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5.19 Lake Edith Watershed Management Plan

5.19.1 General Information

Lake Edith (also known as May’s Lake) is located between Indian Trail South and Stagecoach Trail South, in the City of Afton. The Lake Edith watershed is mostly within the City of Afton, but a small portion of West Lakeland Township also drains to the lake. Areas draining to Lake Edith are shown on Figure 5.19-1.

The lake consists of a north basin connected by a narrow channel to a smaller south basin. Almost half of the Lake Edith tributary area drains to a large wetland area (Metcalf Marsh) approximately 3/4 mile upstream (west) of Lake Edith. This marsh area is characterized by many springs, which contribute water to the marsh and wetland. Lake Edith overflows to the south through a 24-inch diameter culvert under Indian Trail, becoming the headwaters to the north fork of Valley Creek.

The tributary area of the lake is largely undeveloped, with some agricultural land use concentrated in the eastern part of the watershed, and single-family residential in the western part of the watershed (see Figure 5.19-2). Future estimated land use includes some commercial and industrial land use along the I-94 corridor and rural residential development throughout the rest of the watershed. Figure 5.19-2
presents the existing (2010) and estimated future (2030) land use of the Lake Edith watershed.

There currently is no public access to Lake Edith, as the surrounding land is entirely privately owned. Lake access is limited to area residents, who use the lake for a variety of recreational activities, including swimming, fishing, canoeing, and aesthetic viewing. The City of Afton’s shoreland ordinance allows only non-motorized craft on the lake, with the exception of electric motors. Prior to the ordinance, the lake residents agreed among themselves to the same restriction.

The Minnesota Department of Natural Resources (MDNR) has previously recommended that a public access be established on the lake to make it available to the general public for recreational use. The MDNR has indicated its goal would be to maintain a sport fishery of 100 man-hours per acre supported by a Centrarchid complex and northern pike if public lake access becomes available (per 1992 MDNR Lake Management Plan).

5.19.2 Water Quality Management Plan

Lake Edith is classified as a deep lake by the Minnesota Pollution Control Agency (MPCA). Lake Edith currently meets the MPCA’s water quality standards for shallow lakes (see Table 5.19-1) and is not included among the MPCA’s list of impaired waters in Minnesota.

The VBWD has classified Lake Edith a High Priority waterbody according to the VBWD’s waterbody classification system (see Section 4.1 – Water Quality), due to its MPCA classification as a deep lake (see Table 4.1-4). This classification is consistent the high priority given to Lake Edith in the 1995 VBWD Plan and the 2005 VBWD Plan. The Lake Edith watershed crosses community boundaries and Lake Edith’s water quality can impact downstream water bodies, such as Valley Creek.

The VBWD has a non-degradation water quality policy which sets “action triggers” for all of its major waterbodies. Section 4.1 – Water Quality discusses the action triggers in more detail. Action triggers for VBWD lakes consider the following water quality parameters (summer average) relative to MPCA water quality standards and prior water quality data (i.e., trend analysis):

- Secchi disc depth
- Total phosphorus
- Chlorophyll a

Although Lake Edith is not included in the MPCA’s impaired waters list, Lake Edith is included among the waterbodies assessed in the VBWD Watershed Restoration and Protection Strategies (WRAPS) study performed from 2012 to 2015. The WRAPS study identified the primary source of phosphorus loading to Lake Edith as internal loading from sediment, which accounted for approximately half of the total load during the growing season. Other sources in order of decreasing significance included: watershed runoff, groundwater inflow, release from curlyleaf pondweed,
failing subsurface sewage treatment systems (SSTS), and atmospheric deposition. The WRAPS study also identified possible implementation strategies applicable to Lake Edith (see Section 5.19.2). The results of the WRAPS study are described in greater detail in Appendix A-5.19

5.19.2.1 Water Quality Implementation Plan

Specific water quality implementation tasks for Lake Edith are based on the 2015 WRAPS study, and include the following:

1. The VBWD will monitor the water quality of Lake Edith and perform the actions discussed in Section 4.1 – Water Quality for High Priority waterbodies.

   The VBWD will evaluate the average summertime water quality (total phosphorus, chlorophyll a, and Secchi disc transparency) and compare it to applicable water quality standards (Table 4.1-1) and applicable action triggers (described in Section 4.1.7.5). Currently, the water quality in Lake Edith meets applicable standards for shallow lakes.

2. The VBWD will evaluate the feasibility of small scale stormwater BMPs and buffers within the watershed tributary to Lake Edith. The VBWD’s BMP cost-share program may provide opportunities for private landowners to implement water quality improvements. Collectively, many small residential BMPs may have a significant impact on the cumulative phosphorus loading to Lake Edith.

3. The VBWD will cooperate with the City of Afton, MDNR, or other entities to manage macrophytes (aquatic plants) in Lake Edith. Treatment of areas containing dense, monospecific growths of Eurasian watermilfoil with an aquatic herbicide (2,4-D, Triclopyr, or low concentrations of Aquathol® K) is recommended to protect Lake Edith’s native plant community. VBWD efforts may include

   - point-intercept surveys of aquatic vegetation
   - preparation of lake vegetation management plans (LVMP)
   - completion of Invasive Aquatic Plant Management (IAPM) Permit applications
   - design of herbicide treatment programs
   - participation in meetings with MDNR staff
   - other technical analysis

4. The VBWD will promote Washington County financial assistance programs for non-compliant or non-functioning subsurface sewage containment systems (SSTS).
5. The VBWD will continue to implement its Rules and Regulations (2013, as amended) in the Lake Edith watershed. The VBWD Rules address water quality performance standards for development and redevelopment projects, as well as required vegetated buffers around VBWD lakes, streams, and wetlands. The VBWD Rules and Regulations are included in this Plan as Appendix A-4.5.

Additional future measures identified in the WRAPS study may be pursued to address internal loading in Lake Edith if water quality declines. These actions may include:

6. Perform a study to determine carp density, carp movement, and impact on lake water quality (in collaboration with the MDNR)

7. Conduct an in-lake alum treatment (in collaboration with the City of Afton)

5.19.2.2 Water Chemistry Data

Historically, water quality sampling has been conducted on Lake Edith since 1961, and annually since 2005. Water quality samples are typically analyzed for total phosphorus and chlorophyll $a$, while Secchi disc transparency is measured in the field at the time of sampling (see Appendix A-4.1 – Water Quality Background Information).

The most recent 10-year average summer water quality data is presented relative to applicable MPCA and VBWD water quality standards in Table 5.19-1 and illustrated in Figure 5.19-3.

Table 5.19-1 Summary of Lake Edith summer average water quality

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>10-year Average (2004-2013)</th>
<th>Trend in Average</th>
<th>MPCA Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>ug/L</td>
<td>20.6</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>Chlorophyll $a$</td>
<td>ug/L</td>
<td>5.7</td>
<td>None</td>
<td>14</td>
</tr>
<tr>
<td>Secchi Disc Depth</td>
<td>m</td>
<td>2.2</td>
<td>None</td>
<td>1.4</td>
</tr>
</tbody>
</table>

The 10-year averages of summer average total phosphorus, chlorophyll $a$, and Secchi disc transparency are better than the applicable water quality standards (see Table 5.19-1). Maximum summer average chlorophyll $a$ (9.8 ug/L) and minimum Secchi disc transparency (1.6 m) values within the last 10 years occurred in 2010. Summer average total phosphorus in 2010 (20.8 ug/L) was nearly identical to the most recent 10-year average. The maximum (i.e., worst) summer average total phosphorus observed in Lake Edith in the last 10 years occurred in 2006 (32.7 ug/L). The most recent 10-years of data identify no statistically significant trends in total phosphorus, chlorophyll $a$, or Secchi disc transparency.
5.19.2.3 Biological Data

Several types of biological data have been compiled and evaluated for Lake Edith, in addition to physical and chemical parameters. Macrophyte (large aquatic plant), phytoplankton (non-rooted floating plants – algae), zooplankton (microscopic aquatic animals), and fisheries data provide insight into the ecological quality of Lake Edith. Section 4.2 (Water Quality Background Information) provides more information about the importance of fisheries and other biological data.

5.19.2.3.1 Fisheries

The MDNR does not currently manage the fishery in Lake Edith, in part due to a lack of public access. Past MDNR fishery surveys (most recently performed in 1992) indicate the lake is a bass-bluegill lake with northern pike. The 1987 and 1992 surveys indicated good quality northern pike were found in the lake, and its bluegills were of average size for this area. Results of the most recent MDNR fishery survey are summarized in Table 5.19-2 and included in Appendix B-5.19.

In 1987, the MDNR noted that the lake's water levels have allowed carp to spawn successfully. Should carp dominate the fish population to a greater degree, the MDNR has suggested construction of a fish barrier to correct the problem. A MDNR survey completed in 1980 indicated fishing pressure on the lake was 5.7 person-hours per acre, which is considered light for the area (likely due to the lack of public access). The MDNR has previously recommended that a public access be established on the lake to make it available to the general public for recreational use. The DNR has indicated its goal would be to maintain a sport fishery of 100 person-hours per acre supported by a Centrarchid complex and northern pike (per 1992 MDNR Lake Management Plan). The City of Afton has not pursued the development of a public access. Unauthorized use of private property to access the lake has led several lake residents to post signs identifying private property.

No fish consumption guidelines are currently in effect for Lake Edith. The MDNR’s Lakefinder website includes the most current data on fish stocking and surveying in Lake Edith and is available at: [http://www.dnr.state.mn.us/lakefind/showreport.html?downum=82000400](http://www.dnr.state.mn.us/lakefind/showreport.html?downum=82000400)

Table 5.19-2 Summary of 2011 MDNR Fisheries Survey for Lake Edith

<table>
<thead>
<tr>
<th>Fish Species</th>
<th>Numbers</th>
<th>Photograph (Not to Scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluegill</td>
<td>86</td>
<td><img src="image" alt="Bluegill Fish" /></td>
</tr>
<tr>
<td>Yellow Bullhead</td>
<td>2</td>
<td><img src="image" alt="Yellow Bullhead Fish" /></td>
</tr>
</tbody>
</table>
Table 5.19-2 Summary of 2011 MDNR Fisheries Survey for Lake Edith

<table>
<thead>
<tr>
<th>Fish Species</th>
<th>Numbers</th>
<th>Photograph (Not to Scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Pike</td>
<td>6</td>
<td><img src="image" alt="Northern Pike" /></td>
</tr>
<tr>
<td>Black Crappie</td>
<td>41</td>
<td><img src="image" alt="Black Crappie" /></td>
</tr>
<tr>
<td>Largemouth Bass</td>
<td>1</td>
<td><img src="image" alt="Largemouth Bass" /></td>
</tr>
</tbody>
</table>

5.19.2.3.2 Macrophytes (Large Aquatic Plants)

The VBWD conducted macrophyte surveys of Lake Edith in June 1997, August 1997, June 2002, August 2002, June 2005, August 2005, May 2007, June 2008, May 2009, June 2010, August 2010, June 2011, August 2011, and June 2012. Point intercept surveys of curlyleaf pondweed were also performed in 2012, 2013, and 2014. The VBWD collects macrophyte data to identify the conditions of plant growth throughout the lake. Macrophytes are the primary producers in the aquatic food chain, converting the basic chemical nutrients in water and soil into plant matter through photosynthesis, which becomes food for all other aquatic life. While macrophytes can negatively impact the recreational use of a water body, they are critical to the ecosystem as fish and wildlife habitat. Appendix C-5.19 includes information from the macrophyte surveys and point intercept survey results.

In all surveys, a healthy and diverse plant community was found along the lake’s periphery, growing to depths of eight to ten feet. Plant species found in Lake Edith are common to Minnesota lakes and provide good habitat for the fish and aquatic animals living within the lake.

Included in the 17 to 23 individual species observed during each plant survey was a clean water species, Illinois pondweed (Potamogeton illinoensis). The presence of this species indicates the lake consistently has good water transparency, since it is not able to grow in turbid water (Borman et al., 1997).

Curlyleaf pondweed (CLP) was observed in all years Lake Edith was surveyed. Although densities of this plant were generally light to moderate during 1997, density increases over time resulted in areas of heavy growth during 2002. In 2005, the densities were back to light to moderate. The heavy growth in 2002 occurred in the southern end of the lake’s main basin.
Once a lake becomes infested with CLP, this plant typically displaces native vegetation, increasing its coverage and density. CLP begins growing in late August, grows throughout the winter at a slow rate, grows rapidly in the spring, and dies in early summer. Native plants that grow from seed in the spring are unable to grow in areas already occupied by curlyleaf pondweed, and are replaced by this plant. CLP die-off in early summer releases phosphorus to the lake, causing increased algal growth for the remainder of the summer. Hence, CLP density increases may degrade the lake’s water quality.

Since 2005, observations of CLP density were light to moderate and the most consistent population was found on the lake’s west shoreline. In 2013 and 2014 point intercept surveys, CLP was found in less than five percent of survey locations (Barr, 2013 and Barr, 2014).

The VBWD will continue to provide technical assistance to entities seeking to manage aquatic invasive species.

**5.19.2.3.3 Phytoplankton (Non-Rooted, Floating Plants - Algae) and Zooplankton (Microscopic Aquatic Animals)**

The VBWD collected phytoplankton and zooplankton samples from Lake Edith in 2002, 2005, and 2010. Appendix D-5.19 and Appendix E-5.19 present the survey results.

Phytoplankton derive energy from sunlight and use nutrients dissolved in lake water. They provide food for several types of animals, including zooplankton, which in turn are eaten by fish. A phytoplankton population in balance with the lake’s zooplankton population is ideal for fish production. An inadequate phytoplankton population reduces the lake’s zooplankton population and adversely impacts the growth of the lake’s fishery. However, excess phytoplankton, especially blue-green algae, can interfere with recreational use of a lake and is considered problematic.

The numbers of phytoplankton observed in Lake Edith during 2002, 2005, and 2010 were adequate to support the lake’s zooplankton community, yet low enough to affirm the lake’s low nutrient level and excellent water transparency. In each year, the lake’s algal community was fairly diverse, but was dominated by green algae, a type of algae edible to zooplankton and considered favorable for the lake.

In the past, including 2002, blue green algae have been observed in the form of gelatinous balls ranging in size from 1/4-inch to ½-inch in diameter. The balls were observed on the lake bottom in the shallows during June. In August, the balls were free-floating on the water surface and accumulating in areas due to wind and wave action. The blue green algae were most likely *Nostoc spp.* Although balls of *Nostoc spp.* occasionally appear in Minnesota lakes, their appearance is relatively rare. The reason for the appearance of these gelationous balls is unknown.

In surveys, Lake Edith’s zooplankton community was dominated by small-bodied forms. While these animals provide food for the lake’s panfish community, they are unable to control the lake’s algae community due to their small size. Because fish predation generally determines the numbers of large- and small-bodied zooplankters in a lake, increasing the numbers of large-bodied zooplankton is
unrealistic. Because zooplankton grazing will not control the lake’s phytoplankton community, phosphorus loading to the lake solely determines Lake Edith’s algae community. Hence, phosphorus management will provide the best management measures for the lake’s phytoplankton community.

5.19.3 Water Quantity Management Plan

The VBWD does not plan to modify the outlet of Lake Edith. The VBWD had an MDNR staff gage installed at the lake in 2002, and a volunteer for the VBWD measures the water levels. Figure 5.19-4 presents available Lake Edith water level data. The VBWD will continue to monitor the levels of Lake Edith.

The 100-year flood level of Lake Edith and Metcalf Marsh was calculated by the VBWD in 1998 at Elevation 801. At that time, a resident of Metcalf Marsh requested that the VBWD establish a 100-year flood level that the Federal Emergency Management Agency (FEMA) would accept. When the resident made the request, the FEMA Flood Insurance Rate Map (FIRM) of the area showed a floodplain, but not an elevation. Without an elevation, the resident was required to purchase flood insurance even though the resident felt his home was protected from flooding. The VBWD used 10-foot topography mapping supplemented with detailed surveys of various hydraulic structures to complete the study, which included 100-year flood levels for Metcalf Marsh and Lake Edith. FEMA approved the elevations, and the VBWD notified the property owners in the area of the study and that they could also avoid paying for flood insurance if a survey of their home showed it to be above the calculated 100-year flood level.

The VBWD developed a hydrologic and hydraulic model of the Valley Creek watershed in 2006 to evaluate the flood flow characteristics of the creek; the modeling was done using XP-SWMM software. The model included Lake Edith, and predicted a 100-year flood level of Elevation 800.8, which the VBWD has adopted as the 100-year flood level for Lake Edith for VBWD management purposes. The slight difference in predicted flood levels between the 1998 study and the SWMM model are likely because the SWMM model used more detailed 2000 two-foot topography mapping from Washington County. Based on that topography and aerial photographs, there appears to be one home within the 100-year floodplain of Lake Edith.

The VBWD provided the results of the 1998 study and 2006 SWMM model to Washington County and the FEMA to be used in the development of updated Flood Insurance Rate Maps (FIRMs) for Washington County. The current FIRM (effective in 2010) lists the 100-year floodplain elevations for Metcalf Marsh and Lake Edith as Elevation 811 and Elevation 801, respectively (NAVD88 datum).

In 2013, the National Oceanographic and Atmospheric Administration (NOAA) published Atlas 14, Volume 8 (see Section 4.7.6). Atlas 14 contains updated precipitation data for Minnesota and supersedes data sources used in the 1998 study and XP-SWMM model. Over the next several years, the VBWD will update its hydrologic-hydraulic modeling of major subwatersheds, including Lake
Edith. Updated modeling will incorporate the most recent precipitation data (see Section 4.7.7) which may increase 100-year flood levels relative to the existing FIRM.

5.19.4 Groundwater

The groundwater flow patterns around Lake Edith have been assessed as part of a study looking at groundwater contributions in the Valley Creek watershed and evaluate the long-term sustainability of the Valley Creek ground watershed (including Lake Edith). The Valley Creek model is based on a larger east metro groundwater model and is described in greater detail in Section 5.20. Groundwater management within the VBWD is discussed more comprehensively in Section 4.2 of this Plan.

A portion of the northeastern area of the Lake Edith watershed is within the Lakeland/Lakeland Shores Special Well Boring Construction Area (SWBCA). Section 4.2.6.3 includes more information regarding SWBCAs.

5.19.5 References


Borman, S., R. Korth, and J. Temte. 1997. Through the Looking Glass ... A Field Guide to Aquatic Plants. Wisconsin Lakes Partnership (Cooperative Extension of the University of Wisconsin—Extension and the Wisconsin Department of Natural Resources). Stevens Point, WI.


LEGEND
- Lake Edith Watershed
- Major Watershed Divide
- Subwatershed Divide
- Subwatershed Designation
- DNR Protected Waters Designation
- Subwatershed Contributing Runoff
- Overflow Path from Landlocked Watershed
- (Non-Contributing Subwatershed)
- Overflow Path from Semi-Landlocked Watershed
- Lakes, Ponds, Wetlands, Approximate Normal Water Surface Level
- Lakes, Ponds, Wetlands, Approximate 100 Year Flood Surface Level
- FL-100 100 Year Flood Level
- NL Normal Level
- OHW DNR Established Ordinary High Water Elevation
- Project 1007
  - Catch Basin
  - Manhole Cover
  - Open Channel
  - Pipe
  - MN-DOT Pipe
  - Section Lines
  - VBWD Legal Boundary
  - Municipal Boundary

Landlocked: Basin does not overflow using VBWD simplified method for calculating its 100-year flood level or using a more detailed analysis, such as the 1% probability flood level.

Semi-Landlocked: Basin does not overflow in the 100-year 24-hour rainfall total or the 100-year 10-day snowmelt event, but does overflow when calculating its 100-year flood level based on the VBWD simplified method or the 1% probability flood level.

Figure 5.19-1
LAKE EDITH WATERSHED
Valley Branch Watershed District
Figure 5.19-2
LAKE EDITH WATERSHED
CURRENT (2010) AND FUTURE (2030) LANDUSE
2015-2025 Watershed Management Plan
Valley Branch Watershed District

Current (2010) Land Use

- Farmstead
- Seasonal/Vacation
- Single Family Detached
- Manufactured Housing Park
- Single Family Attached
- Multifamily
- Retail and Other Commercial
- Office
- Mixed Use Residential
- Mixed Use Industrial
- Mixed Use Commercial and Other
- Industrial and Utility
- Extractive
- Institutional
- Park, Recreational or Preserve
- Golf Course
- Lake Edith Subwatershed
- Major Subwatershed Boundary
- VBWD Legal Boundary

Source: Metropolitan Council 2010

Future (2030) Land Use

- Agricultural
- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Rights-of-Way (i.e., Roads)
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Open Space or Restrictive Use
- Lake Edith Subwatershed
- Major Subwatershed Boundary
- VBWD Legal Boundary
- Railway (inc. LRT)
- Airport
- Vacant or Unknown
- Open Water

1 inch = 2,000 feet
Edith Lake June-Sept. Secchi Disk Transparency

Edith Lake June-Sept. Average Chlorophyll a

Edith Lake June-Sept. Average Total Phosphorus

MPCA Deep Lake Standard

Figure 5.19-3

Lake Edith Water Quality
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District
Figure 5.19-4
LAKE EDITH WATER LEVELS
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District

100-year flood level in NAVD88 datum
Observed data in unknown datum
Appendix A-5.19 Additional Water Quality Information
Appendix A-5.19 Additional Water Quality Information

MINLEAP Modeling

The Minnesota Lake Eutrophication Analysis Procedure (MINLEAP) is intended to be used as a screening tool for estimating lake conditions and for identifying “problem” lakes. MINLEAP is particularly useful for identifying lakes requiring “protection” versus those requiring “restoration” (Heiskary and Wilson, 1990). In addition, MINLEAP modeling by has been done in the past to identify Minnesota lakes which may be in better or worse condition than they “should be” based on their location, watershed area and lake basin morphometry (Heiskary and Wilson, 1990).

Results of MINLEAP modeling done by the VBWD in 2014 for Lake Edith suggests that the lake should experience “worse” water quality than is currently observed. For Lake Edith MINLEAP predicts a growing season mean total phosphorus concentration of 45 – 49 µg/L versus 15–38 µg/L (observed from 2004 to 2013); a chlorophyll a concentration of 17 – 20 µg/L µg/L versus 4–10 µg/L (observed from 2004 to 2013); and summer average transparency of 2.2 meters versus 1.6–2.7 meters (observed from 2004 to 2013). The predicted phosphorus concentration has a standard error of 17 µg/L. The results of this analysis suggest that the VBWD water quality goal for total phosphorus is realistically attainable for Lake Edith.

Vighi and Chiaudani Method

Vighi and Chiaudani (1985) developed another method to determine the phosphorus concentration in lakes that are not affected by anthropogenic (human) inputs. As a result the phosphorus concentration in a lake resulting from natural, background phosphorus loadings can be calculated from information about the lake’s mean depth and alkalinity or conductivity. Alkalinity is considered more useful for this analysis because it is less influenced by the modifying effect of anthropogenic inputs.

Based on the Vighi and Chiaudani method, and using the average conductivity values from Lake Edith measured in 2005 and 2010, the predicted phosphorus concentration from natural, background loadings should be about 20 µg/L. This predicted phosphorus concentration is similar to the observed phosphorus concentration from 2004 through 2013 and suggest the VBWD’s water quality goal for Lake Edith (40 µg/L) is attainable, given the appropriate phosphorus loadings.

Watershed Restoration and Protection Strategy (WRAPS) and Total Maximum Daily Load (TMDL) Study

Lake Edith is included in the VBWD WRAPS study, which addressed several VBWD waterbodies. One of the key components of the WRAPS study is to understand the sources of phosphorus contributing to the existing nutrient loading. Sources evaluated for Lake Edith in the WRAPS study (and the associated percentage of phosphorus loading during the growing season) include:

- internal loading (47 percent)
- watershed runoff (19 percent)
• groundwater interaction (13 percent)
• aquatic vegetation (10 percent)
• subsurface sewage treatment systems (SSTS) (7 percent)
• atmospheric deposition (4 percent)

**Modeling Methods**

The P8 (Program for Predicting Polluting Particle Passage through Pits, Puddles and Ponds) Urban Catchment (computer) Model (Version 3.4) was used to estimate watershed runoff and total phosphorus loads from the Lake Edith watershed. Noncontributing areas of the watershed, as identified by the VBWD, were not included in the P8 model. In-lake modeling for Lake Edith was accomplished through the creation of a mass balance model that tracks the flow of both water and phosphorus through the lake for the critical water quality growing season as well as the year prior (to establish a steady-state initial condition).

The key input parameters for the in-lake mass balance model included direct precipitation data, evaporation data, runoff loads from the lake’s watershed (as predicted by the P8 model), the lake storage and outlet rating curve, estimated groundwater exchange, and in-lake water quality monitoring data. Additional data, including sediment core data and macrophyte survey information, were used to verify that model estimates of internal phosphorus loading were reasonable.

**Implementation Plan**

Implementation strategies recommended in the WRAPS study address loading from watershed runoff, aquatic vegetation, and failing SSTS. Those strategies include:

• Continue to target small-scale BMPs in residential areas around the lake with the VBWD BMP cost-share program
• Continue to implement the VBWD rules
• Promote Washington County’s financial assistance programs for non-complaint/non-functioning SSTS
• Continue routine monitoring of water quality and macrophytes

Although the primary source of phosphorus to Lake Edith is internal loading, management of internal sources is not recommended unless water quality declines in the future. Additional future measures to address internal loading include:

• Perform a study to determine carp density, carp movement, and impact on lake water quality (in collaboration with the MDNR)
• Conduct an in-lake alum treatment (in collaboration with the City of Afton)
Appendix B-5.19  Additional Fisheries Information
Appendix B-5.19  Additional Fisheries Information

The MDNR’s 1992 fishery survey identified the following:

- Bluegills were high in abundance with both gillnet and trapnet catches above local levels. They have remained virtually unchanged in netting since 1982. Average size of bluegills was good and bluegill growth was average for the local area.

- Northern pike catches were near local levels with three year classes sampled, and have remained relatively stable over the last 15 years. Northern pike growth was good for the local area.

- Black crappie were near local levels in abundance.

- Yellow bullhead and carp catches were below local median abundance.

- One largemouth bass was sampled and determined to be age 3.

- Shoreline seining confirmed year over year production of largemouth bass, bluegill, black crappie, and yellow bullhead.
Appendix C-5.19  Additional Macrophyte Information
- No macrophytes found in water > 8-9 feet
- Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy

### Submerged Aquatic Plants:
- Large-leaf pondweed: Potamogeton amplifolius
- Buttercup: Ranunculus spp.
- Water star grass: Zosterella dubia
- Horned pondweed: Zannichellia palustris
- Curly leaf pondweed: Potamogeton crispus
- Flat stem pondweed: Potamogeton zosteriformis
- Sago pondweed: Potamogeton pectinatus
- Illinois pondweed: Potamogeton illinoensis
- Coontail: Ceratophyllum demersum
- Water celeri: Vallisneria americana
- Muskgrass: Chara spp.
- Bushy pondweed and naiad: Najas flexilis
- Northern water milfoil: Myriophyllum sibiricum

### Floating Leaf:
- Yellow waterlily: Nymphaea variegata

### Emergent:
- Bulrush: Scirpus spp.
- Cattail: Typha spp.
- Giant bur-reed: Sparganium eurycarpum
- Blue flag iris: Iris verticillar

### No Aquatic Vegetation Found:
- No macrophytes found in water > 8-9 feet

### Comments:
Blue green algae present in the form of gelatinous balls ranging in size from 1/4" - 1/2" in diameter. Free floating on water surface and accumulating in areas due to wind and wave action. Most likely Nostoc spp.
- No macrophytes found in water > 8-9 feet
- Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy

Submerged Aquatic Plants:
- Large-leaf pondweed
- Buttercup
- Water stargrass
- Horned pondweed
- Curlyleaf pondweed
- Flatstem pondweed
- Sago pondweed
- Pondweed
- Coontail
- Water celery
- Mussgrass
- Bulbous pondweed and naiad
- Northern water milfoil

Floating Leaf:
- Yellow waterlily

Emergent:
- Bulrush
- Cattail
- Giant bur-reed
- Blue flag iris

No Aquatic Vegetation Found:

Comments: Blue green algae present in the form of gelatinous balls ranging in size from 1/4" - 1/2" in diameter. Gelatinous balls were observed on lake bottom in shallows. Most likely Nostoc spp.
**Submerged Aquatic Plants:**

- Large-leaf pondweed
- Buttercup
- Water stargrass
- Horned pondweed
- Curly leaf pondweed
- Flatstem pondweed
- Sago pondweed
- Illinois pondweed
- Coontail
- Water celery
- Water milfoil
- Northern water milfoil

**Floating Leaf:**

- Yellow waterlily

**Emergent:**

- Bulrush
- Cattail
- Giant bur-reed
- Blue flag iris

**No Aquatic Vegetation Found:**

- Nutrient algae present in the form of gelatinous balls ranging in size from 1/4" - 1/2" in diameter. Free floating on water surface and accumulating in areas due to wind and wave action. Most likely *Nostoc* spp.

**Comments:**

- No macrophytes found in water > 8-10 feet
- Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy
- Gelatinous balls of bluish-green (blue-green algae) most likely *Nostoc* present

---

**Legend:**

- Potamogeton amplifolius
- Potamogeton crispus
- Potamogeton zosteriformis
- Ceratophyllum demersum
- Myriophyllum sibiricum
- Zannichellia palustris
- Chara sp.
- Najas flexilis
- Zosterella dubia
- Myriophyllum sibiricum
- Scirpus spp.
- Nymphaea variegata
- Iris versicolor
- Typha spp.
- Sparganium eurycarpum
- Ranunculus spp.
- Coontail
- Vallisneria americana

**Water Quality Monitoring Location:**

**Scale in Feet:**

0 600 1200
No macrophytes found in water > 8-10 feet

Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy

Gelatinous balls of blue-green algae most likely Nostoc-present

Submerged Aquatic Plants:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-leaf pondweed</td>
<td>Potamogeton amplifolius</td>
</tr>
<tr>
<td>Buttercup</td>
<td>Ranunculus spp.</td>
</tr>
<tr>
<td>Water stargrass</td>
<td>Zostera diea</td>
</tr>
<tr>
<td>Horned pondweed</td>
<td>Zannichellia palustris</td>
</tr>
<tr>
<td>Flatstem pondweed</td>
<td>Potamogeton zosteriformis</td>
</tr>
<tr>
<td>Sago pondweed</td>
<td>Potamogeton pectinatus</td>
</tr>
<tr>
<td>Illinois pondweed</td>
<td>Potamogeton illinoensis</td>
</tr>
<tr>
<td>Coontail</td>
<td>Ceratophyllum demersum</td>
</tr>
<tr>
<td>Water celery</td>
<td>Vallisneria americana</td>
</tr>
<tr>
<td>Muskgrass</td>
<td>Chara spp.</td>
</tr>
<tr>
<td>Bushy pondweed and naiad</td>
<td>Najas flexilis</td>
</tr>
<tr>
<td>Northern water milfoil</td>
<td>Myriophyllum sibiricum</td>
</tr>
</tbody>
</table>

Floating Leaf:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow waterlily</td>
<td>Nymphaea variegata</td>
</tr>
</tbody>
</table>

Emergent:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulrush</td>
<td>Scirpus spp.</td>
</tr>
<tr>
<td>Cattail</td>
<td>Typha spp.</td>
</tr>
<tr>
<td>Giant bur-reed</td>
<td>Sparganium eurycarpum</td>
</tr>
<tr>
<td>Blue flag iris</td>
<td>Iris verticola</td>
</tr>
</tbody>
</table>

No Aquatic Vegetation Found:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
</table>

Comments: Blue green algae present in the form of gelatinous balls ranging in size from 1/4” - 1/2” in diameter. Free floating on water surface and accumulating in areas due to wind and wave action. Most likely Nostoc spp.
No macrophytes found in water > 8-10 feet
Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy
Gelatinous balls of bluish-green (blue-green algae) most likely Nostoc-present

Submerged Aquatic Plants:
- Buttercup
- Water stargrass
- Horned pondweed
- Curlyleaf pondweed
- Narrow leaf pondweed
- Illinois pondweed
- Coontail
- Water celery
- Muskrass
- Bulbous pondweed and naiad
- Northern water milfoil

Floating Leaf:
- White waterlily
- Yellow waterlily

Emergent:
- Bulrush
- Cattail
- Blue flag iris
- Sedge
- Hardstem bulrush
- Softstem bulrush

No Aquatic Vegetation Found:

Comments: Blue green algae present in the form of gelatinous balls ranging in size from 1/4" - 1/2" in diameter. Free floating on water surface and accumulating in areas due to wind and wave action. Most likely Nostoc spp.
• No macrophytes found in water > 8-10 feet rooted/14-15 feet, Ceratophyllum demersum
• Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy
Gelatinous balls of bluish-green (blue-green algae) most likely Nostoc-present

Common Name
Submerged Aquatic Plants:
Buttercup
Water stargrass
Horned pondweed
Curlyleaf pondweed
Flattstem pondweed
Sago pondweed
Illinois pondweed
Coontail
Water celeri
Muskgrass
Bushy pondweed and naiad
Northern water milfoil
Bladderwort

Scientific Name
Ranunculus sp.
Zannichellia palustris
Potamogeton crispus
Potamogeton zosteriformis
Potamogeton pectinatus
Potamogeton illinoensis
Chara sp.
Najas sp.
Nymphaea variegata
Vallisneria americana

Floating Leaf:
White waterlily
Yellow waterlily
Nymphaea tuberosa
Nymphaea variegata

Emergent:
Bulrush
Cattail
Blue flag iris
Sedge
Hard stem bulrush
Soft stem bulrush
Scirpus sp.
Typha sp.
Iris versicolor
Carex sp.

No Aquatic Vegetation Found:

Comments: Blue green algae present in the form of gelatinous balls ranging in size from 1/4” - 1/2” in diameter. Free floating on water surface and accumulating in areas due to wind and wave action. Most likely Nostoc spp.
FIELD NOTES:
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >12-14’
- Gelatinous balls of bluish-green (blue-green algae) most likely Nostoc present (very light density)
- Carex sp. sporadic along perimeter of lake

LAKE EDITH MACROPHYTE SURVEY RESULTS
May 29, 2007
Valley Branch Watershed District

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois pondweed</td>
<td>Potamogeton illinoensis</td>
</tr>
<tr>
<td>bushy pondweed and naiads</td>
<td>Najas sp.</td>
</tr>
<tr>
<td>coontail</td>
<td>Ceratophyllum demersum</td>
</tr>
<tr>
<td>curlyleaf pondweed</td>
<td>Potamogeton crispus</td>
</tr>
<tr>
<td>flatstem pondweed</td>
<td>Potamogeton zosteriformis</td>
</tr>
<tr>
<td>muskgrass</td>
<td>Chara sp.</td>
</tr>
<tr>
<td>northern watermilfoil</td>
<td>Myriophyllum sibiricum</td>
</tr>
<tr>
<td>sago pondweed</td>
<td>Potamogeton pectinatus</td>
</tr>
<tr>
<td>water stargrass</td>
<td>Zosterella dubia</td>
</tr>
<tr>
<td>wild celery</td>
<td>Vallisneria americana</td>
</tr>
<tr>
<td>spatterdock</td>
<td>Nuphar variegata</td>
</tr>
<tr>
<td>blue flag iris</td>
<td>Iris versicolor</td>
</tr>
<tr>
<td>cattail</td>
<td>Typha sp.</td>
</tr>
<tr>
<td>sedge</td>
<td>Carex sp.</td>
</tr>
<tr>
<td>softstem bulrush</td>
<td>Scirpus validus</td>
</tr>
</tbody>
</table>
FIELD NOTES:
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >12-14'
- Gelatinous balls of bluish-green (blue-green algae) most likely Nostoc present (very light density)
- Carex sp. sporadic along perimeter of lake
LAKE EDITH MACROPHYTE SURVEY RESULTS
May 27, 2009
Valley Branch Watershed District

FIELD NOTES:
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >10-12'
- Carex sp. sporadic along perimeter of lake

**Emergent Plants**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>narrowleaf pondweed</td>
<td>Potamogeton sp.</td>
</tr>
<tr>
<td>Illinois pondweed</td>
<td>Potamogeton illinoensis</td>
</tr>
<tr>
<td>bushy pondweed and naiads</td>
<td>Ceratophyllum demersum</td>
</tr>
<tr>
<td>coontail</td>
<td>Potamogeton crispus</td>
</tr>
<tr>
<td>curlyleaf pondweed</td>
<td>Potamogeton zosteriformis</td>
</tr>
<tr>
<td>flatstem pondweed</td>
<td>Potamogeton illinoensis</td>
</tr>
<tr>
<td>northern watermilfoil</td>
<td>Myriophyllum sibiricum</td>
</tr>
<tr>
<td>sago pondweed</td>
<td>Potamogeton pectinatus</td>
</tr>
<tr>
<td>water stargrass</td>
<td>Vallisneria americana</td>
</tr>
<tr>
<td>wild celery</td>
<td>Zosterella dubia</td>
</tr>
</tbody>
</table>

**Floating Leaf Plants**

- Nuphar variegata

**Submerged Aquatic Plants**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>spatterdock</td>
<td>Nuphar variegata</td>
</tr>
</tbody>
</table>

**Emergent Plants**

- Blue flag iris
- Cattail
- Sedge
- Softstem bulrush

*Note: Bold red name indicates extremely aggressive/invasive introduced species.*
**LAKE EDITH MACROPHYTE SURVEY RESULTS**

**August 17, 2009**

**Valley Branch Watershed District**

**FIELD NOTES:**
- Macrophyte densities estimated as follows:
  - 1 = light; 2 = moderate; 3 = heavy
  - Densities generally not noted for emergent and floating leaf plants
  - No macrophytes found in water >10-12'
  - Carex sp. sporadic along perimeter of lake

**Legend**
- **Emergent Plants**
- **Floating Leaf Plants**
- **Submerged Aquatic Plants**
- **No Aquatic Vegetation**

**Common Name**
- narrowleaf pondweed
- Illinois pondweed
- bushy pondweed and naiads
- coontail
- curlyleaf pondweed
- flatstem pondweed
- muskgrass
- northern watermilfoil
- sago pondweed
- water stargrass
- wild celery

**Scientific Name**
- Potamogeton sp.
- Potamogeton illinoensis
- Najas sp.
- Ceratophyllum demersum
- Potamogeton crispus
- Potamogeton zosteriformis
- Chara sp.
- Myriophyllum sibiricum
- Potamogeton pectinatus
- Vallisneria americana

**Common Name**
- spatterdock

**Scientific Name**
- Nuphar variegata

**Common Name**
- blue flag iris
- cattail
- sedge
- softstem bulrush

**Scientific Name**
- Iris versicolor
- Typha sp.
- Carex sp.
- Scirpus validus

*Note: Bold red name indicates extremely aggressive/invasive introduced species.*
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>narrowleaf pondweed</td>
<td>Potamogeton sp.</td>
</tr>
<tr>
<td>Illinois pondweed</td>
<td>Potamogeton illinoensis</td>
</tr>
<tr>
<td>bushy pondweed and naiads</td>
<td>Najas sp.</td>
</tr>
<tr>
<td>coontail</td>
<td>Ceratophyllum demersum</td>
</tr>
<tr>
<td>curlyleaf pondweed</td>
<td>Potamogeton crispus</td>
</tr>
<tr>
<td>flatstem pondweed</td>
<td>Potamogeton zosteriformis</td>
</tr>
<tr>
<td>muskgrass</td>
<td>Chara sp.</td>
</tr>
<tr>
<td>northern watermilfoil</td>
<td>Myriophyllum sibiricum</td>
</tr>
<tr>
<td>sago pondweed</td>
<td>Zostera dubia</td>
</tr>
<tr>
<td>water stargrass</td>
<td>Vallisneria americana</td>
</tr>
<tr>
<td>wild celery</td>
<td>Stuckenia pectinata</td>
</tr>
<tr>
<td>spatterdock</td>
<td>Nuphar variegata</td>
</tr>
<tr>
<td>blue flag iris</td>
<td>Iris versicolor</td>
</tr>
<tr>
<td>cattail</td>
<td>Typha sp.</td>
</tr>
<tr>
<td>seadig</td>
<td>Carex sp.</td>
</tr>
<tr>
<td>softstem bulrush</td>
<td>Schoenoplectus tabernaemontani</td>
</tr>
</tbody>
</table>

*Note: Bold red name indicates extremely aggressive/invasive introduced species.*

**FIELD NOTES:**
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >10-12’
- Carex sp. sporadic along perimeter of lake
- Numerous carp present
- No Stuckenia
- Algal mats on west side

**LAKE EDITH MACROPHYTE SURVEY RESULTS**
June 4, 2010
Valley Branch Watershed District
**LAKE EDITH MACROPHYTE SURVEY RESULTS**
August 16, 2010
Valley Branch Watershed District

**FIELD NOTES:**
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >10-12'
- Carex sp. sporadic along perimeter of lake
- Numerous carp present
- No Nostoc present
- Algal mats on west side

**Legend**
- Emergent Plants
- Floating Leaf Plants
- Submerged Aquatic Plants
- No Aquatic Vegetation

### Common Name
### Scientific Name
- **narrowleaf pondweed**
  - *Potamogeton sp.*
- **Illinois pondweed**
  - *Potamogeton illinoensis*
- **bushy pondweed and naiads**
  - *Najas sp.*
- **coontail**
  - *Ceratophyllum demersum*
- **curlyleaf pondweed**
  - *Potamogeton crispus*
- **flatstem pondweed**
  - *Potamogeton zosteriformis*
- **muskgrass**
  - *Chara sp.*
- **northern watermilfoil**
  - *Myriophyllum sibiricum*
- **sago pondweed**
  - *Stuckenia pectinatus*
- **water stargrass**
  - *Zosterella dubia*
- **wild celery**
  - *Vallisneria americana*
- **spatterdock**
  - *Nuphar variegata*
- **blue flag iris**
  - *Iris versicolor*
- **cattail**
  - *Typha sp.*
- **sedge**
  - *Carex sp.*
- **softstem bulrush**
  - *Schoenoplectus tabernaemontani*

- **Common Name**
  - **Scientific Name**
  - **narrowleaf pondweed**
    - *Potamogeton sp.*
  - **Illinois pondweed**
    - *Potamogeton illinoensis*
  - **bushy pondweed and naiads**
    - *Najas sp.*
  - **coontail**
    - *Ceratophyllum demersum*
  - **curlyleaf pondweed**
    - *Potamogeton crispus*
  - **flatstem pondweed**
    - *Potamogeton zosteriformis*
  - **muskgrass**
    - *Chara sp.*
  - **northern watermilfoil**
    - *Myriophyllum sibiricum*
  - **sago pondweed**
    - *Stuckenia pectinatus*
  - **water stargrass**
    - *Zosterella dubia*
  - **wild celery**
    - *Vallisneria americana*
  - **spatterdock**
    - *Nuphar variegata*
  - **blue flag iris**
    - *Iris versicolor*
  - **cattail**
    - *Typha sp.*
  - **sedge**
    - *Carex sp.*
  - **softstem bulrush**
    - *Schoenoplectus tabernaemontani*

*Note: Bold red name indicates extremely aggressive/invasive introduced species.*
Lake Edith Macrophyte Survey Results
June 9, 2011
Valley Branch Watershed District

**Common Name** | **Scientific Name**
--- | ---
Narrowleaf pondweed | Potamogeton sp.
Illinois pondweed | Potamogeton illinoensis
Slender naiad | Najas sp.
Coontail | Ceratophyllum demersum
**Curlyleaf pondweed** | Potamogeton crispus
Flatstem pondweed | Potamogeton zosteriformis
Muskgrass | Chara sp.
Northern watermilfoil | Myriophyllum sibiricum
Sago pondweed | Stuckenia pectinata
Water stargrass | Zosterella dubia
Wild celery | Vallisneria americana

**Common Name** | **Scientific Name**
--- | ---
Yellow pondlily | Nuphar lutea
Blue flag iris | Iris versicolor
Cattail | Typha sp.
Sedge | Carex sp.
Softstem bulrush | Schoenoplectus tabernaemontani

**Legend**
- Emergent Plants
- Floating Leaf Plants
- Submerged Aquatic Plants
- No Aquatic Vegetation

**Field Notes:**
- Macrophyte densities estimated as follows:
  - 1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >10'-12'
- Carex sp. sporadic along perimeter of lake
- Numerous carp present
- Nostoc present
- Algal mats on west side
LAKE EDITH MACROPHYTE SURVEY RESULTS
August 16, 2011
Valley Branch Watershed District

Common Name: Narrowleaf pondweed
Scientific Name: Potamogeton sp.

Common Name: Illinois pondweed
Scientific Name: Potamogeton illinoensis

Common Name: Slender naiad
Scientific Name: Najas sp.

Common Name: Curlyleaf pondweed
Scientific Name: Potamogeton zosteriformis

Common Name: Flatstem pondweed
Scientific Name: Potamogeton zosteriformis

Common Name: Muskgrass
Scientific Name: Chara sp.

Common Name: Northern watermilfoil
Scientific Name: Myriophyllum sibiricum

Common Name: Sago pondweed
Scientific Name: Stuckenia pectinata

Common Name: Water stargrass
Scientific Name: Zosterella dubia

Common Name: Wild celery
Scientific Name: Vallisneria americana

Common Name: Narrowleaf pondweed
Scientific Name: Potamogeton sp.

Common Name: Illinois pondweed
Scientific Name: Potamogeton illinoensis

Common Name: Slender naiad
Scientific Name: Najas sp.

Common Name: Curlyleaf pondweed
Scientific Name: Potamogeton zosteriformis

Common Name: Flatstem pondweed
Scientific Name: Potamogeton zosteriformis

Common Name: Muskgrass
Scientific Name: Chara sp.

Common Name: Northern watermilfoil
Scientific Name: Myriophyllum sibiricum

Common Name: Sago pondweed
Scientific Name: Stuckenia pectinata

Common Name: Water stargrass
Scientific Name: Zosterella dubia

Common Name: Wild celery
Scientific Name: Vallisneria americana

FIELD NOTES:
- Macrophyte densities estimated as follows: 1=light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >10-12" deep
- Carex sp. sporadic along perimeter of lake
- Numerous carp present
- Nastoc present
- Algal mats on west side
- No Potamogeton crispus observed or sampled

Legend:
- Emergent Plants
- Floating Leaf Plants
- Submerged Aquatic Plants
- No Aquatic Vegetation
**LAKE EDITH MACROPHYTE SURVEY RESULTS**

**June 4, 2012**

**Valley Branch Watershed District**

**Submerged Aquatic Plants**

**Emergent Plants**

**Floating Leaf Plants**

**Submerged Aquatic Plants**

**No Aquatic Vegetation**

**Common Name** | **Scientific Name**
--- | ---
Narrowleaf pondweed | *Potamogeton zosteriformis*
Illinois pondweed | *Potamogeton illinoensis*
Slender naiad | *Najas sp.*
Coontail | *Ceratophyllum demersum*
**Curlyleaf pondweed** | *Potamogeton crispus*
Flatstem pondweed | *Potamogeton zosteriformis*
Muskgrass | *Chara sp.*
Northern watermilfoil | *Myriophyllum sibiricum*
Sago pondweed | *Stuckenia pectinata*
Water stargrass | *Zosterella dubia*
Wild celery | *Vallisneria americana*

**Floating Leaf Plants**

**Emergent Plants**

**Submerged Leaf Plants**

**No Aquatic Vegetation**

**Common Name** | **Scientific Name**
--- | ---
Yellow pondlily | *Nuphar lutea*

**FIELD NOTES:**
- Macrophyte densities estimated as follows:
  - 1-light; 2=moderate; 3=heavy
- Densities generally not noted for emergent and floating leaf plants
- No macrophytes found in water >10-12'
- Carex sp. sporadic along perimeter of lake
- Numerous carp present
- Nostoc present
- Algal mats on west side

*Note: Bold red name indicates extremely aggressive/invasive introduced species.*
Appendix D-5.19 Additional Phytoplankton Information
<table>
<thead>
<tr>
<th>DATE</th>
<th>TAXON</th>
<th>UNITS/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/11/2002</td>
<td>CHLOROPHYTA (GREEN ALGAE)</td>
<td></td>
</tr>
<tr>
<td>7/11/2002</td>
<td>Ankistrodesmus Braunii</td>
<td>0</td>
</tr>
<tr>
<td>8/5/2002</td>
<td>Carteria sp.</td>
<td>0</td>
</tr>
<tr>
<td>8/19/2002</td>
<td>Chlamydomonas globosa</td>
<td>1,503</td>
</tr>
<tr>
<td>9/4/2002</td>
<td>Oocystis parva</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Schroederia Judayi</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>Scenedesmus sp.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Selenastrum minutum</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Selenastrum sp.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sphaerocystis Schroeteri (Colony)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unidentified Green</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>CHLOROPHYTA TOTAL</strong></td>
<td><strong>1,698</strong></td>
</tr>
<tr>
<td>6/11/2002</td>
<td>CHRYSOPHYTA (YELLOW-BROWN ALGAE)</td>
<td></td>
</tr>
<tr>
<td>7/11/2002</td>
<td>Anabaena affinis</td>
<td>0</td>
</tr>
<tr>
<td>8/5/2002</td>
<td>Aphanizomenon flos-aquae</td>
<td>0</td>
</tr>
<tr>
<td>8/19/2002</td>
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**2002 Lake Edith Phytoplankton Data Summary**

**Date**
- 6/11/2002
- 7/11/2002
- 8/5/2002
- 8/19/2002
- 9/4/2002

**No. Per Milliliter**
- Pyrrhophyta
- Euglenophyta
- Cryptophyta
- Bacillariophyta
- Cyanophyta
- Chrysophyta
- Chlorophyta
Appendix E-5.19 Additional Zooplankton Information
### LAKE EDITH
**SAMPLE: BOTTOM TO SURFACE ANALYSIS**
**ZOOPLANKTON ANALYSIS**

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2002 Lake Edith
Zooplankton Data Summary

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Legend:
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- Cladocera