

# Meadow Lake Drawdown Feasibility Report



*Prepared for:*  
**City of New Hope, MN  
Shingle Creek  
Watershed Management Commission**



*Prepared by:*

**WENCK Associates, Inc.**  
7500 Olson Memorial Hwy  
Golden Valley, MN 55427  
Phone: 763-2529-6800  
Wenck.com

## Table of Contents

<b>1.0</b>	<b>INTRODUCTION AND BACKGROUND .....</b>	<b>1-1</b>
1.1	Introduction .....	1-1
1.2	Project Background .....	1-1
<b>2.0</b>	<b>CURRENT CONDITIONS.....</b>	<b>2-1</b>
2.1	Watershed and Lake Characteristics .....	2-1
2.2	Lake Water Quality .....	2-3
2.3	Aquatic Communities .....	2-5
2.3.1	Aquatic Vegetation .....	2-5
2.3.2	Phytoplankton and Zooplankton .....	2-5
2.3.3	Fishery .....	2-6
2.3.4	Other Aquatic Life .....	2-9
2.3.5	Other Observed Wildlife .....	2-9
<b>3.0</b>	<b>PROBLEM ASSESSMENT .....</b>	<b>3-1</b>
3.1	Problem Assessment.....	3-1
3.1.1	Phosphorus Loading.....	3-1
3.1.2	Biologic Condition.....	3-2
3.2	Meadow Lake Management Plan .....	3-2
3.2.1	Project Goals and Objectives .....	3-2
3.2.2	Lake Drawdown .....	3-4
3.2.3	Alum Treatment.....	3-4
<b>4.0</b>	<b>LAKE DRAWDOWN .....</b>	<b>4-1</b>
4.1	Purpose .....	4-1
4.2	Drawdown Details .....	4-1
4.2.1	Pump Operation Plan .....	4-1
4.2.2	Lake Refill .....	4-2
4.3	Project Impacts.....	4-3
4.3.1	Impacted Properties .....	4-3
4.3.2	Impact to Downstream Receiving Waters .....	4-3
4.3.3	Fish and Wildlife Protection Plan .....	4-5
<b>5.0</b>	<b>REFERENCES.....</b>	<b>5-1</b>

### **TABLES**

Table 2.1. Physical characteristics of Meadow Lake. ....	2-1
Table 2.2. Fish data collected on Meadow Lake. ....	2-6
Table 2.3. Turtles observed in Meadow lake.....	2-9
Table 3.1. Updated existing and allowable TP loads for Meadow Lake.....	3-1
Table 4.1. Pumped flow as a percent of Bass Creek flow. ....	4-3

## **FIGURES**

Figure 1-1. Meadow Lake in New Hope, MN. ....	1-2
Figure 2-1. Meadow Lake lakeshed and stormwater features. ....	2-2
Figure 2-2. Meadow Lake historic summer total phosphorus (TP) concentrations. ....	2-3
Figure 2-3. Meadow Lake historic summer chlorophyll-a concentrations. ....	2-4
Figure 2-4. Meadow Lake historic Secchi depth in meters. ....	2-4
Figure 2-5. Zooplankton community for Meadow Lake sampled in summer 2020. ....	2-6
Figure 2-6. Over 30,000 fathead minnows captured (left) and their size distribution (right) from the 2020 survey. ....	2-7
Figure 2-7. 2016 SAV survey results. ....	2-8
Figure 2-8. Mini-fyke net deployed in Meadow Lake in September 2020 (left) and turtles incidentally caught in the 2017 fish survey (right). ....	2-9
Figure 3-1. Meadow Lake Management Plan decision tree. ....	3-3
Figure 4-1. Drawdown pumping schematic plan and outlet structure. ....	4-2
Figure 4-2. Outflow from Meadow Lake to Bass Creek. ....	4-4
Figure 4-3. Meadow Lake bathymetry and proposed un-drained area for turtle hibernation (translucent red). ....	4-6

## **APPENDICES**

Appendix A	Property Owner Consent Documentation
------------	--------------------------------------

# 1.0 Introduction and Background

---

## 1.1 INTRODUCTION

Meadow Lake (27-0057-00) is a shallow eutrophic lake located in New Hope, MN (Figure 1-1). Meadow Lake discharges through storm sewer to Bass Creek, a tributary of Shingle Creek, which is a tributary of the Mississippi River. In 2002 the Minnesota Pollution Control Agency (MPCA) added the lake to the state's 303(d) list of Impaired Waters because of excess nutrient concentrations.

## 1.2 PROJECT BACKGROUND

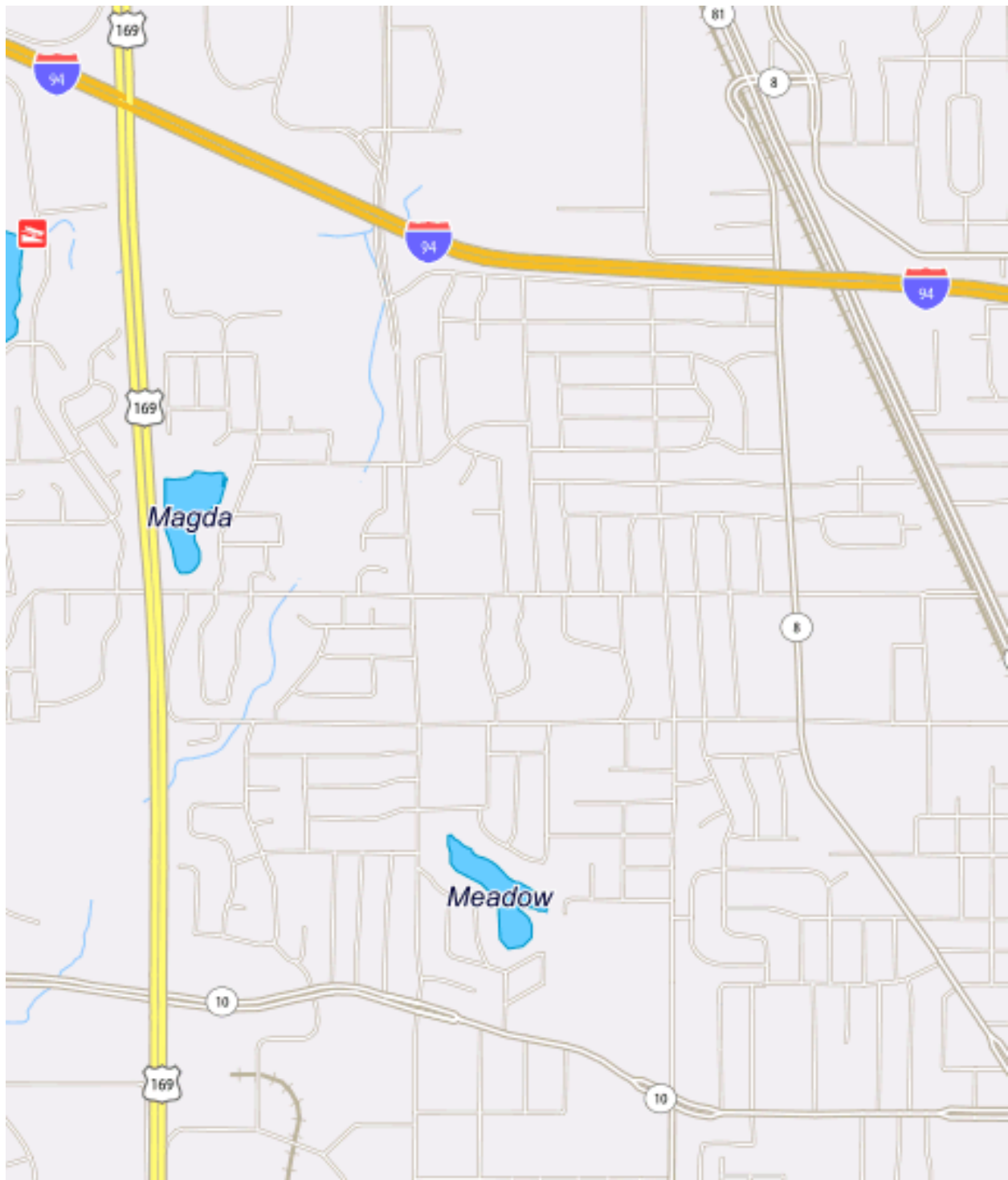
In 2010, the Shingle Creek Watershed Management Commission (Commission) completed a Total Maximum Daily Load (TMDL) study and Implementation Plan to assess nutrient loading concerns and provide strategies to reduce excess nutrient loading ([Wenck 2010a, 2010b](#)). The TMDL identified both watershed and internal phosphorus loading and estimated that the combined daily loads would have to be reduced by 82 percent for the lake to consistently meet state water quality standards.

The implementation plan suggested an approach that included reducing watershed load by adding load and volume reducing Best Management Practices (BMPs) and considering an integrated plan to manage the aquatic vegetation, fish, and zooplankton communities to maintain a level of water clarity desirable both aesthetically and for maintenance of a fishery. The plan also noted that Meadow Lake might be a good candidate for a water level drawdown. A drawdown would expose and consolidate the mucky lake sediments, reduce invasive submersed aquatic vegetation (SAV), and provide an opportunity for the native seed bank to reestablish a more beneficial aquatic vegetation community. However, the lakeshore owners were not supportive of a drawdown at that time.

A follow up progress report in 2019 ([Wenck 2019](#)) summarized progress toward meeting the required TMDL load reductions. The report estimated that the City and property owners had achieved an estimated 42 pounds of the required 61 pounds of annual phosphorus watershed load removal. In addition, several shoreline naturalizations have been planted to protect the shoreline, filter lawn runoff, and provide near-shore habitat.

As a part of the progress report, the lake response model was updated with more recent monitoring data and sediment core phosphorus release testing results, to update the internal load reduction estimate. That modeling estimates an internal load reduction of 93 percent, or 110 pounds per year, is necessary. Fish and SAV surveys revealed a nuisance amount of the invasive curly-leaf pondweed (*Potamogeton crispus*) (CLP) and an ongoing infestation of fathead minnows (*Pimephales promelas*). Both contribute to the poor water clarity, lack of native species, and poor water quality.

Following the completion of the progress report neighbors and city staff at public input meetings expressed an interest in pursuing a drawdown, and the Commission developed a proposed Meadow Lake Management Plan. This plan sets forth a program of activities including a drawdown, alum treatment, and fish and SAV management and a multi-year, phased, stepwise decision tree detailing potential lake responses and follow-up actions.



**Figure 1-1. Meadow Lake in New Hope, MN.**

## 2.0 Current Conditions

---

### 2.1 WATERSHED AND LAKE CHARACTERISTICS

Meadow Lake located in the City of New Hope, MN is within the Shingle Creek watershed boundary. This shallow lake has a relatively small lakeshed that is entirely developed. Land use is single family residential and includes an elementary school. Table 2.1 below shows the physical characteristics of the lake and its lakeshed.

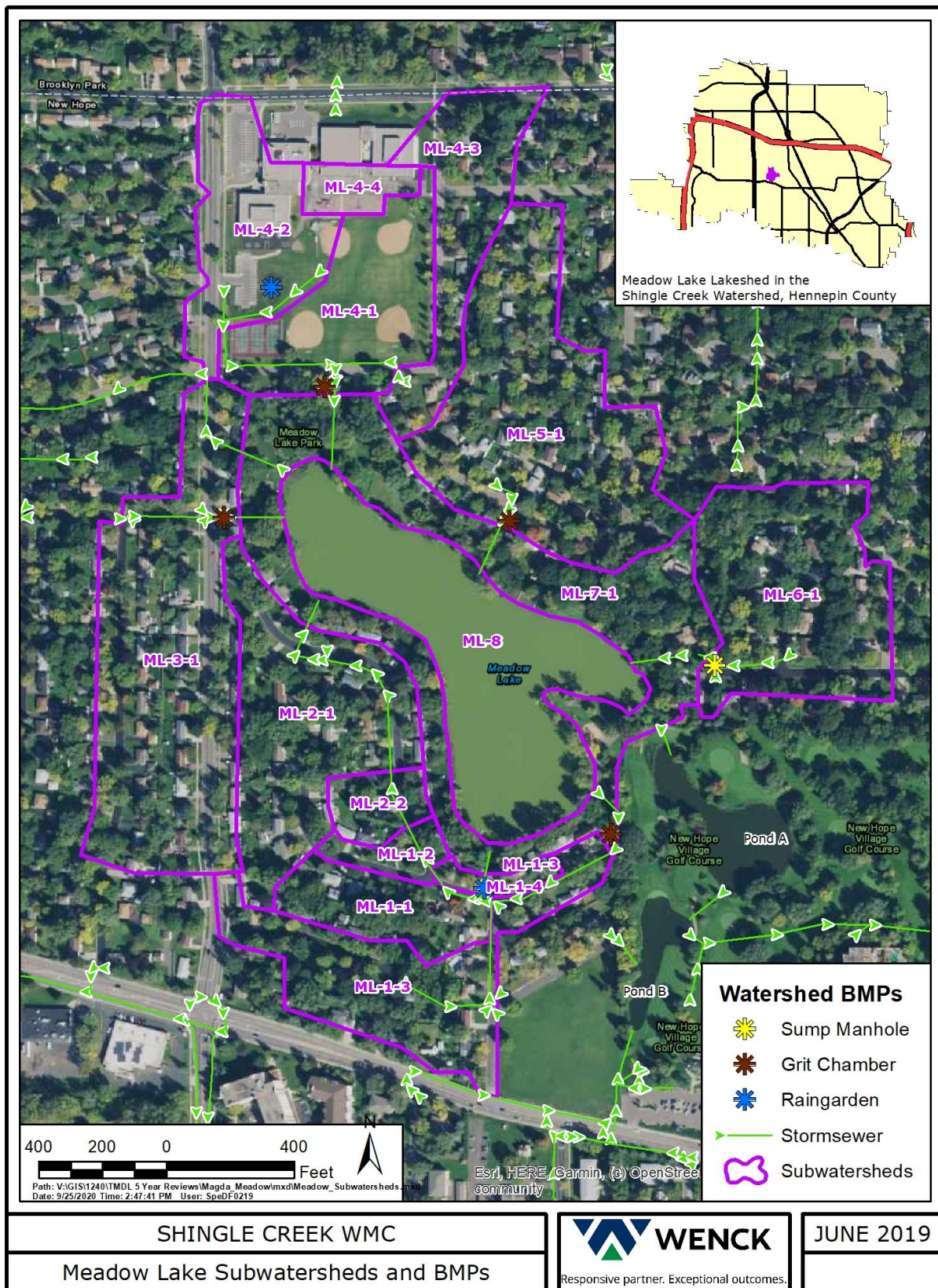
**Table 2.1. Physical characteristics of Meadow Lake.**

Parameter	Meadow Lake
Surface Area (ac)	12
Average (Maximum) Depth (ft)	1.9 (4)
Volume (ac-ft)	23
Residence Time (years)	0.1
Littoral Area (ac)	12 (100%)
Watershed Size (ac)	88

Storm sewers collect runoff from the 88 acre lakeshed (Figure 2-1), which flows into the lake from seven outfalls. Grit chambers or sump manholes have been installed on five of those outlets. A large boulevard rain garden provides additional treatment of street runoff, and a rain garden on the school property treats runoff from one of the parking lots. In the northwest corner of the lake is an outlet structure that discharges into city storm sewer and then into Bass Creek approximately one-half mile to the west.

The lake is hydraulically connected to a pond ("Pond A") on the New Hope Village Golf Course by a pipe with an invert slightly lower than the lake's runout elevation. Pond A is connected to another pond ("Pond B") to the south on the golf course via a pipe with an invert higher than the lake's runout elevation. This is intended to provide an emergency overflow for the lake/pond system. Pond B outlets into storm sewer on Bass Lake Road that flows east, eventually to Upper Twin Lake in the City of Crystal. The City of New Hope intends to use the proposed drawdown of Meadow Lake as an opportunity to drawdown Pond A to repair the equalizer pipe and associated structures.



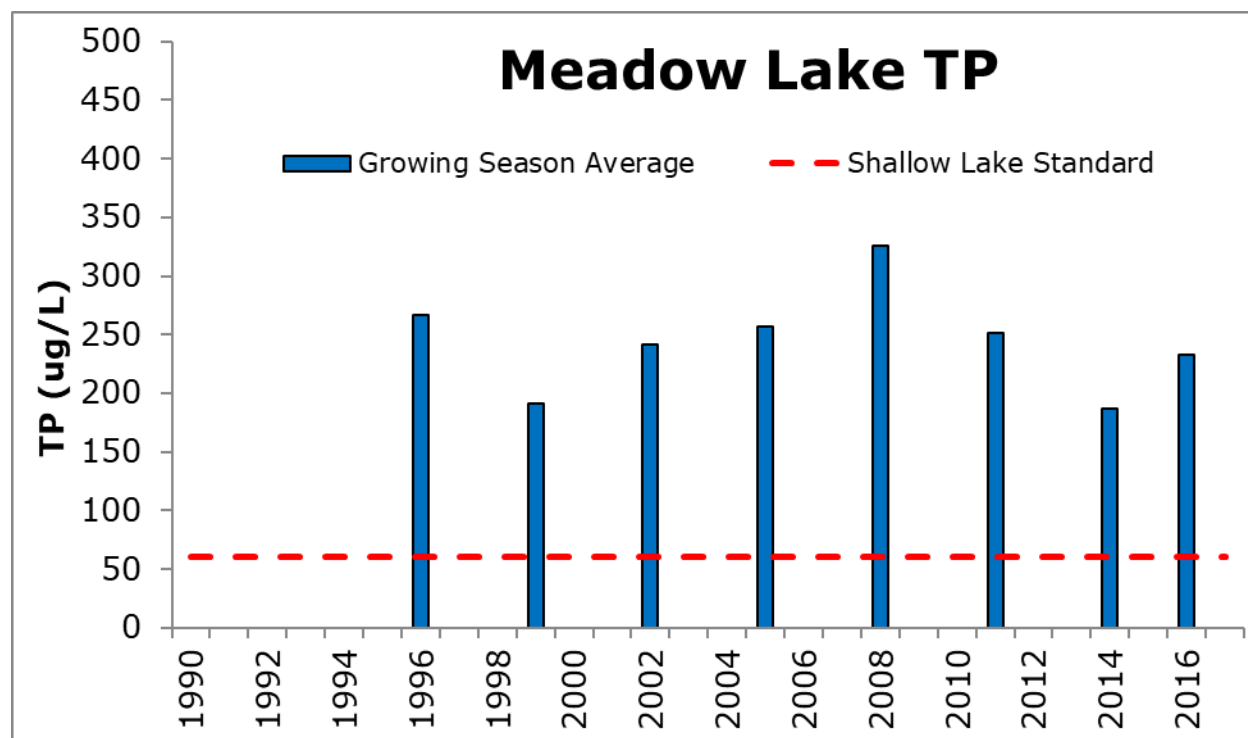


**Figure 2-1. Meadow Lake lakeshed and stormwater features.**

## 2.2 LAKE WATER QUALITY

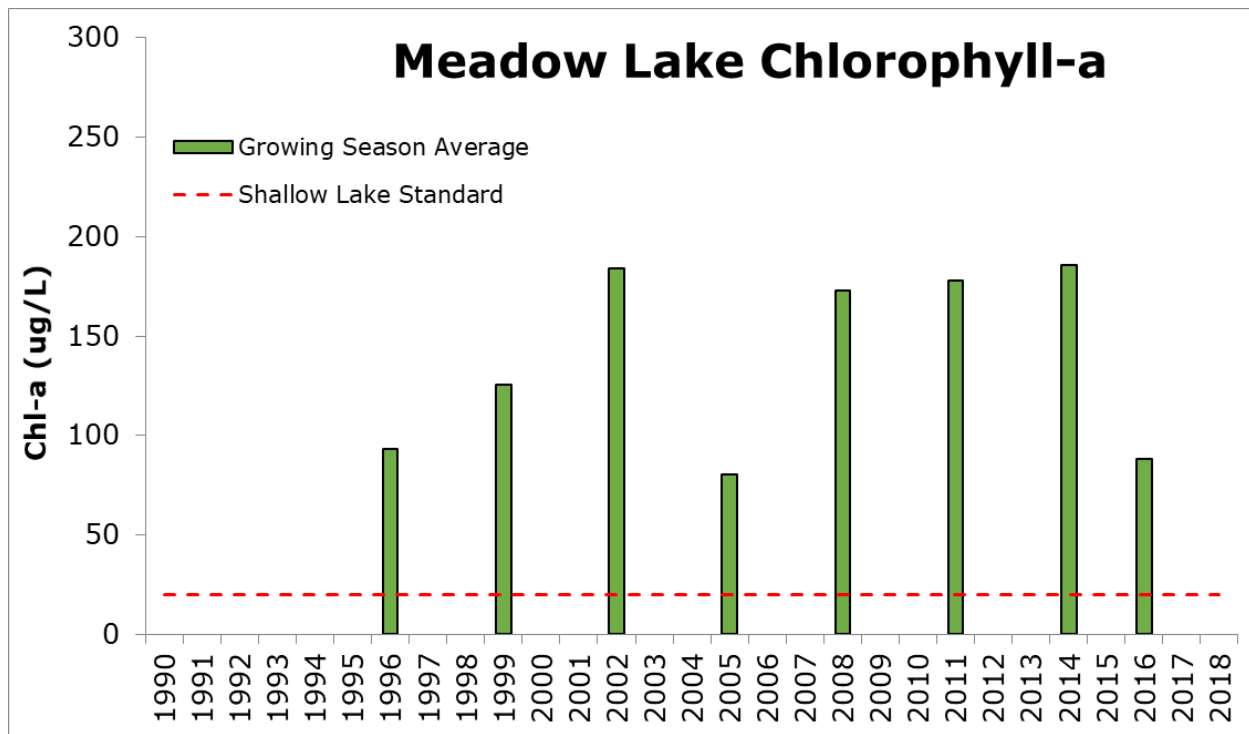
Meadow Lake is hypereutrophic and greatly exceeds the North Central Hardwood Forest shallow lakes standards. The lake is monitored by volunteers every 2-3 years through the Metropolitan Council's Citizen Assisted Monitoring Program (CAMP) and by the Commission approximately every five years. CAMP monitoring is limited to surface samples, while the Commission sampling includes both surface and water column profiles.

Figures 2-2, 2-3, and 2-4 show the summer average total phosphorus (TP) and chlorophyll-a concentrations and summer average Secchi depth. The dashed red horizontal line indicates the applicable state water quality standard for this ecoregion.

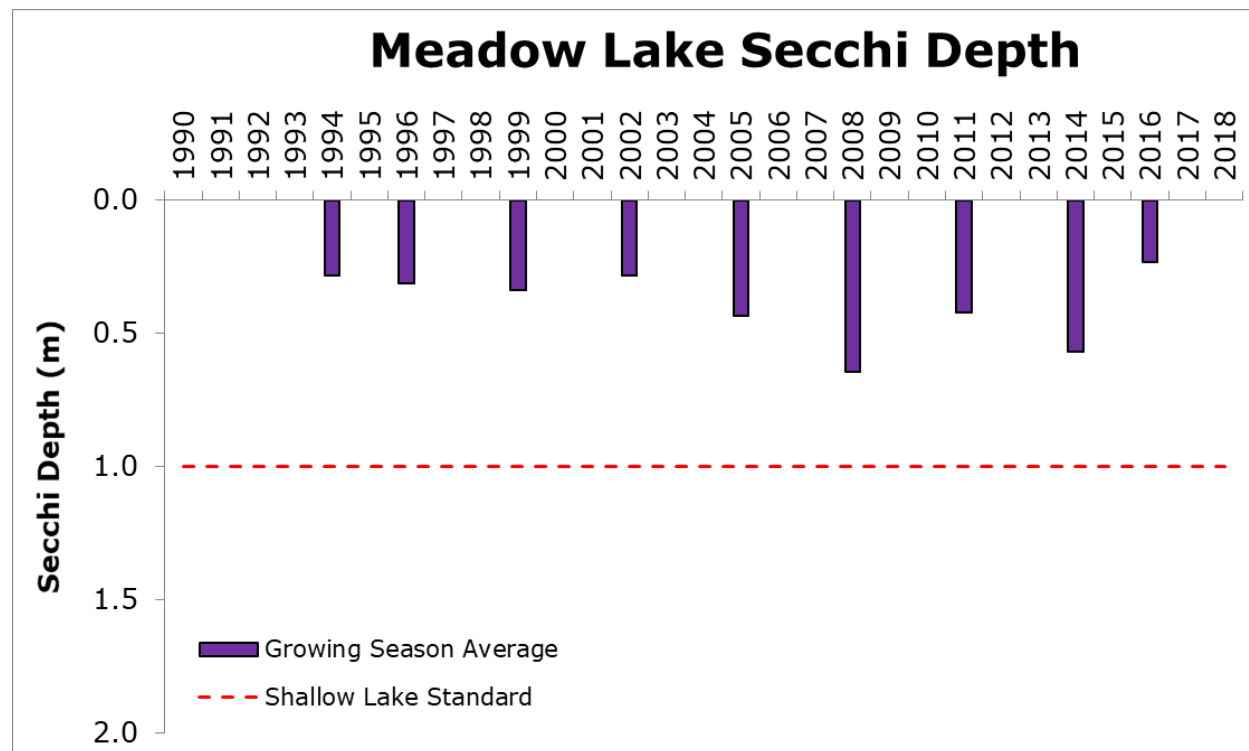


**Figure 2-2. Meadow Lake historic summer total phosphorus (TP) concentrations.**





**Figure 2-3. Meadow Lake historic summer chlorophyll-a concentrations.**



**Figure 2-4. Meadow Lake historic Secchi depth in meters.**

## **2.3 AQUATIC COMMUNITIES**

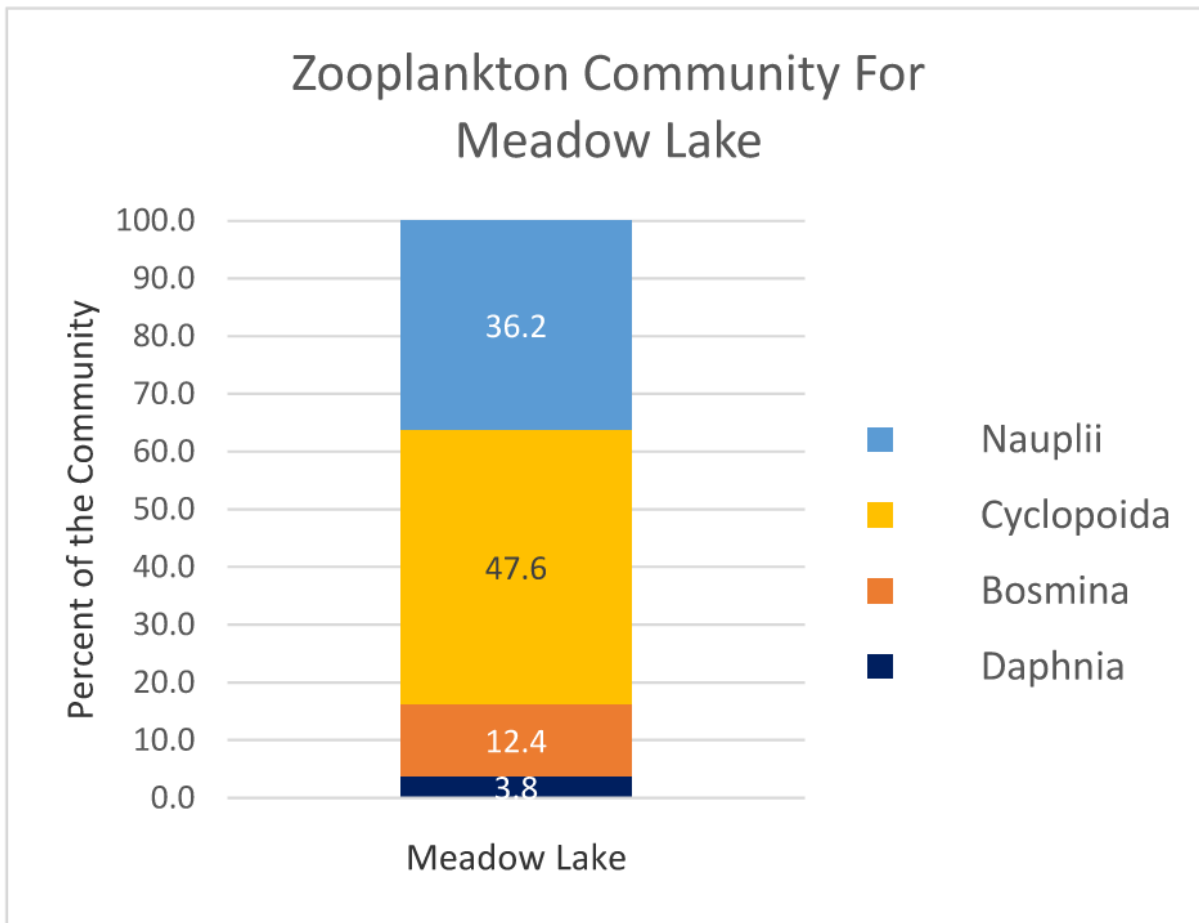
### **2.3.1 Aquatic Vegetation**

Spring and summer vegetation surveys were performed by the Commission on Meadow Lake in 2016 ([Wenck 2017](#)) as part of the routine Intensive Lake Monitoring Program (Figure 2-6) and again in 2020 in preparation for drawdown implementation. To the Commission's knowledge, no other systematic vegetation surveys have been performed on Meadow Lake to date. The 2016 surveys showed low species diversity (four species observed) and a Floristic Quality Index (FQI) score of 5.5 (well below the 17.8 shallow lake threshold). Plant abundance was high (100% coverage) during the June 2016 survey and low (19% coverage) during the August 2016 survey. The most common species observed during the June and August 2016 surveys were CLP (57%) and Elodea (*Elodea canadensis*) (19%), respectively.

The spring and summer 2020 surveys observed seven and nine species and FQI scores of 12.9 and 15.3, respectively. Plant abundance was high during both surveys (93–100% coverage). The most common species observed during the spring and summer 2020 surveys were leafy pondweed (*Potamogeton foliosus*) (75%) and Elodea (86%). CLP was observed in a low abundance during the spring survey (9%) and not observed in the summer. Other common invasive SAV, such as, Eurasian water milfoil (*Myriophyllum spicatum*) were not observed during any survey. Copper sulfate was applied to the lake in the 1990s to suppress algae and vegetation growth with limited success. There was some native vegetation response to a partial drawdown in 2006, which was undertaken to facilitate dredging sediment deltas at the storm sewer outfalls, but the effect was temporary.

### **2.3.2 Phytoplankton and Zooplankton**

Phytoplankton and zooplankton surveys were completed in summer 2020. Cyanobacteria and dinoflagellates were present in the phytoplankton sample, a typical community for a shallow Minnesota lake in the late summer. The concentrations of both phytoplankton types were low and not near nuisance levels. The zooplankton community was dominated by copepods (cylopoida and nauplii), but daphnia and bosmina were also present (Figure 2-5). These zooplankton are ubiquitous in lakes and most common in lakes with a healthy submersed vegetation community. The phytoplankton and zooplankton data provide a snapshot of the summer, pre-drawdown community.



**Figure 2-5. Zooplankton community for Meadow Lake sampled in summer 2020.**

### 2.3.3 Fishery

A fisheries assessment was completed on Meadow Lake in early August 2017. Only two species were observed during the 2017 assessment and the population was dominated by fathead minnow. A follow-up assessment was completed in September 2020. Fathead minnows were the only fish captured during the 2020 assessment. Rusty crayfish (*Orconectes rusticus*) and painted turtles (*Chrysemys picta*) were captured as bycatch. Table 2.2 summarizes fish sampling data.

**Table 2.2. Fish data collected on Meadow Lake.**

Sample Year	Fathead Minnow		Black Bullhead		Creek Chub	
	Biomass (g)	Count	Biomass (g)	Count	Biomass (g)	Count
2009 <sup>1</sup>	2,400		0		0	
2010 <sup>1</sup>	350		0		0	
2011 <sup>1</sup>	0		11,900		0	
2017 <sup>2</sup>	8,782	4,099	0	0	10	1
2020 <sup>2</sup>	54,192	33,827				

<sup>1</sup> 2009-2011 collection by Dr. Kyle Zimmer, University of St. Thomas; 2017 and 2020 collected by Wenck Associates.

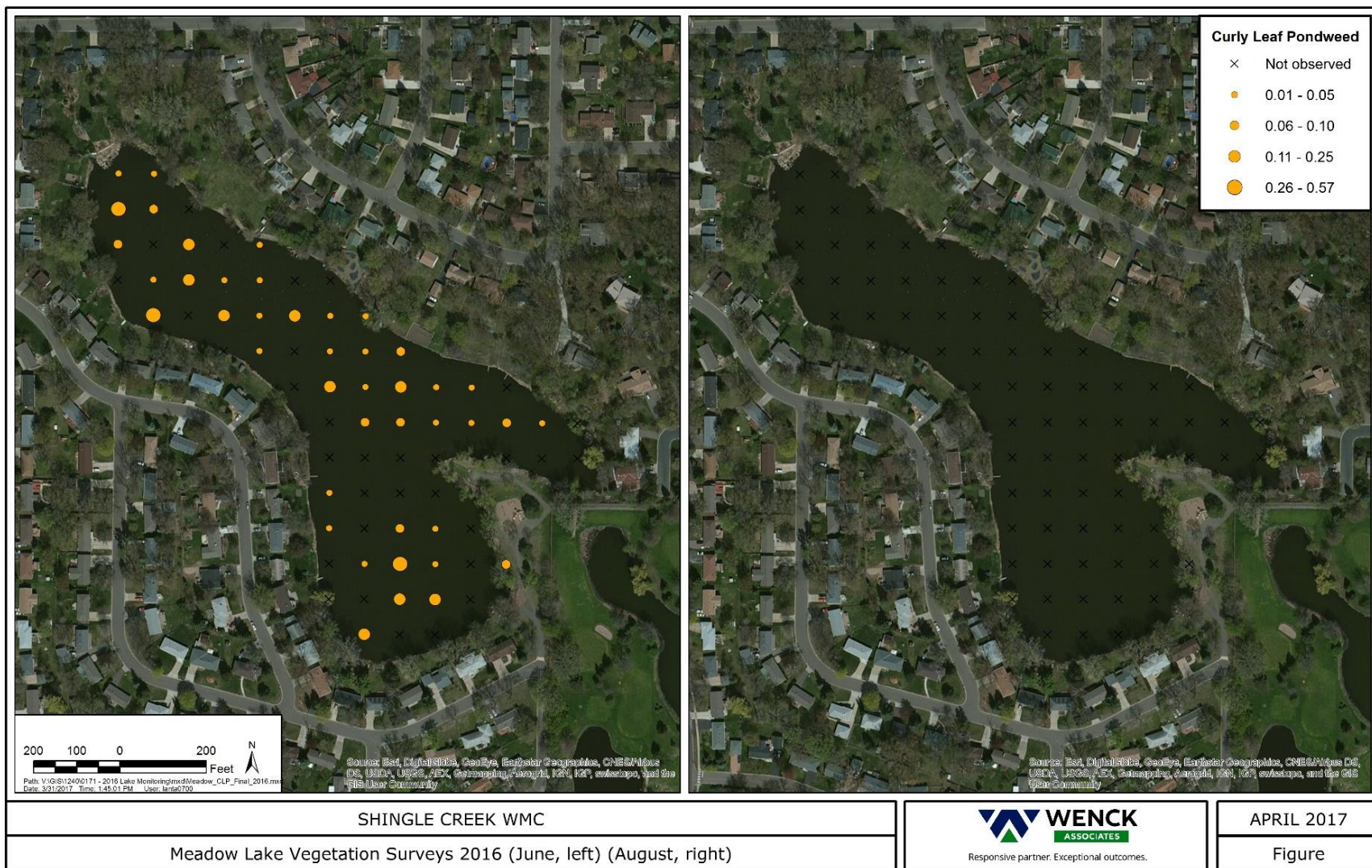
<sup>2</sup> Fathead minnow count during the 2020 survey was estimated using total biomass collected and the average fathead minnow weight.

Previous surveys conducted on Meadow Lake by others for academic research showed that the minnow population varies significantly annually, with sampling some years finding no minnows and some years thousands of individuals. Fathead minnow are very tolerant of winter-kill conditions; however, Meadow Lake is likely not deep enough to support the species year-round. Fish may over winter in the adjacent golf course ponds and/or recolonize the lake from Bass Creek during high water levels. Minnows could also be introduced by human sources, such as dumping a bait bucket into the lake. In high densities, fathead minnow can have significant water quality impacts through feeding on zooplankton, secretion, and sediment resuspension. Thus, it is highly likely that fathead minnows contribute to poor water quality conditions in Meadow Lake.



**Figure 2-6. Over 30,000 fathead minnows captured (left) and their size distribution (right) from the 2020 survey.**





**Figure 2-7. 2016 SAV survey results.**

### 2.3.4 Other Aquatic Life

Lakeshore property owners have observed snapping (*Chelydra serpentine*) and painted turtles in the lake. In 2011 and 2017, fish surveys counted turtles incidentally caught in mini-fyke nets. A visual point survey was conducted in 2020 to document turtle species and their relative abundance in Meadow Lake. No threatened or endangered turtle species have been observed in Meadow Lake.

**Table 2.3. Turtles observed in Meadow lake.**

Sample Year	Snapping Turtle	Painted Belly
2011	0	26
2017	6	104
2020	2	109



**Figure 2-8. Mini-fyke net deployed in Meadow Lake in September 2020 (left) and turtles incidentally caught in the 2017 fish survey (right).**

### 2.3.5 Other Observed Wildlife

In preparation for the lake drawdown, lakeshore residents were requested to report their wildlife observations.

#### Resident 1:

- Spring 2020: two bald eagles in a large crab apple tree near the shoreline.
- After iceout when the water was still clear about 50 seagulls circled overhead and fed on fathead minnows for about two weeks.
- Grey herons and egrets have been observed feeding on the shoreline.

- A goose built its nest in the cattails and laid eggs. Sat on eggs for two weeks, the nest was attacked and eggs did not hatch.
- Painted turtles traveled upland to lay eggs May-June 2020.
- Pair of coyotes traveled across the ice and hunted rabbits and squirrels in my backyard all winter long 2019-2020.
- Buck rubbed and scraped antlers on a young birch tree near shoreline around September 2019. Deer scat in my backyard throughout winter/spring 2019-2020.

#### **Resident 2:**

Over 40 different wildlife species, including bald eagles and 22 other bird species have been recently observed. The wildlife list consists of: wood duck, mallard, gull, bald eagle, egret, great blue heron, owl, wild turkey, northern shoveler, common merganser, hooded merganser, tundra swan, buffelhead, loon, coopers hawk, red hawk, green heron, Canada goose, pied-billed grebe, blue-winged teal, scaup, ring-necked duck, osprey, fox, coyote, opossum, raccoon, painted turtle, snapping turtle, minnows, frogs/toads, crayfish, muskrat, rabbit, squirrel, deer, mink, otter, trumpeter swan, bats.

#### **Resident 3:**

Wildlife seen in the south bay of Meadow Lake, spring and summer 2020:

- Snapping Turtles. Painted Turtles traveling southward from the lake to warm uplands to lay eggs.
- American Toads, Spring Peepers. May be less variety of frogs this year compared to last year.
- Birds: (Blue Herons - spring through the present), Green Herons (July, August), Kingfishers (August), Egrets (spring), many gulls and terns remained for weeks this April and May
- Nesting ducks with chicks included: Wood Ducks, Hooded Mergansers, Mallards
- Nesting Canada Geese and goslings
- Pied-Billed Grebe: April
- Dragon flies and damselflies hatching from the lake
- American Mink, 3 sightings in May and June
- Otters, sighted July 13, 2020
- Blue Herons and Great Egrets were most abundant in the spring. A part of their diet are young turtles, other amphibians, and fish. Green Herons have nested on the lake for about 10 years.
- Bald eagle November 2018 eating a goose on the ice, and December 2019 eating a duck on the ice.
- Coyotes and Red Foxes travel on the ice in winter
- Deer
- Muskrats and opossums
- Canadian Toads, American Toads, Grey Tree Frogs, Spring Peepers, Chorus frogs, Cope's Gray tree frog
- Crayfish
- Ducks, geese, etc. Wood Ducks, Mallards, Blue Winged Teal, Hooded Mergansers, Common Mergansers, Red-breasted Merganser, Pied-billed Grebe, Bufflehead, Ruddy duck, Ring-necked duck, Lesser Scaup, Northern Pintail, Northern Shoveler, Snow goose, Canada Goose, Trumpeter Swan, American Bittern, cormorants, gulls, terns
- Common Loon: summer of 2019 and 2018 diving and residing for a few days
- Other birds: Sharp-tailed Grouse, Turkey, Nighthawks, Robins, warblers, finches, sparrows, flycatchers, woodpeckers, hummingbirds, juncos, nuthatches, swallows, tanagers, waxwings, Cardinals, Catbirds, Chickadees, blackbirds, hawks, owls
- Dragonflies, Damselflies in May and June



## 3.0 Problem Assessment

### 3.1 PROBLEM ASSESSMENT

The City of New Hope, the property owners in the watershed, and the Meadow Lake Watershed Association have undertaken several BMPs to reduce external phosphorus load. There has been no significant improvement in lake water quality and clarity and the lake continues to significantly exceed state water quality standards. While, as noted in Section 2.3.5 above, the lake attracts birds, waterfowl, reptiles, amphibians, wildlife, and various insects, it does not support a balanced fishery, is subject to nuisance algal blooms, and periodically produces mats of curly-leaf pondweed. The lake can be aesthetically unpleasing and is not attractive for recreation by the residents of the 47 homes that border the lake nor users of the park along the southeast side of the lake.

#### 3.1.1 Phosphorus Loading

A TMDL progress report in 2019 ([Wenck 2019](#)) summarized efforts toward meeting the required TMDL load reductions. The report estimated that through structural and nonstructural BMPs and enhanced street sweeping, the City and property owners had achieved about 42 pounds of the required 61 pounds of annual phosphorus watershed load removal.

As a part of the progress report, the lake response model was updated with more recent monitoring data and sediment core phosphorus release testing results, to update the internal load reduction estimate. That modeling estimates an additional 19 pounds of annual TP watershed load reduction and an internal load reduction of 93 percent, or 110 pounds per year, is necessary. Meadow Lake's lab-measured sediment TP release rate was 12.4 mg/m<sup>2</sup>/day, which is high and exceeds the 75<sup>th</sup> percentile of lakes in Minnesota.

Shallow lakes typically do not respond in a stepwise fashion to nutrient load reductions. Impaired shallow lakes tend to stay in a turbid water state until there is enough change in lake inputs to flip the lake to a clear water state. It is likely that even if the watershed load were reduced to zero the water quality conditions in Meadow Lake would not improve until the release of phosphorus from the sediments is controlled.

**Table 3.1. Updated existing and allowable TP loads for Meadow Lake.**

TP Source		Existing TP Load [lbs/yr]	Allowable TP Load [lbs/yr]	Required Load Reduction		Estimated Achieved lbs/yr
				lbs/yr	Percent	
Wasteload	Watershed MS4	87.2	25.7	61.5	71%	42.0
Load	Atmospheric	2.8	2.8	0.0	0%	0
	Internal	117.7	7.7	110.0	93%	0
TOTAL LOAD		207.7	36.2	171.5	83%	42.0



### **3.1.2 Biologic Condition**

As described in Section 2, fish and SAV surveys revealed a nuisance amount of the invasive plant curly-leaf pondweed that varies from year to year and an ongoing infestation of fathead minnows. Both contribute to the poor water clarity, lack of native species, and poor water quality.

Curly-leaf pondweed can form dense mats that shade the lake bottom, limiting the growth of more beneficial native SAV. It senesces in mid to late summer, and microbial activity breaking down the plant matter consumes dissolved oxygen from the water column. In anoxic conditions, lake sediments are more prone to redox reactions that release dissolved phosphorus. As noted above, sediment release rates in Meadow Lake are very high, so this anoxic release can fuel late summer algal blooms. Once the curly-leaf pondweed is established, there is limited native SAV available to stabilize the sediments and to provide shelter, food, and habitat.

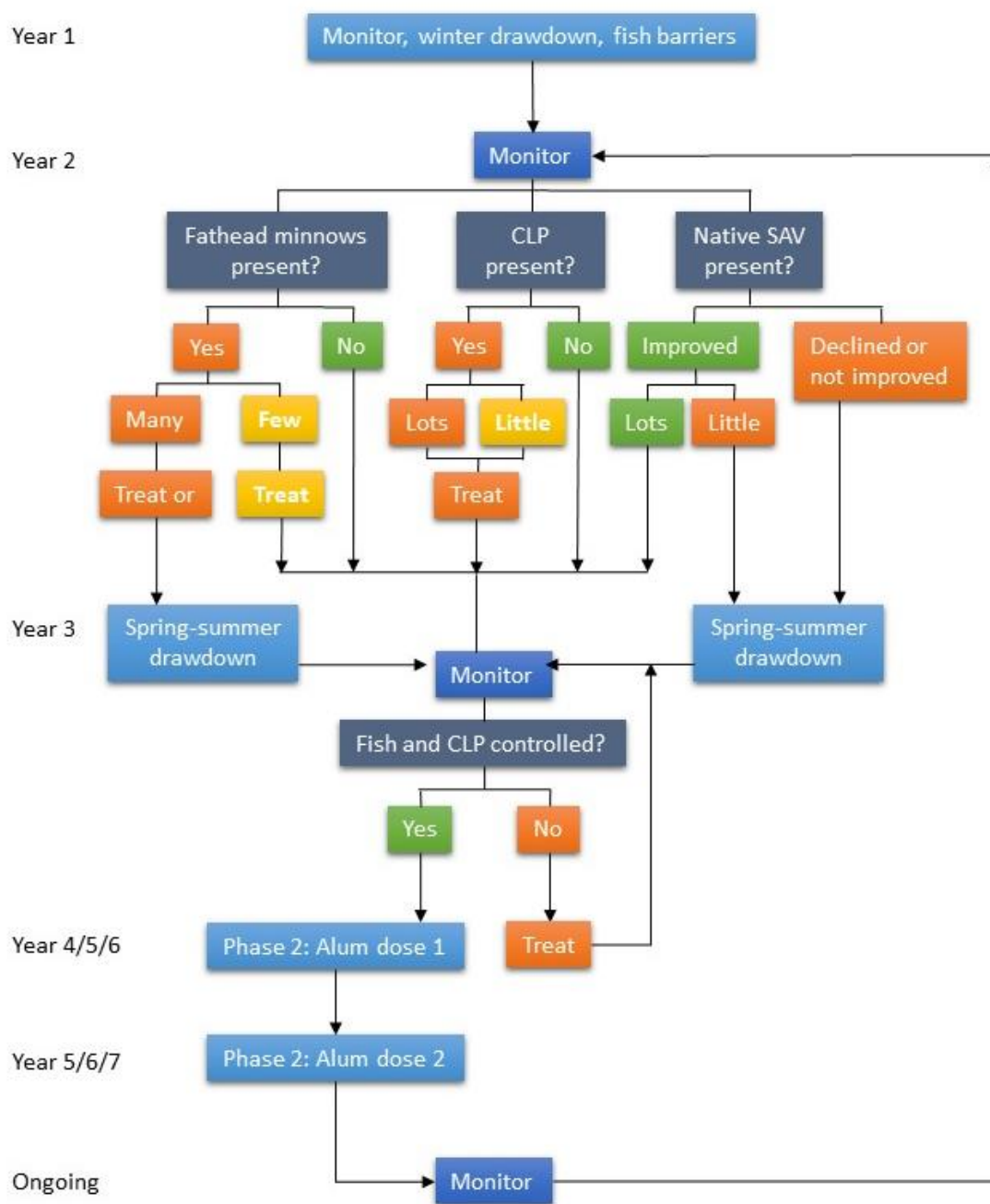
Fathead minnows are omnivores that are categorized as bottom filter feeders, sifting through dirt and silt to find food. The carnivorous portion of their diet is made up of mainly insects, crustaceans, other aquatic invertebrates, and zooplankton. The herbivorous portion of their diet is primarily made up of algae and phytoplankton. Fathead minnows will also feed on bottom detritus. This rooting action releases sediment into the water column, where it reduces clarity and is a source of water column phosphorus. In addition, the lack of any natural fish predators in Meadow Lake, leaves their populations biologically uncontrolled and only increases detrimental water quality impacts.

## **3.2 MEADOW LAKE MANAGEMENT PLAN**

### **3.2.1 Project Goals and Objectives**

The Meadow Lake Management Plan is a multi-year, holistic approach to improving water quality and biotic integrity in the lake. Initial efforts will focus on reestablishing a balanced biology by removing the fathead minnow population and limiting recolonization, reducing curly-leaf pondweed to non-nuisance levels, and restoring a healthy native aquatic vegetation community through one or more temporary drawdowns and supplemental SAV chemical treatments if needed. The second phase of emphasis is on reducing phosphorus loading from the sediments. Annual monitoring would be conducted throughout both phases of the plan and would guide adaptive management until the desired outcome – a clear water lake with a healthy biologic community – is achieved.

Implementation of the plan will be stepwise, with future actions dependent on lake and biotic response. The decision tree shown in Figure 3-1 illustrates how future activities depend upon meeting interim goals. If the interim goals are achieved faster than is shown, then implementation can be accelerated. However, if it takes longer to achieve the interim goals, the City and Commission will not proceed to the next management action until all the interim goals are met.



**Figure 3-1. Meadow Lake Management Plan decision tree.**

### **3.2.2 Lake Drawdown**

The proposed lake drawdown in the first year of implementation is intended to consolidate sediments, eliminate fathead minnows and prevent recolonization, and reduce curly-leaf pondweed growth.

This phase has two primary activities: engineering and water quality and biological monitoring. Engineering would focus on 1) designing, permitting, and implementing the fall drawdown, with pumps estimated to be in place 2-3 months until freeze over; 2) determining whether it is hydraulically necessary to connect the lake and golf course ponds; 3) if the connection is to remain, designing and completing any desired pipe and outfall improvements; and 4) designing and installing fish barriers on the lake outlet structure and if necessary on the outfall from the golf course ponds.

Water quality monitoring for TP, chl-a, and Secchi depth will be completed in 2020 and 2021 by trained volunteers through the Met Council's CAMP program. The Commission will update the fish survey, spring and summer aquatic vegetation surveys, and monthly phyto- and zooplankton surveys. Four pre-drawdown sediment cores will be taken and tested for bulk density and loss-on-ignition (a test for organic content) while an additional core would also be tested for phosphorus fractionation.

Following the drawdown water quality and biologic monitoring will be completed to determine if the drawdown adequately reduced curly-leaf pondweed and eradicated the fathead minnow population. If the native vegetation response is not satisfactory, a summer drawdown may be completed to encourage additional native plant growth. Monthly water quality sampling will include TSS, chl-a, SD, and surface and bottom TP and OP and DO/temperature profiles.

Four post-drawdown sediment cores would be taken and tested for bulk density and loss-on-ignition while an additional core would also be tested for phosphorus fractionation. When the desired fish and vegetation response has been achieved, then the Plan will turn to Phase 2, and alum treatment.

### **3.2.3 Alum Treatment**

This phase would be completed over 2-3 years and includes treating the lake sediments with alum or other chemical treatment to bind phosphorus in the water column and limit release from the sediments.

Two factors are considered when calculating an alum dose: redox-P concentration and the depth of anoxia. Anoxic depth is defined as the sediment area that is exposed to dissolved oxygen lower than 2 mg/L, which represents the area that will be treated with alum. The second factor is the depth of sediment that will be treated with alum. As a conservative estimate the one-foot contour will be used as the alum treatment area, or about 9 acres of the lake's 11.5 acres. The most current sediment release data will be used to compute the optimal alum dose. Alum will be applied in two doses. Between the doses, sediment cores will be taken to verify second dose application rates. Monitoring will include water quality sampling as in year one. Monitoring may also include aquatic vegetation, fish, and zoo- and phytoplankton surveys as warranted.

## 4.0 Lake Drawdown

---

### 4.1 PURPOSE

The purposes of the proposed whole lake drawdown are to:

- Consolidate mucky sediment
- Eradicate the current population of fathead minnows
- Significantly reduce the extent of curly-leaf pondweed by freezing turions in the sediment
- Reinvigorate the native seedbank to reestablish native SAV

### 4.2 DRAWDOWN DETAILS

#### 4.2.1 Pump Operation Plan

The proposed drawdown would begin as soon as permitted, ideally by October 2021. Two 6" diesel dewatering pumps (1.34 cfs each) would be installed in the backyard of a residence in the northwest corner of the lake (see Figure 4-1.) The property owners have provided permission for this installation. The pump will be enclosed in an insulated wooden box to minimize noise and to insulate the pump from freezing temperatures. Silent exhaust kits would also be installed to further reduce noise

Approximately 350 feet of 8" intake hose will be extended out to the deepest contour of the lake (the maximum depth is 3.58 feet). A 6" discharge pipe would be directed to the downstream side of the outlet's weir wall (Figure 4-1.) A similar setup would be repeated at the south end of the lake to pump water from the golf course pond to Meadow Lake. This would then allow the City to replace the culvert between the golf course pond and Meadow lake after drawdown is completed

The pump is proposed to be operated 7:00 am – 5:00 pm (10 hours) weekdays for about 17 days to achieve the initial, full drawdown of the lake. Thereafter, the pump will be operated following rain events, or when the depth of the lake reaches 0.25'. The City's consultant Stantec will subcontract with Iron Eagle Industrial Services staff who will operate and maintain the pump. Iron Eagle is a 24/7/365 emergency response operation which is located approximately one mile from Meadow Lake. Staff at Iron Eagle will be responsible for set up, operation, daily maintenance, and tear down of the pumps during the draw down. Once the drawdown is complete, Iron Eagle staff will visit the site daily to observe the rate of groundwater seepage and side slope weeping and confer with the project engineer to estimate how frequently "maintenance" pumping should occur. As noted later in this report, a small shallow pool will be left to provide a winter refuge for turtles.

The expected drawdown volume is 26.1 acre-feet. Based on Meadow Lake's surveyed bathymetry and estimated values from the Golf Course Pond, the volume below the Normal Water Level is 17.1 acre-feet. The estimated volume was multiplied by 1.25 to conservatively estimate the additional volume expected to enter the lake from the saturated side-slopes. The two 600 GPM diesel pumps are estimated to achieve a conservative 2.2 cfs of pumping after losses through the intake/discharge piping. This assumes the pump is operating at 82% efficiency and there will be a base flow of 0.2 cfs. The baseflow of 0.2 cfs



is equivalent to the estimated inflow of 152 af/yr (0.21 cf/sec) as calculated in the Meadow Lake TMDL lake response model.



**Figure 4-1. Drawdown pumping schematic plan and outlet structure.**

#### **4.2.2 Lake Refill**

Assuming a constant inflow of 0.21 cfs based on the lakeshed's hydrologic model, the 17.4 acre-feet of storage below the outlet will be replenished in approximately 42 days, or 1.4

months. The Golf Course Pond would take roughly nine days. Assuming the pumps are pulled in mid-to-late December, the lake should reach its normal water level during the thaw in early March.

## **4.3 PROJECT IMPACTS**

### **4.3.1 Impacted Properties**

There are 50 parcels directly abutting Meadow Lake. Three are owned by the City of New Hope, and the remaining 47 are single family residences. Many of these residents, as well as property owners not directly on the lake, are members of the Meadow Lake Watershed Association (MLWA), a nonprofit dedicated to improving the quality and natural beauty of Meadow Lake ([meadowlakematters.org](http://meadowlakematters.org)). Commission and City staff discussed the potential drawdown and overall Management Plan with the Association at its annual meeting in early 2019, where the community expressed interest in proceeding. The City hosted a well-attended Open House at the Golf Course on July 30, 2019.

Following a decision by the City Council and Commission to proceed with the project, in mid-2020 the MLWA met door to door with abutting property owners and obtained signatures affirming the property owners' consent from 45 of the 47 residential properties (see Appendix A). The City of New Hope mailed notice of a public hearing to the 47 parcels owners, and the New Hope City Council held a public hearing at its regular Council meeting on August 10, 2020. The meeting was held virtually through WebEx. Several abutting property owners attended and spoke in favor of the project. One property owner submitted written comments opposed to the project.

### **4.3.2 Impact to Downstream Receiving Waters**

The outlet of Meadow Lake discharges to City of New Hope storm sewer (Figure 4-2). The outlet of Meadow Lake is a 16-inch RCP pipe which connects to storm sewer under Boone Avenue. That storm sewer flows along city streets until it ultimately discharges to Bass Creek approximately across from 61<sup>st</sup> Avenue circle.

Approximately three weeks of 2.2 cfs of pumping should have a negligible effect on Bass Creek. At this location, based on the Commission's XP-SWMM model of the watershed, 2.2 cfs falls between 1-3% of the flow during storm events greater than a 1-year event and would be equivalent to 17% of a 1-in storm event. The initial drawdown of the lake will be completed in October-November 2020, when base flows are low and less frequent larger storm events rarely occur.

The streambanks of this reach of Bass Creek were stabilized by the City of New Hope in 2012 with cedar tree revetments, live stakes and bio-log toe protection.

**Table 4.1. Pumped flow as a percent of Bass Creek flow.**

<b>Storm Event</b>	<b>Bass Creek Flow (cfs)</b>	<b>% of Pump Flow (2.2 cfs)</b>
1-in.	13.2	17%
1-yr	71.9	3%
2-yr	94.5	2%
10-yr	147.8	1%
100-yr	202.2	1%





### 4.3.3 Fish and Wildlife Protection Plan

No threatened or endangered species have been observed on Meadow Lake; however, the drawdown project intends to minimize wildlife impacts as much as possible. Fish and other aquatic organisms will be impacted during the drawdown due to loss of habitat and altered over-wintering conditions. Fathead minnow eradication is a goal of the project, and there are no other fish species found in the lake. Other aquatic species such as crayfish may also be impacted, but the only species present are invasive, so any effects would be beneficial in eradicating them. Once complete, the proposed drawdown would enhance habitat for native aquatic organisms by improving water quality and habitat diversity. In addition, the nature of shallow lakes includes low water levels during drought conditions which naturally limit fish species and allows native vegetation to thrive. The use of a drawdown mimics natural cycles that are typically seen and are consistent with pre-settlement conditions.

The snapping turtles and painted turtles in Meadow Lake will be impacted by the drawdown. The drawdown will likely take place in October-November after many turtles have already chosen hibernation habitat. The hibernating turtles are left susceptible to freezing when overlying water is removed and can no longer provide insulation. The Minnesota DNR does not require any mitigation because no threatened or endangered turtle species have been observed on the lake; however, turtle conservation is of particular concern to some homeowners. The City of New Hope and the MLWA understand that turtle mortality is expected as a result of the project. Potential strategies for turtle conservation were discussed with John Moriarty of Three Rivers Park District, and Carol Hall and Erica Hoaglund of the Minnesota DNR in August and September 2020 and July 2021. The adjacent golf course pond (Pond A, **Error! Reference source not found.**) is being drawn down for culvert maintenance and cannot provide suitable refuge for hibernating turtles. The most feasible options for conserving the turtle community discussed are as follows:

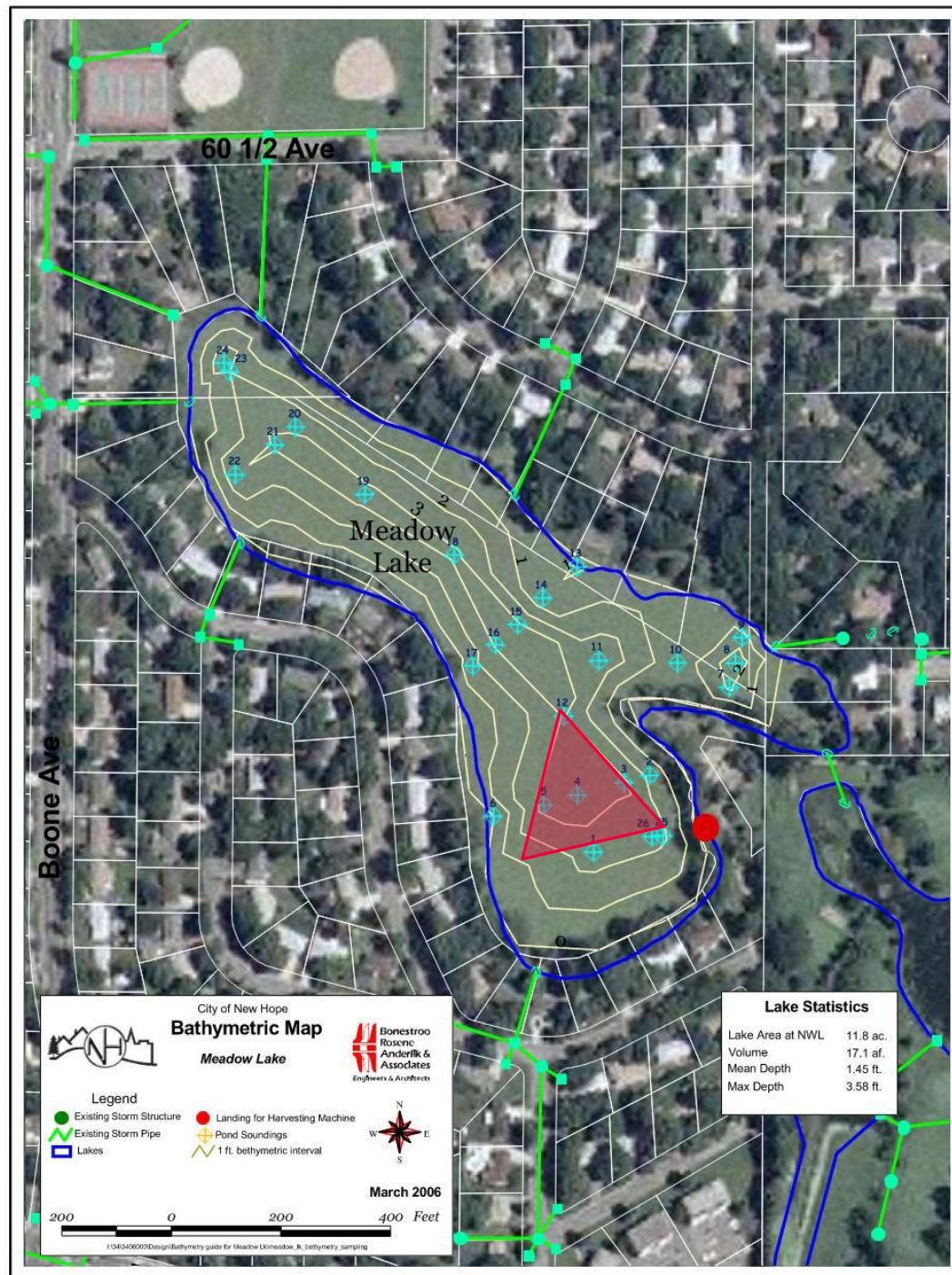
1. Leaving an open-water pool in the southwest portion of the lake during the drawdown (Figure 4-3). This area will provide an opportunity for the turtle population to hibernate safely over winter. During the 2006 partial drawdown, residents observed two points of subsurface groundwater flow, one of which occurred on the southwestern lakeshore. This groundwater flow will potentially provide oxygenated and unfrozen habitat for hibernating turtles.
2. If the drawdown begins before turtles have started hibernating and turtles are spotted migrating to overwintering locations, an option is to capture turtles and relocate them to a nearby water body. Nearby Eagle Lake (DOI: 27011101) is a potential receiving water body for captured turtles.

Mortality of aquatic life will be apparent as water levels return to normal on the lake in Spring 2022. The biomass may reach nuisance levels, and if so a recovery effort may be necessary to collect and appropriately dispose it to minimize impacts to lake residents. It is expected that wildlife will also consume some of the biomass.

The project may have temporary impacts on terrestrial wildlife that use the lake and its surrounding riparian area. Coyote, fox, deer, opossum, mink, and otter have all been observed on or near the lake (Section 2.3.5). Many of these species may abandon habitat on and near Meadow Lake until the proposed work is finished and the water level returns to normal. Because terrestrial organisms are more mobile and have more options for habitat than aquatic organisms, the impacts are expected to be minimal. Nearby resources such as Magda, Eagle, Pike, and Bass Lake, Bass Creek, and public parks provide other habitat and refuge opportunities for the terrestrial community in over the course of winter.



Though the proposed drawdown will have short-term impacts on wildlife, the project's purpose and long-term goal is to enhance overall habitat for wildlife by improving water quality and providing increased habitat diversity. The goal of this project is to "reset" the system. This long-term benefit far outweighs the short term impacts that will happen due to the drawdown.



**Figure 4-3. Meadow Lake bathymetry and proposed un-drained area for turtle hibernation (translucent red).**

## 5.0 References

---

Wenck Associates Inc. 2010a. Meadow Lake Nutrient TMDL.

[pca.state.mn.us/sites/default/files/wq-iw8-18e.pdf](http://pca.state.mn.us/sites/default/files/wq-iw8-18e.pdf)

Wenck Associates Inc. 2010b. Meadow Lake Nutrient TMDL Implementation Plan.

[pca.state.mn.us/sites/default/files/wq-iw8-18c.pdf](http://pca.state.mn.us/sites/default/files/wq-iw8-18c.pdf)

Wenck Associates, Inc. 2019. Lake Magda and Meadow Lake 5 Year Review.

[shinglecreek.org/uploads/5/7/7/6/57762663/magda\\_and\\_meadow\\_5-year\\_tmdl\\_.pdf](http://shinglecreek.org/uploads/5/7/7/6/57762663/magda_and_meadow_5-year_tmdl_.pdf)

# Appendix A

## Signatures of Consent

The City of New Hope and the Shingle Creek Watershed Management Commission in partnership with the Meadow Lake Watershed Association are considering a lake level drawdown on Meadow Lake starting in fall 2020 and ending in spring 2021. The purpose of the drawdown is to control curly-leaf pondweed and rough fish and to consolidate sediments. More information is available at [shinglecreek.org/projects-underway.html](http://shinglecreek.org/projects-underway.html).



Minnesota Statutes 103G.408 (a)(2)(ii) requires that the consent of at least 75 percent of the riparian landowners is required before the Commissioner will consider permitting a shallow lake drawdown.



We, the owners of the properties abutting Meadow Lake consent to the full drawdown of the lake level from fall 2020 to spring 2021 and we have been informed of the nature and purpose of the project.



Owner Name	Property Address	Signature
City of New Hope (Golf Course)	8400 Meadow Lake Road E	
City of New Hope (Park)	8130 Bass Lake Road	
P C Schreiner-Sturm Et Al AD SCHREINER-STURM	8404 Meadow Lake Rd E	
R C Englund Etal	8408 Meadow Lake Rd E	
Jane E Nelson	8412 Meadow Lake Rd E	Jane E Nelson
Tessa Scheller & Jann Luesse	8416 Meadow Lake Rd E	Jann M Luesse
D P Nelson & D L Nelson	8420 Meadow Lake Rd E	Dawn Nelson
D W Stauner & D E Stauner	8424 Meadow Lake Rd E	
L Achterkirch/L Achterkirch	5820 Meadow Lake Rd W	a2
L M Hope & S H Shook	5824 Meadow Lake Rd W	C. Hope
Lauren Bergal	5828 Meadow Lake Rd W	Lauren Bergal
David D Pooley	5832 Meadow Lake Rd W	David D Pooley
Andrew Morris	5836 Meadow Lake Rd W	Andrew Morris

Note: Property owner name is at it appears in the Hennepin County property records. Only one signature per property is necessary.



## Signatures of Consent

The City of New Hope and the Shingle Creek Watershed Management Commission in partnership with the Meadow Lake Watershed Association are considering a lake level drawdown on Meadow Lake starting in fall 2020 and ending in spring 2021. The purpose of the drawdown is to control curly-leaf pondweed and rough fish and to consolidate sediments. More information is available at [shinglecreek.org/projects-underway.html](http://shinglecreek.org/projects-underway.html).



Minnesota Statutes 103G.408 (a)(2)(ii) requires that the consent of at least 75 percent of the riparian landowners is required before the Commissioner will consider permitting a shallow lake drawdown.



We, the owners of the properties abutting Meadow Lake consent to the full drawdown of the lake level from fall 2020 to spring 2021 and we have been informed of the nature and purpose of the project.



Owner Name	Property Address	Signature
G R Mc Elmurry	5840 Meadow Lake Rd W	
Adam Schenck & Rebecca Halat	5900 Meadow Lake Rd W	
Julie Hanley L'HERAULT	5904 Meadow Lake Rd W	
Peter Jason Zedler	5908 Meadow Lake Rd W	
S J Boitz & A E Boitz	5912 Meadow Lake Rd W	
Wilton A Lobitz	5916 Meadow Lake Rd W	
Alan Stano & Michelle Stano	5920 Meadow Lake Rd W	
Michael L Jacobs	5924 Meadow Lake Rd W	
Linda Stokes & Otis Stokes	5928 Meadow Lake Rd W	
Margaret E Hels Trustee	5932 Meadow Lake Rd W	
L D Green & P W Green	5936 Meadow Lake Rd W	
Robert E Copus	5940 Meadow Lake Rd W	
Bradley J Nightingale	5944 Boone Ave N	

Note: Property owner name is as it appears in the Hennepin County property records. Only one signature per property is necessary.

## Signatures of Consent

The City of New Hope and the Shingle Creek Watershed Management Commission in partnership with the Meadow Lake Watershed Association are considering a lake level drawdown on Meadow Lake starting in fall 2020 and ending in spring 2021. The purpose of the drawdown is to control curly-leaf pondweed and rough fish and to consolidate sediments. More information is available at [shinglecreek.org/projects-underway.html](http://shinglecreek.org/projects-underway.html).



Minnesota Statutes 103G.408 (a)(2)(ii) requires that the consent of at least 75 percent of the riparian landowners is required before the Commissioner will consider permitting a shallow lake drawdown.



We, the owners of the properties abutting Meadow Lake consent to the full drawdown of the lake level from fall 2020 to spring 2021 and we have been informed of the nature and purpose of the project.



Owner Name	Property Address	Signature
Vil Of New Hope	86 Address Unassigned	<i>P. Leone</i>
S & D Reed	6016 Boone Ave N	<i>S. Reed</i>
J H Trombley & D L Trombley	6024 Boone Ave N	<i>John Trombley</i>
Kristopher Corts	6032 Boone Ave N	<i>Kristopher Corts</i>
Jaime Makepeace	8541 60 1/2 Ave N	<i>Jaime Makepeace</i>
<del>Harold E. Clough</del> Tim & Brian	8533 60 1/2 Ave N	
Paul A Krejci	8525 60 1/2 Ave N	
A N Mceachern/C M Mceachern	8517 60 1/2 Ave N	<i>Angela Mceachern</i>
Samantha Marie Delomas	8489 Meadow Lake Rd N	
Kathleen R Nelson	8481 Meadow Lake Rd N	
L D Bushway & M J Bushway	8473 Meadow Lake Rd N	
Cynthia Marie Mathison	8465 Meadow Lake Rd N	
Jodi Lynn Taitt	8457 Meadow Lake Rd N	

Note: Property owner name is as it appears in the Hennepin County property records. Only one signature per property is necessary.



## Signatures of Consent

The City of New Hope and the Shingle Creek Watershed Management Commission in partnership with the Meadow Lake Watershed Association are considering a lake level drawdown on Meadow Lake starting in fall 2020 and ending in spring 2021. The purpose of the drawdown is to control curly-leaf pondweed and rough fish and to consolidate sediments. More information is available at [shinglecreek.org/projects-underway.html](http://shinglecreek.org/projects-underway.html).



Minnesota Statutes 103G.408 (a)(2)(ii) requires that the consent of at least 75 percent of the riparian landowners is required before the Commissioner will consider permitting a shallow lake drawdown.



We, the owners of the properties abutting Meadow Lake consent to the full drawdown of the lake level from fall 2020 to spring 2021 and we have been informed of the nature and purpose of the project.



Owner Name	Property Address	Signature
Vil Of New Hope	86 Address Unassigned	
S & D Reed	6016 Boone Ave N	
J H Trombley & D L Trombley	6024 Boone Ave N	
Kristopher Corts	6032 Boone Ave N	
Jaime Makepeace	8541 60 1/2 Ave N	
Harold R Clough	8533 60 1/2 Ave N	
Paul A Krejci	8525 60 1/2 Ave N	
A N Mceachern/C M Mceachern	8517 60 1/2 Ave N	
Samantha Marie Delomas	8489 Meadow Lake Rd N	
Kathleen R Nelson	8481 Meadow Lake Rd N	
L D Bushway & M J Bushway	8473 Meadow Lake Rd N	
Cynthia Marie Mathison	8465 Meadow Lake Rd N	
Jodi Lynn Taitt	8457 Meadow Lake Rd N	

Note: Property owner name is as it appears in the Hennepin County property records. Only one signature per property is necessary.

## Signatures of Consent

The City of New Hope and the Shingle Creek Watershed Management Commission in partnership with the Meadow Lake Watershed Association are considering a lake level drawdown on Meadow Lake starting in fall 2020 and ending in spring 2021. The purpose of the drawdown is to control curly-leaf pondweed and rough fish and to consolidate sediments. More information is available at [shinglecreek.org/projects-underway.html](http://shinglecreek.org/projects-underway.html).



Minnesota Statutes 103G.408 (a)(2)(ii) requires that the consent of at least 75 percent of the riparian landowners is required before the Commissioner will consider permitting a shallow lake drawdown.



We, the owners of the properties abutting Meadow Lake consent to the full drawdown of the lake level from fall 2020 to spring 2021 and we have been informed of the nature and purpose of the project.



Owner Name	Property Address	Signature
G M Decola & L K Decola	8449 Meadow Lake Rd N	LeeAnn DeCola
Mark A Nicholson	8441 Meadow Lake Rd N	Mark Nicholson
Essam Saad Wahbah	8433 Meadow Lake Rd N	Essam Saad Wahbah
D J & A K Tarnowski	8425 Meadow Lake Rd N	Dale Jesser
Dale Jesser	8417 Meadow Lake Rd N	Dale Jesser
Lowell A & Leann A Keifer	8409 Meadow Lake Rd N	Lowell A & Leann A Keifer
Cody P Burckhardt Et Al	8401 Meadow Lake Rd N	Candace Burckhardt
M E & R C Grant Trustee	5900 Xylon Ave N	Robert C Grant
T C Lane Jr & J L Lane	8110 59th Ave N	Bob Lane
Bonnie M Ikola	5833 Wisconsin Ave N	Bonnie M Ikola
Hugo Tamez & Christine Tamez	5825 Wisconsin Ave N	Hugo Tamez

Note: Property owner name is as it appears in the Hennepin County property records. Only one signature per property is necessary.



Responsive partner.  
Exceptional outcomes.