

Technical Memorandum

To:Commissioners, Black Dog Watershed Management Organization (BDWMO)From:Barr Engineering Co.Subject:2017 Orchard Lake Habitat MonitoringDate:February 21, 2018Project:23190457

This memorandum presents the results of the BDWMO's 2017 habitat monitoring of Orchard Lake.

1.0 Introduction and Background to the BDWMO Habitat Monitoring Program

The BDWMO lies south of the Minnesota River in the northwest portion of Dakota County. **Figure 1** shows the subwatersheds to the BDWMO's strategic water bodies. From 2003-2009 Barr staff annually evaluated the habitat quality of all of the strategic water bodies. Beginning in 2011, the BDWMO revised the program to monitor the habitat quality at one strategic water body per year, such that the BDWMO monitors all five strategic water bodies over a five-year cycle. The 2011 through 2015 reports provide 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 2017 habitat monitoring conducted for Orchard Lake.

Habitat quality was evaluated within the submergent, emergent, and upland buffer vegetation zones, and the lake was evaluated for sedimentation and shoreline erosion problems. Wildlife habitat characteristics were evaluated based on diversity of native plant communities present within each vegetation zone and an assessment of wetland functions and values. Additional detail describing the habitat assessment is provided in the technical reference section following this memorandum, which includes

- Orchard Lake aquatic plant survey results (**Appendix A**),
- floristic quality assessment data and methods (Appendix B),
- previous habitat assessment monitoring results from 2003 through 2016 (Appendix C),
- previous recommended and completed management actions from 2003 through 2016 (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**), and
- buckthorn management guidelines (**Appendix H**).

2.0 Orchard Lake Habitat Monitoring

Orchard Lake is a 243-acre lake located in Lakeville. The lake is used primarily for fishing, but swimming, boating, and aesthetic and wildlife viewing are also popular recreational uses of the lake. There is a public boat access on the south shore, a public beach on the west shore, and a public park on the northeast shore of Orchard Lake. Orchard Lake outlets through the Murphy-Hanrehan Park Reserve to the Credit River. Therefore, Orchard Lake is part of the Credit River hydrologic watershed. 2016 aerial imagery of Orchard Lake is shown in **Figure 2**.

2.1 Orchard Lake 2017 Habitat Monitoring Results

Habitat monitoring for Orchard Lake was conducted from 2003 through 2009, in 2012, and in 2017. The 2017 field monitoring of Orchard Lake was conducted on June 9, July 3, and July 12, 2017. Vegetation data were collected in, within, and along the fringe of Orchard Lake's three vegetation zones: (1) submergent, (2) emergent, and (3) upland.

The 2017 Orchard Lake monitoring included transect, plot, and meandering surveys. Photographs were taken to document conditions. Analysis and reporting of the monitoring data was enhanced to include a floristic quality assessment and a four-tiered rating system (poor, moderate, high, and excellent). The current rating system is detailed in footnotes on **Table 1**. Private versus public ownership was identified along the entire shoreline. The survey results, along with parcel data, are used to identify possible locations for restoration and preservation.

Blue Water Science staff conducted aquatic vegetation surveys within the submergent zone on June 9 and July 12, 2017 (**Appendix A**). On July 3, 2017, Barr staff, along with City of Lakeville's Environmental Resource Specialist Ann Messerschmidt, conducted emergent vegetation and upland buffer zone surveys by walking along the shoreline. The monitoring was conducted using a meandering method along the shoreline. In addition, the discrete plots were monitored in the emergent zone and upland buffer as done in 2003-2009 and 2012. **Figure 3** shows the plot locations and the shoreline parcels identifying private versus public ownership. Previous monitoring reports provide the sampling methodology for monitoring conducted before 2017. An overall quality rating for each vegetation zone was computed using the field variables evaluated in each zone. **Table 1** shows the 2012 and 2017 habitat quality ratings for Orchard Lake and **Table 2** shows the recommended management action items. Photos of Orchard Lake were taken during the 2017 monitoring and are included at the end of this memorandum.

The overall ratings in 2017 for each vegetation zone within and adjacent to Orchard Lake are shown on the following schematic diagram:



2.1.1 Orchard Lake Overall Vegetation Zone Ratings

Table 1 shows the 2012 and 2017 Orchard Lake habitat monitoring results. Appendix C provides habitat ratings for the Orchard Lake monitoring conducted prior to 2012.

Submergent Zone

The total number of native species in the submergent zone is **excellent** (16), the average native plant density rating is **excellent** (1.2), the average exotic species density is rated **moderate** (1.1) and the Mean Coefficient of Conservatism Value (C-Value) Rating is **moderate** (5.2). Averaging these four criteria results in a **high** rating overall for the submergent zone of Orchard Lake. This is an improvement from the overall **moderate** rating in 2012.

Curlyleaf pondweed (*Potamogeton crispus*) is common every year in Orchard Lake in in the early spring. This invasive plant often out-competes native vegetation early in the growing season and dies off in early to mid-summer, which creates a sudden loss of habitat and releases nutrients into the water that can produce algal blooms and create turbid water conditions. From 1999 through 2017, the City of Lakeville contracted with Blue Water Science to conduct aquatic plant surveys twice per year. The city harvested curlyleaf pondweed annually from 2004 through 2019 and conducted herbicide treatments annually from 2009 through 2012 and 2015 through 2017. Aquatic plant surveys conducted in 2017 after herbicide treatment indicate that the treatment was effective. The continued curlyleaf pondweed management efforts may be a contributing factor in the resulting excellent ratings for number of native species and density of native species in 2017.

The Mean C-Value Rating was added to the analysis in 2011 to provide an additional assessment of floristic quality. The C-value is a numerical rating of an individual species' conservatism and habitat fidelity in relation to disturbance. C-values range from 0 to 10. Species that are least conservative, or show the least fidelity to specific natural habitats are often opportunistic invaders of natural communities, or are native species typical of disturbed communities, and are assigned a low value. For example, coontail (*Ceratophyllum demersum*) has a C-value of 2 and curlyleaf pondweed has a C-value

of 0). While high values indicate the species is found in undisturbed communities and has a narrow range of ecological tolerances. For example, white stemmed pondweed (*Potamogeton praelongus*) and white water crowfoot (*Ranunculus longirostris*) have C-values of 7. The mean C-value for vegetation found in the submergent zone of Orchard Lake in 2017 was 5.2. This was multiplied by the square root of the number of species to provide a Floristic Quality Index (FQI) as shown in **Appendix B**. For purposes of this habitat assessment, the mean C-value and the number of species are given separate ratings, and are averaged along with the density ratings to provide an overall rating for the submergent zone. Ratings used in this assessment are based on Minnesota Pollution Control Agency (MPCA) C-value guidelines (Floristic Quality Assessment for Minnesota Wetlands, MPCA, May 2007). In December of 2012, the MPCA published the Rapid Floristic Quality Assessment Method using a weighted average. The Rapid Floristic Quality assessment was also calculated in 2017 for Orchard Lake and the results of this calculation are also provided in **Appendix B**. The mean C-value was rated as **moderate**, and the Rapid Floristic Quality Assessment rating was **fair** for floristic quality in the submergent zone.

Emergent Zone

The overall emergent vegetation zone quality is rated **moderate** for Orchard Lake; this is the same as the overall 2012 rating. The emergent zone includes a diverse assemblage of native wetland plant species (50) resulting in an **excellent** rating and a **moderate** percent cover of exotic species (51-75%). The approximate percent cover of vegetation (51-75%) is a **high** rating. The mean C-value rating is **poor** (2.7) and the Rapid Floristic Quality assessment calculations are rated as **fair** for the deep marsh community and **poor** for the forested community within the emergent zone (**Appendix B**).

Non-native species, such as hybrid cattail (*Typha glauca*) and narrowleaf cattail (*Typha angustifolia*), are dominant within the vegetated emergent zone near the boat launch at the south end and in the northeastern portion of Orchard Lake. At the northeastern portion, the cattails are growing with many native species including sedges (*Carex spp.*), burr-reed (*Scirpus* and *Schoenoplectus spp.*), iris (*Iris versicolor*), bluejoint (*Calamagrostis canadensis*), and marsh fern (*Thelypteris palustris*). Channels and pools of shallow open water are present within the cattail marsh where native watershield (*Brasenia schreberi*) and bladderwort (*Utricularia macrorhiza*) are dominant. Green frog calls were heard during the monitoring event. Black coots and eagles were also observed. The marsh areas may provide habitat for the state threatened Blanding's turtle (*Emydoidea blandingii*). Purple loosestrife (*Lythrum salicaria*) was found in the northeast portion and in a bay at the southwest side of Orchard Lake (**Appendix A** and **Figure 4**). Purple loosestrife is an invasive non-native species that has been managed for years through the release of beetles which eat the purple loosestrife plants. This management strategy has been relatively successful within the Twin Cities metropolitan area. The Minnesota Department of Natural Resources (MN DNR) monitoring of the purple loosestrife beetles

indicates that populations are sufficient within the Twin Cities metropolitan area to keep purple loosestrife from becoming a significant problem.

Upland Buffer

The overall upland buffer quality is rated **moderate** for Orchard Lake. The upland buffer around the lake averages less than 10 feet in width and surrounds less than a quarter of the lake. A total of 25 native species and 21 exotic plant species were observed in the upland buffer area in 2017. Exotic plants make up greater than 40 percent of the vegetative cover. The mean C-value rating (1.9) in the upland buffer is poor (**Appendix B**). The upland buffer in the residential properties is dominated by maintained lawn grasses with little to no naturalized vegetation. No significant erosion or sedimentation problems were noted within the lake, but some areas with direct stormwater drainage from impervious surfaces into the lake and bare soil areas could be improved.

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

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

The shoreline property ownership around Orchard Lake is about 70% residential and 30% city ownership.

For Orchard Lake residential shoreline properties:

- The average buffer width is approximately 8 feet.
- Approximately 4% have an adequate buffer width to protect water quality and prevent erosion (≥50 feet).
- Approximately 11% have at least half of the recommended buffer width to protect water quality and prevent erosion (≥25 feet).
- One residential property along the shoreline of Orchard Lake has a naturalized buffer width adequate for wildlife protection (≥100 feet).

Approximately twenty of the residential shoreline properties on Orchard Lake do not have the potential to provide a 50-foot naturalized buffer without altering any structures. However, most of these properties could provide at least a 25-foot naturalized buffer.

For Orchard Lake city-owned public property:

- The average buffer width is approximately 20 feet.
- The buffers on the portion of the city-owned property near Klamath Trail Road average 50 feet wide. These cannot be expanded due to the location of the roadway.
- The City owned property in the boat launch area currently has a 5-foot wide naturalized buffer, but could have a naturalized upland buffer ranging from 25 feet at the west side to 200 feet at the east side.
- At the beach area, there is a concrete retaining wall north of the beach, which extends to the edge of the water. South of the beach, the current 5-foot wide naturalized buffer has the potential for a naturalized buffer ranging from 20 feet to as much as 100 feet wide.
- One city-owned property identified as Lakeview Gardens, located south of 168th Street West, currently has a 20-foot wide naturalized buffer, with the potential for a 50-foot wide naturalized buffer.
- The Wayside Park area currently has a 20-foot wide naturalized buffer, with the potential for a 200-foot wide naturalized buffer.

Minnesota Routine Assessment Method (MNRAM) for Wetlands

In 2012, based on the MNRAM, Orchard Lake rated **low** for overall vegetative diversity and integrity. The Orchard Lake shoreline wetland community rated **moderate** for shoreline protection. Maintenance of characteristic wildlife habitat and fish habitat were rated as **moderate** and amphibian habitat was rated as **low**. Aesthetics/recreation/education rated **high**. The MNRAM assessment also indicates that many of the integral hydrologic and land use processes that affect the lake are intact and in relatively good condition with **moderate** ratings for flood stormwater attenuation, downstream water quality, maintenance of wetland water quality, wetland sensitivity to stormwater and urban development, and additional stormwater treatment needs. The 2012 Orchard Lake MNRAM summary is provided in **Appendix E**. The MNRAM assessment was not repeated in 2017, as it would likely not result in significant changes from the 2012 assessment.

3.0 Orchard Lake Management Recommendations

3.1 Past and Current Actions

From 1999 through 2017, the City of Lakeville contracted with Blue Water Science to conduct aquatic plant surveys twice per year. The city harvested curlyleaf pondweed annually from 2004 through 2009, and conducted herbicide treatments annually from 2009 through 2012 and 2015 through 2017. Purple loosestrife beetles were released by the MN DNR prior to 2002. Follow up monitoring by the MN DNR indicates that beetles are present at a population that is appropriate for biological control. Continued management of the vegetation communities will help to maintain and improve wildlife habitat, vegetation diversity, aesthetics, and recreation. The City of Lakeville annually provides lakeshore owners with shoreline restoration information and encourages homeowners to take advantage of the Blue Thumb restoration program. In 2012, as a result of the Blue Thumb Program, one resident began a shoreline stabilization project that included adding native plants. Two raingardens and one shoreline restoration project were completed on 175th St W. In 2007, the City of Lakeville restored a small area of lakeshore near the boat launch using native plants. In 2010, an aeration system was installed in Orchard Pond adjacent to the southwest end of Orchard Lake, to precipitate out phosphorus and improve water quality flowing into Orchard Lake.

3.2 Recommendations

The 2017 habitat assessment results suggest several recommended management activities that could help maintain and improve the overall wildlife habitat, vegetation diversity, aesthetics, and water quality of the lake. **Table 2** provides a summary of identified problems, recommended management activities, and past actions. The management recommendations are presented below:

- 1. Continue to monitor, control, and manage curlyleaf pondweed. See **Appendix A** for the 2017 aquatic plant survey, which provides more details of actions and recommendations.
- 2. Continue to control common buckthorn (see Appendix H for buckthorn management guidelines).
- 3. Continue to control purple loosestrife. See Figure 4 for purple loosestrife locations.
- 4. Prevent runoff from impervious surfaces from entering the lake by directing stormwater into a rainwater garden, using pervious pavement, or other appropriate infiltration device prior to discharge into the lake, potentially through funding assistance from the Dakota County SWCD Landscaping for Clean Water program. See **Figure 4**, **Potential Restoration Area #6**, and site photos.

- Prevent erosion of bare soil by establishing vegetation, potentially through funding assistance from the Dakota County SWCD Landscaping for Clean Water program. See Figure 4, Potential Restoration Areas #4 and #5, and site photos.
- 6. Improve the shoreline with a wider naturalized upland buffer. Rather than manicured turf grass, the emergent zone and upland buffer could be vegetated with native grasses and wildflowers. A wider buffer of native vegetation could help protect water quality, prevent erosion, and improve wildlife habitat, vegetative diversity, and aesthetics. Lakeshore residents could receive assistance to create shoreline restoration projects through the Dakota County SWCD Landscaping for Clean Water program. See **Figure 4**, **Potential Restoration Areas #1 through 3**, **7 and 8**, **and site photos**. See **Appendix G** for examples of improvements.

Tables

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

		Submergent Zone											
Monitoring Year	Approximate Proportion of the	Overall Submergent Zone Quality ¹	Approximate Proportion of Water Body	Native Species			Exotic Species						
	Water Body Which is Deep Water Habitat (~ > 20 ft. depth)		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)				

Monitoring Year	Emergent Zone											
	Overall Emergent Zone Quality ⁶	Approximate Proportion of Emergent Zone	Approximate Total Percent Vegetative	Total Number of Native	Mean Coefficient of	Exotic Species						
		(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/Sedimentation									
Monitoring Year	Overall Upland	Unmanicured	Estimated Total Vegetative Cover	Total Number of Native Plant	Mean Coefficient of Conservatism Value	Buffer Continuity (Percent Surrounding	Exotic	Species	Shoreline Erosion (Percent	Sediment Deltas	
	Buffer Quality ¹⁰	Buffer Width''	(Percent Range) ¹²	Species ¹³		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 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.

Figures



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2016 CIR Aerial Imagery

Orchard Lake



Figure 2

ORCHARD LAKE Black Dog WMO Lakeville, MN









Figure 3

ORCHARD LAKE PLOT LOCATION AND PARCEL OWNERSHIP Black Dog WMO Lakeville, MN





Photos

Orchard Lake and Shoreline July 3, 2017



Submergent Zone – beach area



Plot 1B Emergent Zone – beach area



Plot 1C Upland Buffer – beach area - Potential Restoration Area #1



Submergent Zone – boat launch area



Plot 2B Emergent Zone – boat launch area



Plot 2C Upland Buffer – boat launch area – Potential Restoration Area #2



Submergent Zone – Wayside Park Area



Plot 3B – Emergent Zone – Wayside Park area



Plot 3C – Upland Buffer – Wayside Park area – Potential Restoration Area #3



Potential Restoration Area #4 – Beach Area – Dilapidated timber retaining wall was taken out and shoreline restoration attempted, but failed. Would need soil improvement to be successful.



Timber wall was replaced by concrete wall at north end of beach area. Poor vegetation establishment above the concrete.



Potential Restoration Area #5 - An established canoe and kayak access at the Wayside Park could help prevent shoreline erosion in this location.



Potential Restoration Area #6 - Stormwater drainage from the road is directed into the lake. A barrier, pre-treatment, and/or naturalized upland buffer could help improve water quality.



Potential Restoration Area #7 – This property is owned by the City of Lakeville and is adjacent to residential shorelines. A shoreline and upland buffer restoration here could provide an example for adjacent residential landowners.



Typical residential shorelines lacking naturalized vegetation in the emergent zone and upland buffer Potential Restoration Area #8 – Nearly All Residential Shoreline properties



A shoreline restoration was established in 2012 in lot shown here beyond the bench. Vegetation has become well established.



Area A



Area B



Area C

Examples of naturalized vegetation in the emergent zone and upland buffer which provides wildlife habitat and water quality protection.

Technical Reference

(Provided in separate report)