County Soil and Water Conservation District



LOCATION:

Keller Lake Road Burnsville



DAKOTA COUNTY

PRACTICE:

Native Shoreline Planting

BENEFITS:

- Shoreline stabilization and erosion reduction
- Improved water quality
- Improved wildlife habitat
- Opportunity for public education and outreach
- Improved aesthetics

PARTNERS:

 Black Dog Watershed Management Organization

WATERSHED:

Black Dog

INSTALLATION:

Summer 2021

ASHENBRENER RESIDENTIAL SHORELINE PLANTING







- **PROJECT:** Installation of a 280 square foot residential shoreline planting
- **COST:** Project materials cost estimated at \$1,410
- **FUNDING:** Landowners receive a \$250 Landscaping for Clean Water grant as well as technical assistance provided by the Dakota County Soil and Water Conservation District



LOCATION:

Burnsville, MN Baypoint Drive



PRACTICE:

• Residential shoreline planting

BENEFITS:

- Shoreline stabilization and erosion reduction
- Improved water quality
- Improved wildlife habitat
- Opportunity for public education and outreach
- Improved aesthetics

PARTNERS:

Black Dog Watershed
 Management Organization

WATERSHED:

• Minnesota River

RECEIVING WATERS:

Unnamed pond

INSTALLATION:

• Summer 2016

DELONG RESIDENTIAL SHORELINE



- **PROJECT:** Installation of a 1,300 square foot native shoreline planting
- **COST:** Project materials cost estimated at \$2,300

FUNDING: Landowners receive a \$250 Blue Thumb grant as well as technical assistance provided by the Dakota County Soil and Water Conservation District



LOCATION:

Lakeville, MN 166th Street W.





PRACTICE:

Residential Native
 Shoreline Planting

BENEFITS:

- Shoreline stabilization and erosion reduction
- Improved water quality
- Improved wildlife habitat
- Opportunity for public education and outreach
- Improved aesthetics

PARTNERS:

Black Dog Watershed
 Management Organization

WATERSHED:

• Minnesota River

RECEIVING WATERS:

Lee Lake

INSTALLATION:

• Summer 2016
PROJECT FACTSHEET

MCCRUM RESIDENTIAL SHORELINE PLANTING







- PROJECT: Installation of a 1000 square foot residential shoreline planting
- **COST:** Project materials cost estimated at \$3,000

FUNDING: Landowners receive a \$250 Blue Thumb grant as well as technical assistance provided by the Dakota County Soil and Water Conservation District



LOCATION:

Burnsville, MN 132nd Street East





• Residential shoreline planting

BENEFITS:

- Shoreline stabilization and erosion reduction
- Improved water quality
- Improved wildlife habitat
- Opportunity for public education and outreach
- Improved aesthetics

PARTNERS:

Black Dog Watershed
Management Organization

WATERSHED:

• Minnesota River

RECEIVING WATERS:

• Minnesota River

INSTALLATION:

• Summer 2015

PROJECT FACTSHEET

GILBERTSON RESIDENTIAL RAINGARDEN



- **PROJECT:** Installation of a 275 square foot residential raingarden
- **COST:** Project materials cost estimated at \$706
- **FUNDING:** Landowners receive a \$250 Landscaping for Clean Water grant as well as technical assistance provided by the Dakota County Soil and Water Conservation District



LOCATION:

Lakeville, MN 170th Street West





PRACTICE:

• Residential raingarden

BENEFITS:

- Runoff volume reduction
- Improved water quality
- Improved wildlife habitat
- Opportunity for public outreach and education
- Improved aesthetics

PARTNERS:

 Black Dog Watershed Management Organization

WATERSHED:

• Minnesota River

RECEIVING WATERS:

Crystal Lake

INSTALLATION:

• Summer 2015

PROJECT FACTSHEET

COADY SHORELINE PLANTING



- **PROJECT:** Installation of a 1000 square foot shoreline planting
- **COST:** Project materials cost estimated at \$3,192
- **FUNDING:** Landowners receive a \$250 Blue Thumb grant as well as technical assistance provided by the Dakota County SWCD



LOCATION:

Burnsville MN Bluebill Bay Road





PRACTICE:

Shoreline Planting

BENEFITS:

- Shoreline stabilization and erosion reduction
- Improved water quality
- Improved wildlife habitat
- Opportunity for public education and outreach
- Improved aesthetics

PARTNERS:

Black Dog Watershed
Management Organization

WATERBODY:

• Crystal Lake

WATERSHED:

• Minnesota River

INSTALLATION:

• Summer 2014

Sullivan Shoreline Planting





Costs: Project material costs were estimated at \$935.

Funding: Dakota County SWCD provided technical assistance and Blue Thumb Grant in the amount of \$100. The City of Burnsville provided Neighborhood Water Resources Enhancement Grant. **Project:** A 375 square foot shoreline planting along Crystal Lake, covering approximately 50 linear feet of shoreline. Erosion control blanket, native shrubs, and deep-rooted native plant plugs were used to stabilize the existing slope.







Location:	A
Burnsville	
Minnesota	

Dakota County Soil and Water Conservation District 4100 220th St. W., Suite 102, Farmington, MN 55024 651-480-7777 www.dakotaswcd.org **Practice:** Shoreline Planting

Shoreline Benefits:

Reduced erosion and sediment into the receiving waterbody

Improved aesthetics

Improved water quality

Slope stabilization

Partners:

Black Dog Watershed Management Organization

City of Burnsville

Watershed: Minnesota River

Construction: July **2009**

Fay Shoreline



Project: A 600 square foot shoreline planting.

Costs: Project material costs were estimated at \$1,847.

Funding: Dakota County SWCD provided technical assistance and Blue Thumb Grant in the amount of \$250.





	213
Location:	Aller
Burnsville	
Minnesota	

Dakota County Soil and Water Conservation District 4100 220th St. W., Suite 102, Farmington, MN 55024 651-480-7777 www.dakotaswcd.org



Practice:

Shoreline planting and Native garden

Benefits:

Runoff volume reduction

Improved aesthetics

Improved water quality

Opportunity for public education and outreach

Wildlife habitat

Slope stabilization

Partner:

Black Dog Watershed Management Organization

Watershed: Minnesota River

Construction:

2013

Appendix H

Buckthorn Management Guidelines

Buckthorn Management Guidelines

<u>Goal</u>: Restore native plant communities in designated natural areas and other park locations by controlling and removing non-native invasive species.

Buckthorn belongs to the *Rhamnaceae* family. It is native to Europe and Asia, first appearing in the U.S. in the late 1700s. Buckthorn quickly naturalized in the woodlands of the northeastern states. Today buckthorn flourishes in the understory of Minnesota woodlands and in brushy thickets along roadsides and fields. It has become a major plant pest in natural woodlands and wetlands.

Buckthorn can grow to 15-20 feet and has dark green elliptical or oval leaves. In the fall its leaves hang on late into the season and without much color change. It starts easily from seed and will tolerate almost any soil condition or location. In partial shade it will outstretch its neighbors toward the light.

Buckthorn removal is recommended for those areas where the native plant community has been displaced by buckthorn species and where there is a high likelihood that the native plant community can be enhanced and restored.

Restoration of the native communities is the overall intent of non-native eradication efforts.

Volunteer Considerations

Volunteers must be trained in species identification, removal techniques and other aspects related to the eradication/restoration efforts.

Identification of buckthorn by volunteers is best performed during the month of October.

Process

Buckthorn removal is a long-term process requiring several steps over a three- to four-year period. Pulling seedlings, cutting and removing mature plants, chemically treating stumps and replanting the site with native species are critical to the long-term success of restoration efforts.

Staff are responsible for cutting mature plants and chemically treating the stumps in areas designated for restoration. A 20%-25% solution of glyphosate (Roundup) with a dye is used to paint, chemically treat, and mark the stumps.

Volunteer procedures

- 1. Hand pulling allowed by volunteers with training or under the supervision of a "trained" volunteer supervisor.
- 2. Use of loppers allowed by volunteers.
- 3. No use of power tools or chemicals by volunteers; chemicals and power tool use only by staff or contractor.
- 4. Volunteers must sign waiver form.

Recommended chronology of restoration activities with volunteers Year one

- Seedlings cut or pulled (September-November)
- Mature trees cut by staff and/or volunteers in late fall (October-December)
- Stumps or stems chemically treated by staff immediately after cutting
- Removal of brush to a chipping location (or pile on site for burning)

Year two

- Remove seedlings by hand pulling or cutting and treating (June-November)
- Follow-up cutting by staff and/or volunteers in late fall (October-December) and chemically treat stump and stems.

Year three

- Seedling removal by hand pulling or cutting and treating as necessary
- Plant native understory shrubs, trees, ferns, wildflowers and grasses to approximate prior native plant community.

Year four

• Continued monitoring and buckthorn seedling removal

Other removal techniques

Mechanical

• Prescribed fire for seedlings; prescribed burns in early spring and fall annually or biannually to control buckthorn may have to be continued for several years

<u>Chemical</u>

- Cut-stump and stem treatment with glyphosate; 20%-25% active ingredient cut-stump; or basal bark spray treatment around the stem with 25-50% a.i. triclopyr (Garlon) – consideration of worker safety issues will dictate chemical selection. Glyphosate products registered for wetland/aquatic use should be used on water bodies and wetlands. Sponge applicators can help prevent chemical spill or spread to workers.
- Fosamine, a non-selective bud inhibitor for woody species, can be applied as a basal bark treatment in the fall at 3% a.i. concentration in winter

Another technique is goat rental.

The method of buckthorn control should be selected based on the site, safety concerns, and opportunities for continued vegetation management.

Other Sources for Guidance

University of Minnesota: http://www.extension.umn.edu/environment/agroforestry/woody-vegetation-control.html

University of Wisconsin: http://mipncontroldatabase.wisc.edu/search?name=common_buckthorn&habitat=7&season=7

Minnesota Department of Natural Resources: <u>http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/control.html</u>

U.S. Department of Agriculture Natural Resources Conservation Service: <u>https://efotg.sc.egov.usda.gov/references/public/MN/797Buckthorn.pdf</u> See Buckthorn Control Quick Guide for a summary of control techniques.

Appendix I

Pollinators Brochure

How can YOU help pollinators?

A decline in pollinators affects us all. Reversing this trend is important to our ecosystem as well as to human health and well-being. Pollinators have evolved with plants over thousands of years, developing unique and interdependent relationships. We can all do our part to help pollinators rebound from the challenges they face.

- A
- 1. Plant a variety of native flowering plants in your home garden, agricultural or natural landscapes (with bloom times from April to October).
- 2. Provide a variety of natural habitats for nesting sites and clean water sources.
- 3. Avoid pesticide use and purchase pollinator plants (and seeds) that have not been treated with systemic pesticides.
- 4. Help increase awareness about the need to protect pollinators

More resources about pollinators can be found at http://www.bwsr.state.mn.us/practices/pollinator/index.html

Minnesota Board of Water & Soil Resources www.bwsr.state.mn.us

PROTECTING

Minnesota's Pollinators

There is increasing evidence that insect pollinators are disappearing at alarming rates. Major factors include loss of forage plants and nesting habitat, disease, pesticide use,

MINNESOTA BOARD OF WATER & SOIL RESOURCES

and pests.





Pollination causes plants to produce the seeds and fruits that sustain wildlife and humans, and provides important ecosystem services. More than 1/3rd of all plants or plant products consumed by humans are dependent on pollinators.

A

Many Minnesota-grown crop plants cannot produce seed without the help of insect pollinators. These include:

> -Apples -Berries -Sunflowers -Clovers -Beans -Squash -Cucumbers





Minnesota's Pollinators & Pollinator Plants **Bees**

With over 4000 species, bees are considered the most important pollinators in North America, around 500 of which are native to Minnesota and Wisconsin. Bee families include honey bees, bumble bees, mason bees, carpenter bees, and sweat bees.

When these critters visit a flower to consume nectar and/or pollen, some of the pollen grains stick to their bodies. Pollination occurs when this pollen is transferred from one plant to another.

Butterflies & Moths

Butterflies and moths are also important pollinators and many are in trouble. Milkweed is the host plant for monarch butterfly caterpillars, and the loss of this plant is drastically reducing monarch butterfly populations. The Poweshiek skipperling, Dakota skipper, and Karner Blue butterflies are threatened or endangered in Minnesota.

Beetles, Flies, Wasps & Midges

Beetles are considered to be important pollinators because of their large numbers. Beetles play an important role in controlling agricultural pests. Though less effective as pollinators, many flies, wasps, midges, and even mosquitos visit flowers and consume nectar as part of their diet.

Hummingbirds

Of the 20 hummingbirds in North America, only the Ruby-throated is regularly found in Minnesota. This charismatic pollinator is attracted to brightly colored tubular flowers like the columbine.





Columbine Aquilegia spp.



Joe Pye Weed *Eupatorium* spp.

Goldenrod Solidago spp.

Milkweed Asclepias spp. Black-eyed Susan Rudbeckia spp.

Prairie Blazing Star Liatris spp.