2016

ANNUAL REPORT

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

VLAWMO

Vadnais Lake Area
Water Management Organization

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VLAWMO
Vadnais Lake Area
Water Management Organization

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Introduction and background

IN THIS SECTION

Letter from the Administrator

Greetings!

2016 was a time of finishing big projects and starting new ones for the Vadnais Lake Area Water Management Organization (VLAWMO). This Annual Report will give you some highlights. I hope you enjoy it. As always we welcome your feedback to make next year's Annual Report even better.

VLAWMO 2017-2026 Water Management Plan and the Joint Powers Agreement (JPA) are now complete and approved. The VLAWMO Water Policies have been updated to reflect current standards. That sounds brief but a tremendous amount of work went into it from a whole team of people. Many thanks go out to our community and agency partners. Because of you we have an exciting Water Plan and the JPA to make it happen. Now it's time to kick off the Implementation plan. You are all part of that.

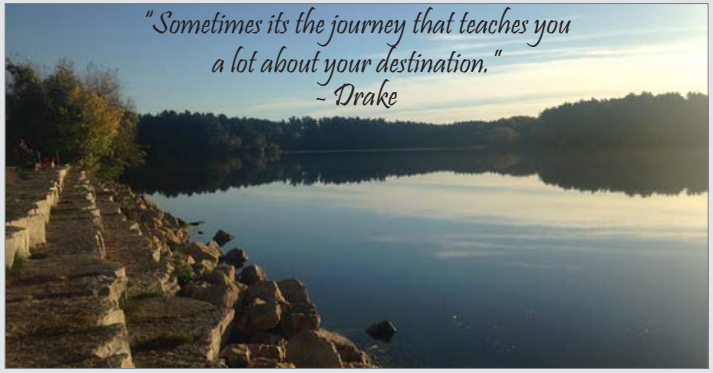
Building capacity to understand, protect and restore the water resources within VLAWMO continued to grow in 2016. Nick Voss joined the staff as Education & Outreach Coordinator in the spring of 2016. He has brought experience and energy to the program, developing an Education and Outreach Plan tied to our new Water Plan and the goals. You will see him out in the community. Or maybe you will see a big blue water drop engaging young and old alike.

Partnerships were critical. Ramsey Conservation District worked with VLAWMO on the lower Kohler streambank restoration bringing technical assistance and grant funding. The City of Vadnais Heights expanded the scope of the creek bank stabilization further down Lambert Creek. RCD also secured funding for the native vegetation portion of the Sucker channel stabilization as well as design help. Through the Landscape 2 grant program VLAWMO had the opportunity to help the local Montessori school create a sustainable and educational outdoor learning area on their grounds with multiple raingardens and a native planting. After several years it was great to see it all come together. Midwest Floating Island in conjunction with the University of MN installed a new treatment island in a paired storm ponds monitoring study. There'll be more to come on that when the results are in.

Bacteria molecular monitoring program on Lambert Creek completed its third of four years of monitoring. This last year focused on wet weather monitoring with very dedicated staff taking consecutive samples and measurements in the middle of last summer's big rain storms. One more year of wet weather – middle of rain storm – monitoring is on tap. Then the full report will available to local partners, state agencies and others interested in bacteria in stormwater in an urban setting. We are excited to be able to share this knowledge within the next year. Thinking about monitoring and partners, do you know how many laboratories VLAWMO works with? Quite a few, Pace Analytical – lake & creek chemistry, Ramsey County – chloride and creek sample prep, St. Paul Reg. Water Service – bacteria enumeration; Weston in CA – DNA analysis, VWR International for sediment analysis. Monitoring reports are on the VLAWMO website as is a wealth of information.

The first year of implementing the new Water Plan is showing great promise. Two big projects with partners a scheduled, Whitaker treatment wetlands will be installed in the fall and the Sucker channel restoration is also scheduled. Planning is ongoing for even more. Watch for more details on our website or facebook page.

- Stephanie McNamara, VLAWMO Administrator



Early Morning on Vadnais Lake

Background

The Vadnais Lake Area Water Management Organization (VLAWMO) was formed in 1983 to protect the Vadnais Lake watershed area in northern Ramsey County and a small portion of Anoka County. Our organization was formed through a Joint Powers Agreement (JPA) that was ratified by the 6 cities within VLAWMO boundaries to comply with the State of Minnesota Metropolitan Surface Water Management Act (Minnesota statute Chapters 103A – 103H). We are governed by a 6 member Board of Directors that is represented by an elected official from each of the communities. VLAWMO covers approximately 25 square miles and includes portions of Vadnais Heights, White Bear Township, White Bear Lake, Gem Lake, Lino Lakes, and all of North Oaks.

OUR APPROACH

Managing a watershed area to protect our vital water resources has become the primary approach across the country. Since water flows across political boundaries, partnerships among local governments, regional, state and federal agencies are vital. Because Vadnais Lake is used as the drinking water reservoir for approximately 400,000 customers in the St. Paul area, VLAWMO frequently partners with the St. Paul Regional Water Service (SPRWS) on a variety of water quality monitoring and improvement projects.

OUR CORE PRINCIPLES

To guide our efforts towards achieving our mission. VLAWMO shares responsibility with its member communities to:

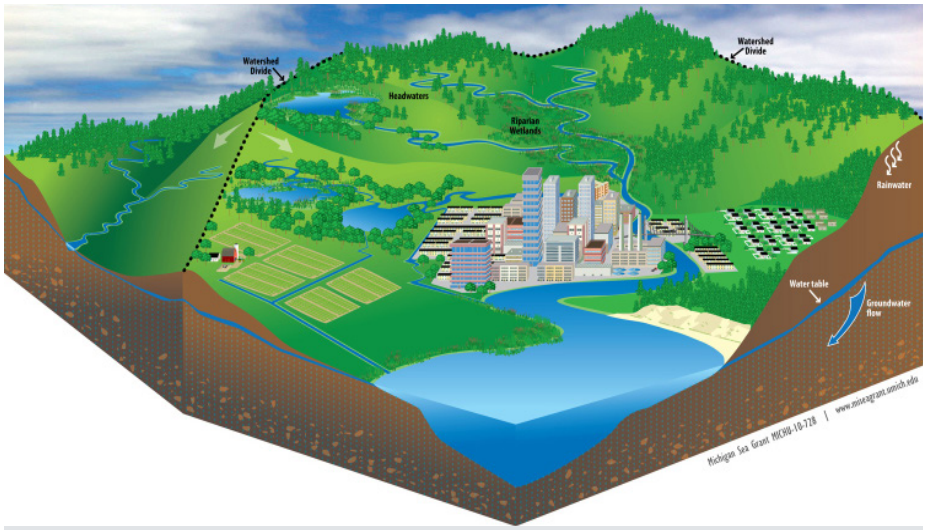
- Protect surface water quality
- Protect groundwater quality and recharge areas
- Provide public education to promote good stewardship of water resources
- Protect and manage wetlands through the Wetland Conservation Act
- Collaborate with other public and private organizations
- Manage stormwater and control flooding through the use of best management practices
- Require good erosion control practices, both during development and as a part of good stewardship

Vadnais Lake pumping house, early 1900s - courtesy of MN Historical Society

Mission Statement

Our mission at the Vadnais Lake Area Water Management Organization is to protect and enhance the water resources within the watershed.

Activities we work on include: water quality monitoring, education and outreach projects, wetland protection, and water quality enhancement projects.



"How Watersheds Work" courtesy of Michigan Sea Grant (MICHU-10-728)

What is a Watershed?

A watershed is all the land area that drains to a specific water resource, such as a lake or stream. Watersheds range in size from a few square miles to an entire continent. As rain and melting snow run downhill, they carry sediment and other materials into streams, lakes, and groundwater.

The land use activities within a watershed have a direct impact on the quality of the water. 96% of the land use within VLAWMO is urban with a small area of agricultural land in the northern end.

Watersheds provide water for drinking, irrigation, streams, and activities such as fishing, swimming, and boating. In addition, watersheds also provide food and shelter for wildlife.

OUR GOALS

Accomplishing our mission requires a focus on common goals. The VLAWMO will pursue the following goals as a way of proceeding towards the mission.

- Protect and improve surface water quality
- Protect and enhance wetland resources
- Protect and improve waters for wildlife habitat and recreation
- Enhance public participation and stewardship
- Make and enable informed decisions
- Optimize public resources
- Protect and improve groundwater quality and quantity
- Analyze and use alternative funding sources
- Improve communications
- Prevent flooding

WHAT IS A WMO?

A watershed management organization (WMO) is a local government agency charged with protecting water resources within its boundaries. All land within the metropolitan area must be within an organized watershed (State Statutes Chapters 103B & 103D). Watershed Districts are governed by County Commissioners while Water Management Organizations are governed on the municipal level.

WHO PAYS FOR IT?

The Vadnais Lake Area Water Management Organization is funded by a stormwater utility fee. Property owners within the watershed are charged a fee to manage the stormwater that runs off their property. This public utility fee is determined by land use (eg residential, commercial etc), and is included on Ramsey County property tax statements. The authority to charge and collect a stormwater utility fee is governed by Minnesota State Law.

Water Resources in the Watershed

LAKES

There are 16 lakes within VLAWMO. East Goose Lake, West Goose Lake and Birch Lake are located in White Bear Lake. Tamarack Lake, Fish Lake and Ox Lake are Located in White Bear Township. Gem Lake is located in Gem Lake. Amelia Lake is Located in Lino Lakes. Pleasant Lake, Charley Lake, Deep Lake, Black Lake, Wilkinson Lake and Gilfillan Lake are located in North Oaks. Sucker Lake, East and West Vadnais Lake are located in Vadnais Heights.

East Vadnais Lake is the drinking water reservoir for the City of Saint Paul. East Vadnais Lake is supplied with water pumped from the Mississippi River in Fridley that flows via underground aqueduct into Lake Charley in North Oaks. The water then flows east to Pleasant Lake, then south into Sucker Lake, and then into East Vadnais.

LAMBERT CREEK

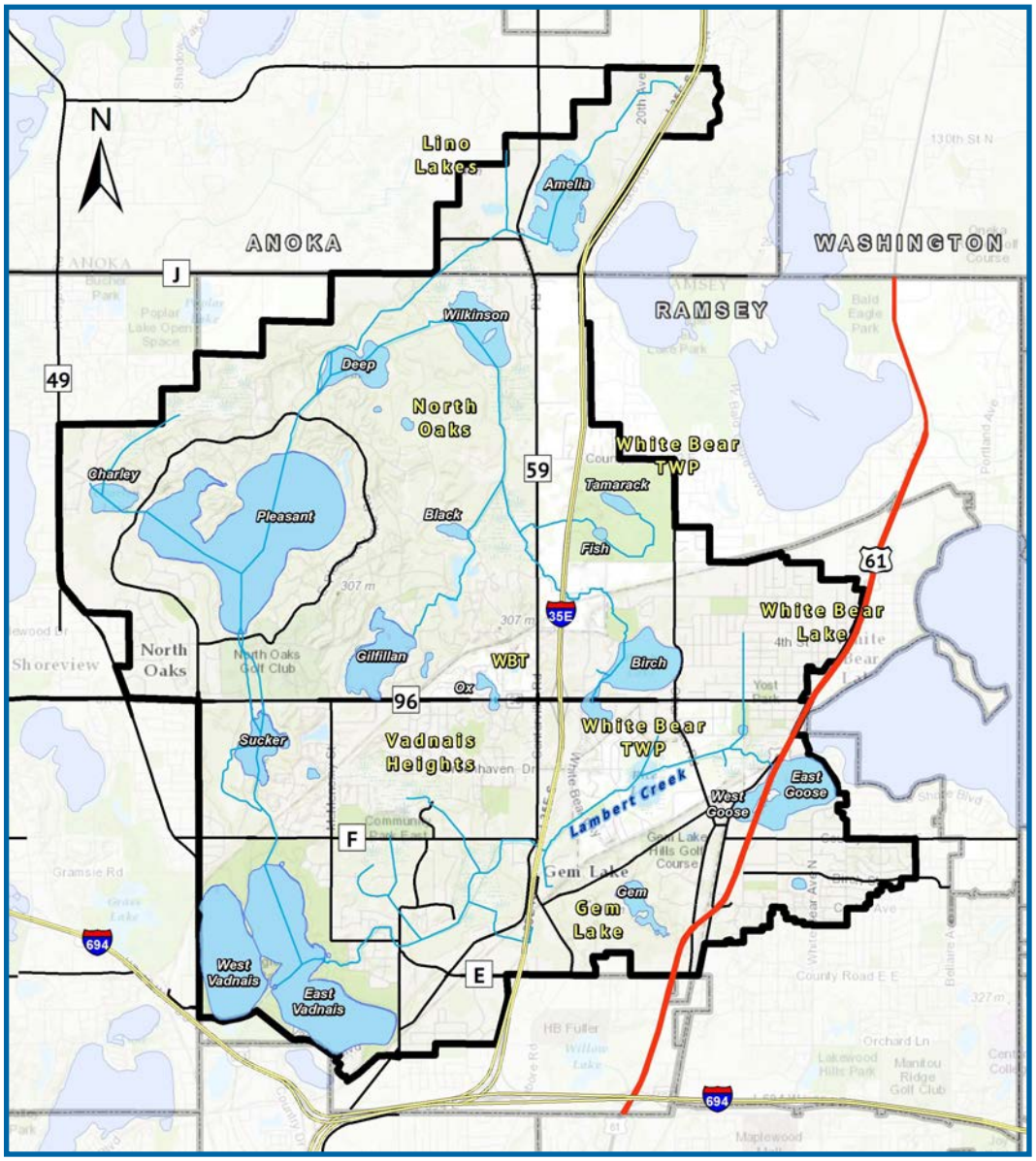
VLAWMO has jurisdiction over Lambert Creek, 4.5 miles of creek and wetland that runs from West Goose Lake and eventually empties into East Vadnais Lake.

WETLANDS

There are over 500 wetlands within VLAWMO. Tamarack, Grass, Wilkinson, Rice, Lambert, and Sobota Slough are a few of the largest tracts of wetlands in the watershed.

GROUNDWATER

Groundwater beneath the land surface of the Watershed flows to local lakes, the Mississippi River, and aquifers including the Prairie du Chien aquifer.



THE YEAR IN REVIEW:
2016 activities, projects, and improvements

IN THIS SECTION

Research

NEW STORMWATER AUTOSAMPLER

Equipped with a new automated storm sampler, VLAWMO took a big step in water monitoring in 2016. With this tool, VLAWMO is now able to more accurately determine what's happening in the surface of the landscape. Currently, this tool is being used to study nutrient levels in Lambert Creek (see page 19).

The sampler takes precise water quality readings during what's called the "first flush" of a rain event. The first flush is roughly the first 5 minutes of a rain event, and is important because it's when whatever is on the landscape washes into a water body. A separate device placed in the water (pictured) detects when the stream's flow is increasing due to rain.

The sampler is then turned on and takes a series of water samples. With these samples VLAWMO can read nutrients such as phosphorous and nitrogen, suspended solids, and e. Coli.

See the Water Monitoring description for more on the sampler and VLAWMO's 2016 monitoring efforts (p.18, 20).

FLOATING ISLAND WETLAND

In a partnership between the University of Minnesota and Floating Island Wetland, VLAWMO installed three floating island wetlands at a stormpond in Vadnais Heights. Floating Islands are a new water quality tool growing in popularity, but little is known about their potential for treating stormwater.

The project was made possible by a U of M grant.

The project will study how the islands improve water quality by monitoring this stormpond from Spring to Fall of 2017, comparing findings to a control pond several hundred feet away. Bioengineering students from the U of MN planted and installed the islands, and will be returning in 2017 with VLAWMO staff to record water quality data.

Landscape Projects

LAMBERT CREEK RESTORATION AT KOHLER BEND

Capital Improvement Project
Location: Vadnais Heights
Completion: Spring, 2017
Cost: $92,580


Digging out the drop structure

This restoration is set on a portion of Lambert Creek as it crosses Kohler Road. Before the restoration, this portion of the creek was heavily eroded from high-intensity street runoff.

The restoration serves to improve creek water quality by decreasing erosion, as well as protect the foundations of nearby homes from further erosion. VLAWMO received $52,200 in cost-share assistance from Ramsey Conservation District.

Tree removal consisted of mostly invasive buckthorn. Instead of a dense shade canopy, native grasses and shrubs are more suitable for stabilizing soil. With sunlight reaching the banks, these native plants will provide a dense mat of roots to hold soil, and dense vegetation near the surface to slow water.

In addition to the restored plant community, bio logs, erosion blankets, and a drop structure are used in the project. The bio logs create soil lifts, or "steps" for plants to grown on, and erosion blankets

The drop structure catches the runoff from Kohler road, acting like a hidden waterfall to absorb the velocity. As water rushes from the street, it falls several feet into an enclosed hole that absorbs the impact.

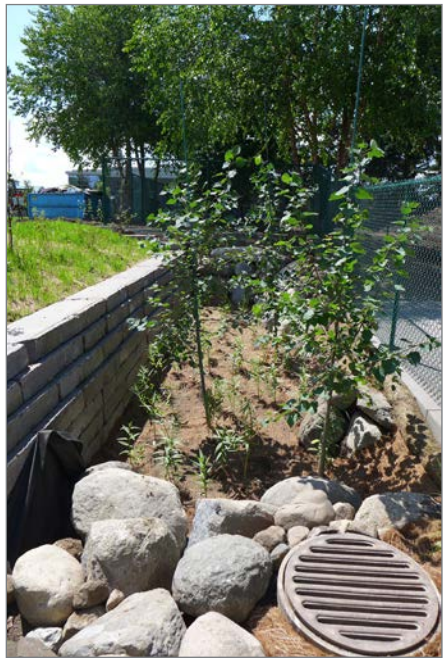

Before: Buckthorn and other vegetation shaded the bank and allowed for bare soil as well as eroded stream banks from runoff.

Water leaving the drop structure exits down at the water level, with much less force and much less wear on the bank.

After : Bio logs and erosion blankets structure and shelter the soil to help establish new plants.

WHITE BEAR MONTESSORI RAINGARDENS

Landscape Level II Grant
Location: Gem Lake
Completion: July, 2016
Amount Awarded: $20,000


White Bear Montessori - south raingarden

The WB Montessori project consists of two large raingardens: one on the north side of the property (450 ft^2) and one on the south side (400 ft^2).

The two raingardens collect water draining from almost 15,000 ft^2 of the property. The project is funded by a VLAWMO cost-share level 2 grant, as well as a grant from the Ramsey Conservation District. Highlights include boulder walls, specialty soil for infiltration, underdrains that direct excess water to stormdrains during large rain events, and birch, tamarack, and quaking aspen trees. The project resulted in a 98% reduction in stormwater runoff leaving the property, including 101 lbs/yr of total suspended solids and .01 lbs/yr of total phosphorous. Lastly, the project serves as an outdoor classroom space for students.


Landscape designers: Steve Mastey (lead, left) and David Chmielewski (right)


White Bear Montessori - north raingarden

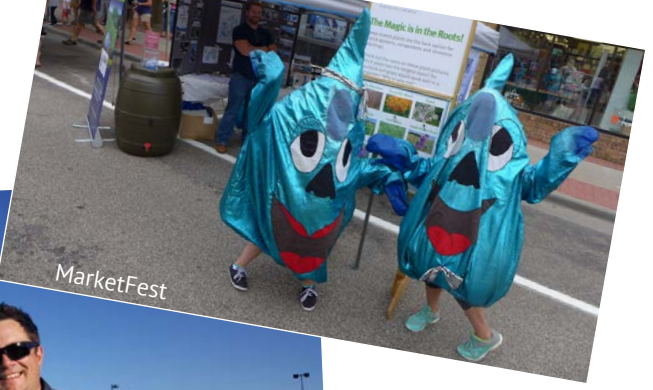
In the Community

COMMUNITY EVENTS

Staffing a booth at popular local events is a fun and valuable way to connect with community members. At events VLAWMO has the opportunity to share its work, provide brochures, give away prizes such as rainbarrels or tote bags, and answer questions for event goers. This year, community events served a dual purpose by also providing a place to conduct community surveys for the Education and Outreach Plan (p. 11).

VLAWMO booths were at the following 2016 events:

- 2016 White Bear Lake Water Conservation Expo - May
- North Oaks Community Fair - June
- WBL Marketfest: Conservation and Environment Day - July
- Taste of Vadnais - July
- Heritage Days - August
- Vadnais Heights Farmers Market - August
- Vadnais Heights Halloween Party - October


MarketFest


Taste of Vadnais


Vadnais Halloween Party


North Oaks Community Fair


North Oaks Community Fair


Taste of Vadnais


MarketFest

Education Programs

EDUCATION AND OUTREACH PLAN

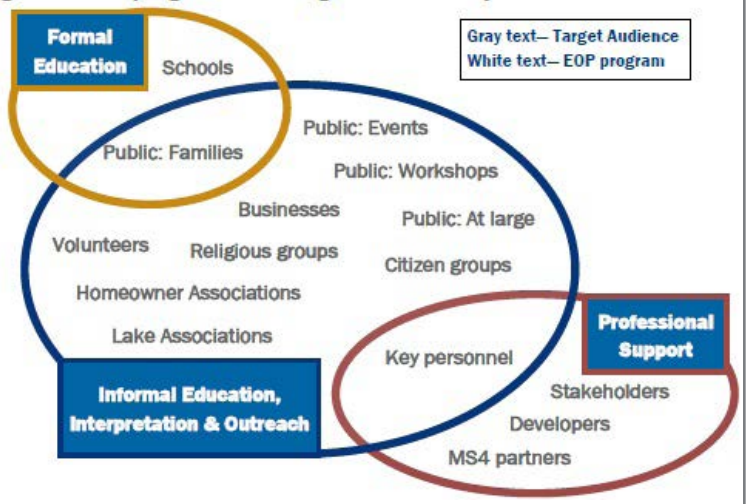
In conjunction with the new 2017-2026 water plan, VLAWMO completed a new Education and Outreach Plan (EOP). Created for the purpose of fulfilling priority issue #3 of the water plan, as well as one of the VLAWMO core activities (right), the EOP divides education and outreach efforts into three programs. These programs are formal education (schools), professional support (cities and municipalities) and informal education, interpretation & outreach (general public, groups, media, and events).

Each program has goals and measurable objectives to keep education, outreach, and communications relevant to VLAWMO's mission of protecting and enhancing water resources in the watershed.

Read more about the EOP on page 33 and at: www.VLAWMO.org/about/why-water-matters

VLAWMO Core activities

EOP programs and target audience layout



Teaching new watershed activities to White Bear Lake Educators

WORKSHOPS & STAKEHOLDER MEETINGS

Providing effective and relevant workshops and training opportunities are a cornerstone of public education and stakeholder engagement. VLAWMO hosted 3 stakeholder meetings and 2 workshops in 2016.

Workshops were focused on raingardens, including theory, design, and construction. Participants learned about the history of development in our watershed, the relationship between the built environment and water, as well as how to get started on a VLAWMO cost-share program.

Stakeholder meetings consisted of public input on the 2017-2026 water plan, decision making about Pleasant Lake lake levels, and problem solving with impaired lakes Goose and Wilkinson (p.14). These meetings laid an essential foundation for continuing the efforts into 2017.

2 RAINGARDEN WORKSHOPS - 30 PARTICIPANTS
3 STAKEHOLDER MEETINGS - 60 PARTICIPANTS

Cost Share Programs

VLAWMO's Cost Share Program exists to provide assistance to public and private landowners for implementing programs and projects that support one or more of the following:

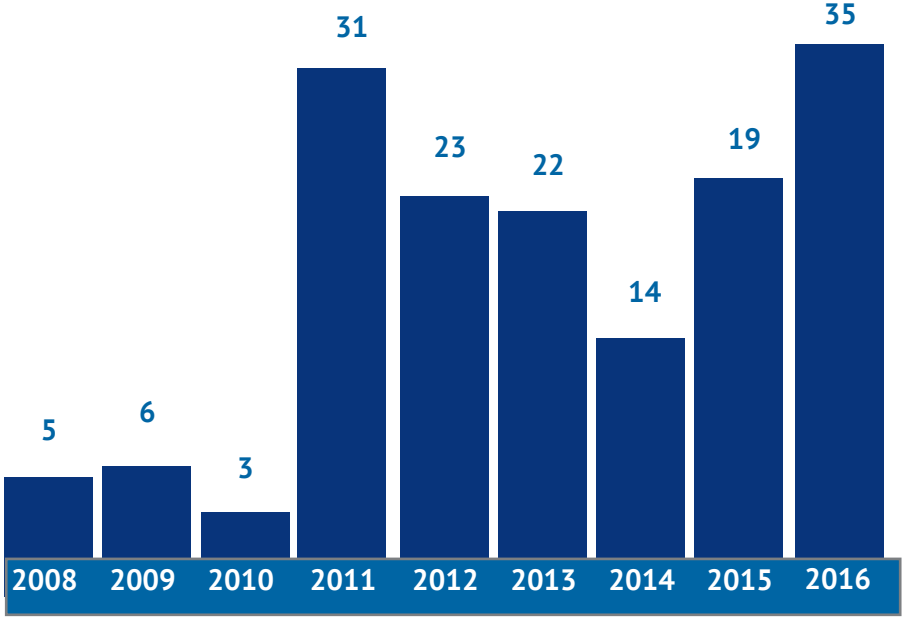
- Prevention of flooding or mitigation of drought
- Water quality improvement or increase in watershed storage capacity
- Preservation, protection, and restoration of native plant and wildlife communities, especially along lakes, streams, and wetlands
- Protection and preservation of groundwater quality and quantity

Available funds vary by year. Once the annual amount is depleted, applicants are advised to reapply the following year.

There are 3 Cost Share Programs:

- Rainbarrel
- Landscape Level 1
- Landscape Level 2

Total Annual Grants: Landscape & Rainbarrel



LANDSCAPE COST SHARE PROGRAMS

Landscape Level 1: Reimburses property owners 75% of the costs associated with implementing approved water quality improvement projects. The maximum reimbursement is $2,000 for this program. Typical projects include raingardens, shoreline restoration, native habitat restoration, or pervious paver installation.

Landscape Level 2: projects with a larger total cost (minimum total cost of $5,000) and will reimburse 75% of the costs, up to $20,000. The program was updated in 2015 to allow funding to be more available for applicants.

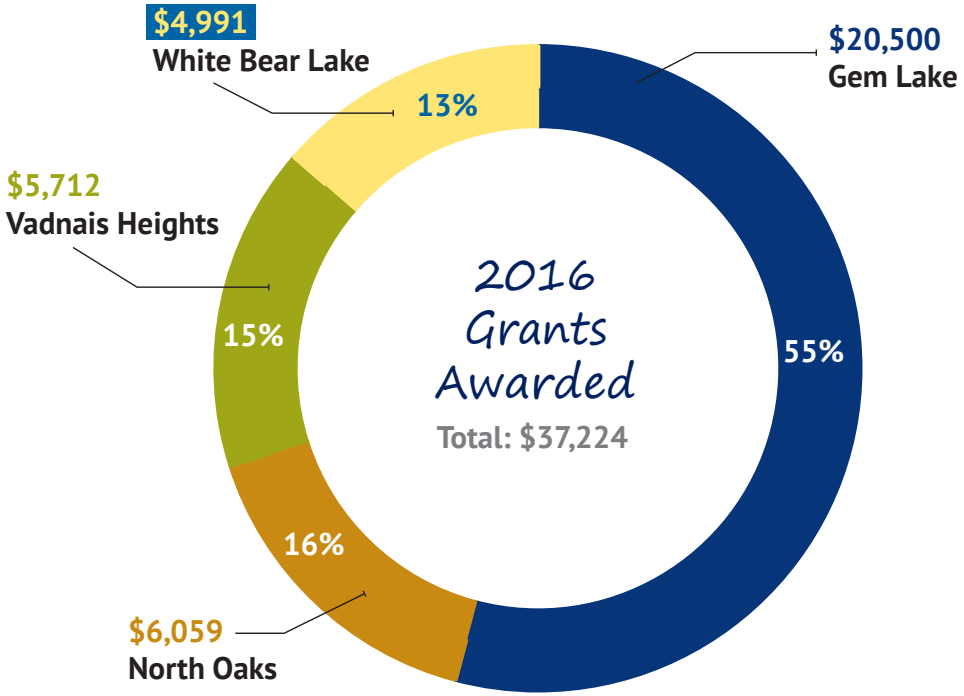
There were *14* landscape projects completed in 2016. Two were shoreline restorations totaling 1,150 ft^2 on Birch Lake. 7 were raingardens totaling 2,513 ft^2 within the cities of White Bear Lake, North Oaks and Vadnais Heights. One was a native plant restoration of over 1,500 ft^2 in North Oaks. The raingardens are estimated by Minimal Impact Design Standards (MIDS) to reduce a combined **76,000 gallons** of runoff per year. Shorelines restorations specialize in protection rather than capturing runoff, but 2016's shorelines still capture an annual **9,785 gallons**.

LANDSCAPE LEVEL 1 SUMMARY 2016

For Landscape Level 1, *12* grants were awarded funding for a total of $15,760.74. An additional $462.50 was awarded in maintenance funding in Gem Lake.

LANDSCAPE LEVEL 2 SUMMARY 2016

1 Landscape Level 2 grant was awarded for a total of $20,000.00



RAINBARREL COST SHARE PROGRAM

The Rainbarrel Program reimburses residents 50% of the cost towards the purchase of up to 2 rainbarrels. Applicants are limited to $125 maximum reimbursement per rainbarrel. In promotion of the program

RAINBARREL SUMMARY 2016

In 2016 VLAWMO awarded grants for *21* rainbarrels, for a total of $1,001.74
A total of 80 rainbarrel grants have been awarded since the program began in 2007. Each time the barrels are filled, up to 4,400 gallons of water is available for reuse. If each rainbarrel gets filled 10 times throughout the year, that's 44,000 gallons! An additional 4 rainbarrels were awarded as prizes during 2016 public events (pictured left).

COMMUNITY BLUE GRANT PROGRAM

Community Blue is an education focused grant program for community groups within VLAWMO. It funds educational events and resources as they relate to water resources, and provides support in making existing stormwater, wetland, or watershed improvements into educational tools with public exposure. 1 Community Blue grant was completed in 2016 (page 14).

Community Blue

PURPLE LOOSESTRIFE CONTROL

In the Spring of 2016, the Rice Lake Project Committee (RLPC) contacted VLAWMO that the purple loosestrife infestation on the Lake had been increasing in the last decade. A purple loosestrife project was created with the goal to reduce the purple loosestrife population, and rebound and increase native vegetation.

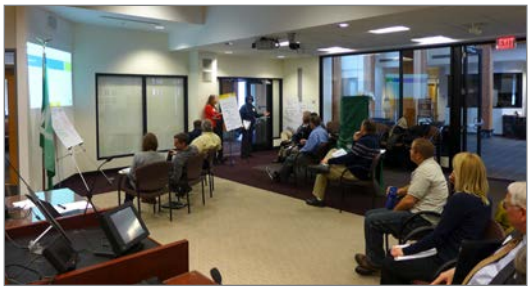
Purple loosestrife is an invasive wetland plant species native to Europe, Asia, Africa and Australia. The plant effectively moves into areas and crowds out native vegetation, decreasing biodiversity and habitat. The RLPC has utilized research from the DNR as well as contract with professionals to conduct their own research on methods of purple loosestrife removal. RLPC findings were congruent with the DNR in that the most effective means of managing purple loosestrife was biological control. Biological control simply entails collecting and introducing a species of beetle to the Lake that feeds only on purple loosestrife. This is a long-term solution to reducing and controlling the invasive plant population.

VLAWMO approved the project application through the Community Blue grant program, which provided for both physical materials and tools as well as educational initiatives with Birch Lake elementary. Up to $10,000 was appropriated for the 3-year treatment and monitoring project - 2016 to 2018.

Monitoring will be conducted each fall to measure changes on the Lake.

Stakeholder Meetings

GOOSE AND WILKINSON: PROJECT PLANNING



Goose and Wilkinson lakes are great examples water bodies that need water quality improvements, but also have multiple priorities and uses. Planning in these situations is nearly impossible, unless all parties are present and part of the plan.

While stakeholder priorities range from development to recreation to aquatic habitat, the shared interest throughout is to improve the lakes' water quality. Contracting a 3rd party firm to facilitate the discussion, VLAWMO is excited to be working with the North Oaks Development Company, the White Bear Lake Ski Otters, the MN DNR, Minnesota Pollution Control Agency (MPCA), and North Oaks Home Owners Association, Ramsey Conservation District (RCD), and the Cities of White Bear Lake and North Oaks.

PLEASANT LAKE: LAKE LEVEL DISCUSSION

For many years, a variety of factors have created challenges with shoreline restoration projects on Pleasant Lake. This year was the first time that all of the parties involved sat down to strategize a plan of action.

- As part of the Vadnais Chain of Lakes, Pleasant Lake feeds into Vadnais. Pleasant's lake level therefore experiences a high degree of fluctuation depending on drinking water demand, facilitated by the Saint Paul Regional Water Service (SPRWS). This provides challenges in plant establishment.
- Home owners have varying opinions on which lake level is best for the lake. and their properties.
- Pleasant Lake is large enough to have a large fetch; wind driven waves and ice that batter the shoreline, causing damage.

VLAWMO is excited to facilitate these discussions, because each challenge provides an opportunity for closer working relationships, increased understanding of party's values and needs, and in turn, improved management of our water resources.

Outreach

PUBLICATIONS AND SOCIAL MEDIA

VLAWMO strives each year to provide updates and education to local news sources as well as our social media outlets. This year, a half-hour segment was added to the local cable channel G-TV, airing weekly and receiving updates as new educational videos are created by VLAWMO staff.
Outreach and social media efforts:

- Seasonal E-newsletters
- Article in the Vadnais Heights Press: November, 2016
- Article in the North Oaks News: December, 2016
- Weekly posts on Facebook and Twitter
- Monthly news stories and blog entries on VLAWMO.org
- Developing informational brochures and posters

FORUMS

VLAWMO presented at the Water & Bees Policy Forum in White Bear Lake on July 12, 2016. Attendees learned about the results of the MN 2015/2016 legislative session and its implications on water resources and pollinators. The event was a cooperation between the City of White Bear Lake, Conservation Minnesota, and VLAWMO. It was also an opportunity for VLAWMO to survey community members on their interests and values pertaining to water, to help create the Education and Outreach Plan.


WBL Water & Bees Policy Forum

CITY AND TOWNSHIP OUTREACH

Keeping Cities and Townships informed and equipped with information and tools helps broadcast water-related messages, and helps municipalities in their Municipal Stormwater (MS4) permitting through the Minnesota Pollution Control Agency.

SALT CUP CAMPAIGN: In 2016, VLAWMO provided resources to each City and Township on proper salt and de-icer application. While VLAWMO recognizes salt is harmful to water quality, it's still widely used for safety reasons. Measuring cups were a way to advocate proper application (according to Minnesota Pollution Control Agency best practices) in a relevant, practical manner. Table tents, posters, and salt measuring cups were dispersed to each city and township. 200 cups were dispersed to each municipality, advertised in their newsletters and websites.

NEW MEDIA!

2016 brought the launch of VLAWMO's new blog and YouTube Channel, as well as renovations to VLAWMO Facebook and Twitter pages.

Blog found on the VLAWMO.org homepage

Follow our social media with the handle: "@VLAWMO"

Changing the Guard

Two watershed champions have moved onto their next life chapters this year. VLAWMO wishes them well and is grateful for their long-term investment of time and energy.

Marc Johannsen (left) has served as the chair of VLAWMO's Board of Directors for 10 years. Also retiring from serving as Mayor of Vadnais Heights, his support for VLAWMO is now as a member of the public.

Paul Petersen (right) served as chair of VLAWMO's Technical Commission for over 10 years, in addition to volunteering in the Citizen Lake Monitoring Program collecting water samples of Lake Amelia.

Volunteer Activities

Volunteers bring VLAWMO's work into the community. Volunteers help with water sampling, booth staffing, brainstorming, and advising VLAWMO on public interest and priorities.

CITIZEN LAKE MONITORING PROGRAM (CLMP)

These volunteers collect water samples and summarized lake conditions Bi-weekly from May through September.

VLAWMO would like to thank the following volunteers for their vital role in the Citizens Lake Monitoring Program. The volunteers for 2016 were: Ron Auger & Jim Grisim (Birch Lake), Paul Peterson (Amelia Lake), and Shannon Stewart (Tamarack Lake). Ron Auger sadly passed away in early 2017 - his help and good cheer will be missed.

WATERSHED ACTION VOLUNTEERS (WAV)

VLAWMO is grateful for the volunteers who have supported the Watershed Action Volunteers in 2016: Bob Larsen, Mike Sorensen, Lisa Finander, Diane Gorder, and Chris Mann. 2016 volunteer activities included:

- Staffing VLAWMO booths at community events
- Planning and creating educational videos for water-friendly lawn care
- Advising VLAWMO on public interest, priorities, and opportunities

WAV
WATERSHED ACTION VOLUNTEERS

Water Monitoring

INTRODUCTION

VLAWMO's regular water quality monitoring program includes nutrient sampling on 6 Lambert Creek sites, and nutrient sampling on 12 of the Vadnais Lake Area Watershed lakes. Nutrients and pollutants sampled for data include: total phosphorus, chlorophyll-A, soluble-reactive phosphorus, iron, total nitrogen, nitrate, total suspended solids, and chloride. VLAWMO's specialty monitoring programs, such as E coli and winter chloride sampling, will continue. See the 2016 Annual Report Summary for a map of monitoring locations.

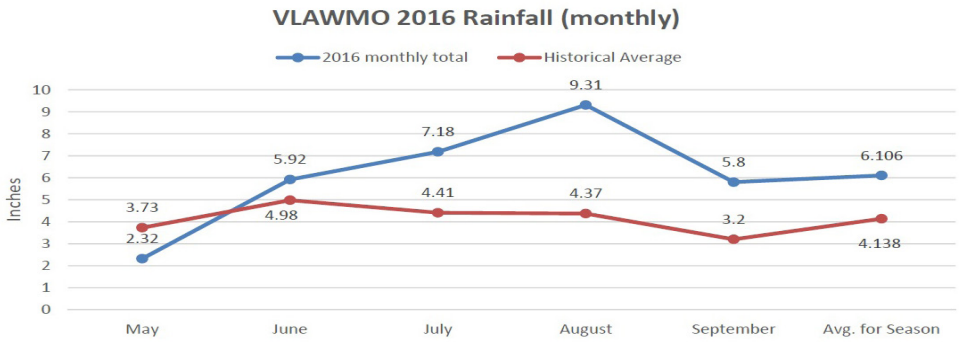
2016 was officially the wettest year on record in Minnesota. Part of VLAWMO's water monitoring includes rainfall measurements because rainfall and the timing of rainfall are factors that influence water quality. Typically, more precipitation implies more water runoff, which carries more contaminants from the land surface into water bodies.

Lakes are summarized with a grading system called the Trophic State Index (TSI). This system was developed in the 1970's to calculate average phosphorus, chlorophyll-A, and Secchi disk readings, and generate a summarizing number. Letter grades are developed from the Metropolitan Council matrix for annual averages.

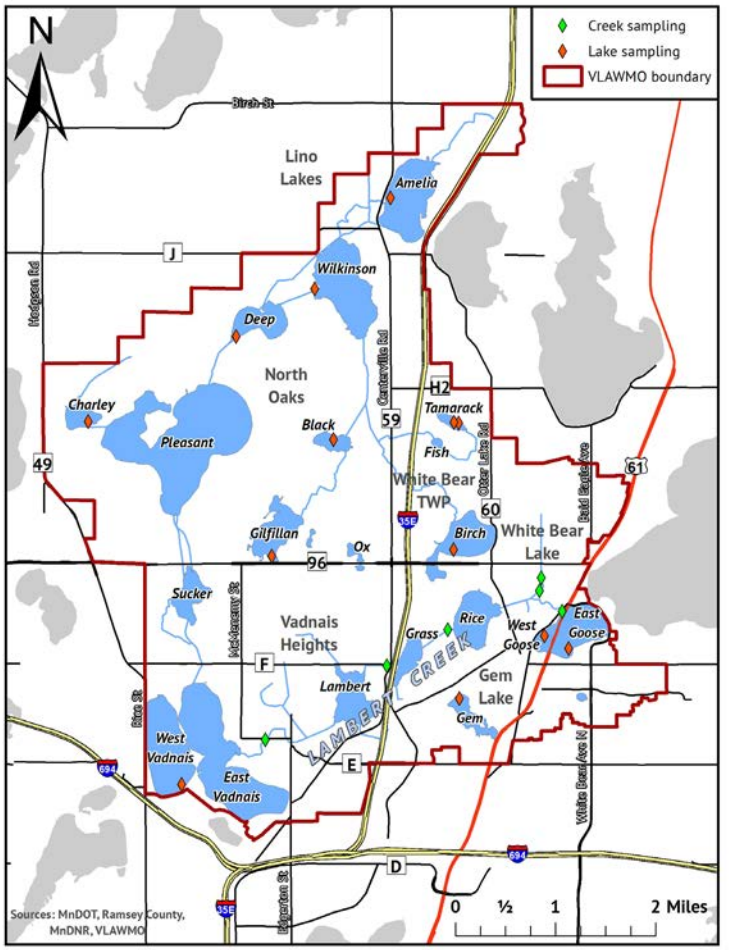
VLAWMO Lake Grades

Lake	2015	2016	TSI Status
Amelia	B	B	Eutrophic
Birch	B+	B	Mesotrophic
Black	B+	A-	Mesotrophic
Charlie	C	C	Eutrophic
Deep	C-	C	Eutrophic
Gem	B	B	Mesotrophic
Gilffilan	C+	C+	Eutrophic
E. Goose	D-	D-	Eutrophic - Hypereutrophic
W. Goose	D	D-	Eutrophic - Hypereutrophic
Tamarack	D	D	Eutrophic - Hypereutrophic
Wilkinson	D	D+	Eutrophic

Eutrophic:
Hypereutrophic:
Mesotrophic:



VLAWMO Monitoring Locations

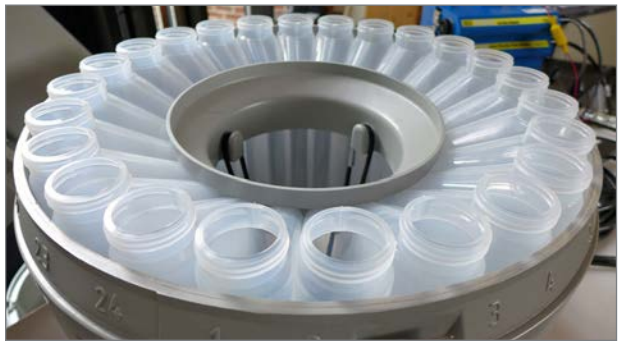


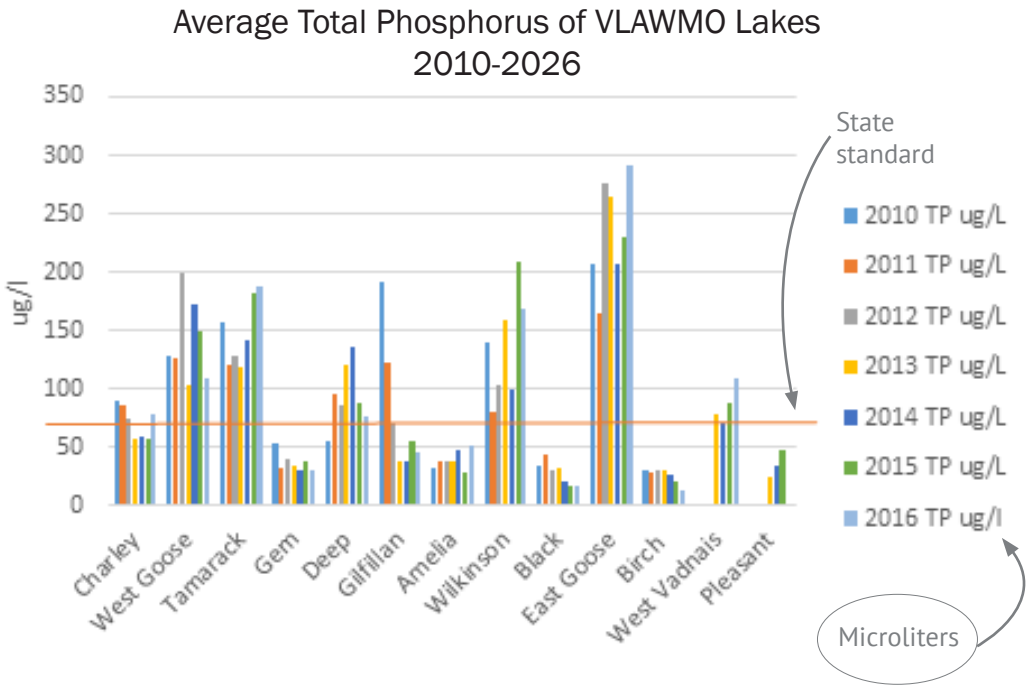
Monitoring results are used to guide local water policies and management, and to help prioritize and locate future water quality projects such as raingardens, underground retention basins, and shoreline restorations. The full 2016 monitoring report is available at: **vlawmo.org/resources**

MONITORING SUMMARY

- **Gem Lake's** chemistry has improved over the last 4 years which may coincide with the work that was done on Highway 61 and the reconstructed grass swales flowing into the lake. The Minnesota Pollution Control Agency (MPCA) is currently looking into delisting Gem Lake from the impaired list.
- **Gilfillan** is another lake that has been on the Impaired List. Since the augmentation system went in in 2012 to raise the water level, the water quality has improved. This improvement is most likely due to dilution. To VLAWMO's knowledge, no augmentation has occurred in the last four years, so the level has maintained on its own. Nutrient levels look to be slightly rising over the las four years.
- **East Goose and West Goose** still have very high nutrient levels. Bullhead removal had limited impact on nutrient levels. Studies have shown this to be a very complex lake system. A project feasibility assessment is being completed in 2017 as well as a follow up fish survey and other studies.
- **Wilkinson's** phosphorus is over state standards but this year the Chlorophyll A is below or at standard. Wilkinson acts more like a wetland and therefore what goes on in the nearby watershed has a greater effect on the chemistry of the lake.
- **Tamarack's** readings are still high. In the third full year of monitoring the floating wetland (installed 2013) has not shown any effect as of yet. Samples were taken right next to the island and compared to samples taken off the dock. There is no difference between the two spots. So far the water chemistry is similar to what was seen in past years. Monitoring will continue. The floating island currently provides additional habitat and education opportunities, While it may be too small to be effective, we hope it will help improve water quality in the next few years.
- **Automated sampler:** VLAWMO installed its first automated storm sampler this summer. It worked great and provided quality results (pictured below).
- **Whitaker:** The two cell system at Whitaker continues to export phosphorus. However the pond and fore bay (installed 2012) have shown a positive effect on suspended solids.
- **Lake chloride levels** were overall similar to last year. We have been sampling for 7 years and there have been no significant changes within the lakes. Black Lake has the lowest levels. Birch Lake and East Goose are the highest which makes sense due to the proximity to major roads. All of the lakes are below the current State standards. The creek samples are difficult to catch because it has to be done when water is flowing. Year round chloride sampling on Birch Lake was done for the second year and levels have stayed steady
- Overall, the other lakes are doing well.

The complete 2016 Monitoring Report can be found at VLAWMO.org

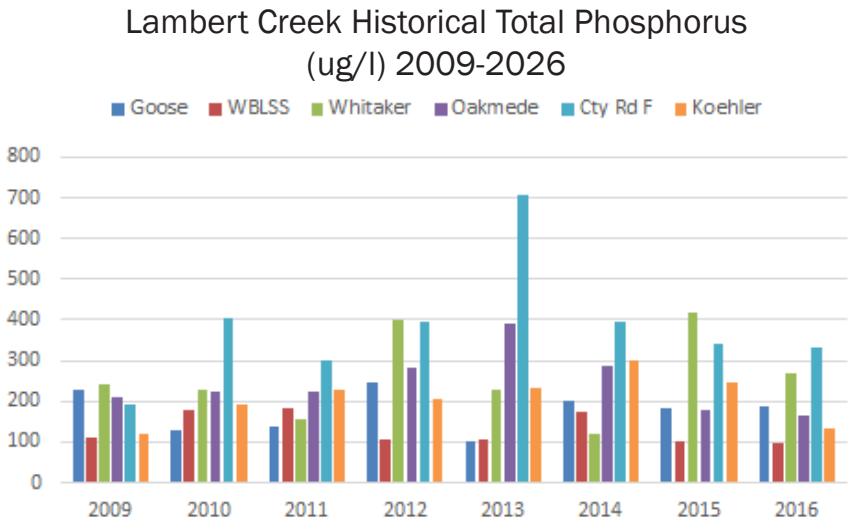




MONITORING SUMMARY - CONTINUED

E. COLI BACTERIA SOURCING

Lambert Creek is currently on the State Impaired Waters 303(d) list for high levels of *E. coli* bacteria. The creek was monitored for *E. coli* at 5 sub-watershed sampling locations weekly during the summer from 2008-2012. VLAWMO has been working with a consultant to perform target monitoring and molecular sourcing to discover the source of the *E. coli* impairment (whether the bacteria comes from human, animal or avian sources). The recently approved Total Maximum Daily Load study (TMDL) suggests a 37%-61% reduction in current bacteria loads to the creek.
At the completion of this project we hope to have an understanding of exactly where the *E. coli* is coming from at these locations on the creek and also determine proper best management practices (BMP's) to reduce the amount of bacteria in the creek. 2014 source monitoring focused on the County Road F and Oakmede sites, while 2015 sampling targeted the Whitaker and Oakmede drainage sites. The 2016 focus was on wet weather sourcing at County Road F and Oakmede sites.



THE E. COLI SOURCING PROCESS

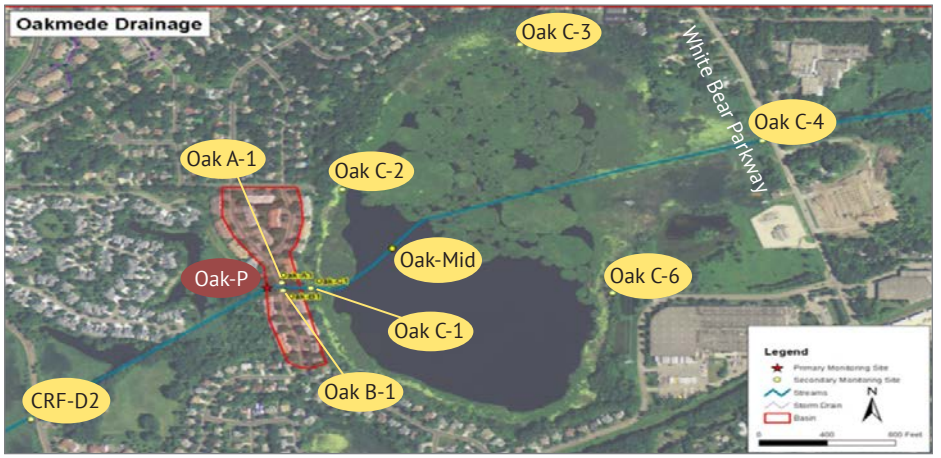
VLAWMO is working with a consultant to perform target monitoring to clarify geographic source of E. coli. Further, DNA analysis is uncovering the host animal source of the E coli impairment (whether the bacteria comes from human, avian, canine, or other animal sources. 3 rain events were targeted for sampling, each containing hundreds of samples taken right before and during rain events.

E.COLI SOURCING RESULTS

VLAWMO completed the County Road F and Oakmede sub-drainages this summer for wet conditions. *E. coli* concentrations were monitored at primary sites as well as tested for the human, canine, and avian genetic markers along with sediment studies in the sub-drainages.

The results from County Road F and Oakmede wet weather E. coli concentrations showed above state chronic standard levels of *E. coli* (more than 126cfu/100ml), indicating the impairment is wet weather related at these sites. Both sites were also negative for the human genetic marker suggesting there are no septic or sanitary sewer leaks contaminating ground water in these areas leeching into the creek. Both sites were positive for the avian and canine markers, suggesting that waterfowl and dog waste have an influence on the bacteria levels in the creek.

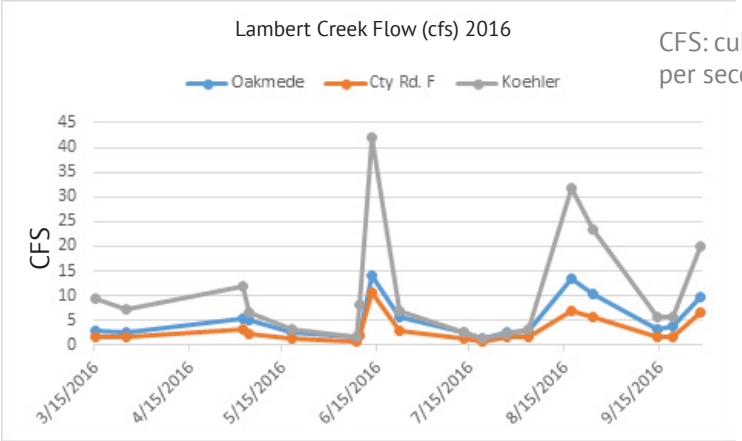
VLAWMO will continue the wet weather monitoring for the Goose and Whitaker sites in 2017.

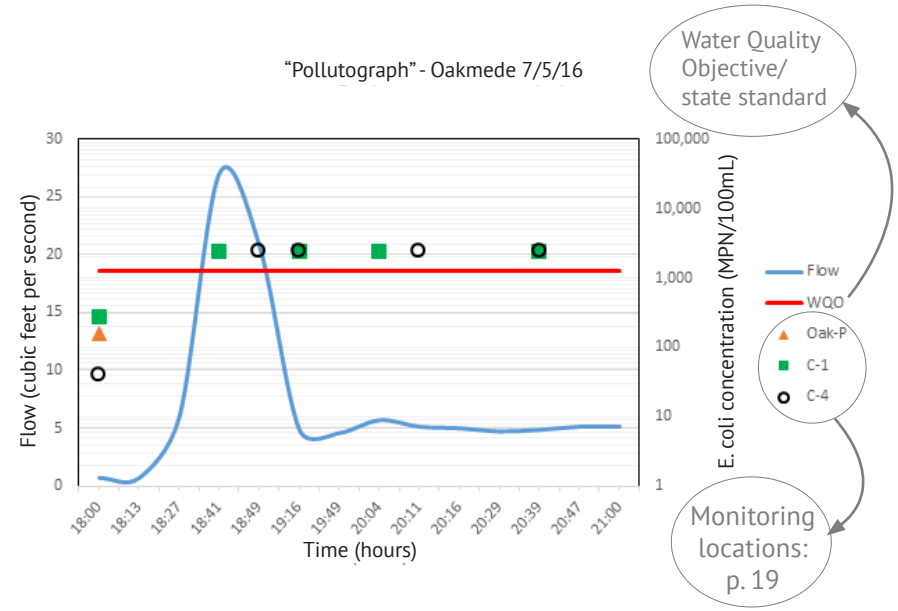


The above map displays Oakmede drainage locations. E.coli readings are expressed on page 20. Oakmede drainage is highlited in red, and to the East is Rice Lake and White Bear Parkway.

MONITORING SUMMARY - CONTINUED

Automated sampler continued: VLAWMO's new automated sampler is used to take storm samples from rainstorm events to measure possible increases in nutrient loading that is introduced to our water bodies from stormwater. The sampler is being used in areas where nutrient loading due to stormwater is suspected to be an issue and to identify areas for possible best management practice (BMP) projects. The graphs below illustrate the magnitude of how much stormwater enters the Creek, as well as how E. coli levels fluctuate with the storm flow.





Review of 2016 Work Plan

2016 was a year heavy in planning. VLAWMO received approval of its new 10 year 2017-2026 Comprehensive WAtershed Management Plan from the state. It was adopted by the Board in October. The new Education and Outreach Plan and the VLAWMO water policy update were also adopted in October. A great deal of stakeholder input went into all three planning and policy documents. VLAWMO wants to thank all the partners and members of the public who helped shape our watershed direction.

It was a big year for VLAWMO's other programs, as well. The cost-share program yielded a record amount of projects and the Community Blue Grant Program kept active with purple loosestrife control. The monitoring program continued lake and stream monitoring, compiling data for VLAWMO's annual monitoring report (available on vlawmo.org). VLAWMO staff also completed a dry weather E. coli sourcing study, finishing 3 remaining sub-drainage areas. Results and action plans from the E. coli sourcing will be completed in 2017.

VLAWMO also held booths at local events and festivals throughout the spring and summer, answering questions, joining in the fun, and garnering interest in local water quality issues.

Review of 2016 Work Plan

Acronyms:
BOD: Board of Directors
BMP: Best Management Practice (pertaining to stormwater treatment)
RFP: Request for Proposal
TEC: Technical Commission

CAPITAL IMPROVEMENT PROJECTS - 2016

Project Name	Description	Goal: Going into 2016	Goal: 2016 Result
Sucker Lake Channel Restoration	This project is a joint effort in partnership with Ramsey Conservation District and the St. Paul Regional Water Service. When completed it will restore approximately 700 linear feet of shoreline that has eroded. Includes fishing access locations to support the current use of the site.	» Continued to work with partners to solidify project plans. Ongoing into 2016.	» Continued to work with partners to solidify project plans. Ongoing into 2017.
Lambert Creek - Lower Kohler Channel Restoration	This project will restore approximately 200 ft. of streambank downstream of the Kohler flume. Engineered armoring will be part of first section below the flume. Native vegetation will planted to help stabilize the banks.	» Installation to be completed by the end of 2016.	» Installation began and was mostly completed in 2016. Plantings and additional stabilization will occur in Spring, 2017.

GRANT PROGRAMS - 2016

Project Name	Description	Goal: Going into 2016	Goal: 2016 Result
Community Blue	Market Community Blue as a broad grant program to support education, outreach, and citizen engagement as they pertain to water resources and watershed improvements. In 2016, the White Bear Preserve Townhome Association received funds to provide hands-on education in AIS control of purple loosestrife in their wetland, Grass Lake.	» Provide grants to support community service initiatives,and citizen engagement efforts focused on watershed protection. Achieve one grant recipient.	» One grant recipient; goals met for 2016.
Landscape Level 1 & Rainbarrel Program	Establish relationships and provide grants to property owners within the watershed to install water quality enhancement projects.	» Install at least 8 projects in multiple communities to engage landowners and provide water quality benefits.	» Spent 81% of funds on 33 grants. LL1: 12 grants, .18 lbs of phosphorus removed/ year from local water. » Rainbarrel: 21 grants

GRANT PROGRAMS - 2016

Project Name	Description	Goals: Going into 2016	Goals: 2016 Results
Landscape Level 2	Establish a new policy that better supports the direction of the program, meet with City Planners/Engineers to educate them about the program and help spread the word on projects they may be working on	» Provide larger grants to property owners to install further-reaching BMPs.	» 2016 LL2 funds were utilized funding the White Bear Montessori School Project. .234 lbs of phosphorus/year removed from local water.

ADMINISTRATION & OPERATIONS - 2016

Project Name	Description	Goals: Going into 2016	Goals: 2016 Results
Joint Powers Agreement Update	The JPA language was reviewed for any recommended updates. The VLAWMO attorney reviewed any updates or changes that were proposed by the Policy and Personnel Committee. The updated JPA was sent to municipal partners for review and approval.	» JPA updates and language changes were considered by the Board before distribution to the JPA members for approval.	» The JPA was approved by the Board and signed and ratified by all members for 2017-2026; goal met.
Storm Sewer Utility	Storm sewer rates are based on the adopted budget and certified to the counties for collection. SSU fees were increased for 2017 to meet current activity. Reserves had been subsidizing the budget in earlier years.	» Provide necessary financing for watershed.	» SSU fees were increased by $7.92 for 2017 as reserves were used up, which kept previous year's rates low.
Wetland Conservation Act (WCA)	Boundary and type & other determinations in consultation with the TEP were completed with notice. Responses were given to WCA questions	» Administer WCA Rules with VLAWMO as LGU.	» Goal met. See page 34 for details.

MONITORING PROGRAM - 2016

Project Name	Description	Goals: Going into 2016	Goals: 2016 Result
***E. coli* Sourcing**	Finished the wet weather monitoring for the Cty Rd F and Oakmede sub-drainages. Enumeration testing was done by SPRWS. Molecular tests were staff collected, filtered by Ramsey Co labs and sent to Weston Solutions, CA lab for DNA tests.	» Complete wet weather monitoring of the 2 sub-drainages for 2016 portion of the source and transport mechanism identification study.	» Goals met, see appendix A-3
Chloride Measurements	Sample lakes and Lambert Creek once annually. Partner with Birch Lake Improvement District (BLID) for chloride samples on Birch Lake May through September.	» Annual creek and lake samples at ice off. Birch Lake monthly winter samples were collected twice in 2016 as ice conditions allowed.	» Goals met, see appendix A-3
Lambert Creek monitoring program	Basic phosphorus,nitrogen and sediment levels are monitored at 6 sites along with pH, conductivity and DO. Automated flow meter & and precipitation gauge are maintained at Whitaker.	» Document and evaluate the general health of the creek using sampling and measuring parameters.	» Goals met, see appendix A-3
Lake Level Program	Gilfillan, Birch, Gem & Goose Lake gauges are calibrated in the spring and read up to 11 times during the summer	» Monitor lake levels on 4 targeted lakes in the watershed to track short & long term trends.	» Goals met, see appendix A-3
Zebra Mussels	PVC pipe monitoring is continued in targeted lakes	» As zebra mussels are in the Vadnais chain of lakes (Charley, Pleasant, Deep, Sucker, Vadnais), monitor other targeted lakes at risk of infestation (Amelia, Wilkinson, Gilfillan, Black).	» Goals met, and no Zebra mussels reported in at-risk lakes.
Citizen Lake Monitoring Program (CLMP)	Water quality sampling and monitoring lakes through the aid of citizen volunteers.	» On 5 lakes, engage with local residents and partner organizations for monitoring assistance (Amelia, Birch, and Tamarack)	» One volunteer retired for personal reasons. Sampling was continued by staff. Goat met.

EDUCATION PROGRAMS - 2016

Project Name	Description	Goals: Going into 2016	Goals: 2016 Results
Workshops	Two raingarden workshops were held in April, 2016, totaling 30 participants.	» Host at least one raingarden workshop annually, depending on demand.	» Two raingarden workshops hosted. Goals for 2016 surpassed.
Community Events	Staffed a VLAWMO booth at WBL Water Conservation Event, Vadnais Heights Farmers Market, North Oaks Community Fair, Taste of Vadnais, Marketfest, Heritage Days, and the Vadnais Halloween Party.	» Partner with the community through local events providing educational information on VLAWMO's projects, programs, and activities.	» Goals surpassed - more events attended than originally planned.
Watershed Action Volunteers (WAV)	Volunteers have helped with several of the educational videos now found on our website, Youtube, and Facebook pages. In addition, volunteers informed VLAWMO on outreach initiatives and helped staff booths.	» Maintain active citizen involvement and support for VLAWMO's programs and community events.	» The WAV had a large boost and upswing in 2016, thanks to fostered efforts.
Website Update	Renovations for resident, schools, developers, projects, and get involved pages were completed. A blog (13 entries in 2016) and new content explaining watershed history, wetlands, and drainage issues were added to the website.	» Organize and structure the website in a way that's practical, engaging, and aesthetically pleasing.	» Website is fully organized with no more loose ends or pages under construction. It serves as a practical tool for both VLAWMO and the public.
Partnerships	Continue support of existing partners and partner activities: Ramsey Conservation District, BLID, Watershed partners, RCGISUG, MS4s.	» Maintain active partnerships, communication, and meeting attendance.	» Goals met.

PLANNING & REPORTS - 2016

Project Name	Description	Goals: Going into 2016	Goals: 2016 Results
Water Quality Sampling & Monitoring Quality Assurance Project Plan	The VLAWMO Water Quality Sampling & Monitoring Quality Assurance Project Plan was released in 2016 to outline VLAWMO's policy for its sample collection and monitoring practices.	» Update and production of the WQS&MQAPP for use by VLAWMO monitoring staff.	» Goals met.
2016 Water Policy Update	Along with the updated Comprehensive Watershed Management Plan, VLAWMO's water policy was updated and renewed to reflect industry standard policy measures. These policies are specifically written for adoption and use in VLAWMO's joint power municipalities' Local Water Plans (LWPs) to establish rules and standards for the protection of water resources in the watershed.	» Update VLAWMO's water policies for use of JPA municipalities in updating their LWPs in the coming years.	» VLAWMO's Board of Directors approved in October 2016. Goals met.
Watershed Management Plan Update (Plan)	A 10-year update of the Plan was required to meet all existing and proposed requirements of Minnesota Rules Chapter 8410, 8420 and 4720.5100 – 4720.5590, Minnesota Statutes 103B, 103D and 471.59. The plan will clearly identify goals, policies, priority concerns, and a strong focus on implementation activities for the Watershed for 2017-2026	» Approval of the Board of Water & Soil Resources and adoption by the VLAWMO Board.	» Comprehensive Plan and comment periods completed. Approval made by the VLAWMO Board of Directors in October, 2016.
Goose-Wilkinson feasibility report	A request for proposal for a feasibility study of possible projects for the Wilkinson and Goose sub-watersheds, as laid out in VLAWMO's 2017-2026 Water Plan.	» Provide guidance for Bmp's and methods in the sub-watersheds	» RFP was approved by the Board of Directors at the December, 2016 BOD meeting. Goals met for 2016.
Joint Powers Agreement (JPA)	The next 10 year update of the VLAWMO JPA which empowers the watershed to function under State Statute shall be reviewed, discussed, and updated.	The updated JPA was sent to all 6 member communities for consideration.	» The 2017-2026 VLAWMO JPA was ratified by all member communities in the Summer of 2016.

LOOKING AHEAD:
2017 goals, plans, and projections

IN THIS SECTION

VLAWMO CORE ACTIVITIES

WATER PLAN STRUCTURE

2017 WORK PLAN PROJECTION

VLAWMO will put the 2017-2026 comprehensive water plan into action. The water plan structure (above) informs issues that will be addressed, goals that VLAWMO will set, and the strategies employed to reach those goals. See the 2017-2026 comprehensive water plan on our website under About > Why Water Matters for a more in-depth look at these plan components.

The 2017 work plan on the following pages is color coded according to the VLAWMO core activities diagram above. Each core activity also has a number, conveyed in the 2017-2026 comprehensive water plan.

ACRONYMS:

WLA: Waste Load Allocation
DNR: Department of Natural Resources
MS4: Municipal Seperate Storm Sewer System
NEMO: Northland
SWPPP: Storm Water Polluiton Prevention Program
STEM: Science, Technology, Engineering, Mathematics
BMP's: Best Management Practices
CIP's: Capital Improvement Project
LGU: Local Governing Unit
LCCMR: Legislative Citizen Commision on Minnesota Resources
AIS: Aquatic Invasive Species
TMDL: Total Maximum Daily Load
TEP: Technical Evaluation Panel

CAPITAL IMPROVEMENT PROJECTS - 2017 WORK PLAN

SUB-

	Project Name	Description	Goals	Timeline
Sucker-Vadnais	**Sucker Lake Channel Restoration**	This project is a joint effort in partnership with Ramsey County Parks, Ramsey Conservation District, and the St. Paul Regional Water Service. When completed it will restore approximately 700 linear feet of shoreline that has eroded. Includes fishing access locations to support the current use of the site.	» Work with partners to finalize designs, secure partner agreements, and go out for bid in the Summer of 2017.	Installation in Fall, 2017.
Lambert Creek	**Whitaker Treatment Wetlands**	A stormwater treatment project partnering with the U of MN with funding through LCCMR grant funding. Stormwater from Whitaker Pond will be routed to underground wetland treatment cells and then infiltrated into shallow groundwater. Treatment cells contain different sorption material - the study will determine which material is most effective at filtering pollutants. VLAWMO will monitor for nutrients and bacteria, while the U of MN will monitor for pathogens.	» Finalize design and cost estimates. Release project plans for bid. » Start installation of treatment wetlands and preliminary sample collection on Whitaker Pond.	Geo-technical engineering, bidding, contracting, and installing of treatment wetlands in 2017. 1st year monitoring in 2018.
Lambert Creek	**Lambert Creek - Lower Kohler Channel Restoration**	This project will restore approximately 200 ft. of streambank downstream of the Kohler flume. Engineered armoring will be part of first section below the flume. Native vegetation will planted to help stabilize the banks. Partner with City of Vadnais Heights on downstream restoration.	» Installation complete by spring of 2017.	Installation in fall 2016 - spring 2017.
Lambert Creek	**Goose & Wilkinson Lakes Load Assessment for Project Development**	VLAWMO will work with consultants to assess all data and information collected on these waterbodies, engage with stakeholders (see page 14), and determine the next best steps for nutrient reduction.	» Determine next steps to reduce nutrient levels in Goose & Wilkinson Lakes. » Begin development plans for 2018 installations. » Assist MS4s in achieving their WLAs.	Installations start in 2018.
Birch	**Birch Lake: 4th & Otter Lake Road Project Development**	VLAWMO will work with a consultant to assess the options for BMPs at the 4th and Otter Lake Rd site. Conceptual designs of best possible projects will be completed and VLAWMO will work with its partners to finalize design and secure funding for 2018 installation.	» Capture stormwater from residential area and reduce nutrients prior to reaching Birch Lake.	Conceptual designs complete Summer 2017. Final designs and partnership agreements complete by end of 2017, installation for 2018.

GRANT PROGRAMS - 2017 WORK PLAN

CORE ACTIVITY #	Project Name	Description	Goals	Timeline
3.4	**Landscape Level 1**	Establish relationships and provide grants to property owners within the watershed to install water quality enhancement projects.	» Install at least 10 projects » Achieve .25 lbs of phosphorus/ year removed from local waters.	Ongoing
3.4	**Landscape Level 2**	Landscape Level 2 Cost Share Program is aimed at assisting landowners with implementing larger BMP projects within the watershed. Preference for projects that have high visibility, educational value and/or local citizen support.	» Install at least 1 project. » Achieve .25 lbs of phosphorus/ year removed from local waters.	Ongoing
3.3	**Community Blue**	A communication and outreach grant program to provide money for projects big and small that otherwise might not qualify for other grant awards. Projects must provide education and outreach benefits that directly relate to water quality.	» Initiate at least 1 approved grant that has a tangible connection to water resources education. » Receive 2 grant applications.	Ongoing

PUBLIC EDUCATION AND OUTREACH - 2017 WORK PLAN

CORE ACTIVITY #	Project Name	Description	Goals	Timeline
3.3	**Watershed Action Volunteers (WAV)**	WAV is a group of volunteer residents that assist with idea development and implementation of outreach opportunities and projects. A new stormdrain stenciling program will allow volunteer groups such as scouts and youth groups to protect our water through stenciling service projects. A new "Adopt-a-Drain" program educates residents and businesses the importance of adopting a stormdrain. WAV also strives to encourage awareness and interaction with local water resources using phenology and basic environmental monitoring.	» At least 2 volunteers will help staff community booths more than once. » Hold at least 5 WAV meetings. » Host at least 3 stenciling service projects, adopt 12 stormdrains, install 1 picture post. » Complete at least 1 educational video related to water resources.	Ongoing
3.3	**Workshops**	Hold raingarden workshops for residents covering watershed processes, raingarden function, and installation how-to. Introduce VLAWMO's cost-share program to participants. In addition to a raingarden workshop, add a native plant workshop based on a survey of past workshop attendees.	» Achieve at least 25 raingarden workshop participants. » At least 3 residents who attend a raingarden or native plant workshop will pursue a cost-share grant.	Workshops: Feb-May Cost-share: ongoing

PUBLIC EDUCATION AND OUTREACH - 2017 WORK PLAN

CORE ACTIVITY #	Project Name	Description	Goals	Timeline
3.3	**Community Events**	Staff a VLAWMO booth at various community events. Develop information and engagement components for community events. A rainbarrel giveaway contest is used to attract event goers, and number of entries signify how many people stopped by the VLAWMO booth. Prizes such as tote bags, boating kits, and craft soda will be provided for free to guests who engage the booth.	» Attend at least 5 community events annually. » Receive at least 200 entries total in rainbarrel giveaways. » Giveaway at least 100 prizes to booth guests.	April - October
3.3	**Commun-ications**	Create and update material and publications for social media, website, seasonal Enews, and local publications. Make all sections of the website active. Create and maintain communications to promote public awareness for responsible use of our water resources.	» Appear in at least 3 news articles in local papers. » Appear in at least 4 City/Township newsletters with opportunities and education. » Reach 200 views on website.	Ongoing
3.3	**K-12**	Develop youth involvement opportunities and programs that improve/benefit VLAWMO's goals and activities: Macroinvertabrates field days, STEM lessons. Reach multiple age demographics through school involvement. Assist schools in establishing and maintaining stormwater best management practices (BMP's).	» Reach 10% of the school age population in 2017 through education and BMP maintenance. » At least 5 adults will contact VLAWMO about cost-share grants as a result of hearing about their student's school activities.	Ongoing
3.3	**Citizen Science**	Picture posts will be a new initiative for VLAWMO to explore phenology (ice-out, algae blooms) and AIS monitoring, with support from volunteers. Citizens assist lake monitoring each year through the Citizen Lake Monitoring Program (CLMP).	» Install at least 1 picture post in the water for phenology monitoring (AIS, ice-out, foliage, etc.) and display data on VLAWMO website. » Volunteers will collect samples for 3 lakes for the 2017 lake monitoring season.	May-November

PUBLIC EDUCATION AND OUTREACH - 2017 WORK PLAN

	Project Name	Description	Goals	Timeline
3.3	**Partnerships**	Continue support of existing partners and partner activities: NEMO, Watershed partners, local businesses, etc. Provide MS4 education summary for SWPPP; Improve stormwater guidance and information.	» Attend meetings with at least 4 partners annually, totaling at least 10 meetings.	Ongoing

MONITORING PROGRAM - 2017 WORK PLAN

SUB-WATERSHED

	Project Name	Description	Goals	Timeline
Lambert Creek	***E. coli* Sourcing**	Continue wet weather monitoring of the Goose and Whitaker sites (wet weather= during rainfall event).	» Address bacteria impairment on Lambert creek through source and transport mechanism identification.	April - September
Lambert Creek	**Lambert Creek monitoring program**	Monitor basic phosphorus, nitrogen, Chlorophyll A, chloride, and sediment levels at 6 sites along with pH, conductivity and DO at the 3 flumes. Maintain automated flow meter and precipitation gauge at Whitaker.	» Document and evaluate the general health of the creek.	April - September
Multiple	**Lake Level Program**	Gilfillan, Birch, Gem & Goose Lake gauges are calibrated in the spring and read up to 11 times during the summer.	» Monitor lake levels on 4 targeted lakes in the watershed to track short & long term trends.	May - September
Multiple	**Lake Surveys**	VLAWMO will work with Ramsey Conservation District to perform bathymetry and vegetation surveys on Wilkinson and Charley Lakes and with Blue Water Science to perform fish surveys on East & West Goose Lakes and Wilkinson Lake. These surveys assist in determining future management of the lakes.	» Complete all identified surveys.	Surveys will be completed by Summer 2017 and reports on findings submitted by Fall 2017.
Multiple	**Stormwater Monitoring**	Automated and manual sampling, including flow measurements on targeted streams into Birch Lake.	» Document watershed nutrient loading into Birch Lake to assist selection of implementation strategies.	May - September

MONITORING PROGRAM - 2017 WORK PLAN

SUB-WATERSHED

	Project Name	Description	Goals	Timeline
Multiple	**Lake Monitoring Program**	Monitor chemistry of 12 of VLAWMO's lakes through nutrient and sediment sampling, along with pH, conductivity, and dissolved oxygen (DO) measurements. Continue integration of automated sampling.	» Keep water quality record of watershed's lakes. » Utilize water quality data for future projects and CIPs.	March - September
Birch	**Chloride Measurements**	Sample lakes and Lambert Creek. Partner with Birch Lake Improvement District (BLID) for summer monitoring of Birch Lake.	» Check monthly measurement.	Jan. - September

ADMINISTRATION & REGULATION - 2017 WORK PLAN

CORE ACTIVITY #

	Project Name	Description	Goals	Timeline
3.1	**Budget & Stormwater Utility**	Storm sewer rates are based on the adopted budget and certified to the counties for collection.	» Provide necessary financing for watershed.	April - October
3.5	**Wetland Conservation Act (WCA)**	Complete boundary and type & other determinations in consultation with the TEP. Respond to WCA questions.	» Administer WCA Rules with VLAWMO as LGU.	Ongoing

SUSTAINABLE LAKE MANAGEMENT PLAN (SLMP) - 2017 WORK PLAN

CORE ACTIVITY #

	Project Name	Description	Goals	Timeline
3.2	**Charley Lake SLMP**	A report covering the subwatershed of Charley Lake on its health and trends, with lake management plans to sustain its health.	» Collect background data, share with lake stakeholders to develop a prioritized list of management strategies.	2017

LOGISTICS:
Core operations

IN THIS SECTION

10 Year Comprehensive Water Plan: First steps

The Comprehensive Water Plan was approved by the VLAWMO board of directors on October 26, 2016 and meets all existing and proposed requirements of Minnesota Rules Chapters 8410, 8420, and 4720.5100 through 4720.5590, as well as Minnesota Statutes 103B, 103D, and 471.59. The Plan is provides a framework for the management of the water and natural resources in the VLAWMO watershed from 2017 to 2026.

1. Protect, preserve, and use natural surface and ground water storage and retention systems.
2. Minimize public capital expenditures needed to correct flooding and water quality problems.
3. Identify and plan for means to effectively protect and improve surface and groundwater quality.
4. Establish more uniform local policies and official controls for surface and groundwater management.
5. Prevent erosion of soil into surface water systems.
6. Promote groundwater recharge.
7. Protect and enhance fish and wildlife habitat and water recreational facilities.
8. Secure the other benefits with the proper management of surface and groundwater.

The Plan identifies and prioritizes actions based on over 30 years of water quality monitoring and investigative studies as well as through input gathered through several stakeholder meetings held during 2015.

2017-2026 Priority issues:

1. Threatened and impaired surface water and natural resources.
2. Threatened or impaired groundwater quality or quantity.
3. Need for education and involvement from citizens and stakeholders.
4. Need for adequate data, analysis, and staff capacity in order to meet goals and accomplish strategies.
5. Aquatic invasive species (AIS) management.
6. Localized flooding.

Education & Outreach Plan

The Education and Outreach Plan (EOP) was finalized and approved by the Board of Directors on October 26, 2016. The EOP will provide guidance and direction by keeping a focus on 6 desired results. These desired results are the intended result of 10 goals, and each goal is further broken down into 2-3 measurable objectives.

Desired results:

1. Have a citizenry that continually seeks knowledge and awareness of natural resources.
2. Observe citizens demonstrating watershed protection behaviors.
3. Observe trained volunteers educating citizens.
4. Confirm that MS4 partners are collaborating, using resources, and meeting state requirements to the best of their ability.
5. Have programs and partnerships that foster education and participation that build on the interests and abilities of VLAWMO residents.
6. Witness evidence that VLAWMO residents are knowledgeable and up to date on actions being taken to address VLAWMO's priority issues.

Goals and objectives are organized into three levels of strategies: High, intermediate, and low. A strategy is defined by the balance between tangible results, community engagement, and short vs. long term time frames.

High strategies: Internally-focused, networking, and long-term planning for VLAWMO's future.

Intermediate strategies: Programs with a high degree of planning, but have visible, tangible results and community involvement. Cost-share promotion, citizen science efforts, school programming, workshops, and Community Blue.

Low strategies: The most publicly visible, community-oriented programs that are generally more short-term. Community events, branding efforts, school visits, media outreach, activities from the Watershed Action Volunteers (WAV) and tours through the watershed.

The EOP will be used in conjunction with the Watershed Management Plan and utilized as a living, evolving document that is evaluated annually. As VLAWMO discovers better avenues for projects, adjustments in goals and objectives will be made and documented on the "why water matters" portion of the

Why Water Matters banner used for displays and promotional materials for the 2017-2026 Watershed Management Plan

Wetland Conservation Act (WCA)

VLAWMO administers the Wetland Conservation Act with review. There were 24 landowner contacts in which wetland related technical assistance was provided during 2016. There were 3 potential WCA violation sites investigated, all 3 were resolved.

WCA SUMMARY

Type of Application	Approved	Denied	Withdrawn
Boundary and Type	6	0	0
No-Loss	1	0	0
Exemption	2	0	0
Sequencing	1	0	0
Replacement Plan	1	0	0

Local Plan Adoption

Adoption of Local Plans: Gem Lake, Lino Lakes, North Oaks, White Bear Lake, White Bear Township, Vadnais Heights are all complete and have been adopted.

Current member communities Local Water Plan update status

Member Community	Last Local Water Plan Update Year
Gem Lake	2010
Lino Lakes	2011
North Oaks	2009
Vadnais Heights	2010
White Bear Lake	2007
White Bear Township	2010

Partnerships

One of VLAWMO's greatest successes is working together with partners to use resources wisely and maximize our effectiveness. Workshops, meetings, and webinars allow VLAWMO to be on the cutting edge of the water resources in the Northeast Metro.

- Metro Watershed Partners provides monthly meetings to keep updated with other watersheds, receive feedback and strategy assistance, as well as hear from guest speakers to enhance education and outreach efforts.
- Ramsey County GIS User Group focuses on sharing, developing, and promoting GIS data and technology. As a member agency, VLAWMO contributes and receives data, and has a voting hand in the content the Group funds and develops. Regular RCGISUG membership fees go to producing aerial images of Ramsey County and other GIS data.
- Ramsey Conservation District holds informative forums on topics of general concern (AIS, State of the Waters, groundwater). They also provide technical assistance for lake studies and BMP design. Lastly, they provide financial partnership in grant funding of projects.
- Northland NEMO provides additional resources such as the watershed game, and trainings in education and outreach.
- Many other organizations and groups (p. 35) help carry out VLAWMO's mission through events, outreach strategies, and project planning.

Biennial Solicitation for Proposals

Proposals for professional auditing services and legal services will be solicited for in 2017.

2016 Partners

- **Metro Watershed Partners**
- **Ramsey County GIS User Group**
- **Ramsey County League of Local Governments**
- **Ramsey Conservation District**
- **Birch Lake Improvement District**
- **North Oaks Home Owners Association**
- **Tamarack Nature Center**
- **Minnesota Pollution Control Agency**
- **Northland NEMO**
- **MN Erosion Control Association**
- **Conservation Minnesota**
- **Schools, Cities/Townships, town homes**

Water Policy Update

The VLAWMO Board after consultation with its member communities adopted the updated 2016 Water Management Policy at its October meeting. Some highlights include a change in wetland buffer widths to be consistent with the Wetland Conservation Act (WCA), an increase in the rate control from 0.5inch runoff to 1.1inch runoff which includes development, redevelopment, and drainage alterations (including roads) creating new impervious areas greater than 10,000 square feet (sq. ft.) and more detailed policy on streambank and shoreline alterations including a shoreline & streambank erosion intensity calculator.

The new policy may be found on the VLAWMO website:

http://www.vlawmo.org/files/3614/7794/3677/Water_Management_Policy_Final_2016.pdf.

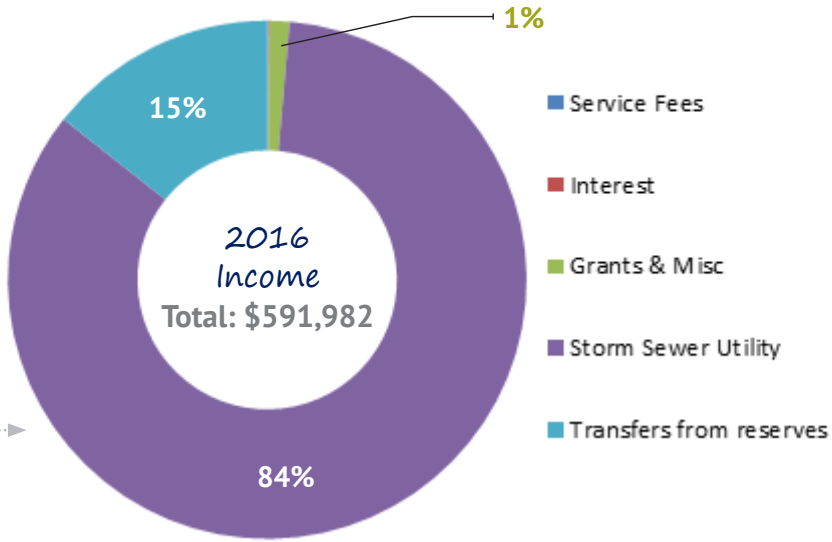
VLAWMO 'Changing the Guard' Celebration

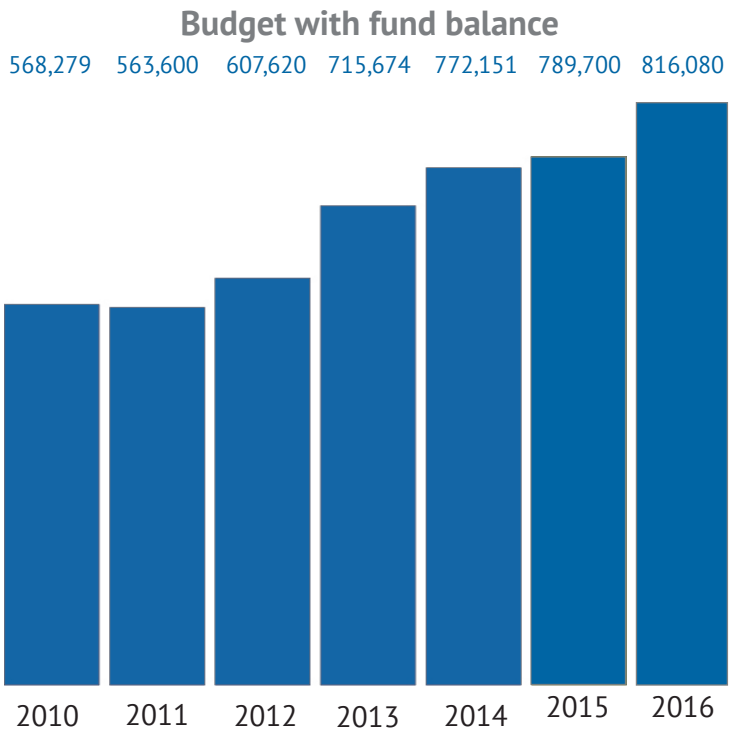
DOLLARS AND CENTS:
Financial statement and budget

IN THIS SECTION

Finance and Budget

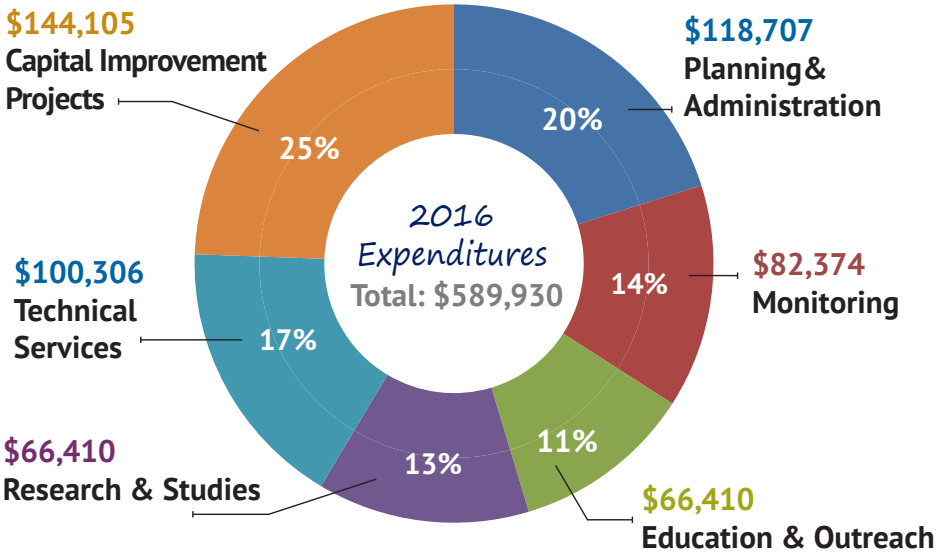
The 2016 budget was established by the Board of Directors at the regular June 2015 with carry over project and program funds added in December 2015. The Budget and Finance Committee with members from the Technical Commission and the Board reviews and makes recommendation on the budget to the Board. The working budget total for 2014 was $772,151.





INCOME

The mainstay of support for VLAWMO work comes from its Storm Sewer Utility (SSU) fees. These fees are based on an estimate of impervious surface for each parcel of land that is in line with its land use classification. $499,305 in SSU were certified to Ramsey and Anoka Counties. The average single family homeowner paid $28.92 per year to support all of the projects and programs conducted by the watershed. That's about $2.41 per month. Ongoing projects resulted in a significant amount of funding being carried over from 2015 to 2016. See transfers from reserves for the fund balance totals approved by the Board.



EXPENSES

Total cash expenses for 2016 were less than budgeted at $589,930 This was a increase from 2015 and reflects funding that will be carried over for planned projects identified in Water Plan amendment to complete the 2007-2016 Water Plan. Further detail is available in the annual audit which will be posted on the VLAWMO website.

GRANTS AND PARTNERSHIPS

Grant funds received in 2016 included both direct and indirect funding. Wetland Conservation Act reimbursement funds totaled $4,255. Partnerships have facilitated indirect grant funding for projects implemented with VLAWMO. Ramsey Conservation District applied for and received $50,000 in State funding for the lower Kohler restoration project. Most of the project was installed in late 2016 with the grant funding passing through the VLAWMO budget in 2017. The City of Vadnais Heights was another key partner in the Kohler project, using the same contractor to continue maintenance work on the creek for another 1,000 lineal feet.

RCD also secured state funding for the Sucker channel restoration project which will be installed in 2017. While awarded in 2016 grant cycle, these funds and the cost-share contributions from Ramsey County Parks and Recreation and St. Paul Regional Water Service will enable the project to be done in 2017. All these indirect funding sources will not be reflected in the VLAWMO budget but the watershed will have the benefit of a long-awaited channel restoration project the will offer multiple benefits.

Sunrise over East Vadnais Lake in March

One other grant was awarded but will not be seen until 2017 and later coming from the Legislative Citizen's Commission on Minnesota Resources. A $500,000 grant will allow VLAWMO to install treatment wetlands in White Bear Township near the outlet of Dillon Ditch into Lambert Creek. The focus will be on the removal of bacteria, nutrients and other pollutants. A linked study on pathogens will be done by the University of Minnesota. This will be reflected in the 2017 budget.
Another partnership with Midwest Floating Island and the University of Minnesota installed two treatment islands in a storm pond as part of a paired pond study. Students will be monitoring the water quality to determine how effective the treatment islands can be in this type of application. VLAWMO received no funding, only the benefit.

WHO WE ARE:
The people behind VLAWMO

IN THIS SECTION

The VLAWMO office is located at:
800 E County Road E
Vadnais Heights, MN 55127

Who we are:

VLAWMO Employs five full-time staff for everyday operations. Consultants are required for a variety of purposes including auditing, bookkeeping, engineering, and technical assistance. The VLAWMO Board of Directors consists of one elected official from each of the six cities within the watershed. Each board member is appointed for a three year term. The VLAWMO Technical Commission consists of one citizen representative from each of the six cities. The Technical Commission meets to review and consider watershed business as well as make recommendations to the Board for wider scope decisions.

BOARD OF DIRECTORS (BOD)

Primary Directors	*Alternate Directors*
Marc Johannsen, Chair 771 Bur Oak Ct Vadnais Heights, MN 55127 651.490.9692	*No alternate available* Vadnais Heights
Dan Jones, Vice Chair 1956 Lakeaires Blvd White Bear Lake, MN 55110 651.283.6097	Bill Walsh White Bear Lake
Marty Long 10 Larch Lane North Oaks, MN 55127 651.407.8507	Gregg Nelson North Oaks
Ed Prudhon 470 Otter Lake Rd White Bear Twp, MN 55110 651.426.2311	Bob Kermes White Bear Township
Robert Uzpen, Treasurer 4200 Otter Lake Rd Gem Lake, MN 55110 651.492.5083	Jim Linder Rick Bosak Gem Lake
Rob Rafferty 1573 Merganser Ct Lino Lakes, MN 55038 651.982.2492	Dave Roeser Lino Lakes

TECHNICAL COMMISSION (TEC)

Commissioners can be reached by contacting VLAWMO

Primary	*Alternate*
Paul Peterson, Chair White Bear Township	*No alternate available* White Bear Township
Mark Graham Vadnais Heights	Kevin Watson Vadnais Heights
Jim Grisim White Bear Lake	Brent Thompson White Bear Lake
Chris Mann North Oaks	Diane Gorder North Oaks
Jim Lindner, Finance Officer Gem Lake	Gretchen Artig-Swomley Gem Lake
Marty Asleson Lino Lakes	*No Alternate Available* Lino Lakes

STAFF

Stephanie McNamara
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Kristine Jenson
Program Manager
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651.204.6074

Brian Corcoran
Water Resources Manager
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651.204.6075

Nick Voss
Education and Outreach Coordinator
nick.voss@vlawmo.org
651.204.6070

Tyler Thompson
GIS Watershed Technician
tyler.thompson@vlawmo.org
651.204.6071

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Eden Prairie, MN 55436
952.835.9090

Burns & McDonnell
8201 Norman Center Dr
Bloomington, MN 55437
952.656.6003

Ehlers & Associates
3060 Centre Point Dr
Roseville, MN 55113
651.697.8500

HDR Engineering, Inc.
701 Xenia Ave. S. Ste. 600
Minneapolis, MN 55416
763.591.5400

Houston Engineering Inc.
6901 E Fish Lake Rd
Maple Grove, MN 55369
763.493.4522

Humphrey Bookkeeping
14214 Geneva Way North
Hugo, MN 55038
651.426.4900

Kennedy & Graven, Chartered
200 South Sixth St Ste. 470
Minneapolis, MN 55402
612.337.9215

Ramsey Conservation District
1425 Paul Kirkwood Dr
Arden Hills, MN 55112
651.266.7270

St Paul Regional Water Service
1900 Rice St
St Paul, MN 55113
651.266.6350

Wenck Associates
1800 Pioneer Creek Center
P.O. Box 249
Maple Plain, MN 55359
763.479.4200

Many thanks to our outgoing Board Directors and Tech Commisioners!

Board: Marc Johannsen, Chair
Robert Uzpen, Treasurer

TEC: Paul Peterson, Chair
Chris Mann

VLAWMO

Vadnais Lake Area
Water Management Organization

Appendix A-2: 2016 Audit Report

CliftonLarsonAllen LLP
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Board of Directors and Management
Vadnais Lake Area Water Management Organization
Vadnais Heights, Minnesota

In planning and performing our audit of the financial statements of the governmental activities and the major fund of the Vadnais Lake Area Water Management Organization (the Organization) as of and for the year ended December 31, 2016, in accordance with auditing standards generally accepted in the United States of America, we considered the Organization's internal control over financial reporting (internal control) as a basis for designing audit procedures that are appropriate in the circumstances for the purpose of expressing our opinions on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the Organization's internal control. Accordingly, we do not express an opinion on the effectiveness of the Organization's internal control.

Our consideration of internal control was for the limited purpose described in the preceding paragraph and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies and, therefore, material weaknesses or significant deficiencies may exist that were not identified. However, as discussed below, we identified certain deficiencies in internal control that we consider to be material weaknesses.

A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct misstatements on a timely basis. A material weakness is a deficiency, or a combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the Organization's financial statements will not be prevented, or detected and corrected, on a timely basis.

Material weaknesses

We consider the following deficiencies in the Organization's internal control to be material weaknesses.

Financial reporting process

The board of directors and management share the ultimate responsibility for the Organization's internal control system. While it is acceptable to outsource various accounting functions, the responsibility for internal control cannot be outsourced.

The Organization engages CliftonLarsonAllen LLP (CLA) to assist in preparing its financial statements and accompanying disclosures, including adjustments for the conversion from modified to full accrual balances. Adjustments also included recording special assessments receivable and other receivables and payables. However, as independent auditors, CLA cannot be considered part of the Organization's internal control system. As part of its internal control over the preparation of its financial statements, including disclosures, the Organization has implemented a comprehensive review procedure to ensure that the financial statements, including disclosures, are complete and accurate. Such review procedures should be performed by an individual possessing a thorough understanding of accounting principles generally accepted in the United States of America and knowledge of the Organization's activities and operations.

The Organization's personnel have not monitored recent accounting developments to the extent necessary to enable them to prepare the Organization's financial statements and related disclosures, to provide a high level of assurance that potential omissions or other errors that are material would be identified and corrected on a timely basis. If the financial statements are not properly monitored, the financial statements on a monthly basis may not be consistent with the annual financial statements.

The outsourcing of this service is not unusual in organizations of your size and is a result of management's cost benefit decision to use our accounting expertise rather than to incur internal resource costs.

Other deficiencies in internal control and other matters

During our audit, we became aware of other deficiencies in internal control and other matters that are opportunities to strengthen your internal control and improve the efficiency of your operations. While the nature and magnitude of the other deficiencies in internal control were not considered important enough to merit the attention of the Board of Directors they are considered of sufficient importance to merit management's attention and are included herein to provide a single, comprehensive communication for both those charged with governance and management.

Documentation and review

During our testing of internal controls, it was noted in several areas the documentation of review was not retained or indicated on the supporting invoices. Bank reconciliations are completed but not reviewed, payroll registers are received but not reviewed, invoices and expense reimbursements do not have a formal review process, and there is no documentation of journal entry review. We recommend the Organization review their policies and procedures and implement formal review processes for all areas. These review processes should include proper documentation of review.

Vendor database

During our testing of disbursements, it was noted there were two vendors with similar names that was actually one vendor. The two vendors were set up with slightly different names in the accounting software and are both being used for the same one vendor. Fraudulent activity can occur within vendors that are not used as frequently as others. We recommend reviewing the listing of vendors and cleaning up the old ones to ensure only proper vendors are used.

Fund balance policy

During our preparation of the financial statements, it was noted the Organization is not meeting their own fund balance policy of keeping unassigned fund balance at 35-50% of next year's budgeted expenditures. Not aligning with policies related to fund balance can lead to cash flow problems in the future. We recommend reviewing the next year's budget and reviewing the fund balance policy to ensure proper cash flow and adherence to such policy.

We will review the status of these comments during our next audit engagement. We have already discussed many of these comments and suggestions with various Organization personnel, and we will be pleased to discuss them in further detail at your convenience, to perform any additional study of these matters, or to assist you in implementing the recommendations.

* * *

This communication is intended solely for the information and use of management, board of directors, and others within the Organization, and is not intended to be, and should not be, used by anyone other than these specified parties.

CliftonLarsonAllen LLP

Minneapolis, Minnesota
April 11, 2017

CliftonLarsonAllen LLP
CLAconnect.com

Board of Directors
Vadnais Lake Area Water Management Organization
Vadnais Heights, Minnesota

We have audited the financial statements of the governmental activities and the major fund of Vadnais Lake Area Water Management Organization (the Organization) as of and for the year ended December 31, 2016, and have issued our report thereon dated April 11, 2017. We have previously communicated to you information about our responsibilities under auditing standards generally accepted in the United States of America, as well as certain information related to the planned scope and timing of our audit. Professional standards also require that we communicate to you the following information related to our audit.

Significant audit findings

Qualitative aspects of accounting practices

Accounting policies

Management is responsible for the selection and use of appropriate accounting policies. The significant accounting policies used by the Organization are described in Note 1 to the financial statements.

No new accounting policies were adopted and the application of existing policies was not changed during 2016.

We noted no transactions entered into by the entity during the year for which there is a lack of authoritative guidance or consensus. All significant transactions have been recognized in the financial statements in the proper period.

Accounting estimates

Accounting estimates are an integral part of the financial statements prepared by management and are based on management's knowledge and experience about past and current events and assumptions about future events. Certain accounting estimates are particularly sensitive because of their significance to the financial statements and because of the possibility that future events affecting them may differ significantly from those expected. There were no accounting estimates affecting the financial statements which were particularly sensitive or required substantial judgments by management.

- Management's estimate of the useful lives of capital assets is based on authoritative guidance and past experience. We evaluated the key factors and assumptions used to develop the useful lives of capital assets in determining that it is reasonable in relation to the financial statements taken as a whole.

- Management's estimate of the amount of the year-end compensated absences payable to employees is based on historical trends and anticipated leave time activity.

- Management's estimate of the City's proportionate share of Public Employees' Retirement Association of Minnesota net pension liabilities as well as the related deferred inflows and outflows of resources is based on guidance from GASB Statement No. 68, GASB Statement

No. 71, and the plans' allocation tables. The plans' allocation tables allocate a portion of the plans' net pension liabilities based on the City's contributions during the plans' fiscal years as a percentage of total contributions received for the related fiscal year by the plans.

Financial statement disclosures

Certain financial statement disclosures are particularly sensitive because of their significance to financial statement users. There were no particularly sensitive financial statement disclosures.

The financial statement disclosures are neutral, consistent, and clear.

Difficulties encountered in performing the audit

We encountered no significant difficulties in dealing with management in performing and completing our audit.

Uncorrected misstatements

Professional standards require us to accumulate all misstatements identified during the audit, other than those that are clearly trivial, and communicate them to the appropriate level of management. Management did not identify and we did not notify them of any uncorrected financial statement misstatements.

Corrected misstatements

The following material and immaterial misstatements detected as a result of audit procedures were corrected by management:

- Reversing and recording special assessments receivable.
- Recording accrued wages and other payables.
- Recording other receivables related to grants.

Disagreements with management

For purposes of this letter, a disagreement with management is a financial accounting, reporting, or auditing matter, whether or not resolved to our satisfaction, that could be significant to the financial statements or the auditors' report. No such disagreements arose during our audit.

Management representations

We have requested certain representations from management that are included in the management representation letter dated April 11, 2017.

Management consultations with other independent accountants

In some cases, management may decide to consult with other accountants about auditing and accounting matters, similar to obtaining a "second opinion" on certain situations. If a consultation involves application of an accounting principle to the entity's financial statements or a determination of the type of auditors' opinion that may be expressed on those statements, our professional standards require the consulting accountant to check with us to determine that the consultant has all the relevant facts. To our knowledge, there were no such consultations with other accountants.

Significant issues discussed with management prior to engagement

We generally discuss a variety of matters, including the application of accounting principles and auditing standards, with management each year prior to engagement as the entity's auditors. However, these discussions occurred in the normal course of our professional relationship and our responses were not a condition to our engagement.

Other audit findings or issues

We have provided a separate letter to you dated April 11, 2017 communicating internal control related matters identified during the audit.

Other information in documents containing audited financial statements

With respect to the required supplementary information (RSI) accompanying the financial statements, we made certain inquiries of management about the methods of preparing the RSI, including whether the RSI has been measured and presented in accordance with prescribed guidelines, whether the methods of measurement and preparation have been changed from the prior period and the reasons for any such changes, and whether there were any significant assumptions or interpretations underlying the measurement or presentation of the RSI. We compared the RSI for consistency with management's responses to the foregoing inquiries, the basic financial statements, and other knowledge obtained during the audit of the basic financial statements. Because these limited procedures do not provide sufficient evidence, we did not express an opinion or provide any assurance on the RSI.

With respect to the net pension liability schedules (collectively, the supplementary information) accompanying the financial statements, on which we were engaged to report in relation to the financial statements as a whole, we made certain inquiries of management and evaluated the form, content, and methods of preparing the information to determine that the information complies with accounting principles generally accepted in the United States of America, the method of preparing it has not changed from the prior period or the reasons for such changes, and the information is appropriate and complete in relation to our audit of the financial statements. We compared and reconciled the supplementary information to the underlying accounting records used to prepare the financial statements or to the financial statements themselves. We have issued our report thereon dated April 11, 2017.

* * *

This communication is intended solely for the information and use of the board of directors and management of Vadnais Lake Area Water Management Organization and is not intended to be, and should not be, used by anyone other than these specified parties.

CliftonLarsonAllen LLP

Minneapolis, Minnesota
April 11, 2017

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

FINANCIAL STATEMENTS AND SUPPLEMENTARY INFORMATION

YEAR ENDED DECEMBER 31, 2016

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
TABLE OF CONTENTS
YEAR ENDED DECEMBER 31, 2016

INTRODUCTORY SECTION

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
BOARD OF DIRECTORS AND APPOINTED OFFICIALS
YEAR ENDED DECEMBER 31, 2016

BOARD OF DIRECTORS

Name	Title	Member City
Marc Johannsen	Chairperson	Vadnais Heights
Dan Jones	Vice-Chair	White Bear Lake
Robert Uzpen	Treasurer	Gem Lake
Rob Rafferty	Board Member	Lino Lakes
Marty Long	Board Member	North Oaks
Ed Prudhon	Board Member	White Bear Township

TECHNICAL COMMISSION

Name	Title	Member City
Mark Graham	Chairperson	Vadnais Heights
Jim Grisim	Vice-Chair	White Bear Lake
Jim Lindner	Treasurer	Gem Lake
Chris Mann/Bob Larson	Commissioner	North Oaks
Marty Asleson	Commissioner	Lino Lakes

FINANCIAL SECTION

CliftonLarsonAllen LLP
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INDEPENDENT AUDITORS' REPORT

Board of Directors
Vadnais Lake Area Water Management Organization
Vadnais Heights, Minnesota

Report on the Financial Statements

We have audited the accompanying financial statements of the governmental activities and the major fund of the Vadnais Lake Area Water Management Organization (the Organization), Vadnais Heights, Minnesota, as of and for the year ended December 31, 2016, and the related notes to the financial statements, which collectively comprise the Organization's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express opinions on these financial statements based on our audit. The prior year comparative information has been derived from the Organization's 2015 financial statements and, in our report dated April 11, 2017, we express unmodified opinions on the respective fund financial statements. We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Organization's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Organization's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the governmental activities and the major fund of the Organization as of December 31, 2016, and the respective changes in financial position and the budgetary comparison for the General fund for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Summarized Prior Year Comparative Information

Other auditors have previously audited the Vadnais Lake Area Water Management Organization's 2015 financial statements and expressed an unmodified opinion on the governmental activities and the major fund in their report dated March 7, 2016. The summarized comparative information presented herein as of and for the year ended December 31, 2015 is consistent, in all material respects, with the audited financial statements from which it has been derived.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis on pages 3 through 11, the schedule of employer's share of PERA net pension liability, and the schedule of employer's share of PERA contributions on page 39 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming opinions on the financial statements that collectively comprise the Organization's basic financial statements. The introductory section is presented for purposes of additional analysis and is not a required part of the basic financial statements.

The introductory section has not been subjected to the auditing procedures applied in the audit of the basic financial statements and, accordingly, we do not express an opinion or provide any assurance on it.

CliftonLarsonAllen LLP

Minneapolis, Minnesota
April 11, 2017

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
MANAGEMENT'S DISCUSSION AND ANALYSIS
DECEMBER 31, 2016

As management of the Vadnais Lake Area Water Management Organization (the Organization), Vadnais Heights, Minnesota, we offer readers of the Organization's financial statements this narrative overview and analysis of the financial activities of the Organization for the fiscal year ended December 31, 2016. We encourage readers to consider the information presented here in conjunction with the financial statements, which follow this section.

Financial Highlights

- The assets and deferred outflows of resources of the Organization exceeded its liabilities and deferred inflows of resources at the close of the most recent fiscal year by $221,485 (*net position*). Of this amount, $113,512 (*unrestricted net position*) may be used to meet the Organization's ongoing obligations.

- The Organization's total net position decreased by $171,237.

- As of the close of the current fiscal year, the Organization's governmental fund reported combined ending fund balances of $315,405, a decrease of $179,059 in comparison with the prior year.

- The ending General fund balance was $314,405. Of this balance, $257,175 is committed purposes disclosed in the financial statements.

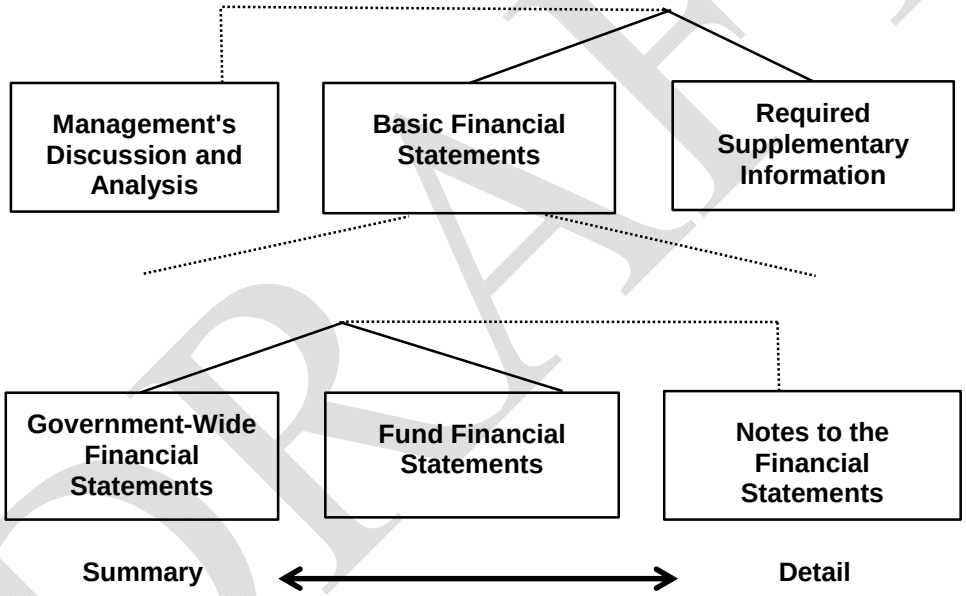
- The Organization's unrestricted cash and temporary investments as of 12/31/2016 decreased to $417,256 from $520,368 as of 12/31/2015.

Overview of the Financial Statements

This discussion and analysis is intended to serve as an introduction to the Organization's basic financial statements. The Organization's basic financial statements are comprised of three components: 1) government-wide financial statements, 2) fund financial statements, and 3) notes to the financial statements. This report also contains other required supplemental information in addition to the basic financial statements themselves.

The financial statements also include notes that explain some of the information in the financial statements and provide more detailed data. The statements are followed by a section of combining and individual fund financial statements and schedules that further explains and supports the information in the financial statements. Figure 1 shows how the required parts of this annual report are arranged and relate to one another.

Figure 1
Required Components of the Organization's Annual Financial Report



Overview of the Financial Statements (Continued)

Figure 2 summarizes the major features of the Organization's financial statements, including the portion of the Organization government they cover and the types of information they contain. The remainder of this overview section of management's discussion and analysis explains the structure and contents of each of the statements.

Figure 2
Major Features of the Government-Wide and Fund Financial Statements

	Fund Financial Statements	
	Government-Wide Statements	**Governmental Funds**
Scope	Entire Organization	The activities of the Organization
Required financial statements	• Statement of Net Position • Statement of Activities	• Balance Sheet • Statement of Revenues, Expenditures, and Changes in Fund Balances
Accounting Basis and measurement focus	Accrual accounting and economic resources focus	Modified accrual accounting and current financial resources focus
Type of asset/liability information	All assets and liabilities, both financial and capital, and short-term and long-term	Only assets expected to be used up and liabilities that come due during the year or soon thereafter; no capital assets included
Type of deferred outflows/inflows of resources information	All deferred outflows/inflows of resources, regardless of when cash is received or paid	Only deferred outflows of resources expected to be used up and deferred inflows of resources that come due during the year or soon thereafter; no capital assets included
Type of inflow/out flow information	All revenues and expenses during year, regardless of when cash is received or paid	Revenues for which cash is received during or soon after the end of the year; expenditures when goods or services have been received and payment is due during the year or soon thereafter

Government-Wide Financial Statements

The government-wide financial statements are designed to provide readers with a broad overview of the Organization's finances, in a manner similar to a private-sector business.

The *statement of net position* presents information on all of the Organization's assets and liabilities, with the difference between the two reported as *net position*. Over time, increases or decreases in net position may serve as a useful indicator of whether the financial position of the Organization is improving or deteriorating.

The *statement of activities* presents information showing how the Organization's net position changed during the most recent fiscal year. All changes in net position are reported as soon as the underlying event giving rise to the change occurs, *regardless of the timing of related cash flows*. Thus, revenues and expenses are reported in this statement for some items that will only result in cash flows in future fiscal periods (e.g., grants and earned but unused vacation and sick leave).

Government-Wide Financial Statements (Continued)

The governmental activities of the Organization include general and administrative, programs, and projects.

Fund Financial Statements

A *fund* is a grouping of related accounts that is used to maintain control over resources that have been segregated for specific activities or objectives. The Organization, like other state and local government, uses fund accounting to ensure and demonstrate compliance with finance-related legal requirements. The Organization currently only uses governmental funds.

Governmental Funds

Governmental funds are used to account for essentially the same functions reported as *governmental activities* in the government-wide financial statements. However, unlike the government-wide financial statements, governmental fund financial statements focus on *near-term inflows and outflows of spendable resources*, as well as on *balances of spendable resources* available at the end of the fiscal year. Such information may be useful in evaluating a government's near-term financing requirements.

Because the focus of governmental funds is narrower than that of the government-wide financial statements, it is useful to compare the information presented for *governmental funds* with similar information presented for *governmental activities* in the government-wide financial statements. By doing so, readers may better understand the long-term impact by the government's near-term financing decisions. Both the governmental fund balance sheets and the governmental fund statements of revenues, expenditures and changes in fund balances provide a reconciliation to facilitate this comparison between *governmental funds* and *governmental activities*.

The Organization adopts an annual appropriated budget for its General fund. A budgetary comparison statement has been provided for the General fund to demonstrate compliance with this budget.

Notes to the Financial Statements

The notes provide additional information that is essential to a full understanding of the data provided in the government-wide and fund financial statements.

Government-Wide Financial Analysis

As noted earlier, net position may serve over time as a useful indicator of a government's financial position. In the case of the Organization, assets and deferred outflows of resources exceeded liabilities and deferred inflows of resources by $221,485 at the close of the most recent fiscal year.

The largest portions of the Organization's net position are unrestricted and available to meet the ongoing needs of the Organization. The Organization has a total of 49% classified as investment in capital assets (e.g., land, buildings, machinery and equipment). The Organization uses these capital assets to provide services to its member cities; consequently, these assets are not available for future spending.

Government-Wide Financial Analysis (Continued)

Vadnais Lake Area Water Management Organization's Summary of Net Position

	December 31, 2016	December 31, 2015	Increase (Decrease)
ASSETS			
Current	$ 1,173,131	$ 1,086,172	$ 86,959
Capital, Net of Accumulated Depreciation	107,973	104,916	3,057
Total Assets	1,281,104	1,191,088	90,016
DEFERRED OUTFLOWS OF RESOURCES			
Deferred Pension Resources	146,551	44,470	102,081
LIABILITIES			
Current	836,175	582,295	253,880
Noncurrent	342,952	37,345	305,607
Total Liabilities	1,179,127	619,640	559,487
DEFERRED INFLOWS OF RESOURCES			
Deferred Pension Resources	27,043	10,713	16,330
NET POSITION			
Net Investment in Capital Assets	107,973	104,916	3,057
Unrestricted	113,512	287,806	(174,294)
Total Net Position	$ 221,485	$ 392,722	$ (171,237)

At the end of the current fiscal year, the Organization is able to report positive balances in both categories of net position.

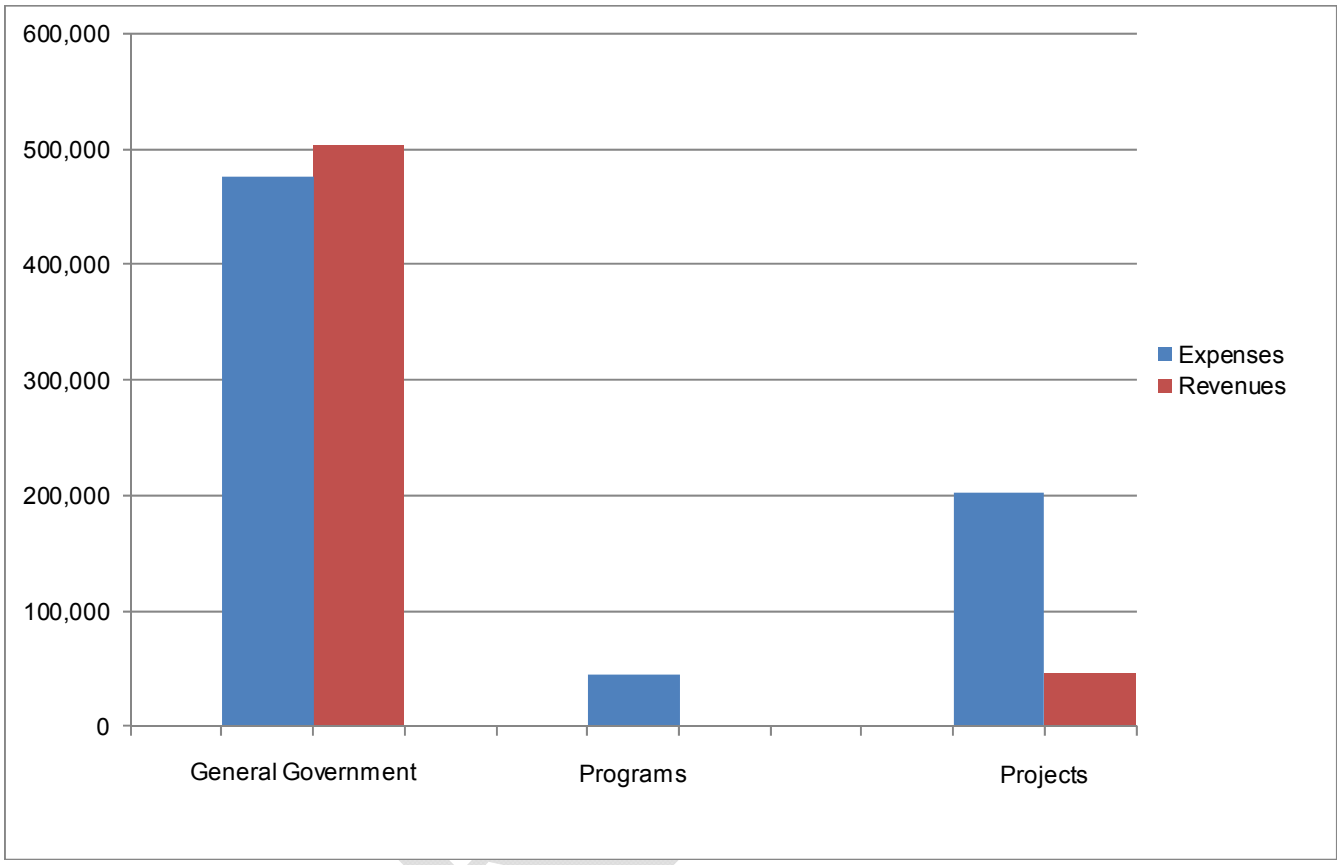
Government-Wide Financial Analysis (Continued)

Vadnais Lake Area Water Management Organization's Changes in Net Position

	December 31, 2016	December 31, 2015	Increase (Decrease)
REVENUES			
Program:			
Charges for Services	$ 503,759	$ 488,102	$ 15,657
Operating Grants and Contributions	46,043	5,359	40,684
General:			
Unrestricted Investment Earnings	577	238	339
Miscellaneous	-	-	-
Total Revenues	550,379	493,699	56,680
EXPENSES			
General and Administrative	475,203	401,158	74,045
Programs	44,384	70,802	(26,418)
Projects	202,029	76,098	125,931
Total Expenses	721,616	548,058	173,558
CHANGE IN NET POSITION	(171,237)	(54,359)	(116,878)
Net Position - January 1	392,722	447,081	(54,359)
NET POSITION - DECEMBER 31	$ 221,485	$ 392,722	$ (171,237)

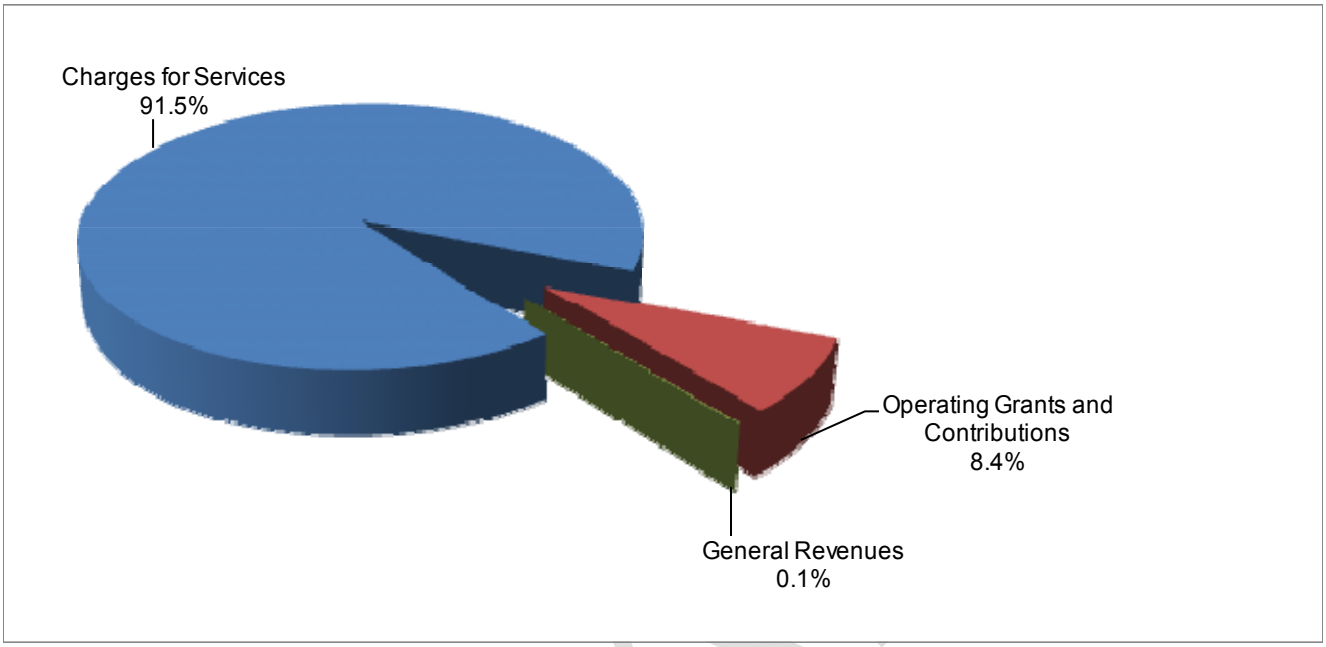
Government-Wide Financial Analysis (Continued)

Expenses and Program Revenues – Governmental Activities



Government-Wide Financial Analysis (Continued)

Revenues by Source – Governmental Activities



Financial Analysis of the Government's Funds

As noted earlier, the Organization uses fund accounting to ensure and demonstrate compliance with finance-related legal requirements.

Governmental Funds

The focus of the Organization's *governmental funds* is to provide information on near-term inflows, outflows and balances of *spendable* resources. Such information is useful in assessing the Organization's financing requirements. In particular, *unassigned fund balance* may serve as a useful measure of a government's net resources available for spending at the end of the fiscal year.

As of the end of the current fiscal year, the Organization's governmental fund reported an ending fund balance of $315,405 a decrease of $179,059 in comparison with the prior year. Approximately 18% of the total amount, $58,230, constitutes unassigned fund balance, which is available for spending at the Organization's discretion. The remainder fund balance of $257,175 is committed for purposes described in the notes to the financial statements.

The General fund is the chief operating fund of the Organization. At the end of the current year, the fund balance of the General fund was $315,405. As a measure of the General fund's liquidity, it may be useful to compare total fund balance to total fund expenditures. Total fund balance represents 46% of 2016 fund expenditures and 51% of 2016 budgeted fund expenditures.

The fund balance of the Organization's General fund decreased $179,059 during the current fiscal year.

General Fund Budgetary Highlights

The Organization's General fund budget was not amended during the year. Actual revenues were over budget by $3,131, mainly due to charges for service exceeding budget by $3,382. Expenditures had a negative budget variance of $64,265, mostly due to project costs being more than anticipated.

Capital Asset and Debt Administration

Capital Assets

The Organization's investment in capital assets for its governmental activities as of December 31, 2016, amounts to $107,973 (net of accumulated depreciation). This investment in capital assets includes infrastructure related to the Lambert Creek Restoration project and monitoring equipment at Whitaker Pond.

Additional information on the Organization's capital assets can be found in Note 3 of this report.

Economic Factors and Next Year's Budgets

The Organization considered and prepared the 2016 budget based on the following factors:

- Revenue is primarily from the storm sewer utility assessment, with occasional income from grants, service fees, and interest.
- Expenditures fall into three main categories: Programs, projects, and general and administration.
- Programs include: monitoring and data analysis, sustainable lake plans, cost-share, education and outreach, maintenance, and 30% of payroll for 5 employees.
- Projects include capital projects such as the Sucker Lake channel restoration, the Water Management Plan update completion, year three of the bacteria source monitoring on Lambert Creek, lower Kohler Lambert streambank restoration, Goose Lake shoreline restoration and development of the Whitaker Treatment wetland project occupying 40% of payroll for 5 employees.
- Operations and administration include office rent and supplies, bookkeeping and general and program audit, information systems, insurance, the update the Joint Powers Agreement and 30% payroll for 5 employees and legal expenses.

All of these factors were considered in preparing the Organization's budget for the 2016 fiscal year.

Requests for Information

This financial report is designed to provide a general overview of the Organization's finances for all those with an interest in the Organization's finances. Questions concerning any of the information provided in this report or requests for additional financial information should be addressed to Stephanie McNamara, Administrator, Vadnais Lake Area Water Management Organization, 800 County Road E East, Vadnais Heights, MN 55127.

BASIC FINANCIAL STATEMENTS

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
STATEMENT OF NET POSITION
DECEMBER 31, 2016

	Governmental Activities
ASSETS	
Cash and Temporary Investments	$ 417,256
Restricted Cash	39,438
Receivables:	
Accounts	27
Special Assessments	674,422
Due from Other Governments	41,988
Capital Assets:	
Depreciable Assets, Net of Accumulated Depreciation	107,973
Total Assets	1,281,104
DEFERRED OUTFLOWS OF RESOURCES	
Deferred Pension Resources	146,551
LIABILITIES	
Accounts Payable	74,755
Escrow Deposits Payable	39,438
Salaries Payable	30,715
Due to Other Government	10,591
Unearned Revenue	650,521
Compensated Absences Payable:	
Due Within One Year	30,155
Due in More than One Year	10,052
Net Pension Liability:	
Due in More than One Year	332,900
Total Liabilities	1,179,127
DEFERRED INFLOWS OF RESOURCES	
Deferred Pension Resources	27,043
NET POSITION	
Net Investment in Capital Assets	107,973
Unrestricted	113,512
Total Net Position	$ 221,485

See accompanying Notes to Financial Statements.

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
STATEMENT OF ACTIVITIES
DECEMBER 31, 2016

Functions/Programs	Expenses	Program Revenues: Charges for Services	Program Revenues: Operating Grants and Contributions	Program Revenues: Capital Grants and Contributions	Net Revenue (Expense) and Changes in Net Position: Governmental Activities
GOVERNMENTAL ACTIVITIES					
General and Administrative	$ 475,203	$ 503,759	$ -	$ -	$ 28,556
Programs	44,384	-	-	-	(44,384)
Projects	202,029	-	46,043	-	(155,986)
Total	$ 721,616	$ 503,759	$ 46,043	$ -	(171,814)
	GENERAL REVENUES				
	Unrestricted Investment Earnings				577
	CHANGE IN NET POSITION				(171,237)
	Net Position - January 1				392,722
	NET POSITION - DECEMBER 31				$ 221,485

See accompanying Notes to Financial Statements.

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
BALANCE SHEET
GOVERNMENTAL FUNDS
DECEMBER 31, 2016
(WITH SUMMARIZED COMPARATIVE INFORMATION AS OF DECEMBER 31, 2015)

ASSETS	2016	2015
ASSETS		
Cash and Temporary Investments	$ 417,256	$ 520,368
Restricted Cash	39,438	39,406
Receivables:		
Accounts	27	120
Special Assessments	674,422	523,264
Due from Other Governments	41,988	3,014
Total Assets	$ 1,173,131	$ 1,086,172
LIABILITIES, DEFERRED INFLOWS OF RESOURCES, AND FUND BALANCES		
LIABILITIES		
Accounts Payable	$ 74,755	$ 13,510
Escrow Deposits Payable	39,438	39,406
Salaries Payable	30,715	-
Due to Other Government	10,591	25,815
Unearned Revenue	650,521	503,564
Total Liabilities	806,020	582,295
DEFERRED INFLOWS OF RESOURCES		
Unavailable Revenue - Special Assessments	51,706	9,413
FUND BALANCES		
Committed	257,175	224,125
Unassigned	58,230	270,339
Total Fund Balances	315,405	494,464
Total Liabilities, Deferred Inflows of Resources, and Fund Balances	$ 1,173,131	$ 1,086,172

See accompanying Notes to Financial Statements.

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
RECONCILIATION OF THE BALANCE SHEET
TO THE STATEMENT OF NET POSITION
GOVERNMENTAL FUNDS
DECEMBER 31, 2016

Amounts reported for the governmental activities in the statement of net position are different because:

Total Fund Balances - Governmental	$	315,405
Capital assets used in governmental activities are not financial resources and therefore are not reported as assets in governmental funds.		
Cost of Capital Assets		204,374
Less: Accumulated Depreciation		(96,401)
Noncurrent liabilities are not due and payable in the current period and therefore are not reported as liabilities in the funds.		
Compensated Absences Payable		(40,207)
Pension Liability		(332,900)
Some receivables are not available soon enough to pay for the current period's expenditures, and therefore are unavailable in the funds.		
Special Assessments		51,706
Governmental funds do not report long-term amounts related to pensions.		
Deferred Outflows of Pension Resources		146,551
Deferred Inflows of Pension Resources		(27,043)
Total Net Position - Governmental Activities	$	221,485

See accompanying Notes to Financial Statements.

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
STATEMENTS OF REVENUES, EXPENDITURES, AND CHANGES IN FUND BALANCES
GOVERNMENTAL FUNDS
YEAR ENDED DECEMBER 31, 2016
(WITH SUMMARIZED COMPARATIVE INFORMATION FOR THE YEAR ENDED DECEMBER 31, 2015)

	2016	2015
REVENUES		
Charges for Services	$ 502,687	$ 489,201
Intergovernmental Grants	2,802	4,394
Interest on Investments	577	238
Miscellaneous	2,020	1,225
Total Revenues	508,086	495,058
EXPENDITURES		
Current:		
General and Administrative	437,675	384,216
Programs	36,384	70,802
Projects	213,086	65,644
Total Expenditures	687,145	520,662
EXCESS (DEFICIENCY) OF REVENUES OVER (UNDER) EXPENDITURES	(179,059)	(25,604)
Fund Balances - January 1	494,464	520,068
FUND BALANCES - DECEMBER 31	$ 315,405	$ 494,464

See accompanying Notes to Financial Statements.

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
RECONCILIATION OF THE STATEMENT OF REVENUES, EXPENDITURES, AND CHANGES IN FUND BALANCES TO THE STATEMENT OF ACTIVITIES
GOVERNMENTAL FUNDS
YEAR ENDED DECEMBER 31, 2016

Amounts reported for the governmental activities in the statement of activities are different because:

Total Net Change in Fund Balances - Governmental Funds	$	(179,059)
Capital outlays are reported in governmental funds as expenditures. However in the statement of activities, the cost of those assets is allocated over the estimated useful lives as depreciation expense.		
Depreciation Expense		(10,937)
Capital Outlays		13,994
Certain revenues are recognized as soon as they are earned. Under the modified accrual basis of accounting, certain revenues cannot be recognized until they are available to liquidate liabilities of the current period.		
Special Assessments		42,293
Some expenses reported in the statement of activities do not require the use of current financial resources and, therefore, are not reported as expenditures in governmental funds.		
Pension Expense		(34,666)
Compensated Absences		(2,862)
Change in Net Position - Governmental Activities	$	(171,237)

See accompanying Notes to Financial Statements.

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
STATEMENT OF REVENUES, EXPENDITURES, AND CHANGES IN FUND BALANCES
BUDGET AND ACTUAL
GENERAL FUND
YEAR ENDED DECEMBER 31, 2016
(WITH COMPARATIVE ACTUAL AMOUNTS FOR THE YEAR ENDED DECEMBER 31, 2015)

	2016				2015
	Budgeted Amounts		Actual	Variance with	Actual
	Original	Final	Amounts	Final Budget	Amount
REVENUES					
Charges for Services	$ 499,305	$ 499,305	$ 502,687	$ 3,382	$ 489,201
Intergovernmental Grants	5,000	5,000	2,802	(2,198)	4,394
Interest on Investments	150	150	577	427	238
Miscellaneous	500	500	2,020	1,520	1,225
Total Revenues	504,955	504,955	508,086	3,131	495,058
EXPENDITURES					
General and Administrative:					
Wages	286,340	286,340	298,211	(11,871)	264,593
Payroll Taxes and Employee Benefits	60,250	60,250	62,343	(2,093)	60,212
Legal	11,000	11,000	3,608	7,392	119
Professional Services	24,600	24,600	21,006	3,594	18,618
Information Systems	25,415	25,415	19,890	5,525	9,979
Insurance	5,200	5,200	4,370	830	4,443
Office	23,375	23,375	20,582	2,793	16,267
Staff Training	4,000	4,000	1,781	2,219	2,280
Telephone	-	-	2,520	(2,520)	2,250
Miscellaneous	11,000	11,000	3,364	7,636	5,455
Programs:				-	
Monitoring	49,700	49,700	33,160	16,540	33,648
Maintenance	22,000	22,000	3,224	18,776	37,154
Projects	100,000	100,000	213,086	(113,086)	65,644
Total Expenditures	622,880	622,880	687,145	(64,265)	520,662
EXCESS (DEFICIENCY) OF REVENUES OVER (UNDER) EXPENDITURES	(117,925)	(117,925)	(179,059)	67,396	(25,604)
Fund Balances - January 1	494,464	494,464	494,464	-	520,068
FUND BALANCES - DECEMBER 31	$ 376,539	$ 376,539	$ 315,405	$ 67,396	$ 494,464

See accompanying Notes to Financial Statements.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Reporting Entity

The Vadnais Lake Area Water Management Organization (the Organization), Vadnais Heights, Minnesota, was established to meet the requirements of the Metropolitan Surface Water Management the Act, re-codified as Minnesota statutes, chapters 103-b and 103-d.

The general purpose of the Organization is to establish a jointly and cooperatively developed water management plan and program to (1) protect, preserve, and use natural surface and groundwater storage and retention systems; (2) minimize capital expenditures necessary to correct flooding and water quality problems; (3) identify and plan for means to effectively protect and improve surface and groundwater quality; (4) establish more uniform local policies and official controls for surface water, wetland and groundwater management; (5) prevent erosion of soil into surface water systems; (6) promote groundwater recharge; (7) protect and enhance fish and wildlife habitat and water recreational facilities; and (8) secure other benefits associated with the proper management of surface ground water, and be in accordance with the Act.

The Organization is governed by a board of directors which consists of six members, one from each of the following governmental units: City of North Oaks, City of White Bear Lake, City of Lino Lakes, White Bear Township, City of Vadnais Heights, and the City of Gem Lake. The board of directors exercises legislative authority and determines all matters of policy. The board of directors appoints personnel responsible for the proper administration of all affairs relating to the Organization's activities.

The Organization has considered all potential units for which it is financially accountable, and other organizations for which the nature and significance of their relationship with the Organization are such that exclusion would cause the Organization's financial statements to be misleading or incomplete. The Governmental Accounting Standards Board (GASB) has set forth criteria to be considered in determining financial accountability. These criteria include appointing a voting majority of an organization's governing body, and (1) the ability of the primary government to impose its will on that organization, or (2) the potential for the organization to provide specific benefits to, or impose specific financial burdens on the primary government. The Organization has no component units that meet the GASB criteria.

Government-Wide and Fund Financial Statements

The government-wide financial statements (i.e., the statements of net position and the statements of activities) report information on all of the nonfiduciary activities of the Organization.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Government-Wide and Fund Financial Statements (Continued)

The statement of activities demonstrates the degree to which the direct expenses of a given function or segment is offset by program revenues. *Direct expenses* are those that are clearly identifiable with a specific function or segment. Amounts reported as *program revenues* include: 1) charges to customers or applicants who purchase, use, or directly benefit from goods, services, or privileges provided by a given function or segment, and 2) grants and contributions that are restricted to meeting the operational or capital requirements of a particular function or segment. Other items not properly included among program revenues are reported instead as *general revenues.*

Separate financial statements are provided for governmental funds. Major individual governmental funds are reported as separate columns in the fund financial statements.

Measurement Focus, Basis of Accounting and Basis of Presentation

The government-wide financial statements are reported using the *economic resources measurement focus* and the *accrual basis of accounting*. Revenues are recorded when earned and expenses are recorded when a liability is incurred, regardless of the timing of related cash flows. Grants and similar items are recognized as revenue as soon as all eligibility requirements imposed by the provider have been met.

Governmental fund financial statements are reported using the *current financial resources measurement focus* and the *modified accrual basis of accounting.* Revenues are recognized as soon as they are both measurable and available. Revenues are considered to be *available* when they are collectible within the current period or soon enough thereafter to pay liabilities of the current period. For this purpose, the Organization considers revenues to be available if they are collected within 60 days of the end of the current fiscal period. Expenditures generally are recorded when a liability is incurred, as under accrual accounting. However, expenditures related to compensated absences and claims and judgments, are recorded only when payment is due.

Charges for service, assessments to members, grants and interest associated with the current fiscal period are all considered susceptible to accrual and so have been recognized as revenues of the current fiscal period. All other revenue items are considered to be measurable and available only when cash is received by the Organization.

Revenue resulting from exchange transactions, in which each party gives and receives essentially equal value, is recorded on the accrual basis when the exchange takes place. On a modified accrual basis, revenue is recorded in the year in which the resources are measurable and become available.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Measurement Focus, Basis of Accounting and Basis of Presentation (Continued)

Nonexchange transactions, in which the Organization receives value without directly giving equal value in return, include grants, entitlement and donations. Eligibility requirements include timing requirements, which specify the year when the resources are required to be used or the year when use is first permitted, matching requirements, in which the Organization must provide local resources to be used for a specified purpose, and expenditure requirements, in which the resources are provided to the Organization on a reimbursement basis. On a modified accrual basis, revenue from nonexchange transactions must also be available before it can be recognized.

Unearned revenue arises when assets are recognized before revenue recognition criteria have been satisfied. Grants and entitlements received before eligibility requirements are met are also recorded as unearned revenue.

The Organization reports the following major governmental fund:

The *General fund* is the Organization's primary operating fund. It accounts for all financial resources of the Organization.

When both restricted and unrestricted resources are available for use, it is the Organization's policy to use restricted resources first, then unrestricted resources as they are needed.

As a general rule the effect of interfund activity has been eliminated from government-wide financial statements.

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect certain reported amounts and disclosures. Accordingly, actual results could differ from those estimates.

Assets, Deferred Outflows of Resources, Liabilities, Deferred Inflows of Resources, and Net Position/Fund Balance

Deposits and Investments

The Organization's cash and temporary investments are considered to be cash on hand, demand deposits and short-term investments with original maturities of three months or less from the date of acquisition. Investments are reported at fair value.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Assets, Deferred Outflows of Resources, Liabilities, Deferred Inflows of Resources, and Net Position/Fund Balance (Continued)

Deposits and Investments (Continued)

The Organization may also invest idle funds as authorized by Minnesota statutes, as follows:

1. Direct obligations or obligations guaranteed by the United States or its agencies.
2. Shares of investment companies registered under the Federal Investment Company Act of 1940 and received the highest credit rating, rated in one of the two highest rating categories by a statistical rating agency, and have a final maturity of thirteen months or less.
3. General obligations of a state or local government with taxing powers rated "A" or better; revenue obligations rated "AA" or better.
4. General obligations of the Minnesota Housing Finance Agency rated "A" or better.
5. Bankers' acceptances of United States banks eligible for purchase by the Federal Reserve System.
6. Commercial paper issued by United States banks corporations or their Canadian subsidiaries, of highest quality category by at least two nationally recognized rating agencies, and maturing in 270 days or less.
7. Repurchase or reverse repurchase agreements and securities lending agreements with financial institutions qualified as a "depository" by the government entity, with banks that are members of the Federal Reserve System with capitalization exceeding $10,000,000, a primary reporting dealer in U.S. government securities to the Federal Reserve Bank of New York, or certain Minnesota securities broker-dealers.
8. Guaranteed Investment Contracts (GIC's) issued or guaranteed by a United States commercial bank, a domestic branch of a foreign bank, a United States insurance company, or its Canadian subsidiary, whose similar debt obligations were rated in one of the top two rating categories by a nationally recognized rating agency.

The Minnesota Municipal Money Market (4M) fund operates in accordance with appropriate state laws and regulations. The 4M fund is an external investment pool not registered with the Securities and Exchange Commission (SEC); however, it follows the same regulatory rules of the SEC under rule 2a7. The reported value of the pool is the same as the fair value of the pool shares. Financial statements of the 4M fund can be obtained by contacting RBC Global Asset Management at 100 South Fifth Street, Suite 2300, Minneapolis, MN 55402-1240.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Assets, Deferred Outflows of Resources, Liabilities, Deferred Inflows of Resources, and Net Position/Fund Balance (Continued)

Restricted Assets

Certain assets of the Organization are set aside for repayment of individual property owners once they meet specific criteria.

Accounts Receivable

Accounts receivable include amounts billed for services provided before year-end.

Special Assessments

Special assessments represent storm sewer utility charges. These assessments are recorded as receivables upon certification to the County. Special assessments are recognized as revenue in the year they are collected or received in cash or within 60 days after year-end. Governmental fund special assessments receivables are offset by deferred inflows of resources or unearned revenue in the fund financial statements.

Capital Assets

Capital assets, which include property, plant and equipment, are reported in the applicable governmental activities columns in the government-wide financial statements. Capital assets are defined by the Organization as assets with an initial, individual cost of more than $5,000 (amount not rounded) and an estimated useful life in excess of one year. Such assets are recorded at historical cost or estimated historical cost if purchased or constructed. Donated capital assets are recorded at estimated fair market value at the date of donation.

The costs of normal maintenance and repairs that do not add to the value of the asset or materially extend assets lives are not capitalized.

Major outlays for capital assets and improvements are capitalized as projects are constructed. Interest incurred during the construction phase of capital assets is included as part of the capitalized value of the assets constructed.

Property, plant, and equipment of the Organization are depreciated using the straight-line method over the following estimated useful lives:

Infrastructure	20 – 30 Years
Equipment	5 – 7 Years

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Assets, Deferred Outflows of Resources, Liabilities, Deferred Inflows of Resources, and Net Position/Fund Balance (Continued)

Deferred Outflows of Resources

In addition to assets, the statement of financial position will sometimes report a separate section for deferred outflows of resources. This separate financial statement element, deferred outflows of resources, represents a consumption of net position that applies to a future period(s) and so will not be recognized as an outflow of resources (expense/expenditure) until then. The Organization has only one item that qualifies for reporting in this category. Accordingly, the item, deferred pension resources, is reported only in the statements of net position. This item results from actuarial calculations and current year pension contributions made subsequent to the measurement date.

Compensated Absences

It is the Organization's policy to permit employees to accumulate earned but unused vacation and sick benefits, which will be paid to the employee upon separation without the considerations of number of years of service. A liability for these amounts is reported in the governmental funds only if they have matured, for example, as a result of employee resignations and retirements. The General fund is used to pay employee benefits upon termination for governmental and proprietary funds.

Pensions

For purposes of measuring the net pension liability, deferred outflows/inflows of resources, and pension expense, information about the fiduciary net position of the Public Employees Retirement Association (PERA) and additions to/deductions from PERA's fiduciary net position have been determined on the same basis as they are reported by PERA except that PERA's fiscal year end is June 30. For this purpose, plan contributions are recognized as of employer payroll paid dates and benefit payments and refunds are recognized when due and payable in accordance with the benefit terms. Investments are reported at fair value.

Deferred Inflows of Resources

In addition to liabilities, the statement of financial position and fund financial statements will sometimes report a separate section for deferred inflows of resources. This separate financial statement element, deferred inflows of resources, represents an acquisition of net position that applies to a future period(s) and so will not be recognized as an inflow of resources (revenue) until that time. The government has only one type of item, which arises only under a modified accrual basis of accounting, that qualifies as needing to be reported in this category. Accordingly, the item, unavailable revenue, is reported only in the governmental funds balance sheet. The governmental funds report unavailable revenues from one source: special assessments. The unavailable amounts are deferred and recognized as an inflow of resources in the period that the amounts become available. Furthermore, the Organization has an additional item which qualifies for reporting in this category. The item, deferred pension resources, is reported only in the statements of net position and results from actuarial calculations.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Assets, Deferred Outflows of Resources, Liabilities, Deferred Inflows of Resources, and Net Position/Fund Balance (Continued)

Fund Balance

In the fund financial statements, fund balance is divided into five classifications based primarily on the extent to which the Organization is bound to observe constraints imposed upon the use of resources reported in the governmental funds. These classifications are defined as follows:

Nonspendable - Amounts that cannot be spent because they are not in spendable form, such as prepaid items.

Restricted - Amounts related to externally imposed constraints established by creditors, grantors or contributors; or constraints imposed by state statutory provisions.

Committed - Amounts constrained for specific purposes that are internally imposed by formal action (resolution) of the board of directors, which is the Organization's highest level of decision-making authority. Committed amounts cannot be used for any other purpose unless the board of directors modifies or rescinds the commitment by resolution.

Assigned - Amounts constrained for specific purposes that are internally imposed. In governmental funds other than the General fund, assigned fund balance represents all remaining amounts that are not classified as nonspendable and are neither restricted nor committed. In the General fund, assigned amounts represent intended uses established by the board of directors itself or by an official to whom the governing body delegates the authority. The board of directors has adopted a fund balance policy which delegates the authority to assign amounts for specific purposes to the Administrator.

Unassigned - The residual classification for the General fund and also negative residual amounts in other funds.

The Organization considers restricted amounts to be spent first when both restricted and unrestricted fund balance is available. Additionally, the Organization would first use committed, then assigned, and lastly unassigned amounts of unrestricted fund balance when expenditures are made.

The Organization has formally adopted a fund balance policy for the General Fund. The Organization's policy is to maintain a minimum unassigned fund balance of 35% to 50% of budgeted operating expenditures for cash-flow timing needs.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Assets, Deferred Outflows of Resources, Liabilities, Deferred Inflows of Resources, and Net Position/Fund Balance (Continued)

Net Position

Net position represents the difference between assets and liabilities. Net position is displayed in three components:

a. Net investment in capital assets - Consists of capital assets, net of accumulated depreciation reduced by any outstanding debt attributable to acquire capital assets.

b. Restricted net position - Consist of net position balances restricted when there are limitations imposed on their use through external restrictions imposed by creditors, grantors, laws or regulations of other governments.

c. Unrestricted net position - All other net position balances that do not meet the definition of “restricted” or “net investment in capital assets”.

Comparative Data/Reclassifications

Comparative total data for the prior year has been presented for the fund financial statements in order to provide an understanding of the change in financial position. Certain amounts presented in prior year data have been reclassified in order to be consistent with the current year’s presentation.

NOTE 2 STEWARDSHIP, COMPLIANCE, AND ACCOUNTABILITY

Budgetary Information

Annual budgets are prepared on a basis consistent with accounting principles generally accepted in the United States of America for the General Fund. All annual appropriations lapse at year end. The Organization does not use encumbrance accounting.

During the budget year, supplemental appropriations and deletions are or may be authorized by the board of directors. The budget was not amended by the board of directors in 2016.

NOTE 3 DETAILED NOTES ON ACCOUNTS

Deposits and Investments

Deposits

Custodial credit risk for deposits and investments is the risk that in the event of a bank failure, the Organization's deposits may not be returned or the Organization will not be able to recover collateral securities in the possession of an outside party. In accordance with Minnesota statutes and as authorized by the board of directors, the Organization maintains deposits at those depository banks which are members of the Federal Reserve System.

Minnesota statutes require that all Organization deposits be protected by insurance, surety bond or collateral. The market value of collateral pledged must equal 110% of the deposits not covered by insurance or bonds, or irrevocable standby letters of credit from Federal Home Loan Banks.

Authorized collateral in lieu of a corporate surety bond includes:

- United States government Treasury bills, Treasury notes, Treasury bonds;
- Issues of United States government agencies and instrumentalities as quoted by a recognized industry quotation service available to the government entity;
- General obligation securities of any state or local government with taxing powers which is rated "A" or better by a national bond rating service, or revenue obligation securities of any state or local government with taxing powers which is rated "AA" or better by a national bond rating service;
- General obligation securities of a local government with taxing powers may be pledged as collateral against funds deposited by that same local government entity;
- Irrevocable standby letters of credit issued by Federal Home Loan Banks to a municipality accompanied by written evidence that the bank's public debt is rated "AA" or better by *Moody's Investors Service, Inc.*, or *Standard & Poor's Corporation*; and
- Time deposits that are fully insured by any federal agency.

Minnesota statutes require that all collateral shall be placed in safekeeping in a restricted account at a Federal Reserve Bank, or in an account at a trust department of a commercial bank or other financial institution that is not owned or controlled by the financial institution furnishing the collateral. The selection should be approved by the Organization.

At year-end, the Organization's carrying amount of deposits was $97,628 and the bank balance was $97,991. The entire bank balance was covered by federal depository insurance.

NOTE 3 DETAILED NOTES ON ACCOUNTS (CONTINUED)

Deposits and Investments (Continued)

Investments

The Organization does not have an investment policy and is permitted to invest its idle funds as authorized by Minnesota Statutes as follows:

- Direct obligations or obligations guaranteed by the United States or its agencies.
- Shares of investment companies registered under the Federal Investment Company Act of 1940 and received the highest credit rating, are rated in one of the two highest rating categories by a statistical rating agency and all of the investments have a final maturity of 13 months or less.
- General obligations rated "A" or better; revenue obligations rated "AA" or better.
- General obligations of the Minnesota Housing Finance Agency rate "A" or better.
- Bankers' acceptances of United States banks eligible for purchase by the Federal Reserve System.
- Commercial paper issued by United States banks corporations or their Canadian subsidiaries, of highest quality category by a least two nationally recognized rating agencies, and maturing in 270 days or less.
- Guaranteed investment contracts guaranteed by United States commercial banks or domestic branches of foreign banks or United States insurance companies if similar debt obligations of the issuer or the collateral pledged by the issuer is in the top two rating categories.
- Repurchase or reverse purchase agreement and securities lending agreements financial institutions qualified as a "depository" by the government entity, with banks that are members of the Federal Reserve System with capitalization exceeding $10,000,000, a primary reporting dealer in U.S. government securities to the Federal Reserve Bank of New York, or certain Minnesota securities broker-dealers.

Interest rate risk – Interest rate risk is defined as the risk that changes in interest rates will adversely affect the fair value of an investment. Investments are categorized to give an indication of the level of interest rate risk assumed at year-end. Investments as of December 31, 2016 are as follows:

Type of Investments	Credit Quality/ Ratings (1)	Segmented Time Distribution (2)	Fair Value and Carrying Amount
Pooled Investments:			
Minnesota Trust Term Series	N/A	Less than 6 Months	$ 219,586
Minnesota Municipal Money Market Fund	N/A	Less than 6 Months	139,456
Total Investments			$ 359,042

(1) Ratings are provided by Moody's where applicable to indicate associated credit risk.
(2) Interest rate risk is disclosed using the segmented time distribution method.
N/A Indicates not applicable or available.

NOTE 3 DETAILED NOTES ON ACCOUNTS (CONTINUED)

Deposits and Investments (Continued)

Investments (Continued)

The investments of the Organization are subject to the following risks:

- *Credit Risk*. Credit risk is the risk that an issuer or other counterparty to an investment will not fulfill its obligations. Ratings are provided by various credit rating agencies and where applicable, indicate associated credit risk. Minnesota statutes limit the Organization's investments to the list on page 29 of the notes.

- *Custodial Credit Risk*. The custodial credit risk for investments is the risk that, in the event of the failure of the counterparty to a transaction, a government will not be able to recover the value of investment or collateral securities that are in the possession of an outside party.

- *Concentration of Credit Risk.* Concentration of credit risk is the risk of loss attributed to the magnitude of a government's investment in a single issuer.

- *Interest Rate Risk.* Interest rate risk is the risk that changes in interest rates will adversely affect the fair value of an investment.

The Organization does not have an investment policy that addresses the risks described above.

The Minnesota Municipal Money Market Fund Trust and the US Bank Money Market are money market accounts that are valued at amortized cost with maturities of investments of one year or less.

The Minnesota Municipal Money Market Trust Fund does not have its own credit rating. PMA Financial Network, Inc., who administers the Minnesota Municipal Money Market Fund Trust, holds an organization credit rating of AA by *Standard & Poor's*.

A reconciliation of cash and temporary investments as shown in the financial statements of the Organization follows:

Carrying Amounts of Deposits	$	97,628
Investments		359,042
Cash on Hand		24
Total	$	456,694
Cash and Investments		
Unrestricted	$	417,256
Restricted		39,438
Total	$	456,694

NOTE 3 DETAILED NOTES ON ACCOUNTS (CONTINUED)

Fair Value Measurements

The Organization uses fair value measurements to record fair value adjustments to certain assets and liabilities and to determine fair value disclosures.

The Organization follows an accounting standard that defines fair value, establishes a framework for measuring fair value, establishes a fair value hierarchy based on the quality of inputs used to measure fair value, and requires expanded disclosures about fair value measurements. In accordance with this standard, the Organization has categorized its investments, based on the priority of the inputs to the valuation technique, into a three-level fair value hierarchy. The fair value hierarchy gives the highest priority to quoted prices in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). If the inputs used to measure the financial instruments fall within different levels of the hierarchy, the categorization is based on the lowest level input that is significant to the fair value measurement of the instrument.

Financial assets and liabilities recorded on the combined statement of financial position are categorized based on the inputs to the valuation techniques as follows:

- *Level 1* – Financial assets and liabilities are valued using inputs that are unadjusted quoted prices in active markets accessible at the measurement date of identical financial assets and liabilities. The inputs include those traded on an active exchange, such as the New York Stock Exchange, as well as U.S. Treasury and other U.S. government and agency mortgage-backed securities that are traded by dealers or brokers in active over-the-counter markets.
- *Level 2* – Financial assets and liabilities are valued based on quoted prices for similar assets, or inputs that are observable, either directly or indirectly for substantially the full term through corroboration with observable market data.
- *Level 3* – Financial asset and liabilities are valued using pricing inputs which are unobservable for the asset, inputs that reflect the reporting entity's own assumptions about the assumptions market participants and would use a pricing the asset.

Assets measured at fair value on a recurring basis:

	December 31, 2016			
Type	Level 1	Level 2	Level 3	Total
N/A	$ -	$ -	$ -	$ -
Subtotal	$ -	$ -	$ -	-
NAV Funds				359,042
Total Investments				$ 359,042

The Minnesota Municipal Money Market Fund Trust is an external investment pool (Pool) that is managed to maintain a dollar-weighted average portfolio maturity of no greater than 60 days and seeks to maintain a constant net asset value (NAV) per share of $1.00. The Pool elects to measure its investments at amortized cost in accordance with accounting statements issued by the Government Accounting Standards Board.

The City reports its investment in the Pool at the NAV per share, the fair value established by the Pool.

NOTE 3 DETAILED NOTES ON ACCOUNTS (CONTINUED)

Restricted Assets

The Organization set aside the following cash balances for repayment of individual property owners:

Mitigation Restricted Cash	$ 39,438

Capital Assets

Capital asset activity for the year ended December 31, 2016 was as follows:

	Beginning Balance	Increases	Decreases	Ending Balance
Governmental Activities				
Capital Assets, Being Depreciated:				
Infrastructure	$ 181,219	$ -	$ -	$ 181,219
Equipment	9,161	13,994	-	23,155
Total Capital Assets Being Depreciated	190,380	13,994	-	204,374
Less Accumulated Depreciation for:				
Infrastructure	(76,303)	(9,538)	-	(85,841)
Equipment	(9,161)	(1,399)	-	(10,560)
Total Accumulated Depreciation	(85,464)	(10,937)	-	(96,401)
Total Governmental Activities	$ 104,916	$ 3,057	$ -	$ 107,973

The full depreciation expense amount was charged to projects.

NOTE 3 DETAILED NOTES ON ACCOUNTS (CONTINUED)

Operating Lease

The Organization entered into a lease agreement with the City of Vadnais Heights for office space. The lease agreement has an effective period beginning January 1, 2015 and will terminate on December 31, 2017.

The lease agreement calls for monthly payments for office space, as well as amounts for the Organizations portion of normal operating expenses, such as: janitorial, secretarial, office supplies, postage, utilities, IT support, and any other costs that arise.

The Organization paid $17,400 and $15,200 for rent in 2016 and 2015, respectively. The Organization's rent for fiscal year 2017 is expected be $18,715 as outlined in the lease agreement.

Unearned Revenue

Governmental funds report unearned revenue in connection with receivables for revenues that have been received, but not yet earned. At the end of the current fiscal year, the various components of unearned revenue reported were as follows:

	Unearned
Special Assessments Receivable	$ 650,521

Changes in Long-Term Liabilities

Long-term liability activity for the year ended December 31, 2016 was as follows:

	Beginning Balance	Increases	Decreases	Ending Balance	Current Portion
Governmental Activities					
Net Pension Liability	$ 212,483	$ 120,417	$ -	$ 332,900	$ -
Compensated Absences Payable	37,345	28,604	(25,742)	40,207	30,155
Government-Type Activity Long-Term Liabilities	$ 249,828	$ 149,021	$ (25,742)	$ 373,107	$ 30,155

NOTE 3 DETAILED NOTES ON ACCOUNTS (CONTINUED)

Fund Balance Classifications

At December 31, 2016, portions of the Organization's fund balance are not available for appropriation due to board of directors' action (committed). The following is a summary of the commitments:

Commitments:		
Insurance	$	500
Information Systems		2,500
Legal Assistance		5,000
Engineering and Technical Assistance		10,000
Payroll		10,000
Staffing Assistance - GIS Etc.		4,000
Financial Incentives		4,000
Education and Marketing		3,000
Maintenance		18,000
Equipment		2,500
Monitoring and Analysis		2,000
Lambert Creek Restoration		28,675
Water Quality Projects		80,000
Community Blue		12,000
Implementation on Impaired Waters		75,000
Total Committed	$	257,175

NOTE 4 DEFINED BENEFIT PENSION PLANS – STATEWIDE

Plan Description

The Organization participates in the following cost-sharing multiple-employer defined benefit pension plans administered by the Public Employees Retirement Association of Minnesota (PERA). PERA's defined benefit pension plans are established and administered in accordance with Minnesota statutes, chapters 353 and 356. PERA's defined benefit pension plans are tax qualified plans under Section 401 (a) of the Internal Revenue Code.

General Employees Retirement Fund (GERF)

All full-time and certain part-time employees of the Organization, other than teachers, are covered by the General Employees Retirement Fund (GERF). GERF members belong to either the Coordinated Plan or the Basic Plan. Coordinated Plan members are covered by Social Security and Basic Plan members are not. The Basic Plan was closed to new members in 1967. All new members must participate in the Coordinated Plan.

NOTE 4 DEFINED BENEFIT PENSION PLANS – STATEWIDE (CONTINUED)

Benefits Provided

PERA provides retirement, disability and death benefits. Benefit provisions are established by Minnesota statute and can only be modified by the state legislature.

Benefit increases are provided to benefit recipients each January. Increases are related to the funding ratio of the plan. Members in plans that are at least 90% funded for two consecutive years are given 2.5% increases. Members in plans that have not exceeded 90% funded, or have fallen below 80%, are given 1% increases.

The benefit provisions stated in the following paragraphs of this section are current provisions and apply to active plan participants. Vested, terminated employees who are entitled to benefits but are not receiving them yet are bound by the provisions in effect at the time they last terminated their public service.

GERF Benefits

Benefits are based on a member's highest average salary for any five successive years of allowable service, age, and years of credit at termination of service. Two methods are used to compute benefits for PERA's Coordinated and Basic Plan members. The retiring member receives the higher of a step-rate benefit accrual formula (Method 1) or a level accrual formula (Method 2). Under Method 1, the annuity accrual rate for a Basic Plan member is 2.2% of average salary for each of the first ten years of service and 2.7% for each remaining year. The annuity accrual rate for a Coordinated Plan member is 1.2% of average salary for each of the first ten years and 1.7% for each remaining year. Under Method 2, the annuity accrual rate is 2.7% of average salary for Basic Plan members and 1.7% for Coordinated Plan members for each year of service. For members hired prior to July 1, 1989, a full annuity is available when age plus years of service equal 90 and normal retirement age is 65. For members hired on or after July 1, 1989, normal retirement age is the age for unreduced Social Security benefits capped at 66.

NOTE 4 DEFINED BENEFIT PENSION PLANS – STATEWIDE (CONTINUED)

Contributions

Minnesota statutes, chapter 353 sets the rates for employer and employee contributions. Contribution rates can only be modified by the state legislature.

GERF Contributions

Basic Plan members and Coordinated Plan members were required to contribute 9.10% and 6.50%, respectively, of their annual covered salary in calendar year 2016. The Organization was required to contribute 11.78% of pay for Basic Plan members and 7.50% for Coordinated Plan members in calendar year 2016. The Organization's contributions to the GERF for the years ended December 31, 2016 and 2015 were $19,128 and $19,530, respectively. The Organization's contributions were equal to the contractually required contributions for each year as set by Minnesota statute.

Pension Costs

GERF Pension Costs

At December 31, 2016, the Organization reported a liability of $332,900 for its proportionate share of the GERF's net pension liability. The Organization's net pension liability reflected a reduction due to the State of Minnesota's contribution of $6 million to the fund in 2016. The State of Minnesota is considered a nonemployer contributing entity and the State's contribution meets the definition of a special funding situation. The State of Minnesota's proportionate share of the net pension liability associated with the Organization totaled $4,396. The net pension liability was measured as of June 30, 2016, and the total pension liability used to calculate the net pension liability was determined by an actuarial valuation as of that date. The Organization proportion of the net pension liability was based on the Organization contributions received by PERA during the measurement period for employer payroll paid dates from July 1, 2015, through June 30, 2016, relative to the total employer contributions received from all of PERA's participating employers. At June 30, 2016, the Organization's proportion was 0.0041% which was the same as its proportion measured as of June 30, 2015.

For the year ended December 31, 2016, the Organization recognized pension expense of $51,122 for its proportionate share of GERF's pension expense. In addition, the Organization recognized an additional $1,311 as pension expense (and grant revenue) for its proportionate share of the State of Minnesota's contribution of $6 million to the General Employees Fund.

NOTE 4 DEFINED BENEFIT PENSION PLANS – STATEWIDE (CONTINUED)

Pension Costs (Continued)

GERF Pension Costs Continued)

At December 31, 2016, the Organization reported its proportionate share of GERF's deferred outflows of resources and deferred inflows of resources, and its contributions subsequent to the measurement date, from the following sources:

	Deferred Outflows of Resources	Deferred Inflows of Resources
Differences Between Expected and Actual Experience	$ -	$ 19,997
Changes in Actuarial Assumption	-	-
Net Difference Between Projected and Actual Earnings on Plan Investments	121,322	-
Changes in Proportion	14,092	7,046
Contributions to GERF Subsequent to the Measurement Date	11,137	-
Total	$ 146,551	$ 27,043

Deferred outflows of resources totaling $11,137 related to pensions resulting from the Organization's contributions to GERF subsequent to the measurement date will be recognized as a reduction of the net pension liability in the year ended December 31, 2016. Other amounts reported as deferred outflows and inflows of resources related to GERF pensions will be recognized in pension expense as follows:

Year Ending December 31,	Amount
2017	$ 32,099
2018	32,099
2019	32,147
2020	12,026

NOTE 4 DEFINED BENEFIT PENSION PLANS – STATEWIDE (CONTINUED)

Actuarial Assumptions

The total pension liability in the June 30, 2016 actuarial valuation was determined using the following actuarial assumptions:

Inflation	2.50% Per Year
Active Member Payroll Growth	3.25% Per Year
Investment rate of Return	7.50%

Salary increases were based on a service-related table. Mortality rates for active members, retirees, survivors and disabilitants were based on RP-2014 tables for males or females, as appropriate, with slight adjustments. Benefit increases for retirees are assumed to be 1% per year for all future years for the General Employees Plan.

Actuarial assumptions used in the June 30, 2016 valuation were based on the results of actuarial experience studies. The most recent four-year experience study in the General Employees Plan was completed in 2015.

The following changes in actuarial assumptions occurred in 2016:

General Employees Fund:

- The assumed post-retirement benefit increase rate was changed from 1.0% per year through 2035 and 2.5% per year thereafter to 1.0% per year for all future years.
- The assumed investment return was changed from 7.9% to 7.5%. The single discount rate was changed from 7.9% to 7.5%.
- Other assumptions were changed pursuant to the experience study dated June 30, 2015. The assumed future salary increases, payroll growth, and inflation were decreased by 0.25% to 3.25% for payroll growth and 2.50% for inflation.

The State Board of Investment, which manages the investments of PERA, prepares an analysis of the reasonableness on a regular basis of the long-term expected rate of return using a building-block method in which best-estimate ranges of expected future rates of return are developed for each major asset class. These ranges are combined to produce an expected long-term rate of return by weighting the expected future rates of return by the target asset allocation percentages. The target allocation and best estimates of geometric real rates of return for each major asset class are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return
Domestic Stock	45.00%	5.50%
International Stock	15.00	6.00
Bonds	18.00	1.45
Alternative Assets	20.00	6.40
Cash	2.00	0.50
Total	100.00%	

NOTE 4 DEFINED BENEFIT PENSION PLANS – STATEWIDE (CONTINUED)

Discount Rate

The discount rate used to measure the total pension liability in 2016 was 7.5%, a reduction from the 7.9% used in 2015. The projection of cash flows used to determine the discount rate assumed that contributions from plan members and employers will be made at rates set in Minnesota Statutes. Based on these assumptions, the fiduciary net position of the General Employees Fund was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Pension Liability Sensitivity

The following presents the Organization's proportionate share of the net pension liability for all plans it participates in, calculated using the discount rate disclosed in the preceding paragraph, as well as what the Organization's proportionate share of the net pension liability would be if it were calculated using a discount rate 1 percentage point lower or 1 percentage point higher than the current discount rate:

	City Proportionate Share of NPL		
	1 Percent Decrease (6.50%)	Current (7.50%)	1 Percent Increase (8.50%)
GERF	$ 472,816	$ 332,900	$ 217,647

Pension Plan Fiduciary Net Position

Detailed information about each defined benefit pension plan's fiduciary net position is available in a separately-issued PERA financial report that includes financial statements and required supplementary information. That report may be obtained on the Internet at www.mnpera.org; by writing to PERA at 60 Empire Drive #200, St. Paul, Minnesota, 55103-2088; or by calling (651) 296-7460 or (800) 652-9026.

NOTE 5 OTHER INFORMATION

Risk Management

The Organization is exposed to various risks of loss related to torts; theft of, damage to and destruction of assets; errors and omissions; injuries to employees; and natural disasters for which the Organization carries insurance. The Organization pays annual premiums for its workers compensation and property and casualty insurance. Settled claims have not exceeded the Organization's coverage in any of the past three fiscal years.

Liabilities are reported when it is probable that a loss has occurred and the amount of the loss can be reasonably estimated. Liabilities, if any, include an amount for claims that have been incurred but not reported (IBNRs). The Organization's management is not aware of any incurred but not reported claims.

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Employer's Share of PERA Net Pension Liability – General Employees Retirement Fund

		Required Supplementary Information						
Fiscal Year Ending	Fiscal Year Ending	Organization's Proportion of the Net Pension Liability	Organization's Proportionate Share of the Net Pension Liability (a)	State's Proportionate Share of the Net Pension Liability Associated with the City (b)	Total (a+b)	Organization's Covered Payroll (c)	Organization's Proportionate Share of the Net Pension Liability as a Percentage of Covered Payroll ((a+b)/c	Plan Fiduciary Net Position as a Percentage of the Total Pension Liability
6/30/2016	6/30/2016	0.0041%	$ 332,900	$ -	$ 332,900	$ 286,044	116.4%	68.9%
6/30/2015	6/30/2015	0.0041%	$ 212,483	$ -	$ 212,483	$ 242,844	87.5%	78.2%

Schedule of Employer's Share of PERA Contributions – General Employees Retirement Fund

	Required Supplementary Information				
Year Ending	Statutorily Required Contribution (a)	Contributions in Relation to the Statutorily Required Contribution (b)	Contribution Deficiency (Excess) (a-b)	Organization's Covered Payroll (c)	Contributions as a Percentage of Covered Payroll (b/c)
12/31/16	$ 19,128	$ 19,128	$ -	$ 255,040	7.50%
12/31/15	$ 19,530	$ 19,530	$ -	$ 260,400	7.50%

Note: Information is required to be presented for 10 years. However, until a full 10-year trend is compiled, the Organization will present information for only those years for which information is available.

OTHER REQUIRED REPORT

CliftonLarsonAllen LLP
CLAconnect.com

INDEPENDENT AUDITORS' REPORT ON MINNESOTA LEGAL COMPLIANCE

Board of Directors
Vadnais Lake Area Water Management Organization
Vadnais Heights, Minnesota

We have audited, in accordance with auditing standards generally accepted in the United States of America, the financial statements of the governmental activities and the major fund of the Vadnais Lake Area Water Management Organization (the Organization), Vadnais Heights, Minnesota, as of and for the year ended December 31, 2016, and the related notes to the financial statements as and have issued our report thereon dated April 11, 2017.

The *Minnesota Legal Compliance Audit Guide for Other Political Subdivisions*, promulgated by the State Auditor pursuant to Minnesota statute §6.65, contains six categories of compliance to be tested: contracting and bidding, deposits and investments, conflicts of interest, claims and disbursements, miscellaneous provisions, and tax increment financing. Our audit considered all of the listed categories except for tax increment financing because the Organization does not have any established tax increment financing districts.

In connection with our audit, nothing came to our attention that caused us to believe that the Organization failed to comply with the provisions of the *Minnesota Legal Compliance Audit Guide for Other Political Subdivisions*, except as described in the schedule of findings and recommendations as item 2016-001. However, our audit was not directed primarily toward obtaining knowledge of such noncompliance. Accordingly, had we performed additional procedures, other matters may have come to our attention regarding the Organization's noncompliance with the above referenced provisions.

The Organization's written response to the legal compliance finding identified in our audit described in the schedule of findings and recommendations. The Organization's response was not subject to the auditing procedures applied in the audit of the financial statements and, accordingly, we express no opinion on it.

This report is intended solely for the information and use those charged with governance and management of the Organization and the State Auditor and is not intended to be and should not be used by anyone other than these specified parties.

CliftonLarsonAllen LLP

Minneapolis, Minnesota
April 11, 2017

VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION
SCHEDULE OF FINDINGS AND RECOMMENDATIONS
DECEMBER 31, 2016

MINNESOTA LEGAL COMPLIANCE FINDING

2016-001 Out of State Travel Policy – Section 471.661

Finding: Minnesota Statutes Section 471.661 requires all political subdivisions to have and adopt and out-of-state travel policy that covers all employees and board members. It was noted during our testing, the Organization does not have a formally adopted policy in accordance with State Statute.

CORRECTIVE ACTION PLAN (CAP):

Explanation of Disagreement with Audit Finding
There is no disagreement with the audit finding, however, they were not aware the policy was required when there is no out of state travel by staff or board members.

Actions Planned in Response to the Finding:
The Organization will adopt a policy that meets the requirements of the Statute.

Official Responsible for Ensuring CAP:
The Organization's Administrator will be responsible for ensuring the CAP.

Planned Completion Date for CAP:
The Organization will adopt the policy during calendar year 2017.

Plan to Monitor Completion of CAP:
The board will be monitoring this corrective action plan.

Appendix A-3: 2016 Water Quality Report

EST 1983

VLAWMO

Vadnais Lake Area
Water Management Organization

2016 WATER QUALITY REPORT

Pictured – Tyler Thompson VLAWMO GIS Watershed Technician

Prepared by

Brian Corcoran, VLAWMO Water Resource Manager

December 2016

VLAWMO would like to thank the volunteers for their vital role in the Citizens Lake Monitoring Program. The volunteers for 2016 were: Ron Auger & Jim Grisim (Birch Lake), Paul Peterson (Amelia), and Shannon Stewart (Tamarack Lake)

VLAWMO would also like to acknowledge and thank the following agencies for their assistance with assuring the quality of water within the watershed: St. Paul Regional Water Service, the Citizen's Lake Monitoring Program at the Minnesota Pollution Control Agency, the Lake Level Program at the Minnesota Department of Natural Resources, the Ramsey County Limnology Lab, Pace Analytical and Burns & McDonnell.

Definitions & Abbreviations

Ammonia (NH3) – an inorganic form of nitrogen that is contained in fertilizers, septic system effluent, and animal wastes. It is also a product of bacterial decomposition of organic matter. NH3 becomes a concern if high levels of the un-ionized form are present. In this form NH3 can be toxic to aquatic organisms. The presence of un-ionized ammonia is a function of the NH3 concentration, pH, and temperature. Conversion of NH3 to NO2 by nitrification requires large quantities of oxygen which can kill aquatic organisms due to the lowered dissolved oxygen concentrations in water.

Aquatic Invasive Species (AIS) – non-native species such as zebra mussels and Eurasian watermilfoil

Birch Lake Improvement District (BLID) – Homeowner/lakeshore owners on Birch Lake in White Bear Lake MN

Chlorophyll-a (Chl A) - Chl A is a green pigment in algae. Measuring Chl A concentration gives an indication of how abundant algae are in a waterbody.

Colony Forming Units (CFU) – unit used in measuring the level of E. coli in a water sample.

Conductivity (mS/cm) - Conductivity is a good measure of salinity in water. The measurement detects chloride ions from the salt. Salinity affects the potential dissolved oxygen levels in the water. The greater the salinity, the lower the saturation point. Measurement in millisiemens per cm. 1 mS/cm = 1000 uS/cm.

Dissolved Oxygen (DO) - The concentration of molecular oxygen (O2) dissolved in water. The DO level represents one of the most important measurements of water quality and is a critical indicator of a water body's ability to support healthy ecosystems. Levels above 5 mg/L are considered optimal, and most fish cannot survive for prolonged periods at levels below 3 mg/L. Microbial communities in water use oxygen to breakdown organic materials, such as animal waste products and decomposing algae and other vegetation. Low levels of dissolved oxygen can be a sign that too much organic material is in a water body.

Ecoli – Criteria for E. coli set forth in Minn.R. 7050.0222 creek must not exceed 126 organisms per 100 ml as a geometric mean of not less than 5 samples in any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 ml

EQuIS - a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others. The MPCA uses the information entered into the database to determine the quality of the state's water bodies. If water quality standards are not met, the water body will designated as impaired and will need to have a TMDL study conducted.

Eutrophic – a water body that is high in nutrients and low oxygen content. A eutrophic lake is usually shallow, green, with limited oxygen in the bottom layer of water.

Eutrophication – The aging process by which lakes are fertilized with nutrients. Natural eutrophication will gradually change the character of a lake. Human activities can accelerate the process.

Hypereutrophic – A very nutrient-rich lake with murky water, frequent algal blooms and fish kills, foul odor, and rough fish

Impaired Waters – The Clean Water Act requires states to publish, every two years, a list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list, is based on violations of water quality standards.

Mesotrophic – the classification between eutrophic and oligotrophic lakes. These lakes have moderately clear water, late-summer algal blooms, moderate macrophyte populations, and occasional fish kills.

Molecular Sourcing – the use of specific DNA markers to determine presence of a specific host origin of E.coli in a water sample (example, Human or Avian)

Most Probable Number (MPN) - unit used in measuring the level of E. coli in a water sample, similar to (CFU)

Nitrate (NO3) – High NO3 levels are often caused by over application of fertilizers that leach into waterbodies. Nitrate loading from water bodies in Minnesota has national implications as it is the primary chemical contributing to the hypoxia (low oxygen) zone at the mouth of the Mississippi River in the Gulf of Mexico. The Environmental Protection Agency (EPA) has a standard for nitrates in drinking water of 10ppb, infants and children are especially at risk.

Nitrite (NO2) – The second stage of the nitrogen cycle. Nitrite is poisonous to fish. Levels over 75 ug/L can cause stress in fish and greater than 500 ug/L can be toxic

Nitrogen (N) – Nitrogen is second only to phosphorus as an important nutrient for plant and algae growth. The amount of nitrogen in a water body strongly correlates to land use. Nitrogen comes from fertilizers, animal waste, sewage treatment plants and septic systems through surface runoff or groundwater sources. Nitrogen does not occur naturally in soil minerals but is a major component of all organic matter.

Nitrogen Cycle - the process of nitrogen breakdown in water. The first stage is the production of NH3. The second stage is the oxidation of NH3 into NO2 which is very poisonous to fish. The final stage is conversion of NO3 which aquatic plants use. Once the plants have used their share of NO3, bacteria change it back into a gaseous form and release it back to the atmosphere. The Nitrogen Cycle is dependent on oxygen. If a water body has low DO, organic decay of nitrogen is slower and the water will have increased interim levels of toxic products (NH3 and NO2). The cycle also moves quicker in warmer water.

Oligotrophic – a water body that is generally clear, deep, and free of weeds or large algae blooms.

Particulate Phosphorus – a form of phosphorus that is attached to sediment particles and in plant and animal fragments suspended in the water and may not be immediately available to support algae growth. Some of this phosphorus is readily available but the amount can vary.

Phosphorus (P) - Phosphorus is the primary cause of excessive plant and algae growth in lake systems. Phosphorus originates from a variety of sources, many of which are human related. Major sources include human and animal wastes, soil erosion, detergents, septic systems and runoff from farmland, yards, and streets.

Secchi Disk – a round, white, metal disk that is used to determine water clarity. It is lowered into the water until it is not visible. The depth is recorded, and then the disk is raised until it is visible. The mean value of the two readings gives the clarity.

Secchi Disk Transparency (SDT) - the term used in describing the results of a secchi reading expressed in feet or meters.

Soluble Reactive Phosphorus (SRP) – a form of phosphorus that dissolves in water and is readily available (bio-available) to algae and has an immediate effect on algae growth and DO depletion. Its concentration varies widely over short periods of time as plants take it up and release it.

St. Paul Regional Water Service (SPRWS) – Agency which assists VLAWMO with water quality testing and controls the Vadnais chain of lakes, which supplies drinking water to the city of St. Paul.

Surface Water Assessment Grant (SWAG) - Grant awarded by the PCA to help fund surface water monitoring

Total Kjehldahl Nitrogen (TKN) – The sum of NO2, NO3, and NH3 in a water body. High measurements of TKN typically results from sewage and manure discharges to water bodies.

Total Maximum Daily Load (TMDL) – Calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and an allocation of that amount to the pollutant's source.

Total Nitrate and Nitrite Nitrogen - Nitrate (NO3) plus nitrite (NO2) as nitrogen. In lakes, most nitrate/nitrogen is in NO3 form.

Total Phosphorus (TP) – A nutrient essential to the growth of organisms, and is commonly the limiting factor in the primary productivity of surface water bodies. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particle form. Agricultural drainage, wastewater, and certain industrial discharges are typical sources of phosphorus, and can contribute to the eutrophication of surface water bodies.

Total Suspended Solids (TSS) – Very small particles remaining dispersed in a liquid due to turbulent mixing that can create turbid or cloudy conditions. A measure of the material suspended in water in mg/l. Total suspended solids (TSS) cause: a) interference with light penetration, b) buildup of sediment and c) potential reduction in aquatic habitat. Solids also carry nutrients that cause algal blooms and other toxic pollutants that are harmful to fish. Clay, silt, and sand from soils, phytoplankton (suspended algae), bits of decaying vegetation, industrial wastes, and sewage are common suspended solids.

Trophic Status Indicator (TSI) – TSI is an indicator of water quality. Lakes can be divided into three categories based on trophic state – oligotrophic, mesotrophic and eutrophic. A natural aging process occurs in lakes which cause them to change from oligotrophic to eutrophic over time and eventually fill in. Humans can accelerate this process by allowing nutrients from agriculture, lawn fertilizers, streets, septic systems, and urban storm drains to enter lakes. Trophic status is determined through TP, Chl A, and SDT measurements.

Turbidity – a water quality parameter that refers to how clear the water is. It is an indicator of the concentration of suspended solids in the water. Excessive sedimentation in streams and rivers is considered

to be the major source of surface water pollution in the United States. Polluted waters are commonly turbid. Turbidity is expressed in NTU (Nephelometric Turbidity Units).

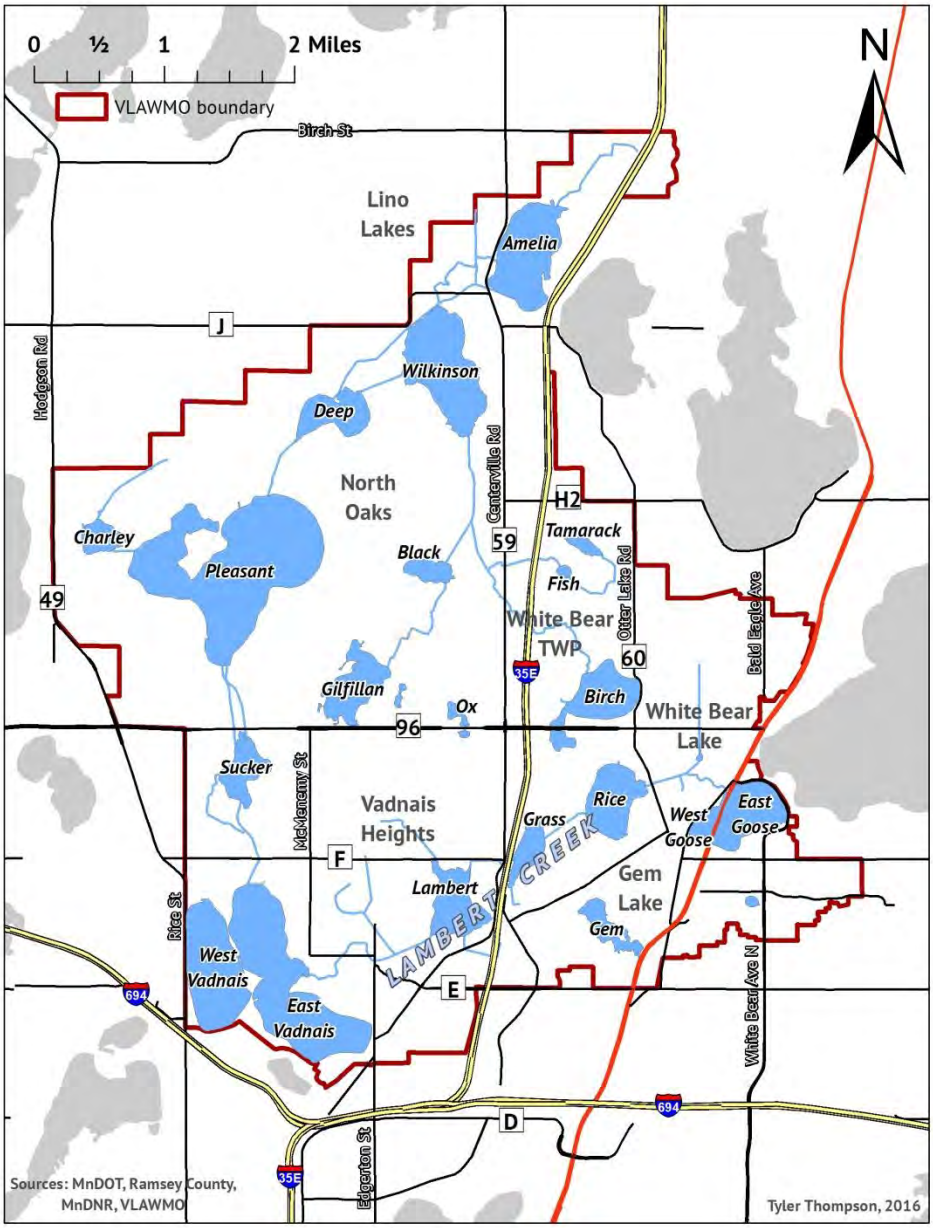
Volatile Suspended Solids (VSS) – a measure of the organic matter in suspended particles. When measured in conjunction with TSS, the proportions of organic versus mineral content of the particles can be determined.

Introduction

The Vadnais Lake Area Water Management Organization (VLAWMO) covers approximately 25 square miles in the northeast metropolitan area. The watershed encompasses the City of North Oaks and portions of the Cities of White Bear Lake, Gem Lake, Vadnais Heights, Lino Lakes, and White Bear Township. The watershed is 96% urbanized; agricultural land exists in the northern end of the boundaries. New land development is occurring near Wilkinson Lake. Data collected through this program tracks changes in water quality in conjunction with the change in land use around these water bodies.

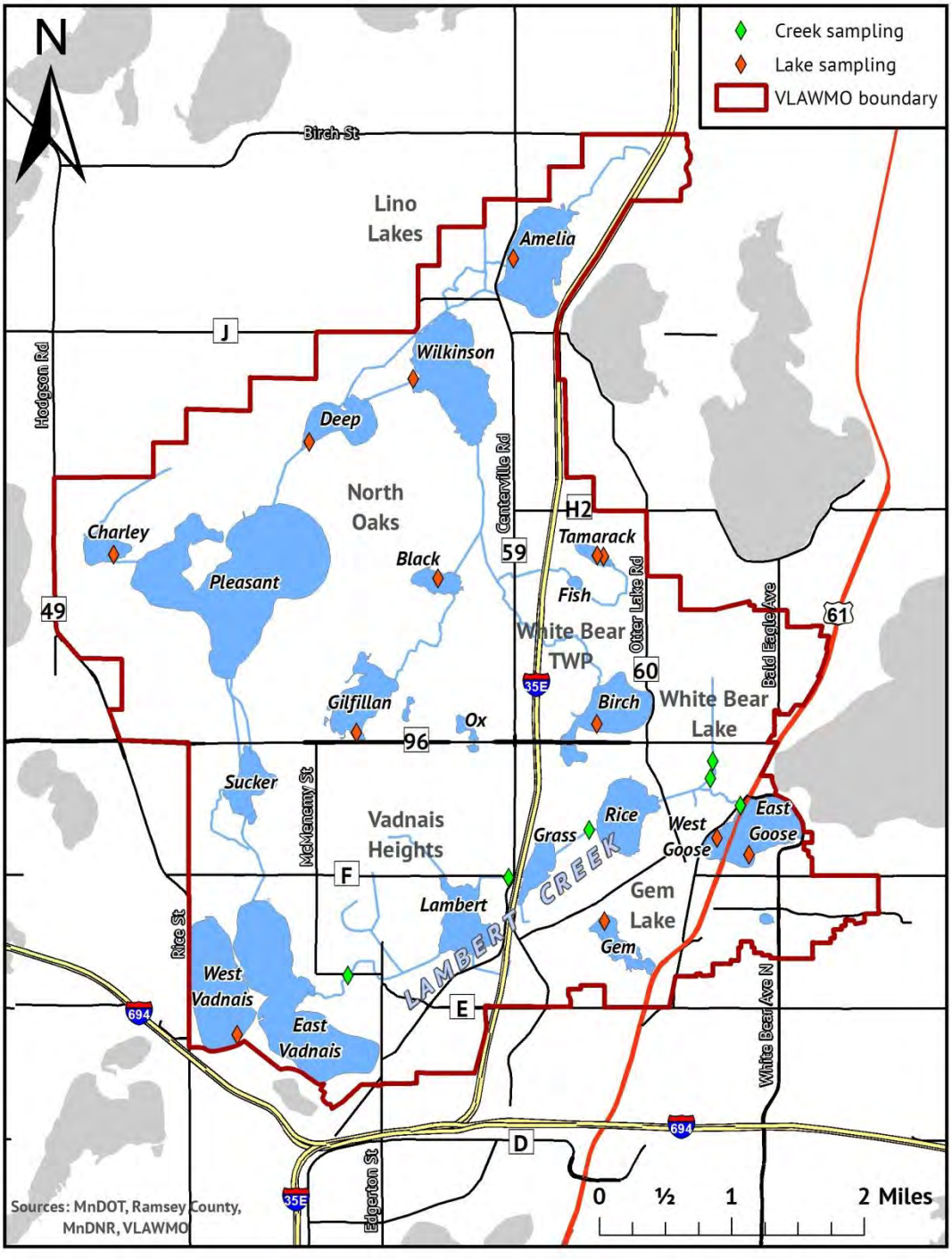
VLAWMO works in conjunction with the St. Paul Regional Water Service (SPRWS) on water quality monitoring. The SPRWS monitors the direct surface water flow into Vadnais Lake to assure high quality drinking water for over 400,000 consumers. The SPRWS monitors the main chain of lakes (Charley Lake, Pleasant Lake, Sucker Lake and Vadnais Lake) and while VLAWMO monitors Lambert Creek which flows directly into Vadnais Lake.

Figure 1: Map of VLAWMO



VLAWMO began the Citizens Lake Monitoring Program (CLMP) in 1997 to monitor several lakes and ponds within the watershed that were identified as having local significance. CLMP volunteers have helped collect samples from 12 water bodies: Amelia Lake, Birch Lake, Black Lake, Charlie Lake, Deep Lake, Gem Lake, Gilfillan Lake, Goose Lake East, Goose Lake West, Tamarack Lake, West Vadnais Lake and Wilkinson Lake. These lakes are all shallow with average depths no greater than 9 feet. Six areas along Lambert Creek are also sampled as part of the Organization's mission to protect and improve the water-related environment. The data received from the monitoring is used by VLAWMO and the Minnesota Pollution Control Agency (MPCA) to determine the health of the state's waters.

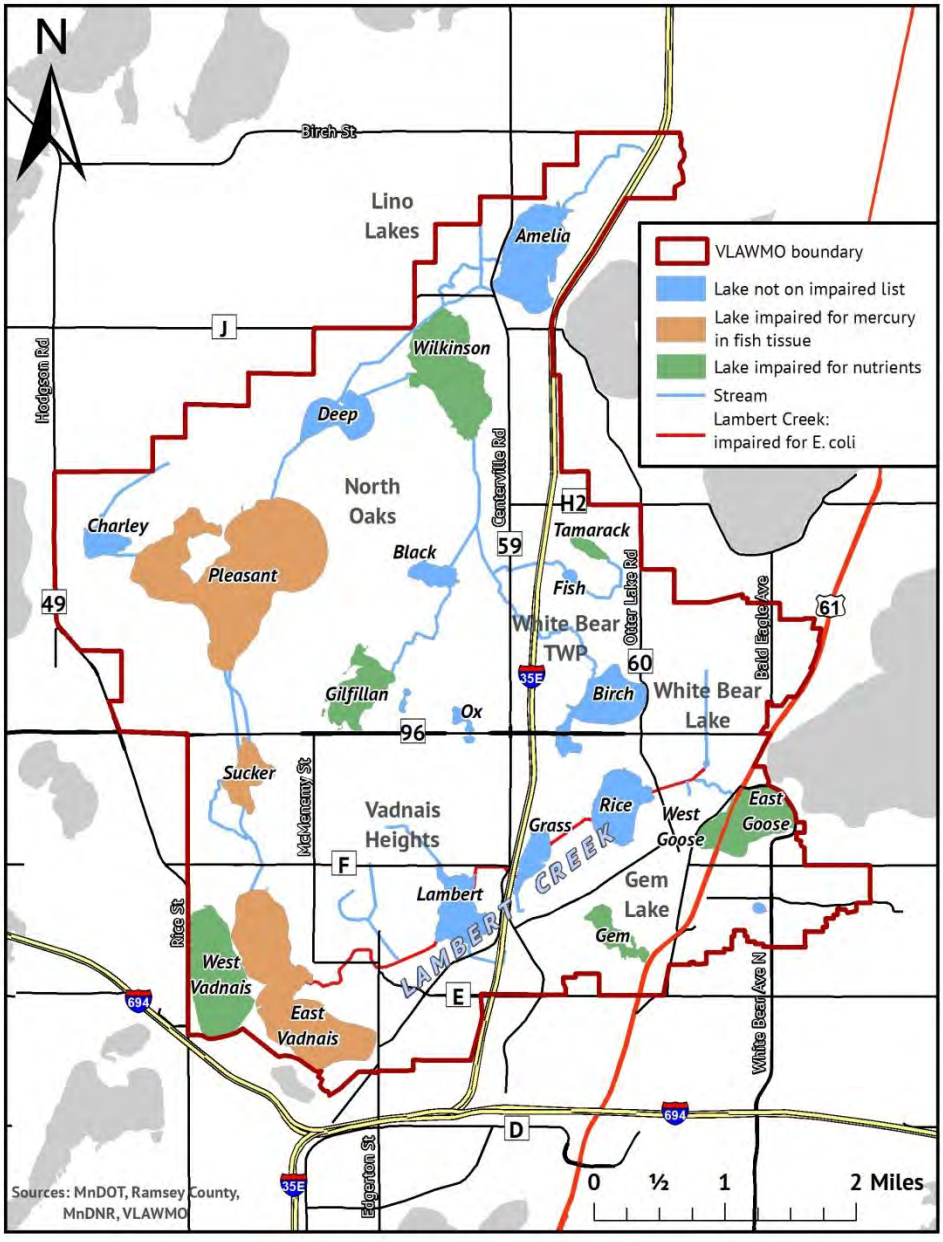
Figure 2: Sites Monitored by VLAWMO



Impaired Water Designations

The watershed has had several water bodies listed on the MPCA 303(d) list for Impaired Waters. The SPRWS Chain of Lakes (Pleasant, Sucker and Vadnais Lakes) have all been listed for nutrient pollution, specifically mercury. These lakes have been infested with zebra mussels, an aquatic invasive species, though this is not a condition of the Impaired Waters listing. This chain of lakes is fed by the Mississippi River through a pump in Fridley, MN. Lambert Creek (including Goose Lake and Whitaker Pond) has been added to the impaired list for bacteria, specifically fecal coliform or E. coli. Gem Lake, Gilfillan Lake, Goose Lake and Wilkinson Lake, impaired for nutrients, have also been added to the study due to the PCA's new "watershed wide' approach for TMDL's to make them more efficient. These water bodies are now scheduled for a TMDL study to determine the extent of pollution and if possible, where the pollutant is coming from. VLAWMO will initiate the study for Lambert Creek, Gilfillan, Wilkinson, Goose and Gem; while SPRWS will manage the study for Pleasant, Sucker, and Vadnais. Study began fall of 2010, still in review stage.

Figure 3: Waterbodies listed on the MPCA 303(d) Impaired Waters List



Typical Measurements for Lakes and Streams

VLAWMO's watershed falls within the North Central Hardwood Forest (CHF) ecoregion. This ecoregion is an area of transition between the forested areas to the north and east and the agricultural areas to the south and west. The terrain varies from rolling hills to smaller plains. Non-urbanized upland areas are forested by hardwoods and conifers. Plains include livestock pastures, hay fields and row crops such as potatoes, beans, peas and corn.

The ecoregion contains many lakes, and water clarity and nutrient levels are moderate. Land surrounding many of these lakes has been developed for housing and recreation, and the densely populated metropolitan area dominates the eastern portion of this region. Water quality problems that face many of the water bodies in the area are associated with contaminated runoff from paved surfaces and lawns.

Below are typical measurements one might find for lakes and streams in the CHF ecoregion:

Lakes							
Field pH	TSS (mg/L)	NO_X (µg/L)	TP (µg/L)	Turb (NTU)	SDT (m)	Chl-a (µg/L)	TKN (µg /L)
8.6 – 8.8	2 – 6	<100	23 – 50	1 – 2	1.5 – 3.2	5 – 22	600 - 1200
Streams							
Field pH	TSS (mg/L)	NO_X (µg/L)	TP (µg/L)	Turb (NTU)	Fecal Coliform (cfu/100 ml)	Temp (˚C)	BOD (in mg/L)
7.9 – 8.3	4.8 – 16	4 - 26	6 – 15	3 – 8.5	40 – 360	2 – 21	1.5 – 3.2

The MPCA has water quality standards based on a designated use for the water body. VLAWMO's water is classified as "2B". The SPRWS chain of lakes has a stricter designation of "2Bd" due to it being the drinking water source for St. Paul. The quality of Class 2B water must be suitable for aquatic recreation of all kinds as well as to support fish and aquatic plant life. In 2008, the MPCA approved new standards which will separate deep from shallow lakes. All of the lakes VLAWMO monitors are considered shallow and therefore those standards will apply. For those parameters which the MPCA does not have standards, the federal Environmental Protection Agency (EPA) has maximum contaminant level standards. VLAWMO's goal is to have its waterbodies within these standards.

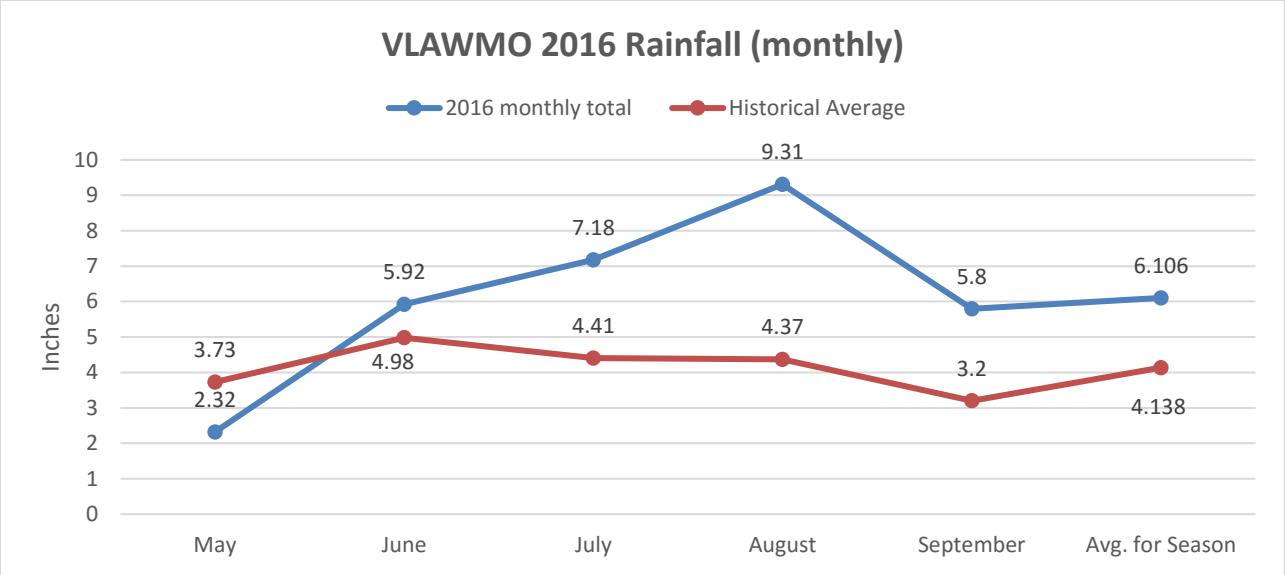
MPCA Standards Lakes					EPA Standards	
TP (µg/L)	Chl A (µg/L)	SDT (m)	Turb (NTU)	TSS (mg/L)	TKN (µg/L)	NO_2 (µg/L)
< 60	< 20	> 1	< 25	< 100	< 1000	< 100
MPCA Standards – Rivers and Streams					**EPA Standards**	
Fecal Coliform daily maximum (cfu/100 ml)	Chloride (Cl) chronic (mg/L)	Turb (NTU)	TSS (mg/L)	Un-ionized Ammonia (µg/L)	TKN (µg/L)	NO_2 (µg/L)
< 1260	< 230	< 25	< 100	<40	< 1000	< 100

Precipitation in 2016

Major factors influence water quality including the amount of precipitation, timing of precipitation events, and land use practices in the watershed. Long-term monitoring is necessary to characterize the impacts of various land use practices on surface water runoff within VLAWMO.

The 2016 monitoring season precipitation was very steady. Above average monthly rainfall amounts each month except May, even had rain in November and December. The sampling season averaged 1.97" above average monthly (May through September), compared to 1.07" above average in 2015. Precipitation moves contaminants resting on lawns, roofs, streets, and parking lots into nearby water bodies or into storm sewers that outlet into water bodies. Typically, the more precipitation that occurs, the more runoff there will be in the watershed. However, the timing and intensity of the precipitation, as well as soil types, land slopes, land uses, and other factors can influence the amount of runoff that reaches the water bodies. Lack of rain can also have an effect on the concentration of nutrients and chemicals in our water bodies. With a smaller volume of water in our water bodies, the more concentrated the nutrients and chemicals can become.

2016 Precipitation Data (in inches) Vadnais Heights City Hall Rain Gauge, Vadnais Heights, MN			
	2016 monthly total	Historical Average	Deviation
May	2.31	3.73	**-1.41**
June	5.92	4.98	**0.94**
July	7.18	4.41	**2.77**
August	9.31	4.37	**4.94**
September	5.8	3.2	**2.6**
Avg. for Season	**6.11**	**4.14**	**1.97**



- Rain gauge used for data is located at Vadnais Heights City Hall

Preliminary Analysis of Lake Data

VLAWMO staff worked with volunteers to collect samples from the lakes at two-week intervals from May through September. VLAWMO staff collected all creek samples. At the time of collection, volunteers measure water transparency with a Secchi disk (SDT), evaluate the physical and recreational conditions of the water, and if available, take a lake level reading. Samples are brought to Braun Intertec by VLAWMO staff within 24 hours for chemical analysis. Parameters measured at the lab include Phosphorus (TP &SRP), Chlorophyll-a (Chl A), total Kjeldahl Nitrogen, nitrate, ammonia and Total Suspended Solids (TSS). The data from these tests aid in the determination of the state of the water quality in a particular lake or stream and allow for monitoring of the long term health of the water body. Standards for water quality are set by the US Environmental Protection Agency (EPA) and enforced through the MPCA.

A measure of the lake health and lake age is Carlson's Trophic State Index (TSI), which measures the productivity level of a lake or degree of eutrophication. As a lake ages, it becomes more eutrophic, however human impact speeds up the process. High TSI values can relate to poorer water quality but not always. Trophic state is an absolute scale that describes the biological condition of a water body. Water quality, on the other hand, is a term used to describe the condition of a water body in relation to human needs or values

Water quality grades are given to each lake based on standards established by the Metropolitan Council. The standards give a range to each letter grade for the June – September averages of TP concentration, Chl A concentration, and SDT. The overall lake water quality grade is the average of the grades for each parameter. Other indicators of lake condition, such as aquatic plant growth or invasive species are not factored into the grades. As of 2016, the letter grades assigned to VLAWMO water bodies are as listed below:

VLAWMO Lake Grades

Lake	Grade 2015	Grade 2016	TSI Status
Amelia	B	B	Eutrophic
Birch	B+	B	Mesotrophic
Black	B+	A-	Mesotrophic
Charlie	C	C	Eutrophic
Deep	C-	C	Eutrophic
Gem	B	B	Mesotrophic
Gilffilan	C+	C+	Eutrophic
E. Goose	D-	D-	Eutrophic - Hypereutrophic
W. Goose	D	D-	Eutrophic - Hypereutrophic
Tamarack	D	D	Eutrophic - Hypereutrophic
Wilkinson	D	D+	Eutrophic

Below is the raw data and chart explaining the TSI Status 2015 & 2016

2015 Data	avg SD (m)	TSI (SD)	avg CHL (ug)	TSI (CHL)	avg TP (ug)	TSI(TP)
Amelia	1.1	59	21	60	28	52
Birch	1.7	52	1	31	21	48
Black	1.6	53	14	56	18	46
Charlie	1.1	59	14	56	57	62
Deep	1	60	23	61	89	69
Gem	2.2	49	23	61	38	57
Gilfillan	0.6	67	36	66	55	62
Goose East	0.6	67	115	77	231	83
Goose West	0.6	67	97	75	149	76
Tamarack	0.4	73	119	77	183	79
West Vadnais	0.3	77	108	77	88	69
Wilkinson	0.5	70	147	80	109	72

A list of possible changes that might be expected in a north temperate lake as the amount of algae changes along the trophic state gradient.

TSI	Chl (ug/L)	SD (m)	TP (ug/L)	Attributes	Water Supply	Fisheries & Recreation
<30	<0.95	>8	<6	**Oligotrophy:** Clear water, oxygen throughout the year in the hypolimnion	Water may be suitable for an unfiltered water supply.	Salmonid fisheries dominate
30-40	0.95-2.6	8-4	6-12	Hypolimnia of shallower lakes may become anoxic		Salmonid fisheries in deep lakes only
40-50	2.6-7.3	4-2	12-24	**Mesotrophy:** Water moderately clear; increasing probability of hypolimnetic anoxia during summer	Iron, manganese, taste, and odor problems worsen. Raw water turbidity requires filtration.	Hypolimnetic anoxia results in loss of salmonids. Walleye may predominate
50-60	7.3-20	2-1	24-48	**Eutrophy:** Anoxic hypolimnia, macrophyte problems possible		Warm-water fisheries only. Bass may dominate.
60-70	20-56	0.5-1	48-96	Blue-green algae dominate, algal scums and macrophyte problems	Episodes of severe taste and odor possible.	Nuisance macrophytes, algal scums, and low transparency may discourage swimming and boating.
70-80	56-155	0.25-0.5	96-192	**Hypereutrophy:** (light limited productivity). Dense algae and macrophytes		
>80	>155	<0.25	192-384	Algal scums, few macrophytes		Rough fish dominate; summer fish kills possible

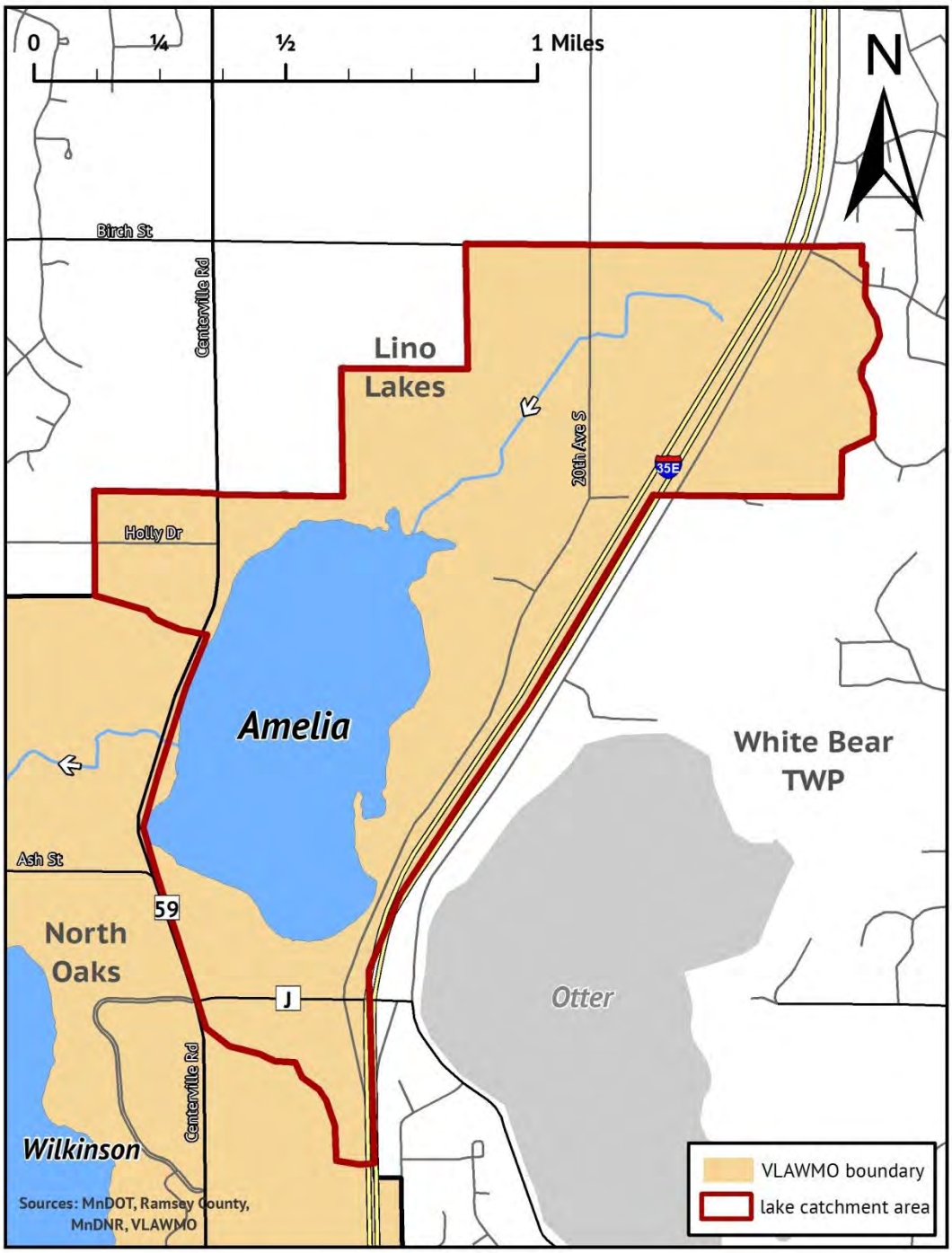
2016 Data	avg SD (m)	Tsi (SD)	avg CHL (ug)	Tsi (CHL)	avg TP (ug)	Tsi(TP)
amelia	1.1	59	12	55	51	61
birch	1.8	52	7	50	14	42
black	2	50	4	44	17	45
charlie	1.2	57	10	53	78	67
deep	1.1	59	8	51	76	67
gem	1.6	53	18	59	30	53
gilfillan	0.7	65	25	62	48	60
goose east	0.5	70	84	74	291	86
goose west	0.4	73	67	72	187	80
tamarack	0.4	73	87	74	187	80
west vadnais	0.3	77	71	72	110	72
wilkinson	1.1	59	24	62	169	78

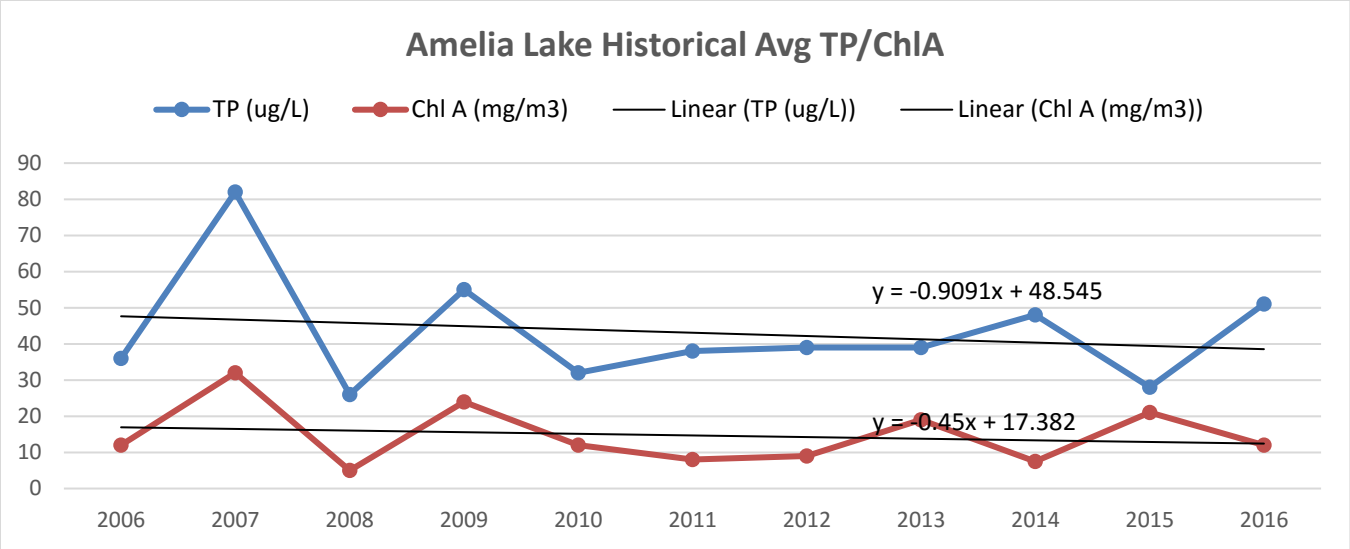
VLAWMO's water resource manager completes the required data entry each year into the MPCA EQuIS program which makes the determination of impairment and opens opportunities for grants to help remedy the impairments.

2016 Monitoring Results

Amelia Lake

Amelia is located in Anoka County and is approximately 217 acres. Maximum depth for the lake is 4 feet. The majority of agricultural land left in the watershed is near Amelia Lake. VLAWMO staff also collected all DO and YSI parameter readings on Amelia. VLAWMO has been monitoring Amelia since 1997. As you can see from the data below the trend for both TP and ChlA has been slightly downward over the last 10yrs. Overall Amelia is below the state standard of 60ug/L for TP and 20mg/m3 for ChlA over the last seven years. Runoff and rain events are a big factor in these parameters for Amelia due to the amount of agricultural land surrounding the lake. Due to the great water quality, runoff from the surrounding area does not seem to be affecting the lake.





Amelia Lake Data

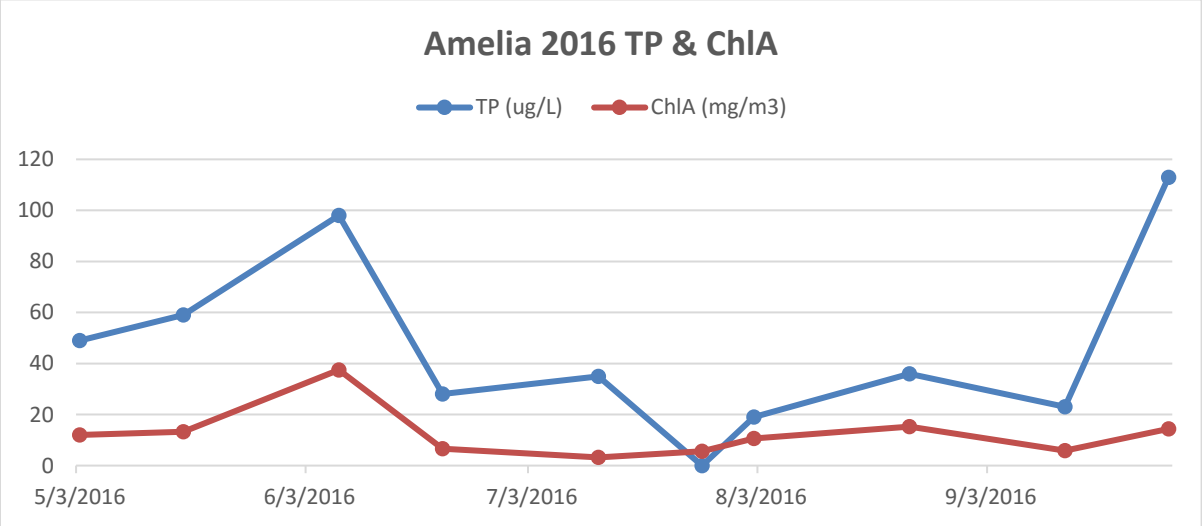
Amelia Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.03	0.463	8.2	8.18
1997	28	0	1.5	5/16/2016	t	13.28	0.462	7.95	8.11
1998	36	14	1.1	6/10/2016	b	23.73	0.412	7.67	9.16
1999	38	9	1.2	6/10/2016	t	23.84	0.414	7.69	9.11
2000	40	12	0.9	7/20/2016	b	26.4	0.374	6.97	9.3
2001	33	8	1.1	7/20/2016	t	26.43	0.374	7.22	9.38
2002	34	13	1.4	9/20/2016	b	19.91	0.385	6.18	8.47
2003	29	7	1.5	9/20/2016	t	19.87	0.386	5.84	8.57
2004	28	0	0						
2005	24	7	0						
2006	36	12	0						
2007	82	32	0.4						
2008	26	5	1.1						
2009	55	24	0.9						
2010	32	12	1.1						
2011	38	8	1.1						
2012	39	9	1.1						
2013	39	19	1.1						
2014	48	7.5	1.3						
2015	28	21	1.1						
2016	51	12	1.1						

- YSI parameters are good for Amelia Lake, no signs of concern. Red values indicate averages above state standard. Amelia has been below state standard for last 7 years

Amelia Lake 2015 Raw Data

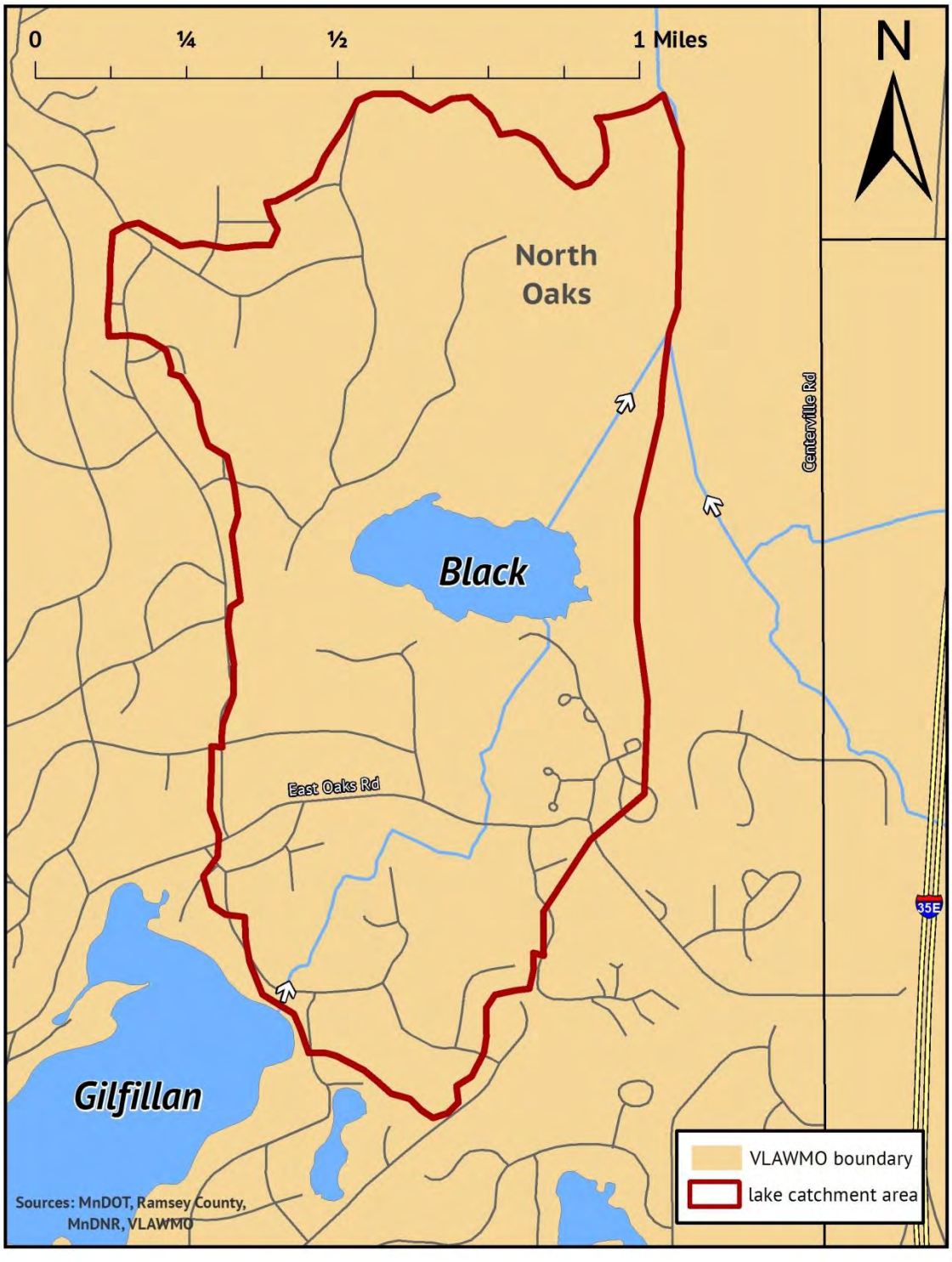
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	NO3 (mg/L)	Cl (mg/L)
amelia	3/28/2016							60
amelia	5/3/2016	3.5	49	12	2.9			
amelia	5/17/2016	3	59	13.3				
amelia	6/7/2016	3	98	37.5	3.9	0.24		
amelia	6/21/2016	4	28	6.6				
amelia	7/12/2016	3	35	3.2	1.8	0.11		
amelia	7/26/2016	4	ND	5.6				
amelia	8/2/2016	2.5	19	10.6	1.5	ND		
amelia	8/23/2016	3	36	15.3				
amelia	9/13/2016	3.75	23	5.9	1.1	ND		
amelia	9/27/2016	3.5	113	14.4				

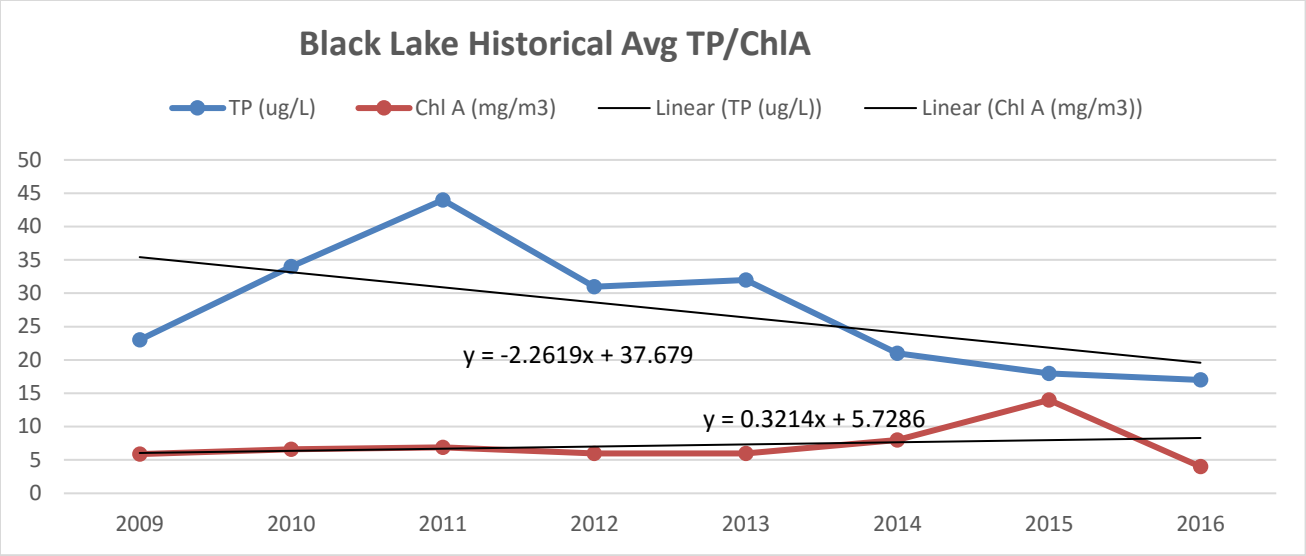
- Nitrogen and ammonia levels are well below state standards for Amelia Lake as well as chloride.



Black Lake

Black Lake is located in North Oaks. There is very little developed land or roads around the lake. The lake is about 10 acres and has a maximum depth of 12 feet. VLAWMO began to monitor Black Lake in 2009. Black Lake is also one of, if not the only lake left within VLAWMO that has a significant population of wild rice. Access to the lake is minimal and the lake is surrounded by private property, is very isolated and has a large wetland fringe. Black Lake is one of the healthiest lakes within VLAWMO with all lake nutrient parameters well below the state standards. An aquatic vegetation survey was completed in July 2014.





Black Lake Data

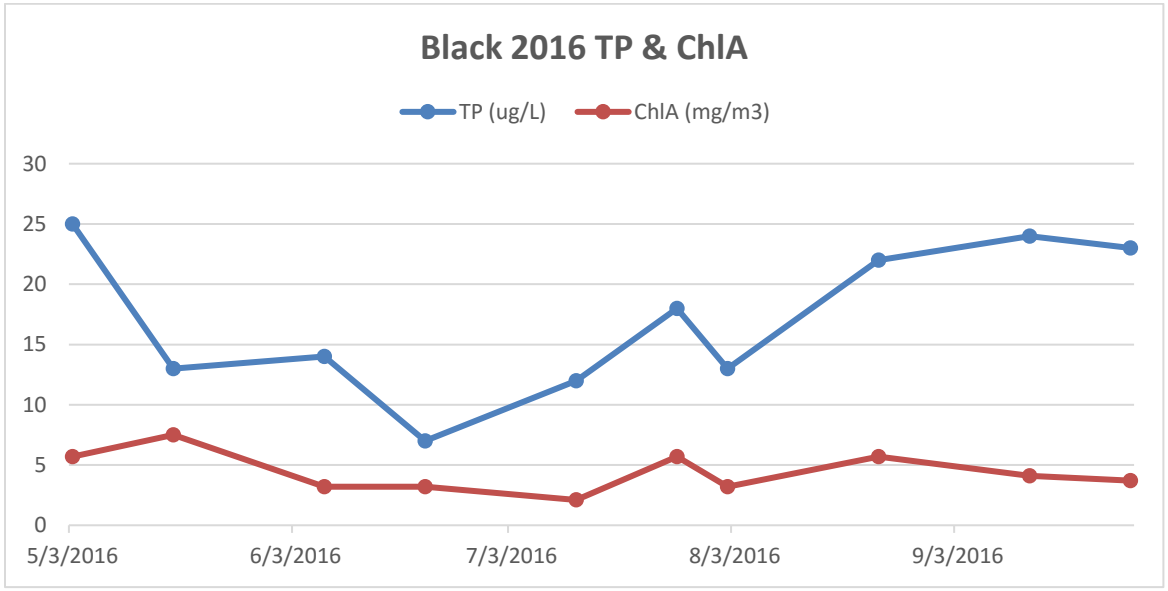
Black Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	12.82	0.289	8.06	7.8
2009	23	5.9	2	5/16/2016	t	13.66	0.287	8.46	7.7
2010	34	6.6	2.1	6/10/2016	b	19.19	0.308	2.04	8.02
2011	44	6.9	2.3	6/10/2016	t	25.04	0.261	7.19	8.82
2012	31	6	2.4	7/20/2016	b	22.61	0.273	0.33	7.37
2013	32	6	2	7/20/2016	t	26.79	0.236	6.48	8.39
2014	21	8	2	9/20/2016	b	19.22	0.308	0.6	7.69
2015	18	14	1.6	9/20/2016	t	20.19	0.3	3.27	7.86
2016	17	4	2						

- Black Lake YSI parameters are very good for this type of lake. Black Lake is around 12 ft deep and does show some signs of stratification

Black Lake 2016 Raw Data

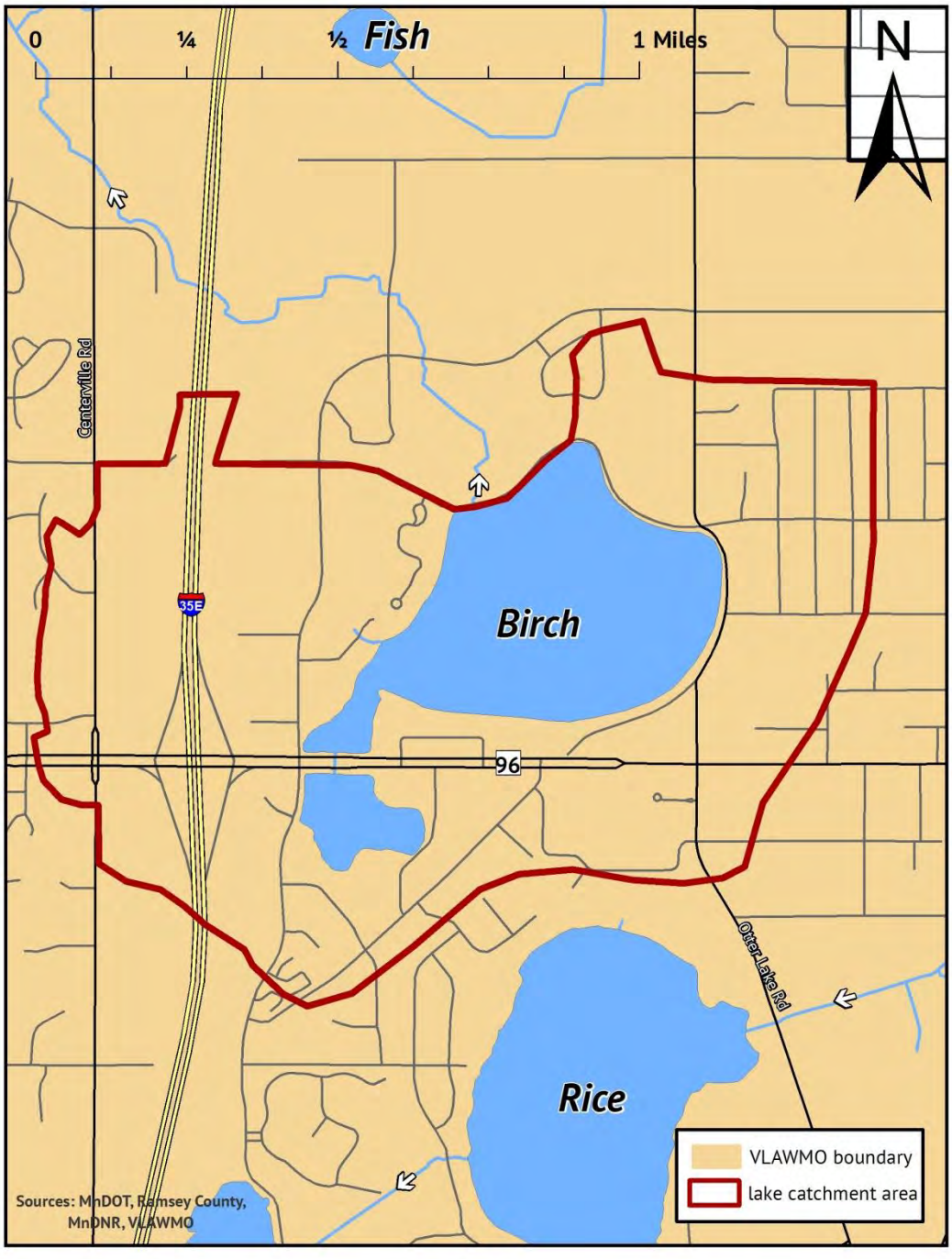
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Black	3/28/2016						10
Black	5/3/2016	6	25	5.7	0.94		
Black	5/17/2016	6	13	7.5			
Black	6/7/2016	7	14	3.2	0.95	ND	
Black	6/21/2016	7	7	3.2			
Black	7/12/2016	9	12	2.1	0.98	ND	
Black	7/26/2016	6	18	5.7			
Black	8/2/2016	6.5	13	3.2	0.82	ND	
Black	8/23/2016	7	22	5.7			
Black	9/13/2016	6	24	4.1	0.89	ND	
Black	9/27/2016	5	23	3.7			

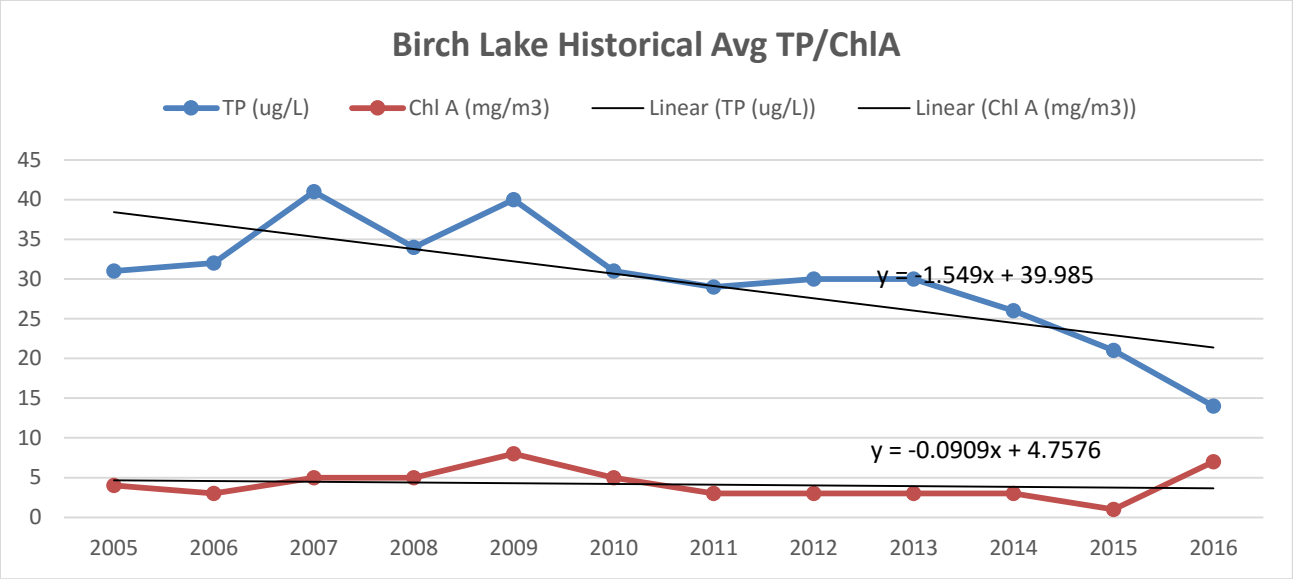
- Nitrogen and ammonia levels are well below state standards for Black Lake as well as chloride.



Birch Lake

Birch Lake is located within the City of White Bear Lake and is 127 acres with a maximum depth of 6 feet. Land is completely developed around Birch Lake and there are 4 main storm sewer inlets around the lake as well as other storm inlets. Birch Lake is a rare find in the metropolitan area because of its clarity and water quality. Results of ChlA and TP are very low for such an urbanized water body. TP and ChlA have had a slight down trend the last 16 years. This is good to see especially for a metro lake because it suggests that runoff from the surrounding watershed entering the lake is also low in nutrient levels and pre-treated. Birch Lake experienced a winter fish kill in 2014. Fish survey completed fall of 2014 did not show much change to the fish population from the 2011 survey except for a lack of largemouth bass in 2014. A lake vegetation survey was also completed in 2015.





Birch Lake Data

Birch Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.1	0.342	9.25	8.86
1997	22	14	2.4	5/16/2016	t	13.07	0.343	9.15	8.8
1998	41	4	2.4	6/10/2016	b	23.64	0.354	7.43	9.72
1999	31	8	2.4	6/10/2016	t	23.9	0.354	7.12	9.53
2000	27	14	2.4	7/20/2016	b	27.02	0.363	6.7	9.7
2001	42	8	2.4	7/20/2016	t	27.19	0.364	6.8	9.75
2002	31	10	2.4	9/20/2016	b	20.08	0.307	6.52	9.14
2003	35	13	2.4	9/20/2016	t	20.2	0.307	6.61	9.23
2004	31	0	2.4						
2005	31	4	2.4						
2006	32	3	2.4						
2007	41	5	2.4						
2008	34	5	1.2						
2009	40	8	1.1						
2010	31	5	1						
2011	29	3	2						
2012	30	3	2						
2013	30	3	2						
2014	26	3	1.7						
2015	21	1	1.7						
2016	14	7	1.8						

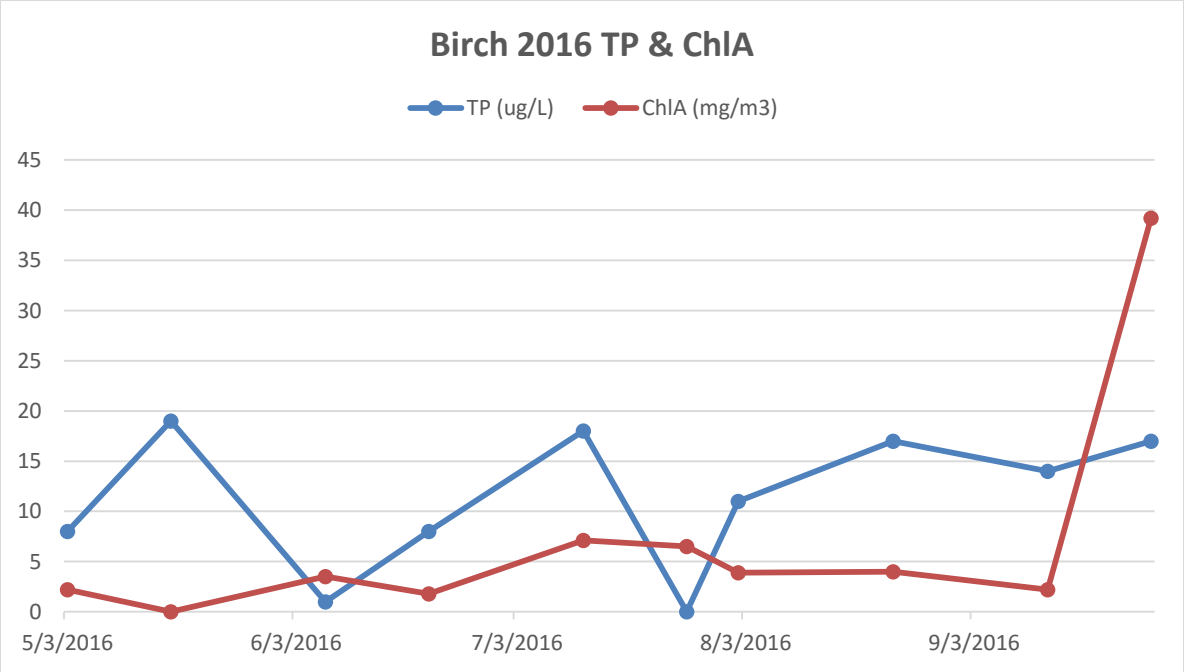
- Secchi reading for Birch is to lake bottom at sample site. Can see to bottom of lake throughout

- YSI parameters are very good for Birch Lake. Conductivity is on the high side but not unusual for a metro lake. This is most likely due to the amount of road runoff that enters Birch Lake. Winter conductivity levels are a bit higher

Birch Lake 2016 Raw Data

SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Birch	1/21/2016						85
Birch	2/23/2016						85
Birch	3/28/2016						73
Birch	5/3/2016	5.5	8	2.2	0.63		77.9
Birch	5/17/2016	6	19	ND			80.3
Birch	6/7/2016	5.5	1	3.5	0.77	ND	85.6
Birch	6/21/2016	5.5	8	1.8			80.3
Birch	7/12/2016	4.5	18	7.1	0.93	ND	82.7
Birch	7/26/2016	5.5	ND	6.5			83.8
Birch	8/2/2016	5.5	11	3.9	0.72	ND	81.3
Birch	8/23/2016	5.5	17	4			73
Birch	9/13/2016	4	14	2.2	0.67	ND	71.6
Birch	9/27/2016	6.5	17	39.2			61.2

- Nitrogen and ammonia levels are well below state standards for Birch Lake

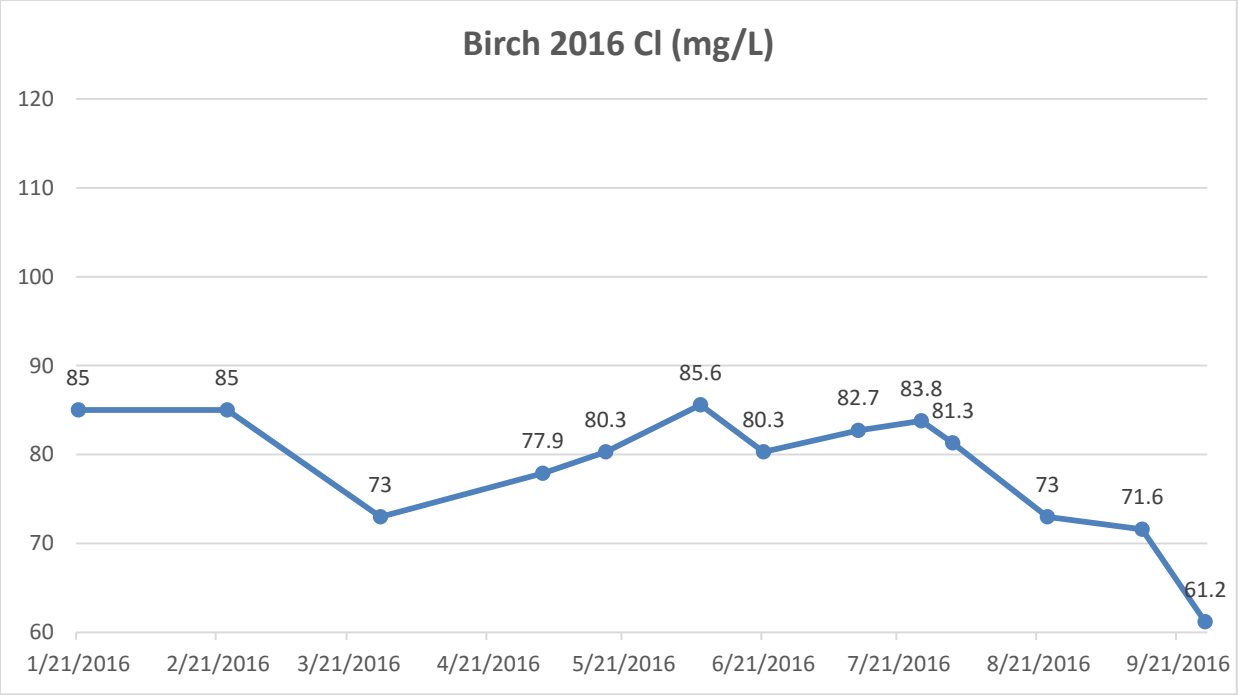


Birch Lake 2016 Winter YSI Readings

Lake	Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
birch1	1/21/2016	t	2.46	0.37	10.18	5.93
birch1	1/21/2016	b	3.77	0.365	7.88	5.57
birch1	2/23/2016	t	3.76	0.387	7.44	5.93
birch1	2/23/2016	b	4.36	0.391	7.33	5.9
birch2	1/21/2016	t	2.72	0.371	10.1	5.77
birch2	1/21/2016	b	4.04	0.386	6.23	5.83
birch2	2/23/2016	t	4.15	0.396	8.53	6.39
birch2	2/23/2016	b	4.18	0.396	8.47	6.55
birch3	1/21/2016	t	3.28	0.365	10.15	5.87
birch3	1/21/2016	b	3.95	0.375	7.23	6.06
birch3	2/23/2016	t	4.06	0.398	8.51	6.65
birch3	2/23/2016	b	4.22	0.399	7.8	6.68

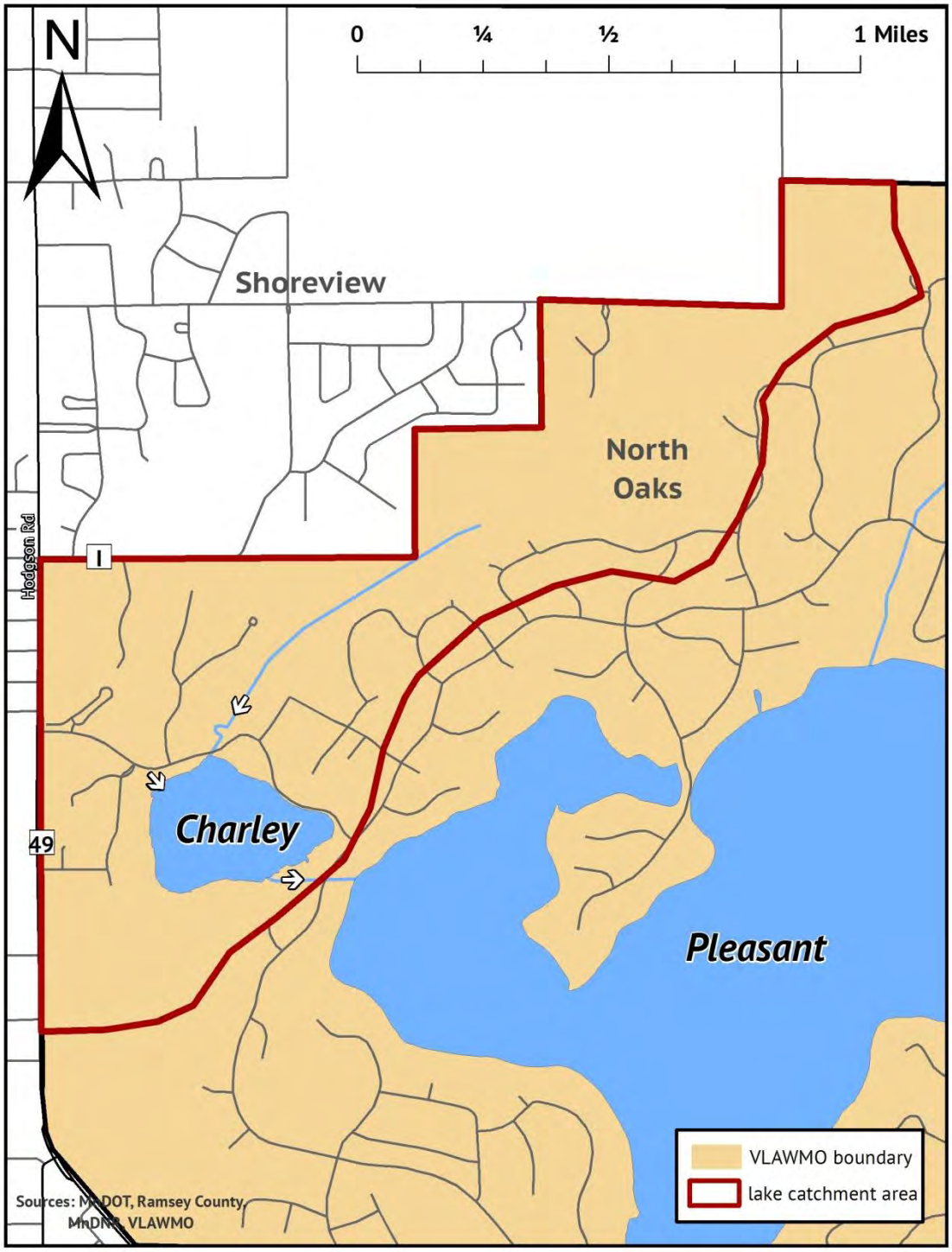
- VLAWMO started a year round chloride program on Birch in 2015. Bi-weekly samples were taken throughout the summer and winter monthly samples taken as well. Levels average around 80 mg/l. This is well below the 230mg/l state standard.

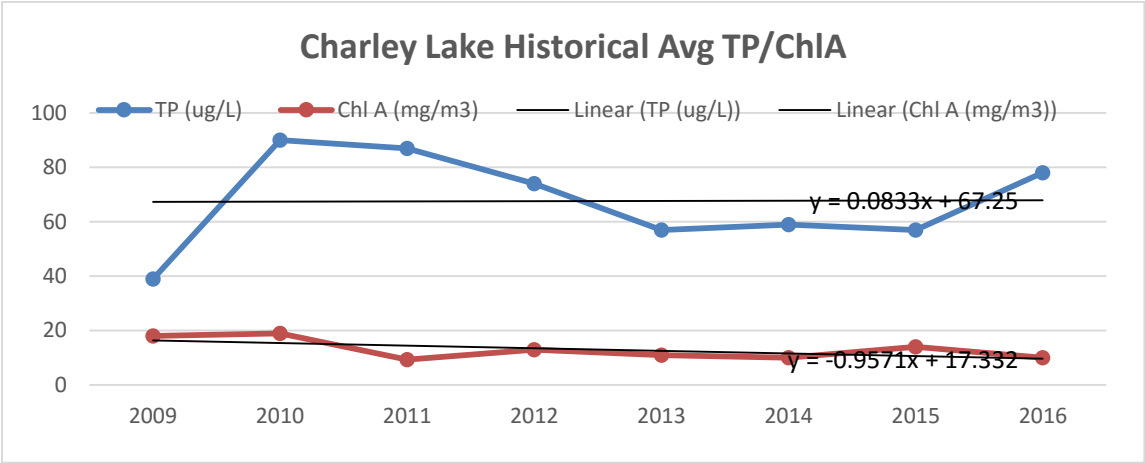
Birch Lake 2016 Chloride Readings



Charley Lake

Water is pumped from the Mississippi River to Charley Lake via a 60 inch 8 mile long pipe from a pumping station in Fridley. An average of 32 million gallons of water is pumped into Charley Lake each day. Charley Lake is the start of the chain of lakes controlled by the St. Paul Water Utility. This chain of lakes supplies drinking water for more than 400,000 customers. Most of the drinking water is coming from the Mississippi River, while some comes from wells to help cool the water and reduce treatment costs. VLAWMO began sampling Charley in 2009.





Charley Lake Data

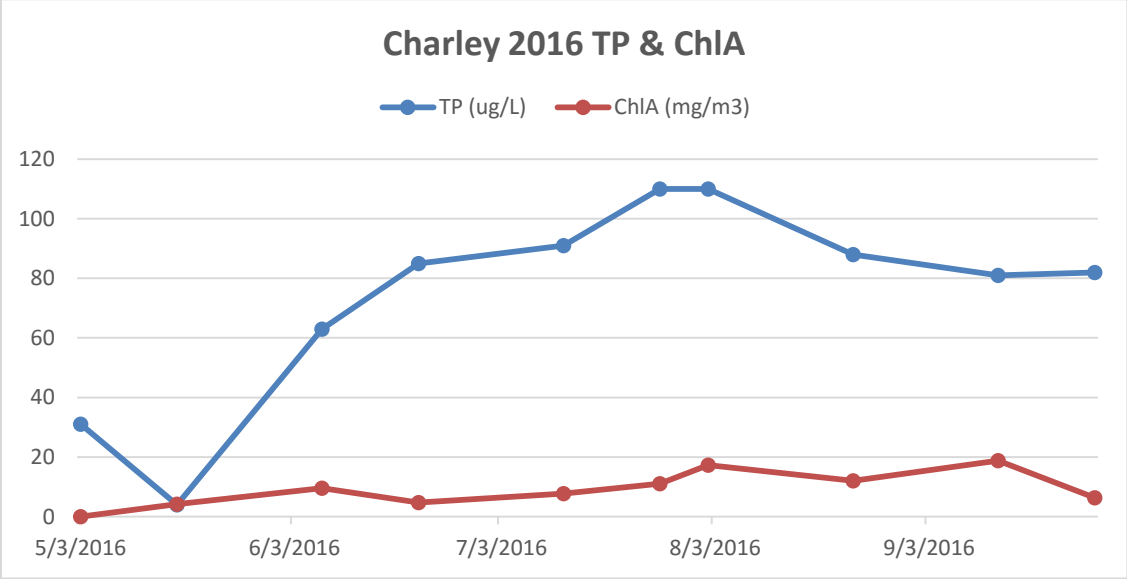
Charley Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.52	0.346	8.19	8.14
2009	39	18	1	5/16/2016	t	14.9	0.338	8.95	8.37
2010	90	18.9	1	6/10/2016	b	21.75	0.397	6.14	8.58
2011	87	9.3	1.1	6/10/2016	t	22.92	0.398	6.26	8.46
2012	74	13	1	7/20/2016	b	22.84	0.221	4.65	7.68
2013	57	11	1	7/20/2016	t	26.12	0.225	6.74	8.18
2014	59	10	1.1	9/20/2016	b	19.4	0.371	2.73	7.06
2015	57	14	1.1	9/20/2016	t	20.4	0.362	8.03	7.44
2016	78	10	1.2						

- Charley Lake YSI parameters are good. There is a constant flow of millions of gallons of Mississippi river water through Charley Lake year round and with that these parameters seem consistent with normal metro lakes. TP levels were higher than state standard of 40ug/l for deep lakes

Charley Lake 2016 Raw Data

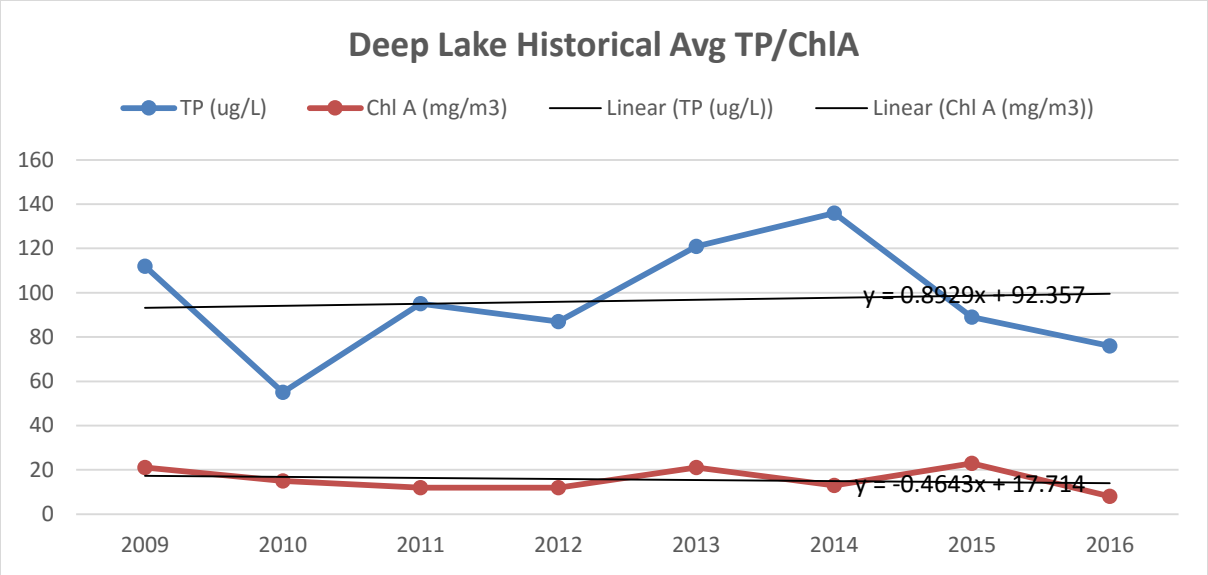
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Charley	3/28/2016						15
Charley	5/3/2016	4.5	31	ND	0.91	ND	
Charley	5/17/2016	4.5	4	4.2			
Charley	6/7/2016	4	63	9.6	0.7	ND	
Charley	6/21/2016	5	85	4.7			
Charley	7/12/2016	4	91	7.7	1	ND	
Charley	7/26/2016	4	110	11.1			
Charley	8/2/2016	3	110	17.3	0.94	ND	
Charley	8/23/2016	3	88	12			
Charley	9/13/2016	3	81	18.8	0.98	ND	
Charley	9/27/2016	4	82	6.3			

- Nitrogen and ammonia levels are below state standards for Charley Lake. NO3 levels are higher in Charley compared to the rest of VLAWMO lake and is most likely due to the Mississippi water that is pumped through the lake



Deep Lake

Deep lake is a little over 80 acres and sits between and is hydro logically connected to Wilkinson Lake to the north and Pleasant Lake to the south. A channel connects the three lakes. A Deep Lake Preservation Committee was formed in 2009 by the residents living around Deep Lake to help maintain and improve the quality of the lake. All VLAWMO lakes are tested for nitrogen's and ammonia and Deep lake year over year tends to have the highest concentrations, although they are still below the standards. TP and ChlA have been trending up since sampling began in 2009. By mid to late summer Deep Lake is very weedy and this has been a concern for residents along with the high nutrients coming from Wilkinson.



Deep Lake Data

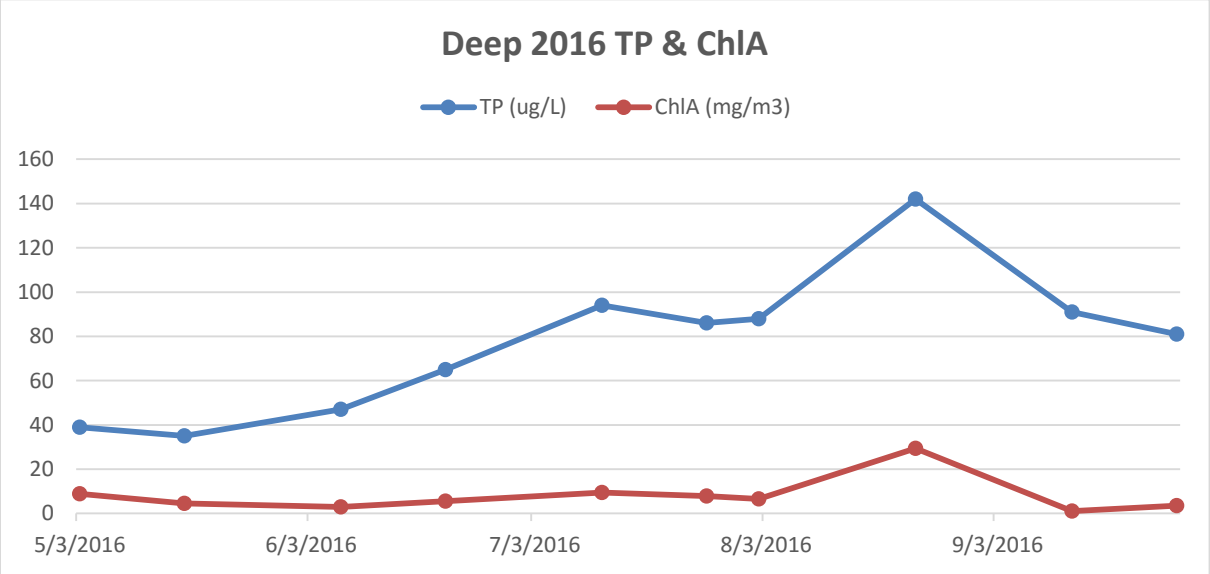
Deep Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/ Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	m	14.4	0.382	7.8	8.2
2009	112	21	1	6/10/2016	m	24.26	0.385	7.68	9.28
2010	55	15	0.9	7/20/2016	m	25.62	0.404	3.9	8.31
2011	95	12	1.2	9/20/2016	b	18.89	0.412	2.47	7
2012	87	12	1	9/20/2016	t	18.99	0.412	2.55	6.99
2013	121	21	1						
2014	136	13	1.1						
2015	89	23	1						
2016	76	8	1.1						

- Deep Lake YSI data is similar to that of Charlie Lake. Conductivity is on the high side. TP levels are very high with very low ChlA levels. This is unusual, TP and ChlA levels usually reflect each other, High TP = High ChlA, Low TP = Low ChlA. Charley is very weedy and this may be reducing the ChlA levels.

Deep Lake 2016 Raw Data

SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Deep	3/28/2016						45
Deep	5/3/2016	4.5	39	8.8	1.1	ND	
Deep	5/17/2016	4	35	4.6			
Deep	6/7/2016	4	47	2.9	0.97	ND	
Deep	6/21/2016	4	65	5.6			
Deep	7/12/2016	3	94	9.5	1.2	ND	
Deep	7/26/2016	3	86	7.9			
Deep	8/2/2016	5	88	6.6	1.2	ND	
Deep	8/23/2016	2.5	142	29.4			
Deep	9/13/2016	3.5	91	1.1	1.7	0.39	
Deep	9/27/2016	4.5	81	3.5			

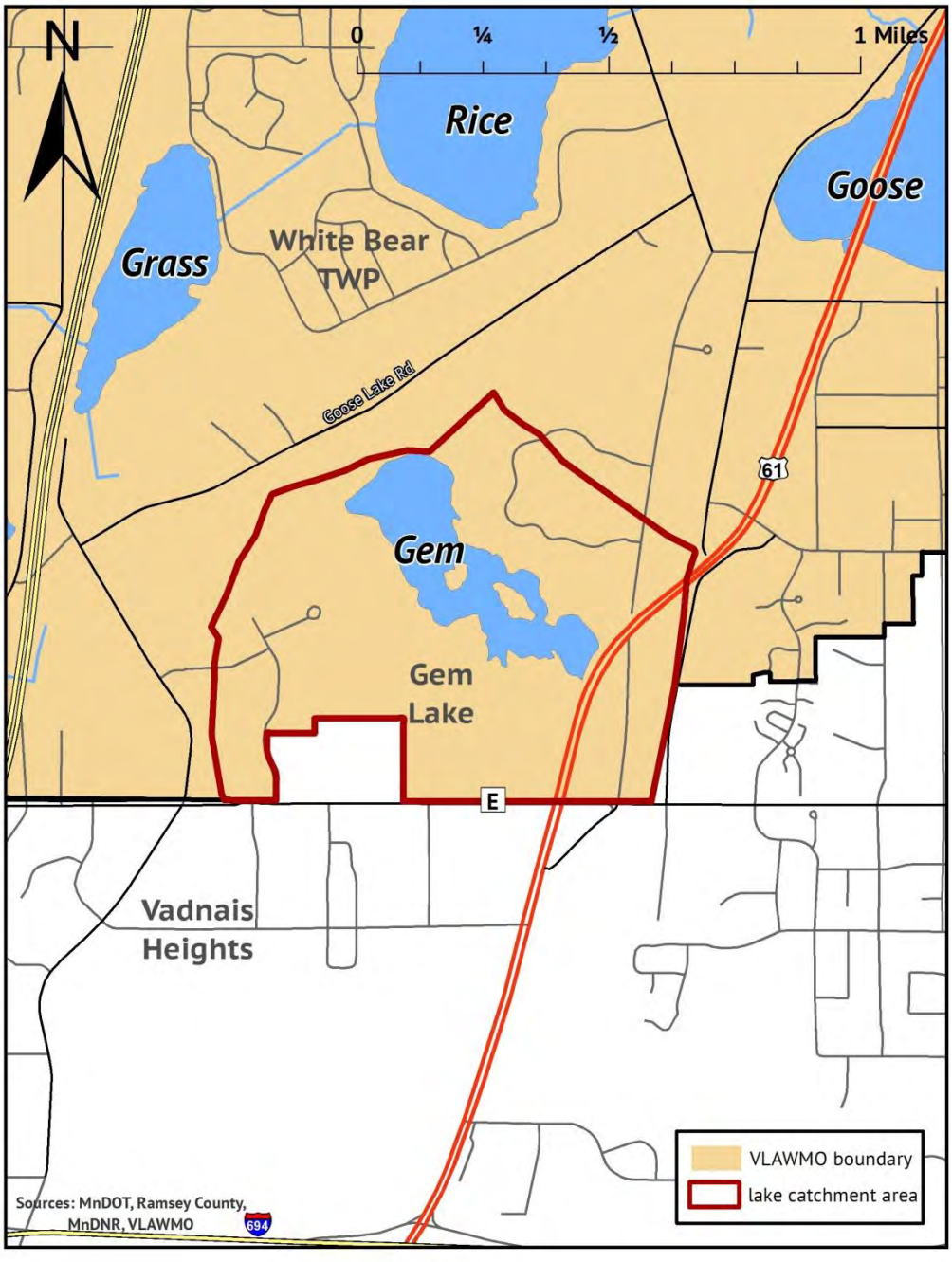
- Nitrogen and ammonia levels are below state standards for Deep Lake.

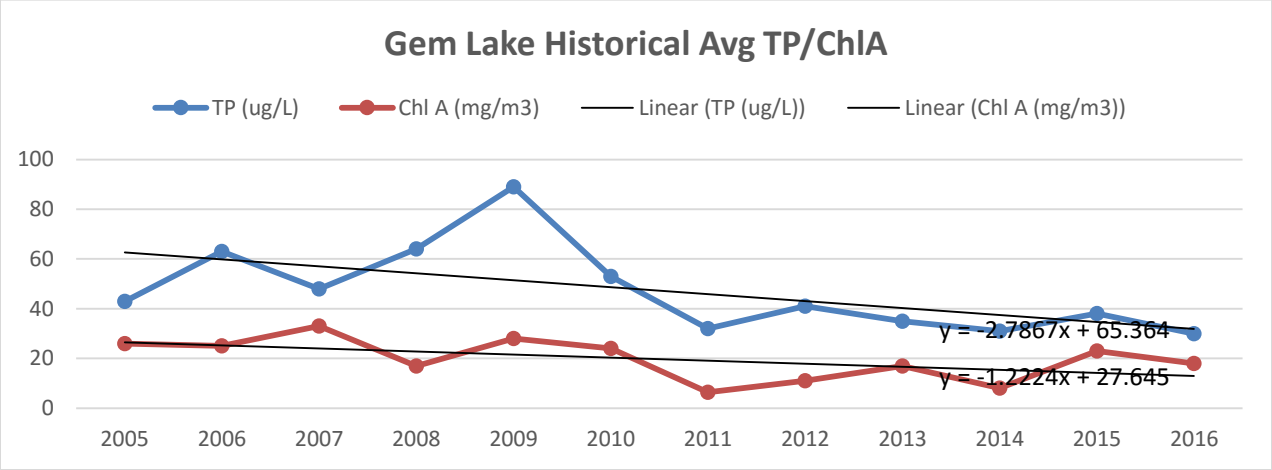


Gem Lake

Gem Lake is within the City of Gem Lake and has no public access. It is 25 acres in size and is 17 feet deep. There has been development along portions of the lake in recent years. In 2000, volunteers noticed a distinct algae bloom and noted that water clarity was getting poorer. Over the 16 years of monitoring data there is a slight up trend in TP levels with a slight down trend in ChlA levels.

Gem Lake has also been included on the Lambert Creek TMDL study for nutrient impairment. Recent years of monitoring data are suggesting that the trend may be heading down for nutrient levels in Gem Lake and the MN Pollution Control Agency will be assessing the data winter of 2017 for removal from the state impaired waters list. The City of Gem Lake, VLAWMO and stakeholders will be working together to implement the TMDL strategies from the approved 2014 report. MNDOT's Hwy 61 ditch work in 2011 has seemed to improve the water quality in Gem Lake.





Gem Lake Data

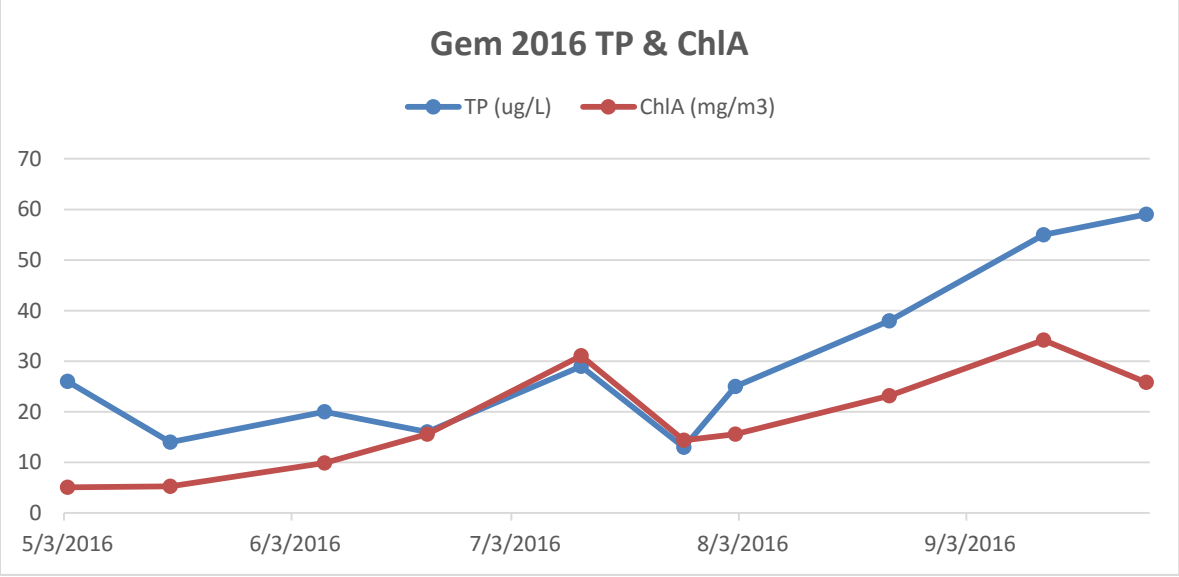
Gem Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Middle /Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.3	0.185	6.83	8.07
1997	54	23	1.2	5/16/2016	m	14.08	0.185	7.11	8.06
1998	33	24		5/16/2016	t	14.31	0.185	7.3	8.15
1999	26	16	1.2	6/10/2016	b	16.16	0.192	1	7.81
2000	36	17	1.1	6/10/2016	m	21.09	0.191	6.93	8.07
2001	56	12	1.8	6/10/2016	t	23.22	0.19	6.79	8.74
2002	39	25	1.3	7/20/2016	b	24.72	0.185	4.66	7.61
2003	52	20	1.4	7/20/2016	t	26.35	0.185	5.92	8.23
2004	49	0	1.5	9/20/2016	b	20.29	0.176	3.28	8.19
2005	43	26	0	9/20/2016	m	20.49	0.176	5.69	8.19
2006	63	25	0	9/20/2016	t	20.58	0.176	5.78	8.15
2007	48	33	1.1						
2008	64	17	1.5						
2009	89	28	1.3						
2010	53	24	1.4						
2011	32	6.4	2.1						
2012	41	11	2						
2013	35	17	2						
2014	31	8	2.9						
2015	38	23	2.2						
2016	30	18	1.6						

- Gem Lake YSI data is similar to that of other metro lakes. Conductivity is pretty low which is good and usually Gem Lake shows signs of stratification. At 17ft, Gem is the deepest lake VLAWMO monitors. Gem usually has a late season algae bloom and that was the case in 2015. TP and ChlA levels are well below state standards for the 5th year in a row. Hwy 61 was redone in 2011 and MNDOT did work on the ditches along the Hwy. That work seems to have benefited the water quality in Gem

Gem Lake 2016 Raw Data

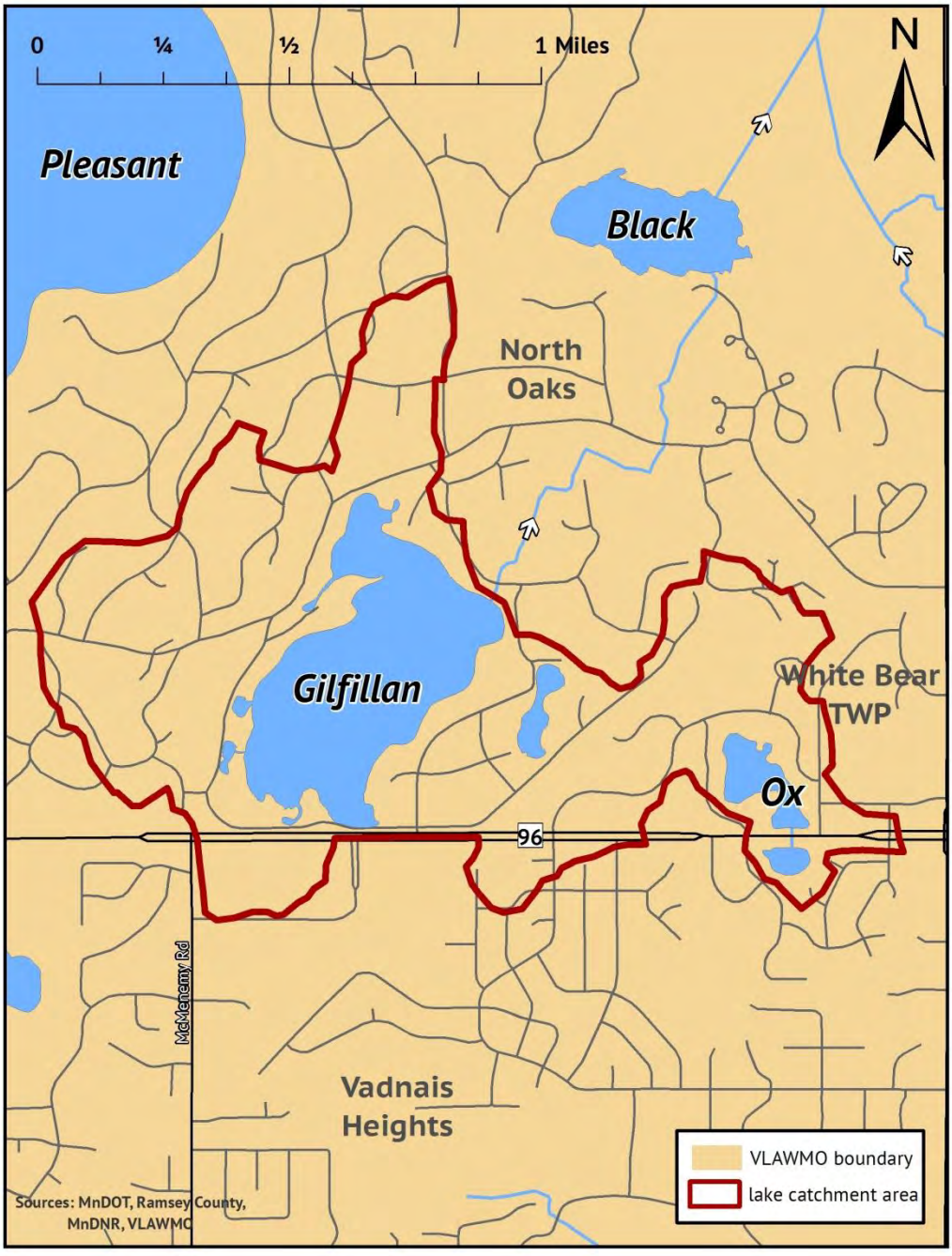
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Gem	3/28/2016						38
Gem	5/3/2016	8	26	5.1	0.71		
Gem	5/17/2016	9	14	5.3			
Gem	6/7/2016	5	20	9.9	1.1	ND	
Gem	6/21/2016	5.5	16	15.6			
Gem	7/12/2016	3	29	31.1	1.5	ND	
Gem	7/26/2016	4	13	14.4			
Gem	8/2/2016	5.5	25	15.6	0.88	ND	
Gem	8/23/2016	4	38	23.2			
Gem	9/13/2016	3	55	34.2	1	ND	
Gem	9/27/2016	4	59	25.8			

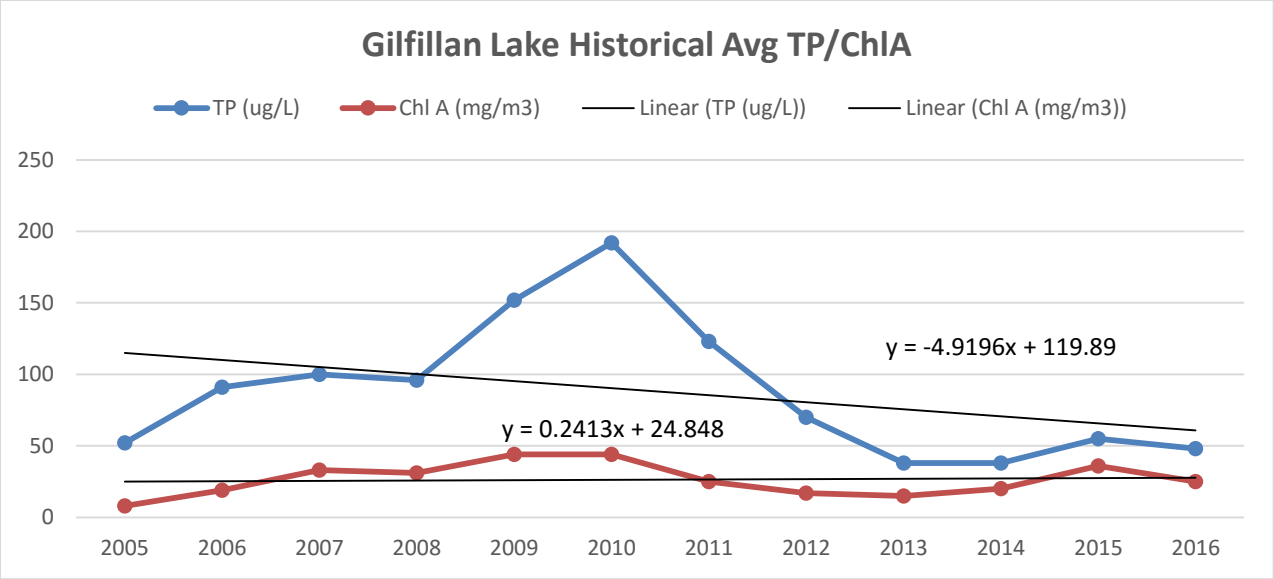
- Nitrogen and ammonia levels are below state standards for Gem Lake.



Gilfillan Lake

Gilfillan Lake is located within the City of North Oaks and is surrounded by homes. It is 110 acres with a maximum depth of 6 feet. The Minnesota Department of Natural Resources has used the lake for walleye stocking nursery in the past. According to available information, there has not been any fish stocking activity for a few years other than homeowners socking minnows. Gilfillan is one of four VLAWMO lakes that are part of the TMDL study due to nutrient impairment. The City of North Oaks and the SPRWS have been pumping water from Pleasant Lake to Gilfillan Lake to increase water levels. The pump, filter and piping were installed fall of 2011, pumping began spring of 2012. The increased water level (about 4.5ft) has significantly reduced nutrient levels in the lake, although they are still above state standards. The pumps have been turned on in the spring the last few years to make sure everything was working properly and were then shut off for the season due to high water. Water level stayed close to the max elevation of 910ft for the summer.





Gilfillan Lake Data

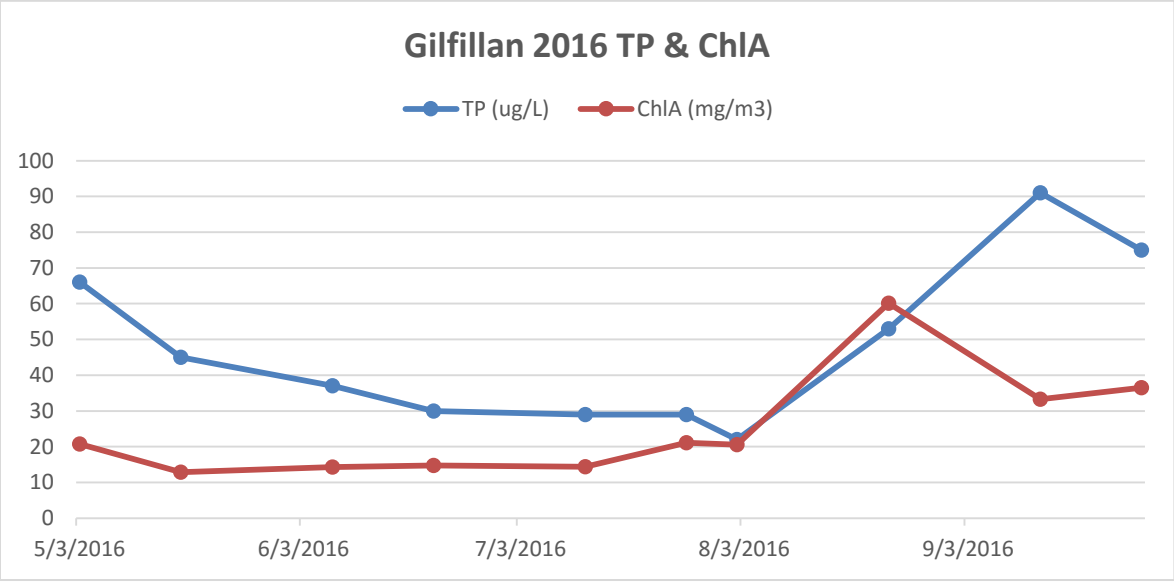
Gilfillan Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/ Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.69	0.28	7.4	7.88
1997	96	32	0.5	5/16/2016	t	14.33	0.279	7.62	7.79
1998	47	44	0.5	6/10/2016	b	20.37	0.282	8.11	8.74
1999	72	23	0	6/10/2016	t	24.07	0.28	7.91	9.02
2000	35	47	0	7/20/2016	b	24.9	0.269	7.85	8.41
2001	84	20	0	7/20/2016	t	26.7	0.27	7.8	8.59
2002	81	43	0.4	9/20/2016	b	19.96	0.267	7.6	8.01
2003	44	25	1.4	9/20/2016	t	20.51	0.267	7.66	8.14
2004	58	0	0						
2005	52	8	0						
2006	91	19	0						
2007	100	33	0.7						
2008	96	31	0.5						
2009	152	44	0.4						
2010	192	44	0.4						
2011	123	25	0.4						
2012	70	17	0.8						
2013	38	15	1						
2014	38	20	0.8						
2015	55	36	0.6						
2016	48	25	0.7						

- Gilfillan Lake YSI data is similar to that of other metro lakes. Conductivity is pretty low and is consistent with other lakes that don't receive much or any road runoff. Inlet data is from 2012, shows below state standard Tp levels being pumped into main lake. Since augmentation began again in 2012, lake nutrients have dropped substantially. This could very well be due to the 4+ft of Pleasant Lake water added to Gilfillan in 2012. Since 2012 very little augmentation has taken place to the lake due to natural precipitation keeping the lake at the residents desired elevation of around 910ft. Nutrient levels look be slightly rising from the lows at the start of augmentation.

Gilfillan Lake 2016 Raw Data

SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Gilfillan	3/28/2016						30
Gilfillan	5/3/2016	3	66	20.7	1.8		
Gilfillan	5/17/2016	2.5	45	12.9			
Gilfillan	6/7/2016	1.5	37	14.3	1.8	ND	
Gilfillan	6/21/2016	3	30	14.7			
Gilfillan	7/12/2016	3	29	14.4	1.4	ND	
Gilfillan	7/26/2016	2.5	29	21.1			
Gilfillan	8/2/2016	3.5	22	20.6	1.3	ND	
Gilfillan	8/23/2016	2.5	53	60.1			
Gilfillan	9/13/2016	3	91	33.3	1.5	ND	
Gilfillan	9/27/2016	2	75.000	36.5			

- Nitrogen and ammonia levels are below state standards for Gilfillan Lake.



Goose Lake

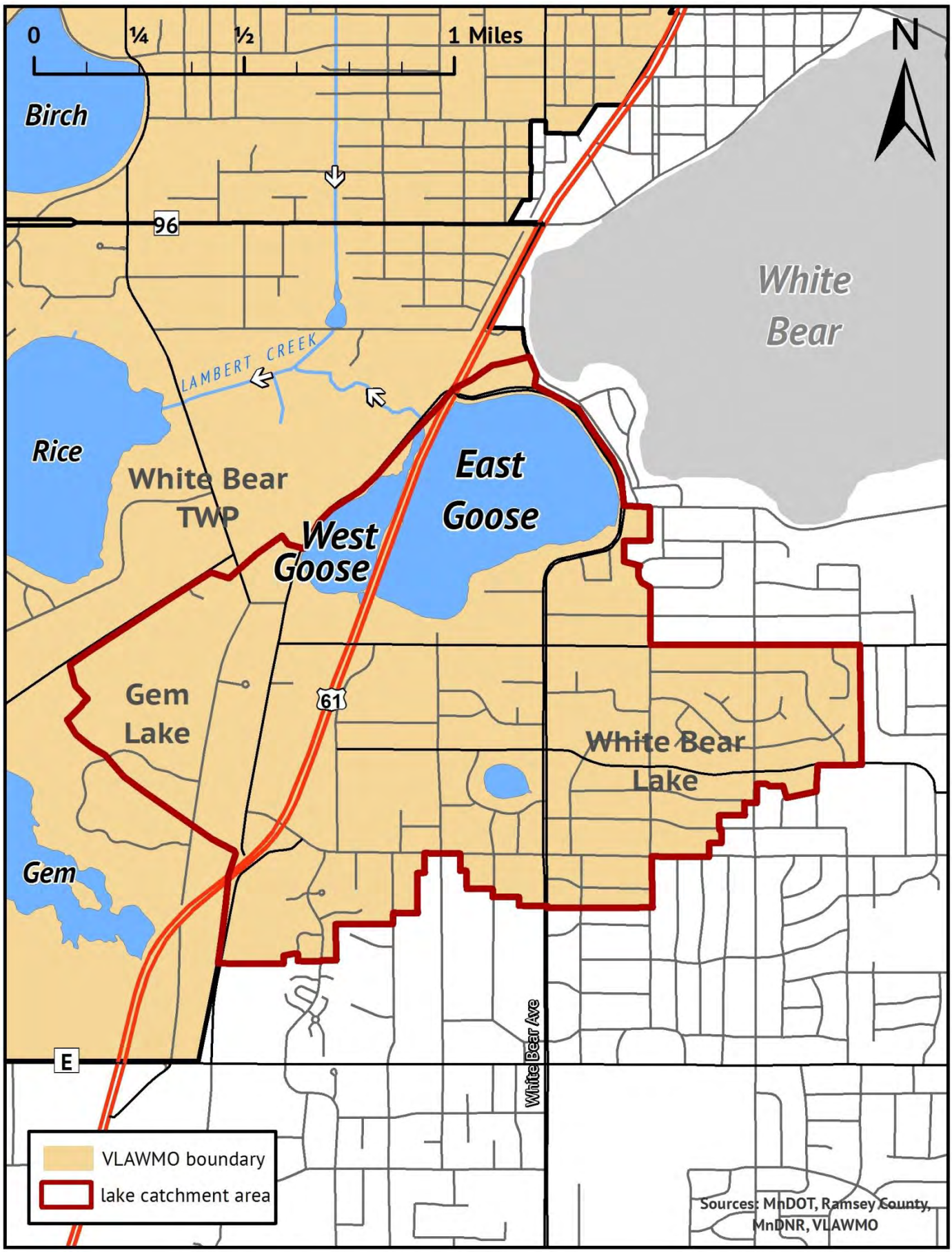
Goose Lake is located in White Bear Lake and is 145 acres with a maximum depth of 7 feet. The land use is largely residential and industrial around the lake and Highway 61 cuts through the lake. The old White Bear Lake sewage treatment plant discharged to Goose Lake for almost 50 years. A sediment study conducted in 1989 found that there was PCB contamination as well as high levels of cadmium, lead, and zinc. Another sediment study should be conducted to look for any changes in the last 20 years.

Though the lake is connected via culverts under the highway, VLAWMO began to assess the lake on each side of the road to track any differences between the two water bodies. In years past, only the east side of the lake was monitored. In 2006, VLAWMO began to collect samples from the west side. Both East and West Goose Lake are included in the Lambert Creek TMDL for nutrient impairment.

Groundwater used to cool equipment at the Kohler Mix Company is continuously discharging into the south end of West Goose Lake year round at a rate of 500 gallons/minute. This seems to be "flushing" the west side of the lake and could be a major reason the west side of the lake has consistently had better water quality compared to the east side over the years. The north end of West Goose discharges through a weir into Lambert Creek which flows into East Vadnais Lake, the drinking water reservoir for the SPRWS.

Approximately 16,000lbs of bullhead were removed out of both basins in 2013. The main source of nutrient issues in Goose Lake is from internal loading. Rough fish (bullhead, carp, sucker) suspend nutrients in the water column while foraging for food. We hope to see a decrease in nutrient levels over the next few years due to the rough fish removal. Spring of 2015 nets were be placed in the lake again to make sure the fish harvest was successful. BioBase surveys were done on both basins in 2014 to monitor the aquatic vegetation.

In 2017 another fish survey will be completed to determine how well the rough fish removal worked. VLAWMO also hired specialized consultants to work on Goose Lake to help determine what is causing the extremely high nutrient levels and to figure out what steps are needed to remedy the issue.


0
¼
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LAMBERT CREEK
Rice
White Bear TWP
East Goose
West Goose
Gem Lake
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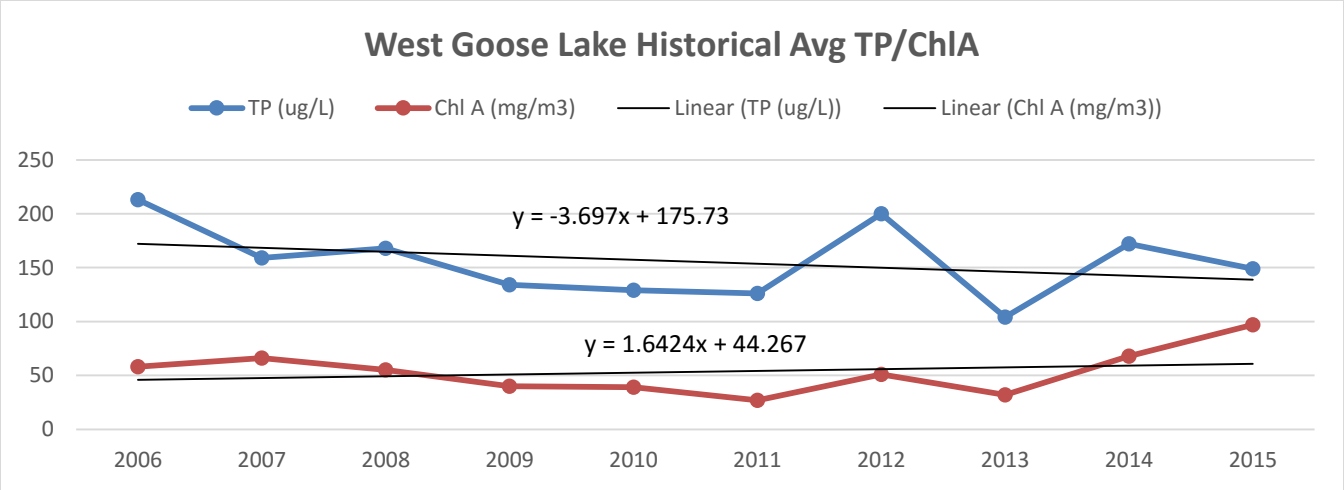
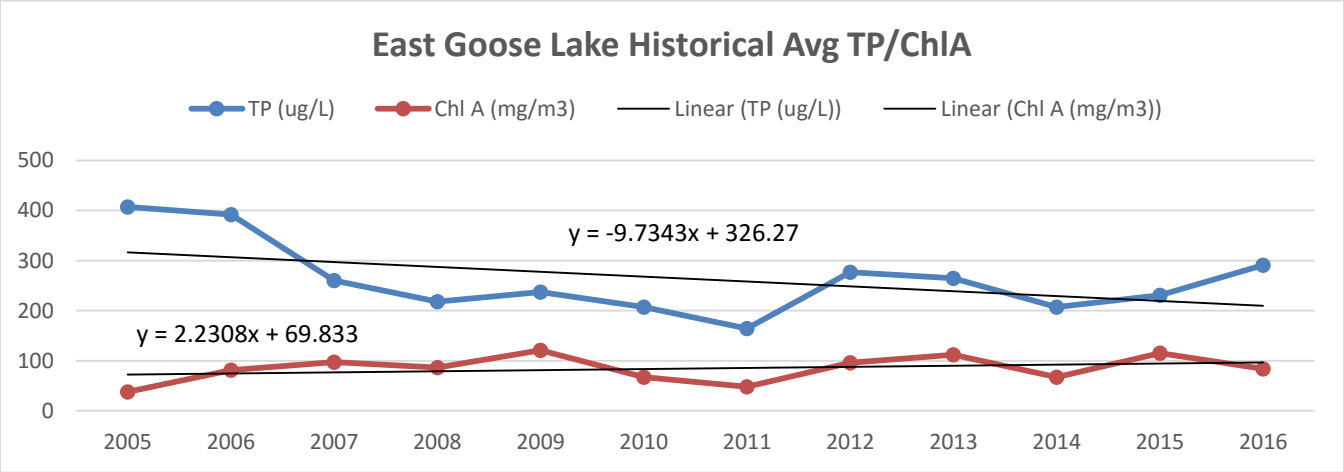
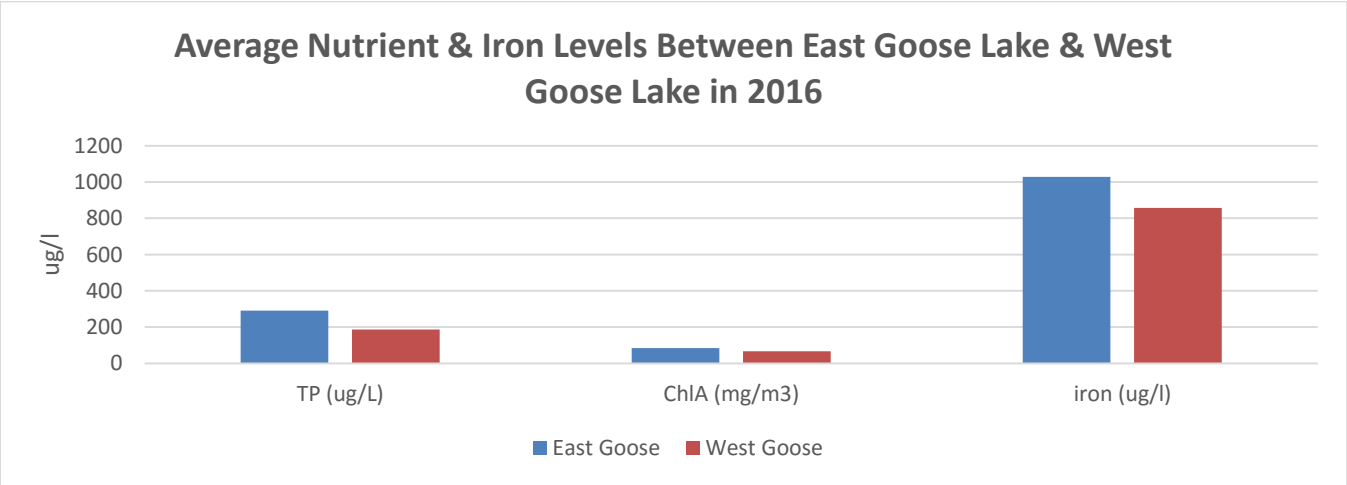
VLAWMO boundary
lake catchment area
Sources: MnDOT, Ramsey County, MnDNR, VLAWMO





- Both the East and West side are showing long term downward trends for both TP & ChlA. This is a good sign but both these water bodies are still well above state standards.



- Comparison of water quality between the two basins above shows that Goose Lake West has better average TP and Chla levels compared to Goose Lake East, however both basins are still above PCA

standards. TMDL will focus on strategies to move these two basins closer to state standards. Rough fish removal by VLAWMO along with new road construction projects around the lake by the City of White Bear Lake will hopefully help with both the external and internal nutrient loading to the lake reducing overall nutrient levels in the lake.

Goose Lake Data

East Goose

East Goose Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/ Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.11	0.323	9.01	9.01
1997	21	134	0.4	5/16/2016	t	13.21	0.323	8.93	8.93
1998	17	93	0.2	6/10/2016	b	19.81	0.332	2.14	8.68
1999	475	56	0.3	6/10/2016	t	24.01	0.374	12.2	10.19
2000	49	154	0.3	7/20/2016	b	24.26	0.306	1.28	N/A
2001	603	28	0.3	7/20/2016	t	25.88	0.315	7.07	N/A
2002	613	170	0.2	9/20/2016	b	19.39	0.259	6.6	9.18
2003	342	66	0.3	9/20/2016	t	19.76	0.26	6.95	9.31
2004	526	0	0						
2005	407	38	0						
2006	392	81	0						
2007	260	97	0						
2008	218	86	0.3						
2009	237	121	0.3						
2010	207	67	0.3						
2011	164	48	0.3						
2012	277	96	0.2						
2013	265	112	0.5						
2014	207	67	0.4						
2015	231	115	0.6						
2016	291	84	0.5						

- East Goose Lake YSI data is similar to that of other metro lakes.

West Goose

West Goose Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.43	0.302	7.4	8.12
2006	213	58		5/16/2016	t	13.61	0.302	7.82	8.52
2007	159	66		6/10/2016	b	23.33	0.312	7.91	9.08
2008	168	55	0.3	6/10/2016	t	23.43	0.312	7.81	9.12
2009	134	40	0.5	7/20/2016	b	26.12	0.301	5.7	8.75
2010	129	39	0.5	7/20/2016	t	26.17	0.301	5.85	8.96
2011	126	27	0.8	9/20/2016	b	19.93	0.281	7.12	9.02
2012	200	51	0.7	9/20/2016	t	20	0.281	7.24	9.17
2013	104	32	1						
2014	172	68	0.5						
2015	149	97	0.5						
2016	187	67	0.4						

- West Goose Lake YSI data is similar to that of East Goose Lake. .

Goose Lake 2016 Raw Data

East Goose

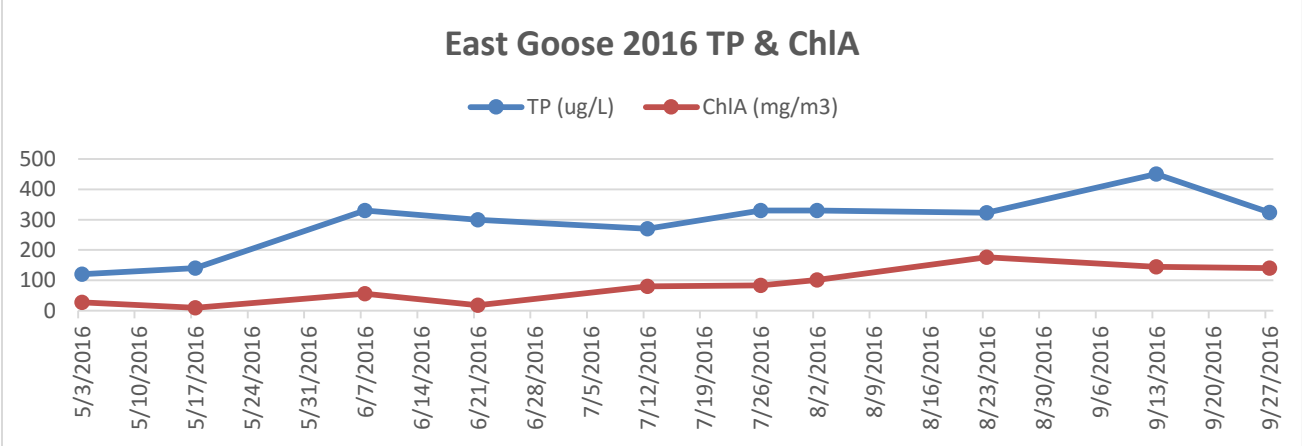
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)	Iron (ug/L)
East Goose	3/28/2016						61	
East Goose	5/3/2016	2	120	27.7	2.1			527
East Goose	5/17/2016	1.25	140	9.6				681
East Goose	6/7/2016	0.5	330	56	3.9	ND		923
East Goose	6/21/2016	0.5	300	18.6				1020
East Goose	7/12/2016	0.5	270	80.1	3.2	ND		846
East Goose	7/26/2016	0.5	330	83.3				1590
East Goose	8/2/2016	0.5	330	102	2.7	ND		1160
East Goose	8/23/2016	0.5	323	176				1290
East Goose	9/13/2016	0.5	450	145	3.5	ND		1200
East Goose	9/27/2016	0.5	324	140				1050

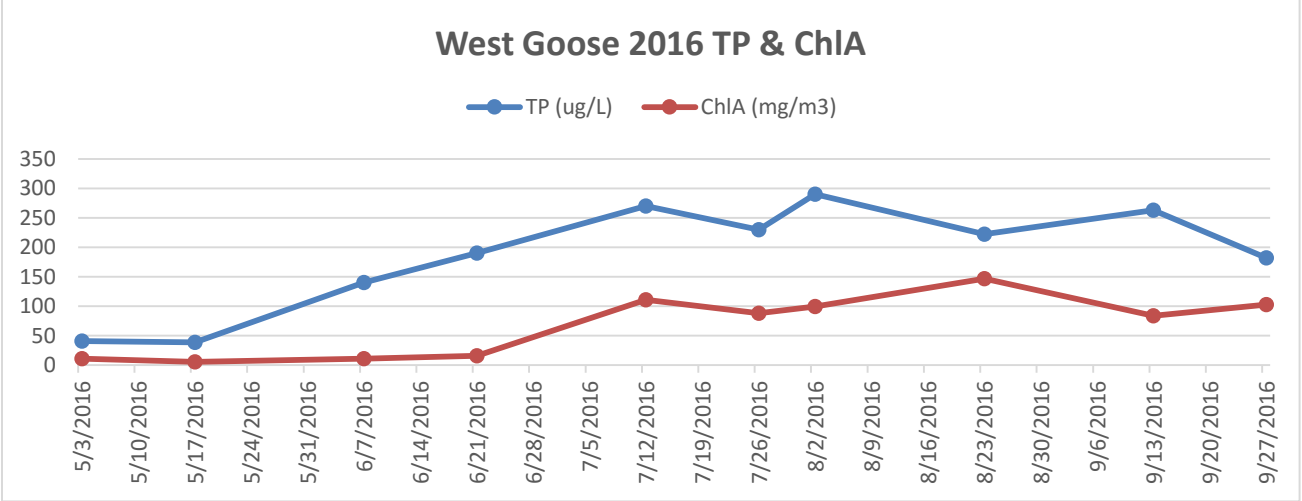
- Iron levels are well above standards for East Goose Lake 300 ug/l

West Goose

SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)	Iron (ug/L)
West Goose	3/28/2016						29	
West Goose	5/3/2016	3.5	41	10.9	0.86			651
West Goose	5/17/2016	2.5	39	5.5				330
West Goose	6/7/2016	1	140	11.2	2.4	ND		885
West Goose	6/21/2016	0.5	190	15.9				845
West Goose	7/12/2016	0.5	270	111	4.1	ND		1080
West Goose	7/26/2016	0.5	230	88				930
West Goose	8/2/2016	0.5	290	99.5	1.1	ND		888
West Goose	8/23/2016	0.5	222	147				1330
West Goose	9/13/2016	0.5	263	83.8	1.1	ND		684
West Goose	9/27/2016	0.5	182	103				942

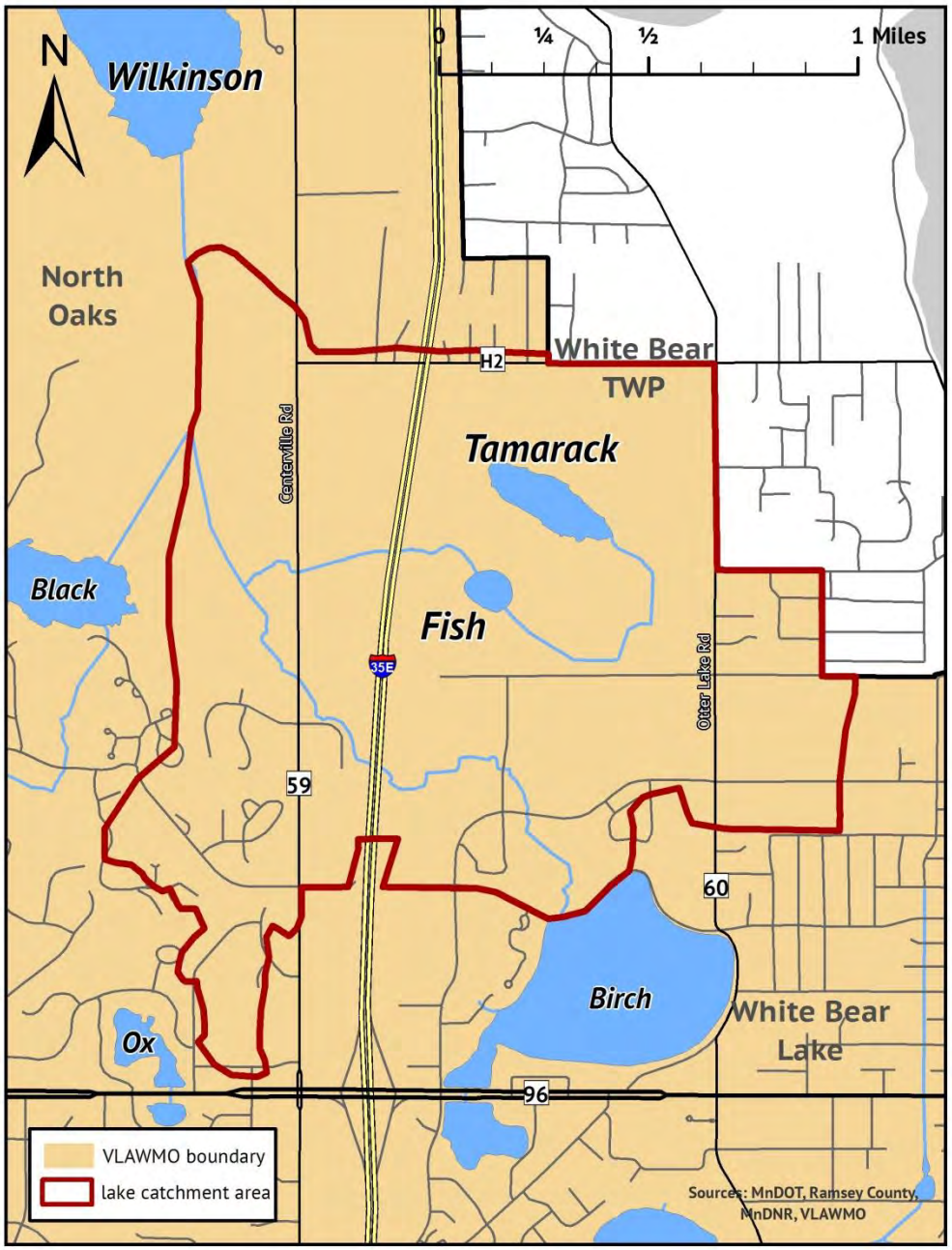
- Iron levels are well above standards for West Goose Lake. West side levels are slightly lower than the East side levels, overall they are pretty similar considering the big differenceses in nutrient levels between the two basins even though they are connected.

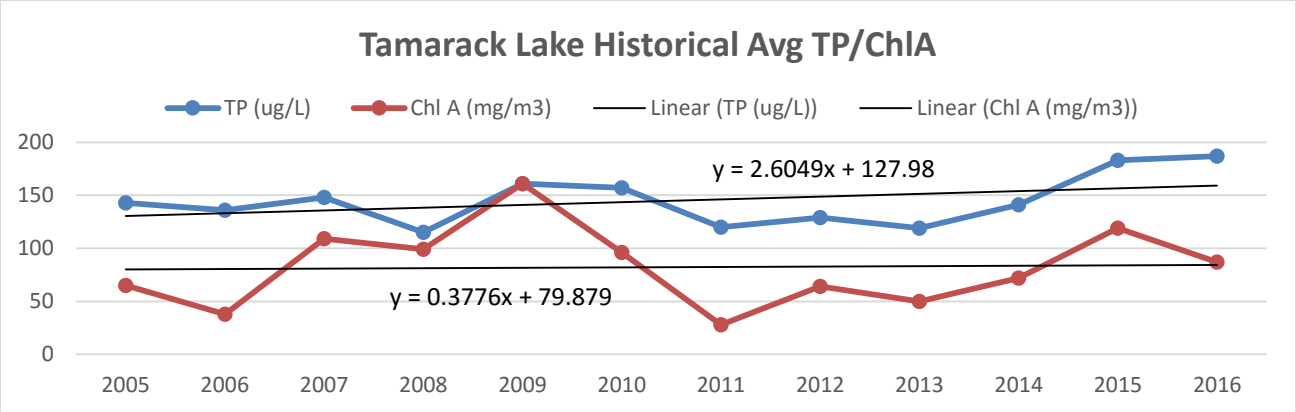




Tamarack Lake

Tamarack Lake is part of the Tamarack Nature Center. It is 86 acres with a maximum depth of 10 feet. As there is no boat access, samples are taken from the observation dock on the southeast side of the lake. Ramsey County restored a large ditched wetland downstream of Tamarack and upstream of Fish Lake, as part of a wetland-banking project in 1997. Tamarack Lake is one of 4 lakes listed as impaired for nutrients on the 2010 Lambert Creek TMDL study. Internal loading is the major reason for the impairment. This is a very isolated lake with a large natural buffer, runoff from Hwy 35E will make its way to Tamarack on the west side after going through a large wetland. Historically Tamarack was surrounded by farmland. TP & ChlA levels are extremely high and show little sign of lowering. In the summer of 2013 VLAWMO installed a floating island on the lake. The island was planted with native vegetation. The root systems that develop below the island create a large surface area for highly beneficial microbes allowing for increased nutrient uptake and reduction in overall nutrient levels in the lake.





Tamarack Lake Data

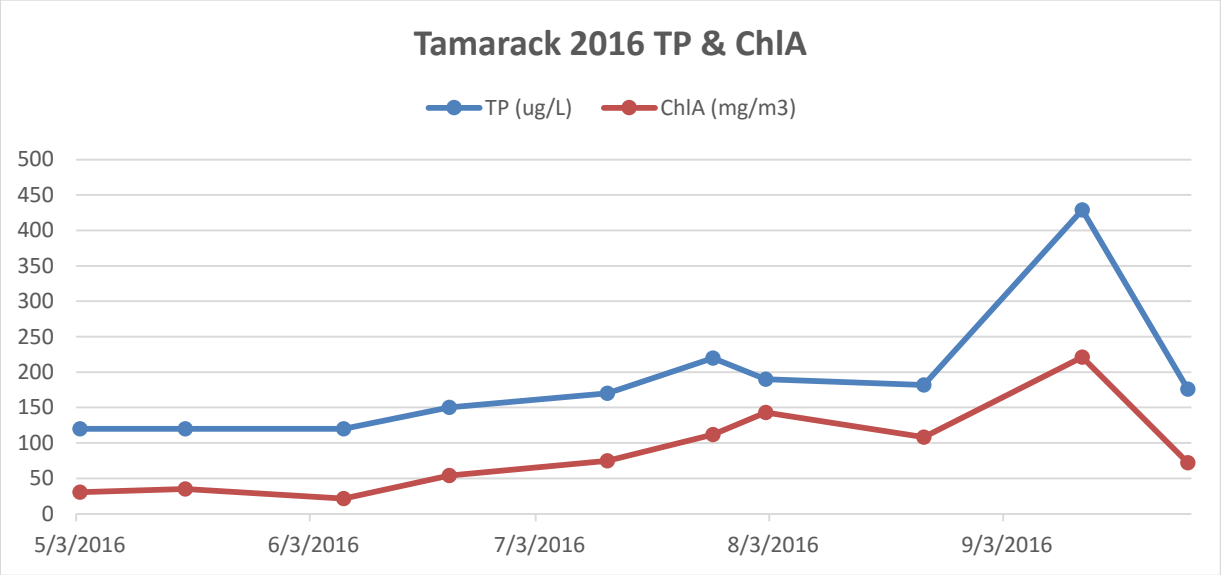
Tamarack Lake Historical Avg TP/ChlA/SDT					Dock			
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)		6/7/2016	7/12/2016	8/2/2016	8/13/2016
1997	17	180	0.2	Sample ID	V70	V111	V153	V194
1998	54	32	0.5	Temp.	20.22/20.04	25.66/25.44	25.7/26.56	20.53/20.59
1999	90	26	0.4	Cond.	.405/.406	.387/.390	.376/.369	.370/.369
2000	60	27	0.4	DO	6.97/6.74	6.71/6.20	4.21/8.72	6.56/6.60
2001	132	37	0.4	pH	8.42/8.33	8.51/8.33	8.42/8.87	8.08/8.25
2002	164	120	0.4	Secchi Depth	1.5 ft	1	1	1
2003	168	95	0.3	Weather conditions	Sunny & warm	Sunny & warm	Sunny & humid	Sunny & cool
2004	96	0	0.8		Island			
2005	143	65	0		6/7/2016	7/12/2016	8/2/2016	8/13/2016
2006	136	38	0	Sample ID	V71	V112	V154	V195
2007	148	109	0.5	Temp.	20.09/19.28	25.04/24.43	22.38/27.67	20.47/20.59
2008	115	99	0.3	Cond.	.404/.408	.387/.402	.475/.362	.369/.369
2009	161	161	0.2	DO	7.20/6.70	6.61/3.64	.41/8.40	5.57/5.61
2010	157	96	0.2	pH	8.40/8.23	8.09/7.32	7.40/8.46	8.29/8.27
2011	120	28	0.6	Secchi Depth	1.5	1	1	1
2012	129	64	0.4	Weather conditions	Sunny & warm	Sunny & warm	Sunny & humid	Sunny & cool
2013	119	50	0.5					
2014	141	72	0.5					
2015	183	119	0.4					
2016	187	87	0.4					

- Tamarack Lake YSI data is similar to that of similar metro lakes, nutrient levels are very high especially for an isolated lake with significant buffers. Internal loading is most likely the cause of these high levels.

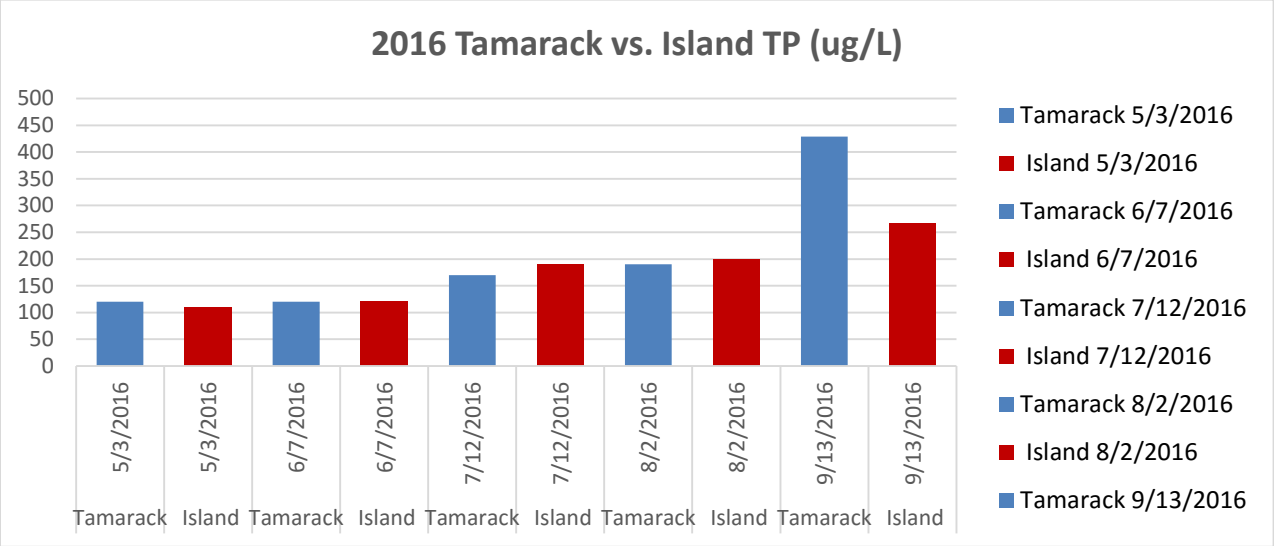
Tamarack Lake 2016 Raw Data

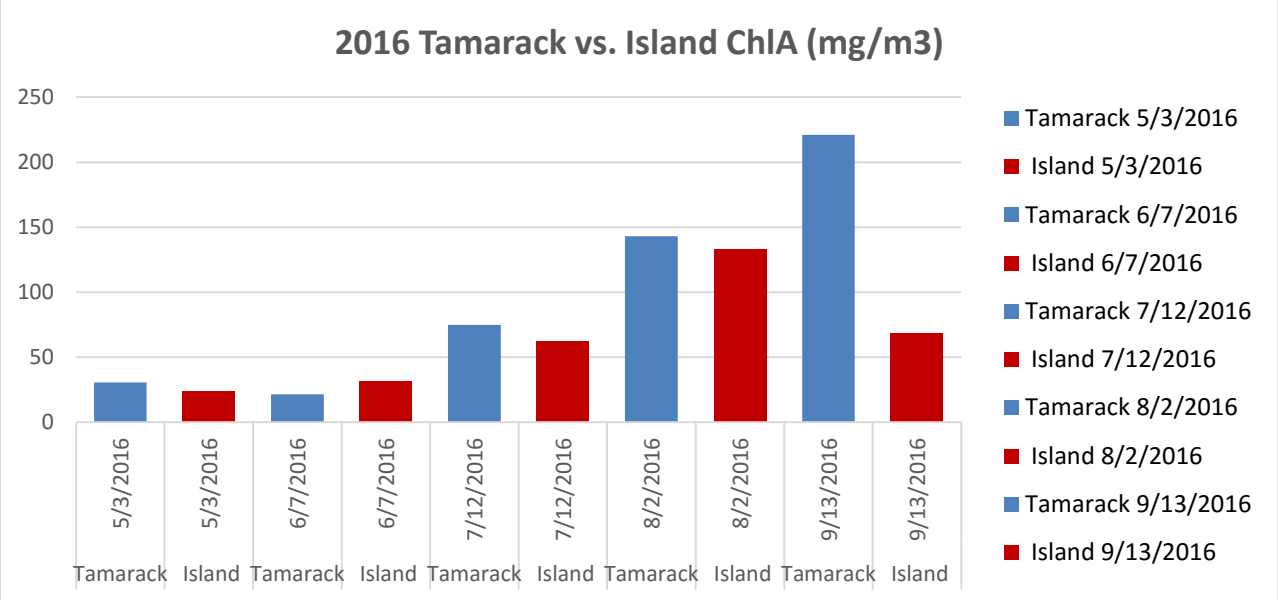
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Tamarack	3/28/2016						30
Tamarack	5/3/2016	1.5	120	30.5	1.9		
Tamarack	5/17/2016	1.5	120	34.9			
Tamarack	6/7/2016	1.5	120	21.4	2.3	ND	
Tamarack	6/21/2016	1.5	150	54.1			
Tamarack	7/12/2016	1	170	75	2.7	ND	
Tamarack	7/26/2016	1	220	112			
Tamarack	8/2/2016	1	190	143	3.5	ND	
Tamarack	8/23/2016	1	182	108			
Tamarack	9/13/2016	1	429	221	2.4	ND	
Tamarack	9/27/2016	0.5	176	72			

- Nitrogen and ammonia levels are below state standards for Tamarack Lake and similar to the rest of the VLAWMO lakes



Floating Island Data





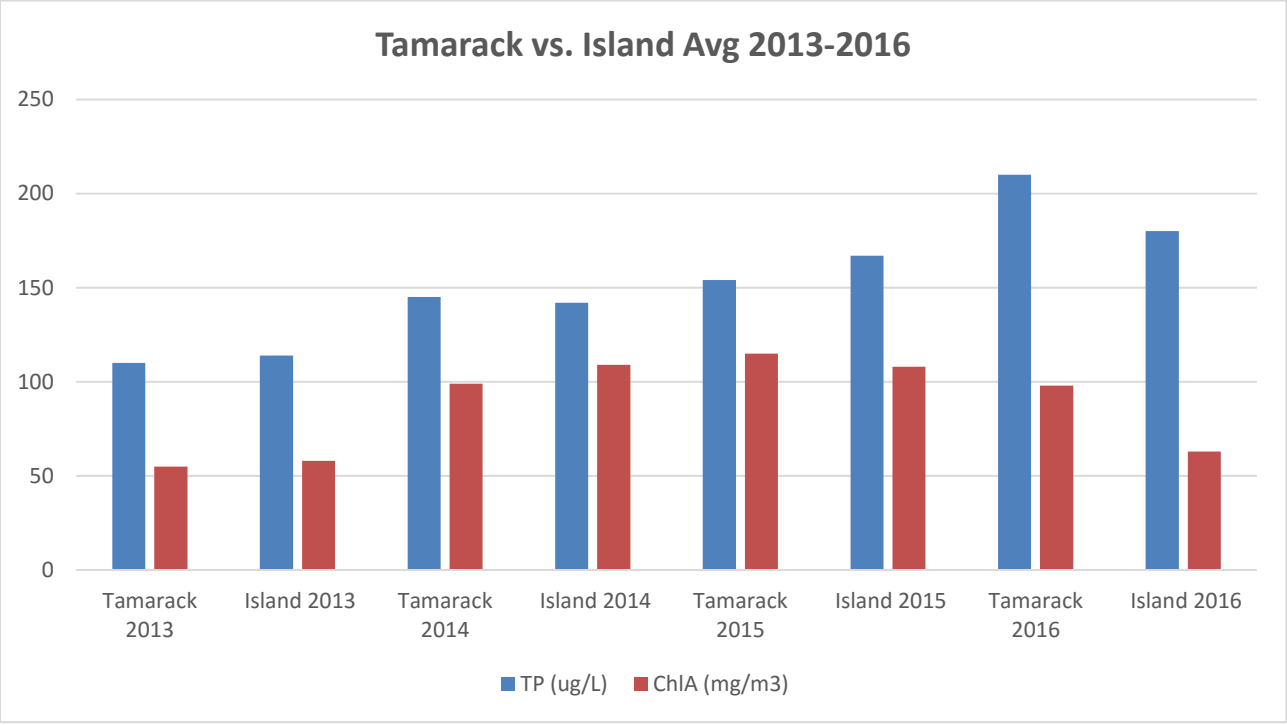
- A floating island was installed July 2013 to reduce nutrient levels in Tamarack. Island is located in the middle of the lake. Samples are taken at both the island and the dock each sample run to monitor changes between both sits. Below is the potential effect the island could have on nutrient levels

Reductions based on 2012 avg TP of 129 ug/L			
reductions	result (ug/L)	reductions	result (ug/L)
10%	116.1	25%	96.75
15%	109.65	50%	64.5

Tamarack VS Floating Island 2016 Raw Data

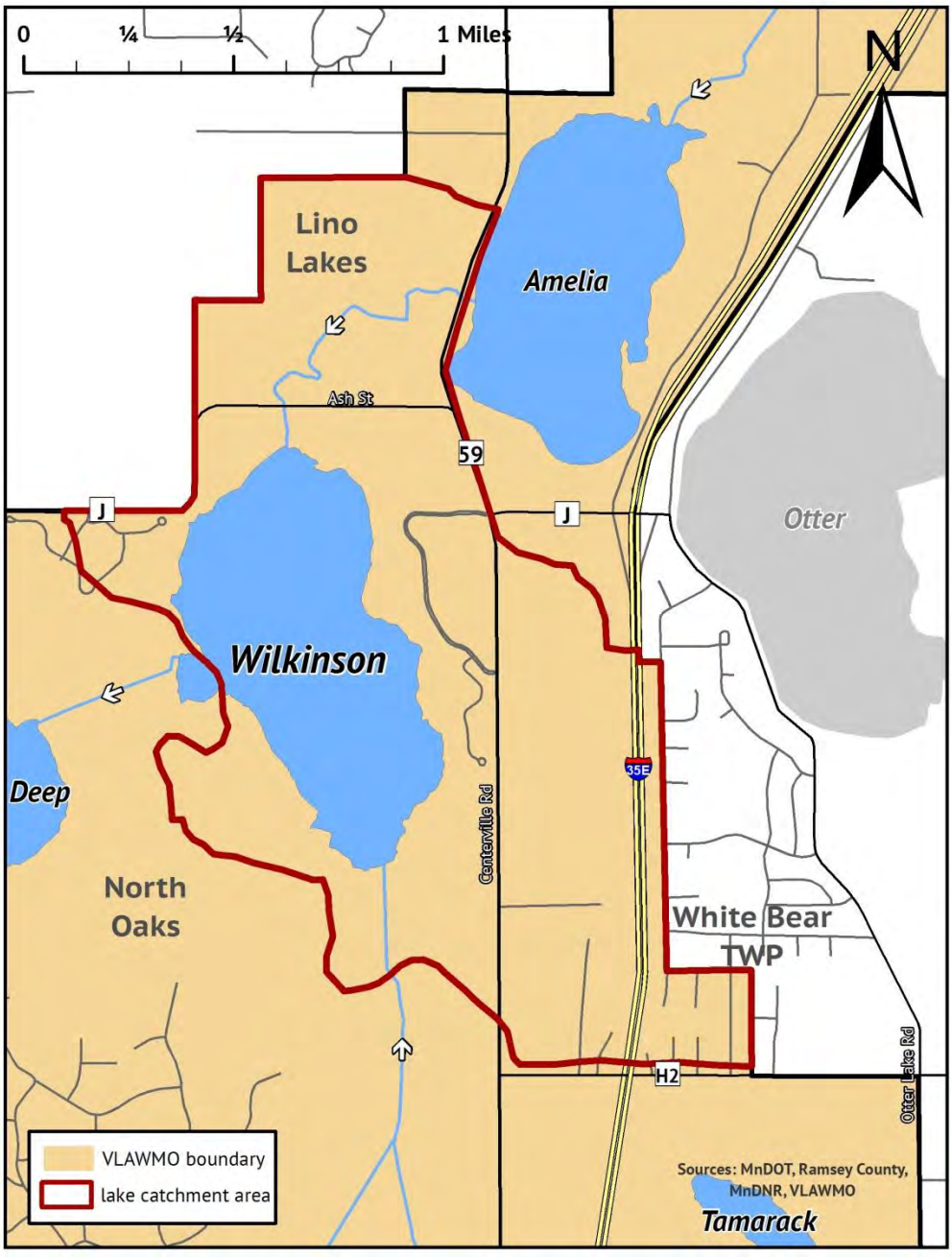
SITE	DATE	Secchi (ft)	TP (mg/L)	ChlA (ug/l)	TKN (mg/L)	NH3 (mg/L)
Tamarack	5/3/2016	1.5	0.12	30.5	1.9	
Tamarack	6/7/2016	1.5	0.12	21.4	2.3	ND
Tamarack	7/12/2016	1	0.17	75	2.7	ND
Tamarack	8/2/2016	1	0.19	143	3.5	ND
Tamarack	9/13/2016	1	0.4291	221	2.4	ND
	average	***1.20***	***0.21***	***98.18***	***2.56***	***#DIV/0!***
Island	5/3/2016	1.75	0.11	24	2.3	
Island	6/7/2016	1.5	0.12	31.8	2.2	ND
Island	7/12/2016	2	0.19	62.6	3	ND
Island	8/2/2016	1	0.2	133	3.2	ND
Island	9/13/2016	1	0.267	68.5	2.3	ND
	average	***1.45***	***0.18***	***63.98***	***2.60***	***#DIV/0!***
	Difference	***-0.25***	***0.03***	***34.20***	***-0.04***	***#DIV/0!***

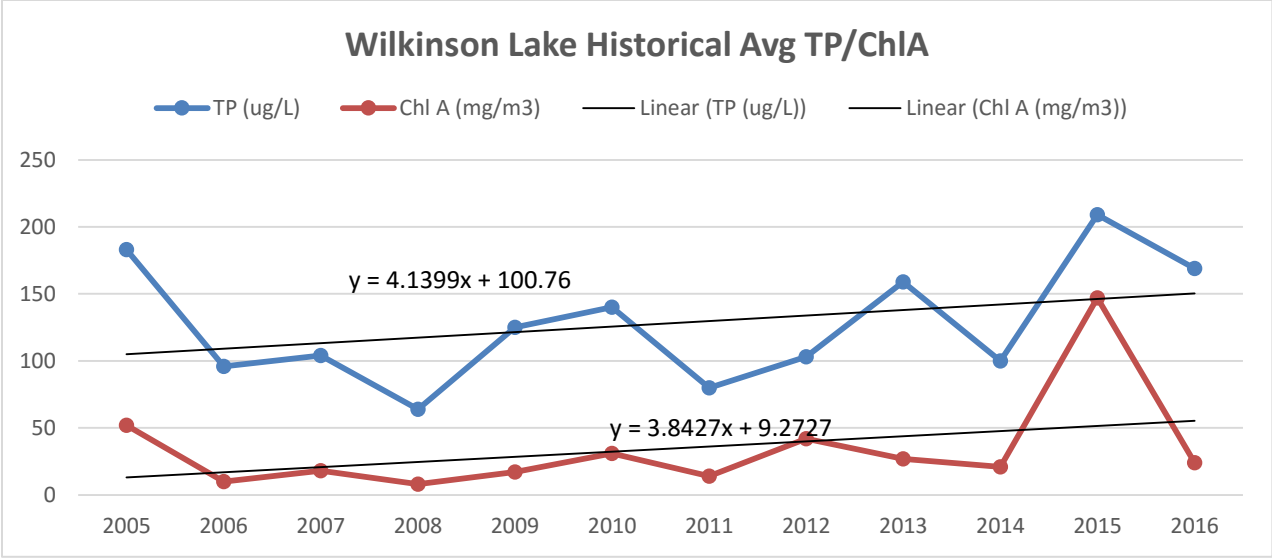
- This was the fourth year of sampling the Island and there has yet to be any significant sign of water quality improvement in Tamarack Lake from the Island. ChlA was much lower at the Island this year, but will have to see if this trend continues to be able to conclude the Island is helping.



Wilkinson Lake

Wilkinson Lake was part of the James J. Hill experimental farm and is now part of the Minnesota Land Trust, which preserves the land in a natural condition. The City of North Oaks required 150-foot buffer between the lake edge and any structures. The property on the northwest side of the lake is currently being developed. The North Oaks Company has spent considerable time and effort over the years to restore the lake including the installation of a fish barrier to attempt to keep the rough fish from destroying the natural vegetation and waterfowl habitat and to improve water quality. The lake has also had two drawdowns to kill the carp. Wilkinson is the fourth lake within VLAWMO to be on the 2010 impaired waters list for nutrients and is part of the on-going Lambert Creek TMDL study. Farmland runoff and internal loading seem to be the main factors to the poor water quality. Water quality has not changed much over the last 16 years of monitoring, but a noticeable spike in average TP levels has occurred the last three years. TP levels are still within the 16 year monitoring range.





Wilkinson Lake Data

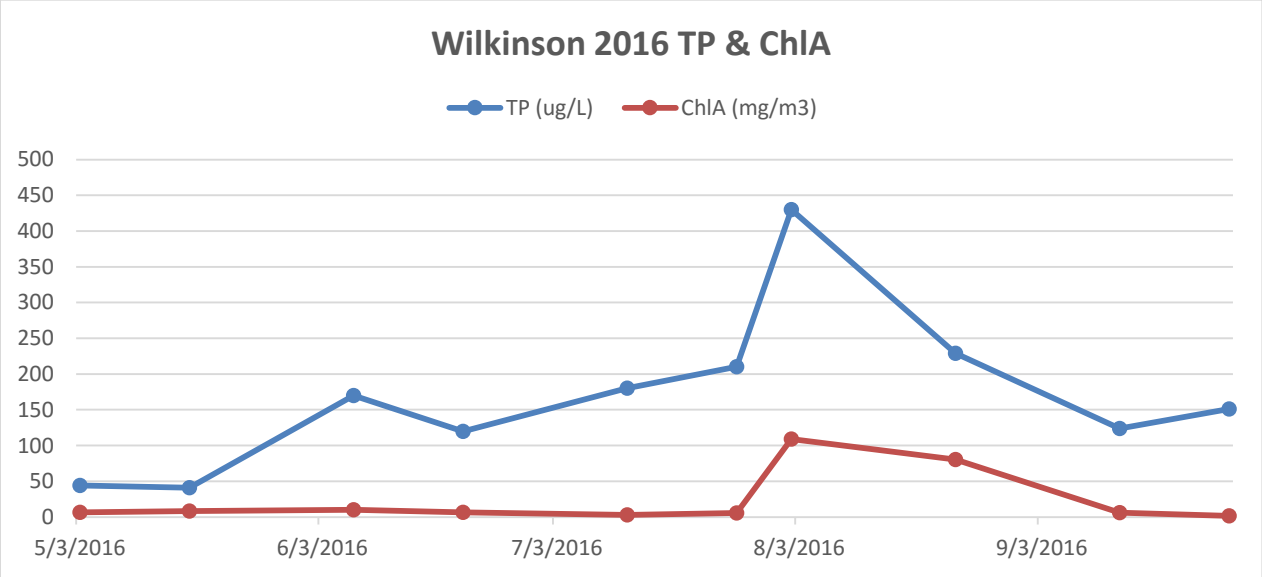
Wilkinson Lake Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	12.91	0.467	9.06	8.16
1998	48	26	1.1	5/16/2016	t	13.69	0.469	8.71	8.15
1999	62	8	0	6/10/2016	b	22.97	0.381	3.22	8.75
2000	38	34	0	6/10/2016	t	24.25	0.377	7.52	9.16
2001	299	99	0.2	7/20/2016	b	24.73	0.413	2.27	8.31
2002	107	40	0	7/20/2016	t	25.2	0.419	3.3	8.24
2003	130	18	0	9/20/2016	b	18.7	0.422	1.05	7.79
2004	72	0	0	9/20/2016	t	19.07	0.422	0.85	8.2
2005	183	52	0						
2006	96	10	0						
2007	104	18	0.9						
2008	64	8	0.3						
2009	125	17	1						
2010	140	31	0.8						
2011	80	14	1						
2012	103	42	0.9						
2013	159	27	0.9						
2014	100	21	0.9						
2015	209	147	0.5						
2016	169	24	1.1						

- Wilkinson Lake YSI data is similar to that of similar metro lakes, DO's are slightly lower on average than the rest of VLAWMO lakes, Conductivity is on the high side for VLAWMO lakes.

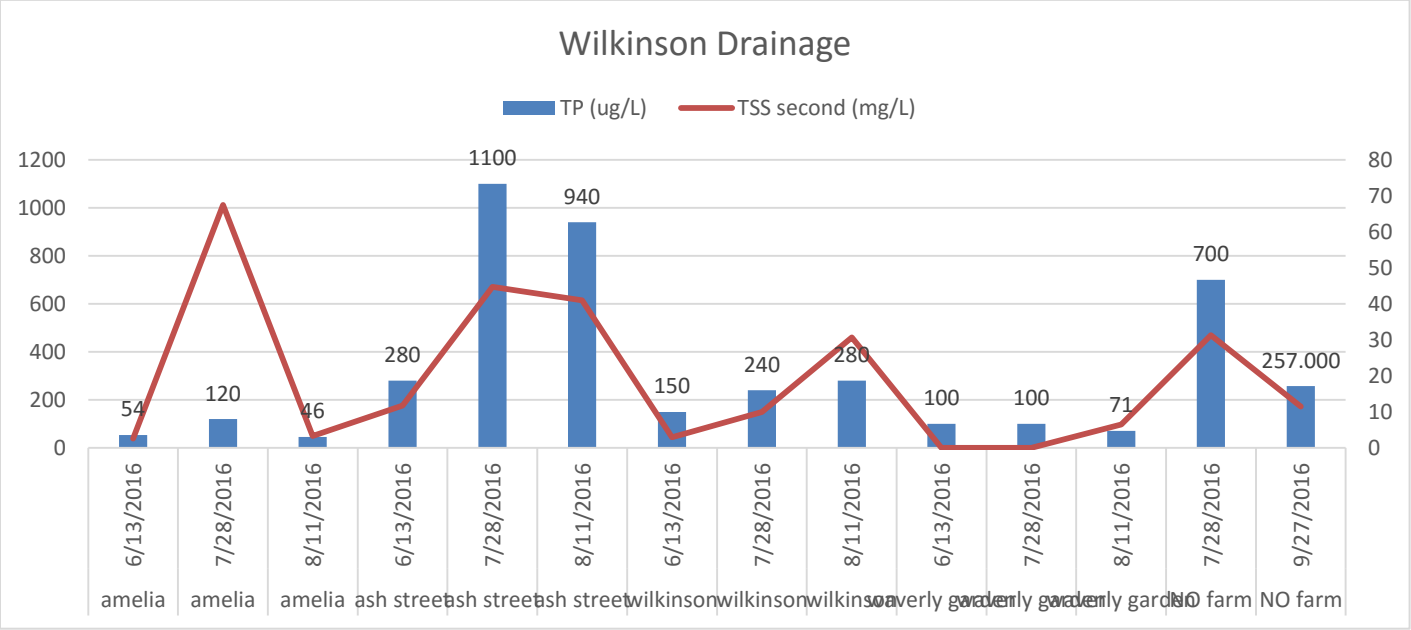
Wilkinson Lake 2016 Raw Data

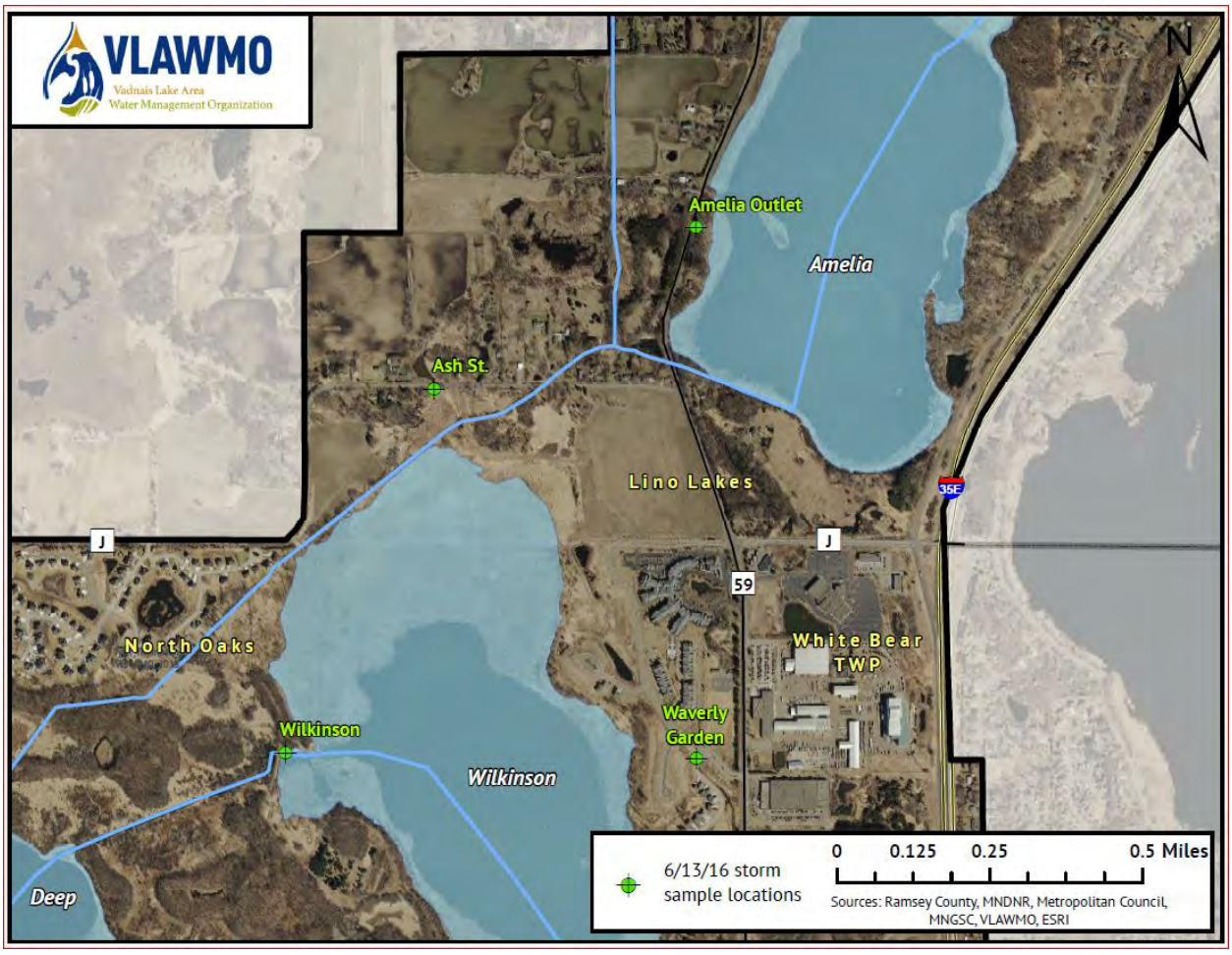
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
Wilkinson	3/28/2016						55
Wilkinson	5/3/2016	3.5	44	6.6	1.1		
Wilkinson	5/17/2016	4.5	41	8.1			
Wilkinson	6/7/2016	4.5	170	10.3	1.7	0.25	
Wilkinson	6/21/2016	3	120	6.4			
Wilkinson	7/12/2016	4.5	180	3	1.6	0.15	
Wilkinson	7/26/2016	3	210	5.6			
Wilkinson	8/2/2016	1	430	109	2.3	ND	
Wilkinson	8/23/2016	1.5	229	80.5			
Wilkinson	9/13/2016	4	124	6	1.8	0.51	
Wilkinson	9/27/2016	4	151	1.6			

- Nitrogen and ammonia levels are below state standards for Wilkinson Lake and similar to the rest of the VLAWMO lakes. TP levels have increased dramatically over the last two years but are still within the 16 year monitoring range



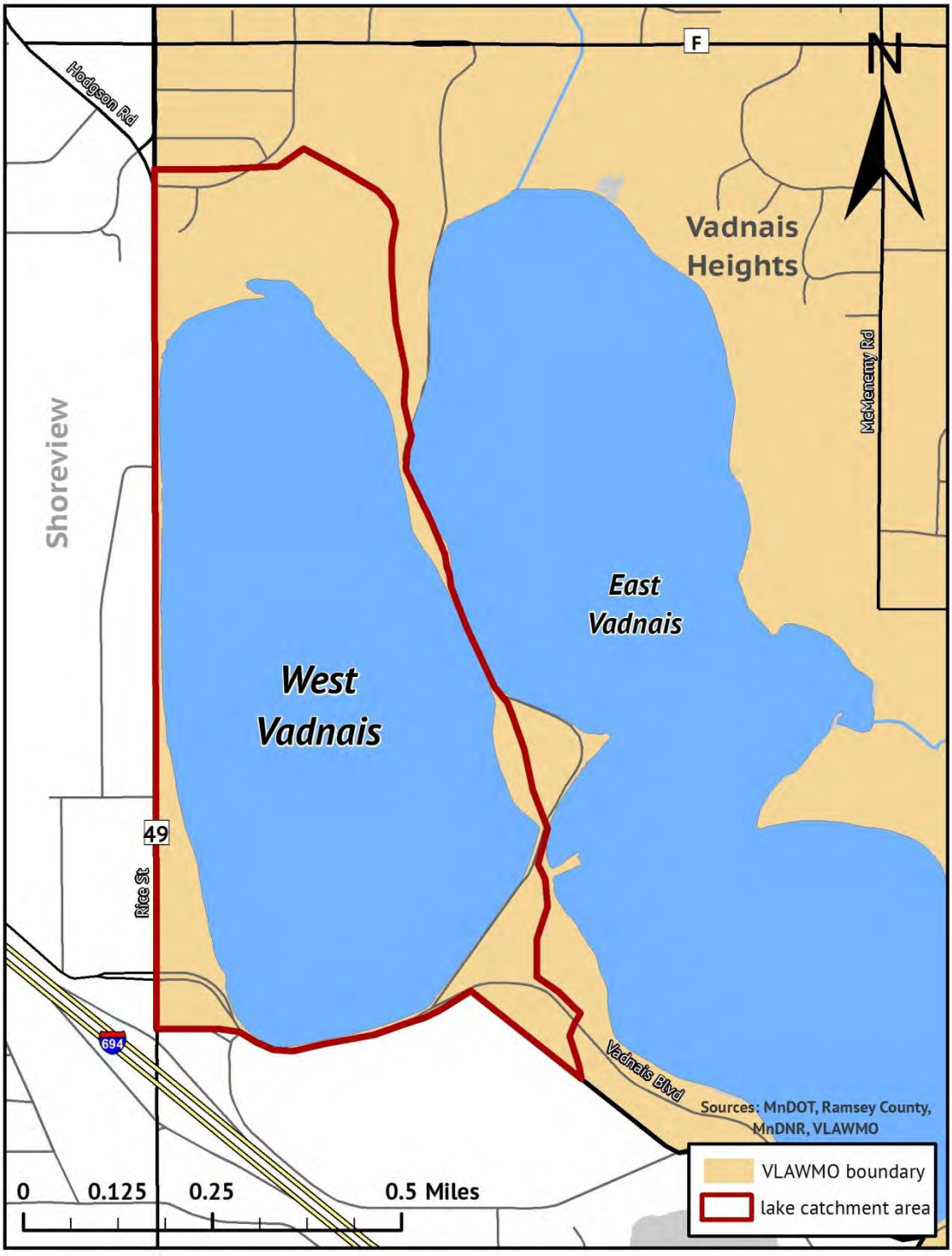
Wilkinson Drainage Data

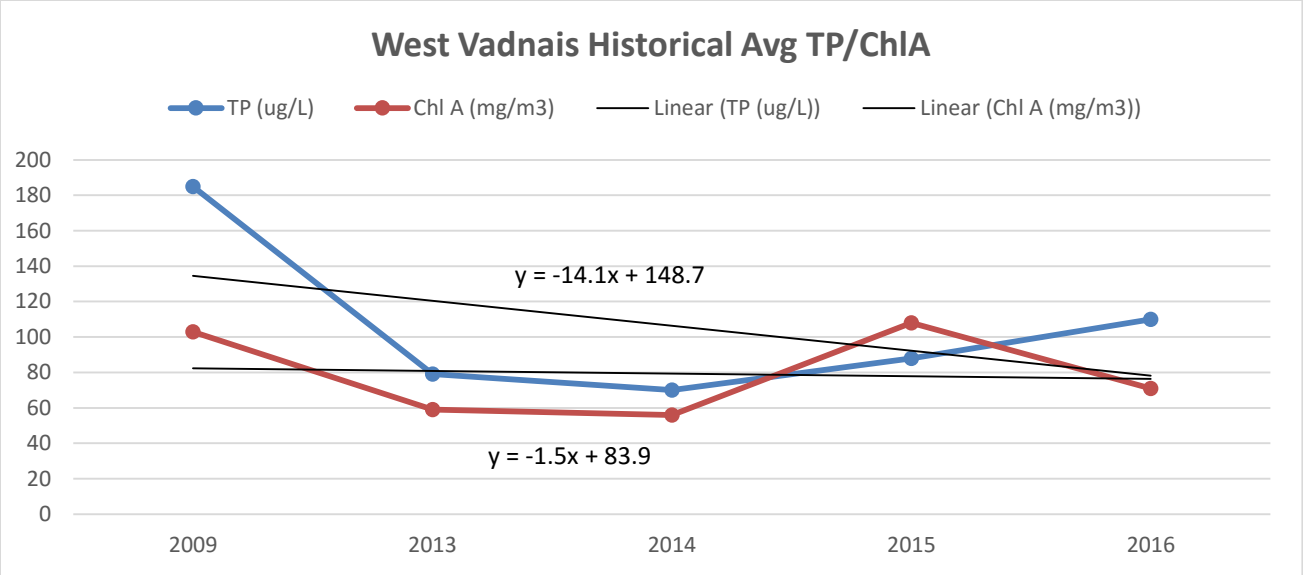




West Vadnais Lake

West Vadnais Lake is located in the southwest corner of the watershed. Its neighbor, East Vadnais Lake, receives in lake treatment by the Saint Paul Water Authority (SPRWS) as a measure to protect the drinking water supply. Even though these lakes are right next to each other they are not connected and have drastically different water quality. The SPRWS monitors East Vadnais Lake. VLAWMO monitored West Vadnais for part of 2009 and began full monitoring in 2013. West Vadnais is on the 2014 impaired waters list for nutrients.





West Vadnais Lake Data

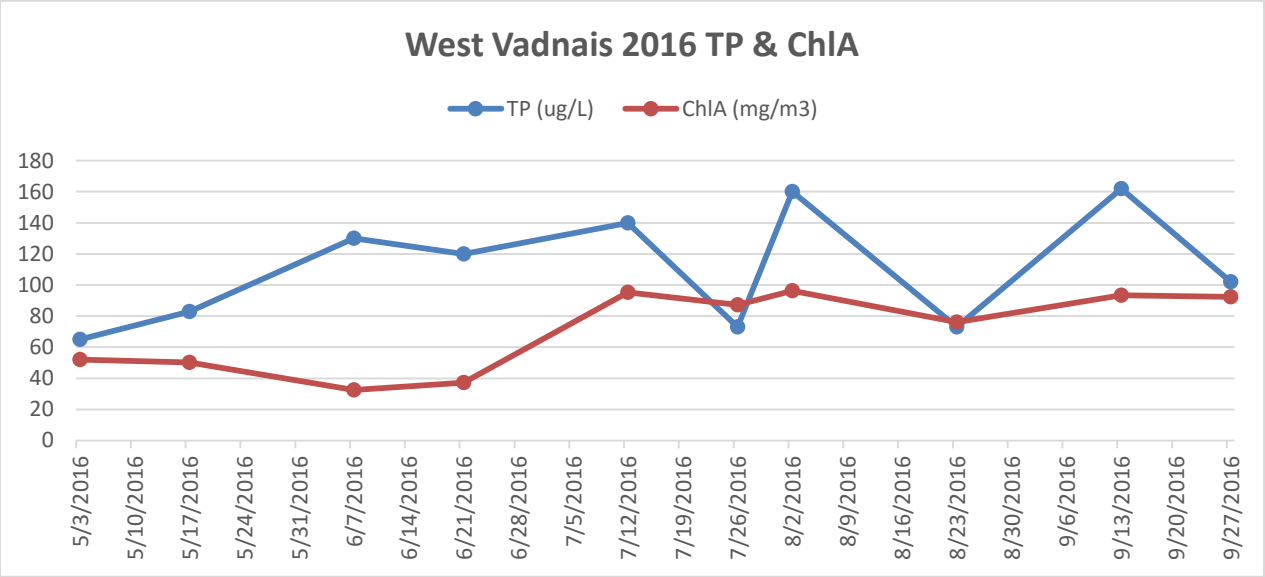
West Vadnais Historical Avg TP/Chl A/SDT				Date	Reading Depth (Bottom/Top)	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP (ug/L)	Chl A (mg/m3)	Secchi (m)	5/16/2016	b	13.08	0.47	9.25	7.58
2009	185	103	0.4	5/16/2016	t	13.12	0.468	9.48	7.77
2013	79	59	0.4	6/10/2016	b	21.72	0.506	3.4	8.06
2014	70	56	0.5	6/10/2016	t	23.07	0.499	7.06	8.54
2015	88	108	0.3	7/20/2016	b	24.61	0.489	0.59	8.49
2016	110	71	0.3	7/20/2016	t	25.78	0.454	7.45	8.82
				9/20/2016	b	19.55	0.42	4.72	8.3
				9/20/2016	t	19.72	0.419	5.27	8.36

- Wilkinson Lake YSI data is similar to that of similar other metro lakes, conductivity is on the high side for VLAWMO lakes.

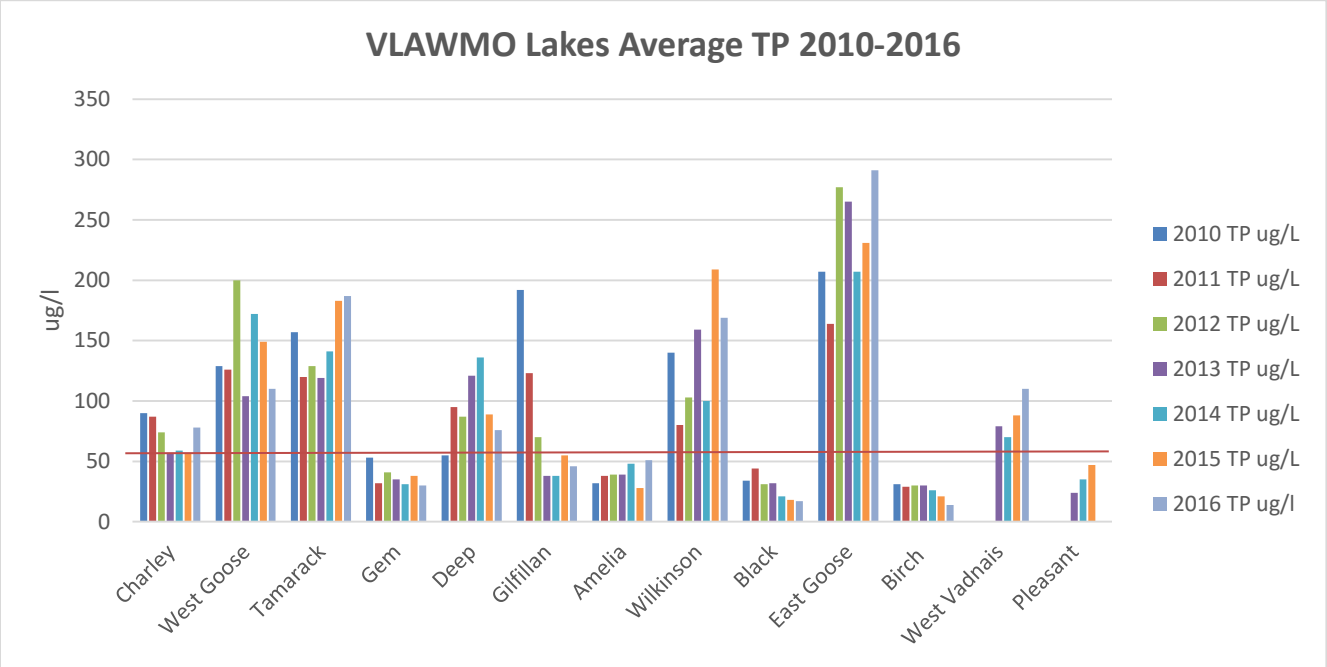
West Vadnais Lake 2016 Raw Data

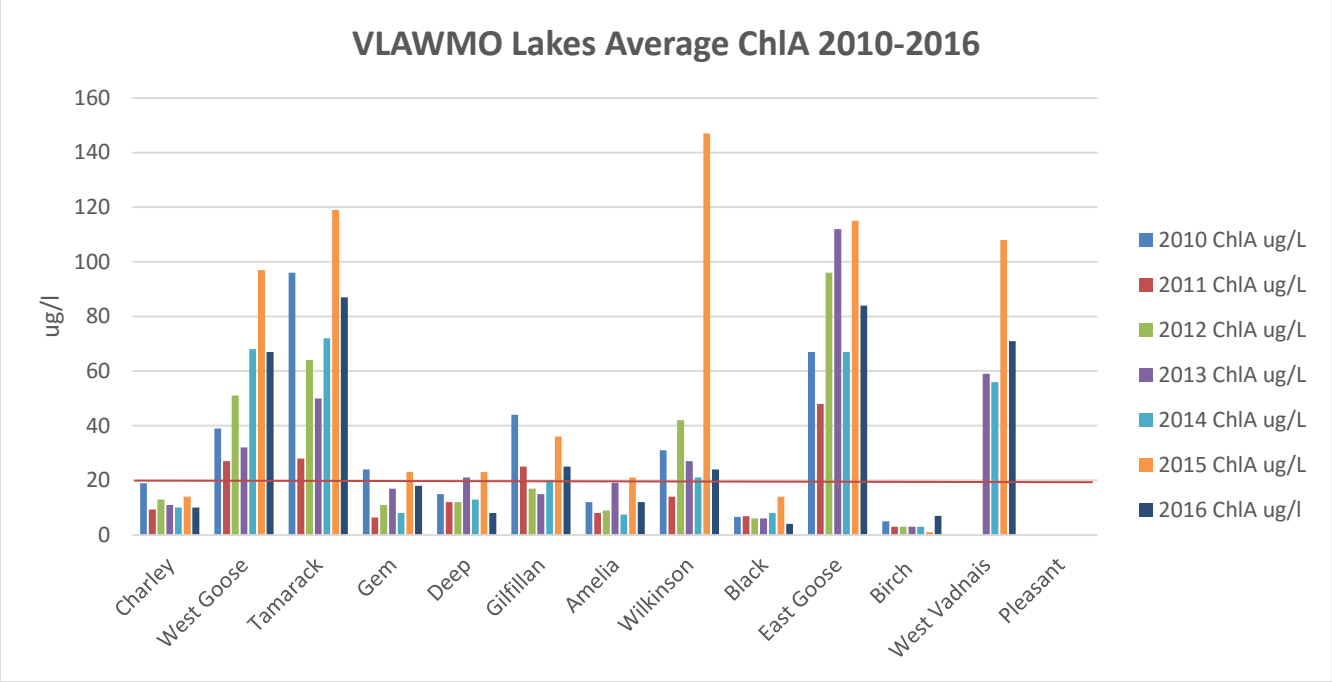
SITE	DATE	Secchi (ft)	TP (ug/L)	ChlA (mg/m3)	TKN (mg/L)	NH3 (mg/L)	Cl (mg/L)
West Vadnais	3/28/2016						80
West Vadnais	5/3/2016	1.5	65	52	3.2		
West Vadnais	5/17/2016	1	83	50.1			
West Vadnais	6/7/2016	1.00	130	32.5	4.1	1.3	
West Vadnais	6/21/2016	1	120	37.2			
West Vadnais	7/12/2016	0.5	140	95.2	3.2	0.57	
West Vadnais	7/26/2016	1	73	87.2			
West Vadnais	8/2/2016	1	160	96.3	1.4	ND	
West Vadnais	8/23/2016	1	73	76.1			
West Vadnais	9/13/2016	0.75	162	93.4	1.9	ND	
West Vadnais	9/27/2016	1	102	92.3			

- Nitrogen and ammonia levels are below state standards for West Vadnais Lake and similar to the rest of the VLAWMO lakes.



Lake TP and ChlA Summary





VLAWMO 2016 Lake Chloride Levels

Chloride Standards:

Chronic Exposure Standard;

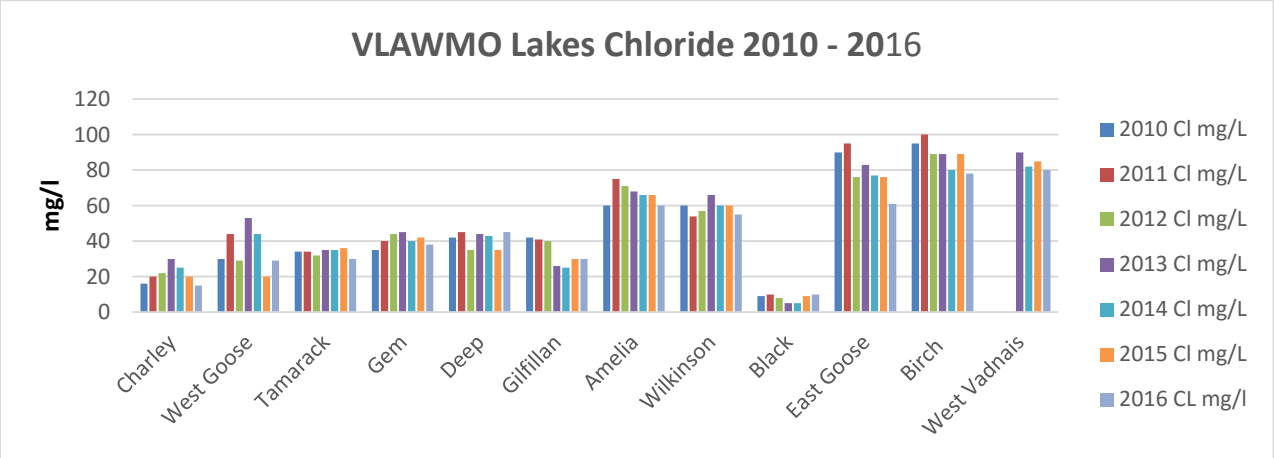
- 4 day average >230 mg/l

Acute Exposure Standard;

- One hour >860 mg/l

Impairment Threshold;

- Two or more exceedances in a three year period having at least five data points



- VLAWMO staff takes Lake Chloride readings in the spring right after ice-off. The samples are taken from the middle of the lake. 2016 was the seventh year of VLAWMO's chloride program. The lakes with the highest chloride levels are typically the lakes that receive the most street/storm water runoff. Most of our cities have gone to an all salt mix for winter ice control and future monitoring will be interesting to see how that will affect the chloride levels in VLAWMO lakes..

	2010 Cl mg/L	2011 Cl mg/L	2012 Cl mg/L	2013 Cl mg/L	2014 Cl mg/L	2015 Cl mg/L	2016 CL mg/l
Charley	16	20	22	30	25	20	15
West Goose	30	44	29	53	44	20	29
Tamarack	34	34	32	35	35	36	30
Gem	35	40	44	45	40	42	38
Deep	42	45	35	44	43	35	45
Gilfillan	42	41	40	26	25	30	30
Amelia	60	75	71	68	66	66	60
Wilkinson	60	54	57	66	60	60	55
Black	9	10	8	5	5	9	10
East Goose	90	95	76	83	77	76	61
Birch	95	100	89	89	80	89	78
West Vadnais				90	82	85	80

Lake Level Data

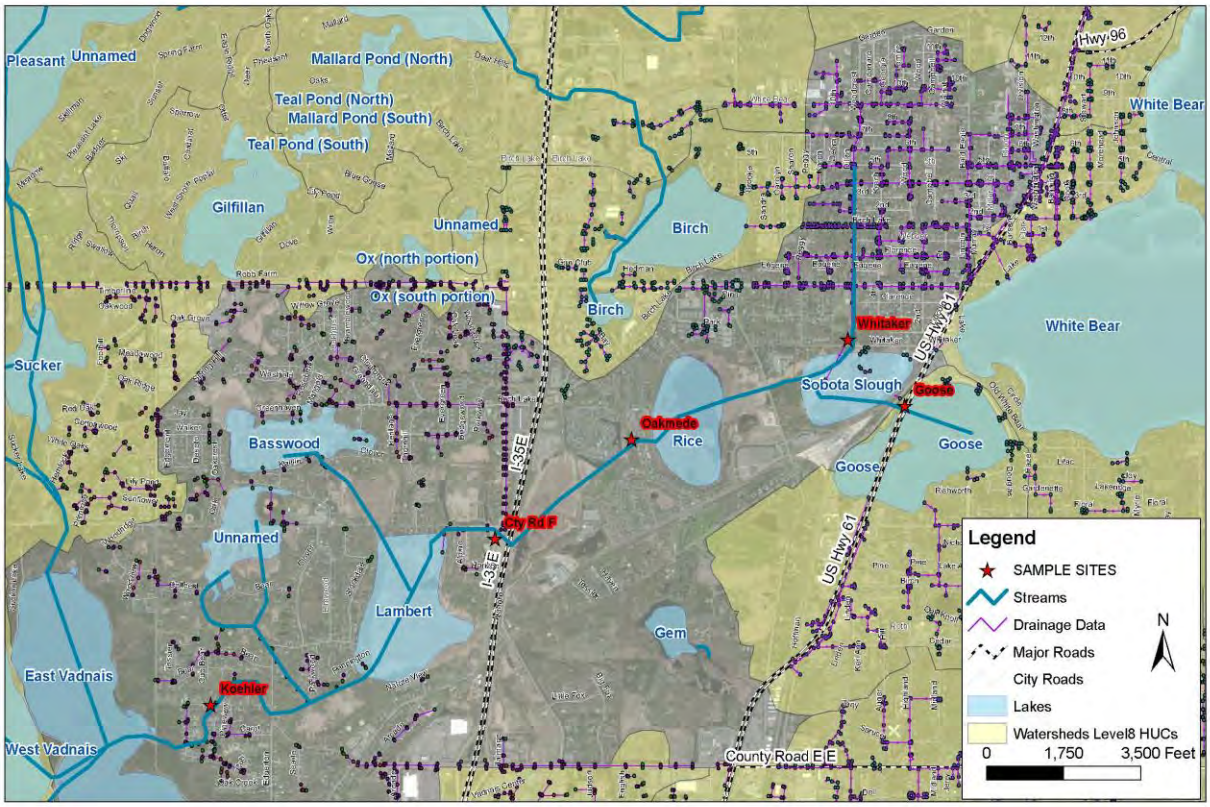
	Lake Elevations 2016					
	Gilfillan	**Birch**	**Gem**	**Goose**	**Wilkinson**	**Pleasaant**
gauge reading start	1.66	2.5	9.63	0.8		1.01
lake level start 4/29/2016	911.13	920.19	947.44	924.5		892.51
0.00 out	909.47	917.69	937.81	923.7		891.5
5/3/2016	911.08	917.65	947.39	924.4	1.84	
5/17/2016	911.03	920.05	947.32	924.35	1.75	
6/7/2016	910.87	919.85	947.12	924.28	1.62	
6/13/2016		920.14			1.83	
6/21/2016	911.11	921.19	947.62	924.59	1.85	
7/12/2016	910.95	919.95	947.47	924.38	1.65	
7/26/2016	910.89	919.85	947.41	924.36	1.62	
8/2/2016	910.87	919.89	947.53	924.38	1.66	892.51
8/23/2016	911.35	920.04	na	924.6	2	
9/13/2016	911.3	920.21	947.91	924.38	1.85	893.05
9/27/2016	911.68	920.59	948.41	924.66	2.21	893.15
yearly increase/decrease	**0.55**	**0.4**	**0.97**	**0.16**	**0.37**	

2016 Lambert Creek Monitoring Results

Lambert Creek Monitoring Details

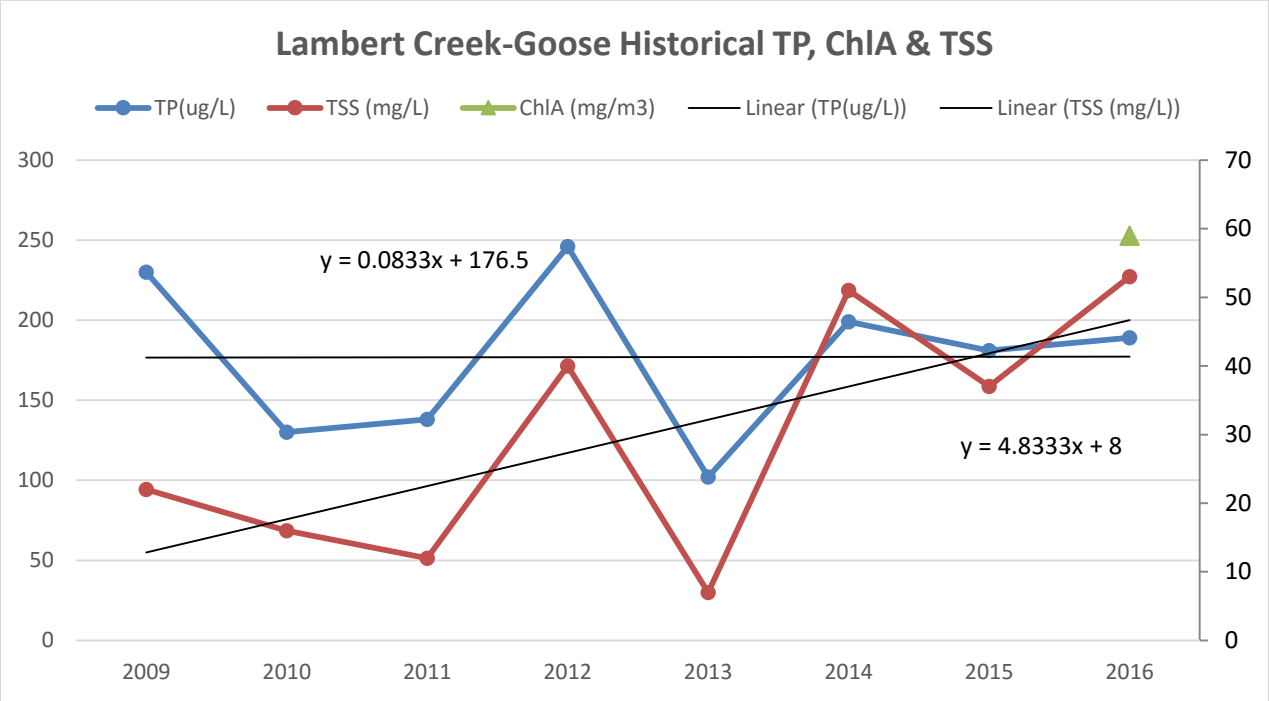
Samples are collected by VLAWMO staff at six sites along Lambert Creek on a bi-weekly basis May through September. The six sites noted in charts and graphs are: Goose Lake, WBL storm sewer, Whitaker Pond, Oakmede, County Rd F, and Kohler Rd. The samples are analyzed by Pace Analytical for TP, SRP, TKN, NH3, N03, TSS. VLAWMO staff collects pH, conductivity, DO and temperature readings at all locations except the WBL storm sewer. Creek flow is also collected at the flumes along with a flow meter in the WBL storm sewer. This information will also help with the TMDL process and allows us to set baselines to compare with future monitoring data.

VLAWMO has collected samples at five of the six sites to test for E. coli. Samples were analyzed at the SPRWS lab. Lambert Creek is on the impaired waters list for its high levels of E. coli. Water contaminated with bacteria from human or animal fecal material can cause illness in humans if ingested. The maximum daily level allowed is 1260 cfu/100ml. The maximum 30 day mean level is 126 cfu/100ml. Standards are designed to protect swimmers who might ingest small quantities of water from getting sick. VLAWMO began the E.coli source monitoring study in 2014 concentrating on the County Rd F and Oakmede sites during dry weather conditions, at least 72hrs after a rain event. We continued this study in 2015 concentrating on the Goose and Whitaker drainages. In 2016 we did wet weather conditions at County Rd F and Oakmede sites.



- Red marks the creek sampling locations. From left to right Koehler, Cty Rd F, Oakmede, Whitaker and WBLSS, and Goose.

Lambert Creek-Goose Lake Data

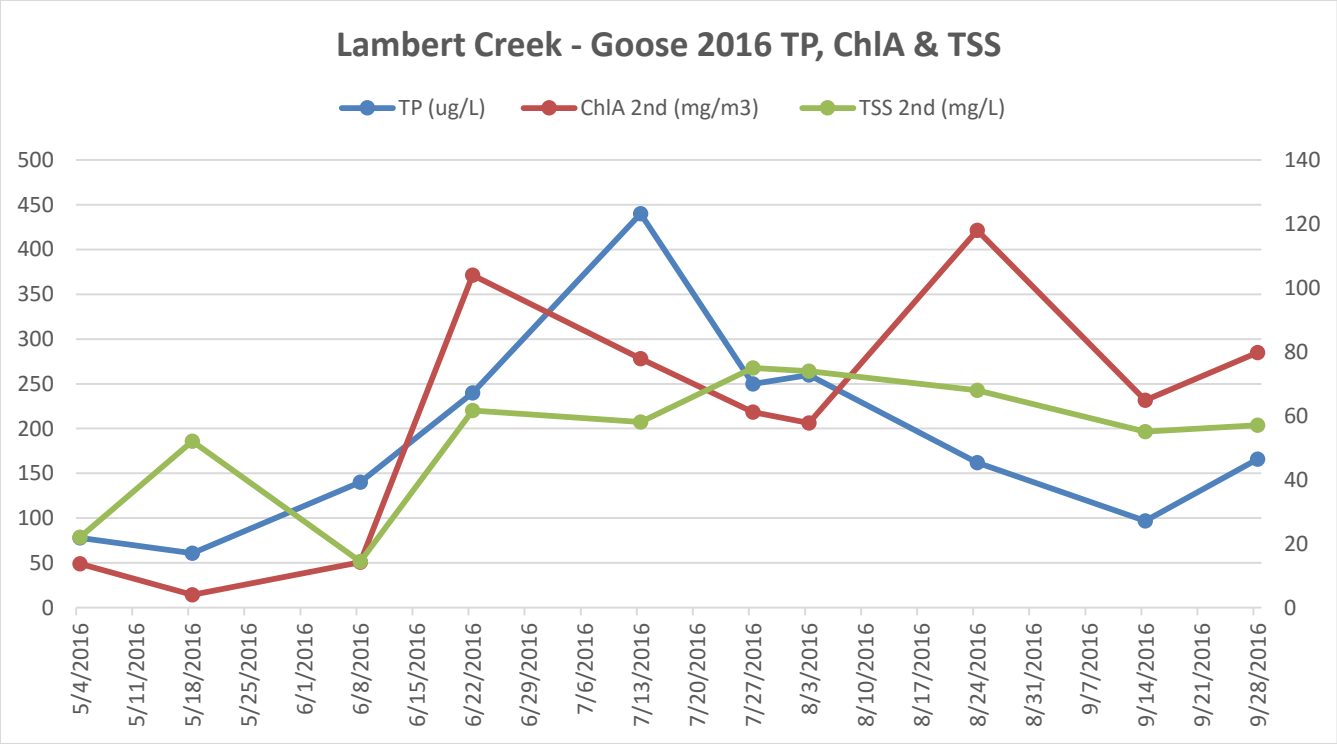


- LC-Goose Lake was close to the state standards for TP and the lowest average over the last 5 years. State standard is 150 ug/l. State standard for TSS is 14mg/l. LC-Goose TSS has been pretty constant over the last 5 years. 2016 was the first year of collecting ChlA on the creek.

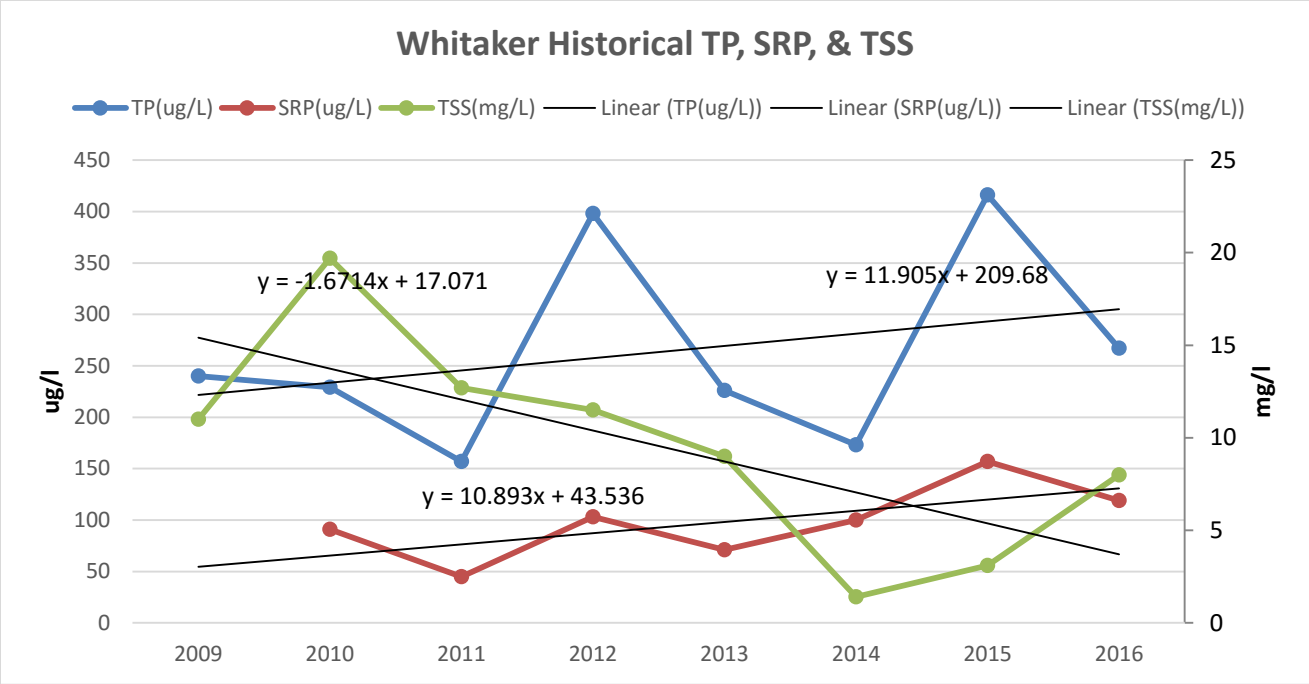
Lambert Creek-Goose				Date	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP(ug/L)	TSS (mg/L)	ChlA (mg/m3)	5/2/2016	16.59	0.319	9.33	8.42
2009	230	22		6/9/2016	22.57	0.286	7.81	8.86
2010	130	16		7/19/2016	25.44	0.3	5.22	8.8
2011	138	12		9/19/2016	19.66	0.248	4.97	8.47
2012	246	40						
2013	102	7						
2014	199	51						
2015	181	37						
2016	189	53	59					

Goose – LC 2016 Raw Data

SITE	DATE	TP (ug/L)	ChlA 2nd (mg/m3)	TSS 2nd (mg/L)	TKN (mg/L)	NH3 (mg/L)	NO3 mg/L	Cl (mg/L)
LC-Goose	3/14/2016							30
LC-Goose	3/25/2016							30
LC-Goose	5/4/2016	78	13.7	22	1.3	ND	ND	
LC-Goose	5/18/2016	61	4	52				
LC-Goose	6/8/2016	140	14.2	14.4	1.9	ND	ND	
LC-Goose	6/22/2016	240	104	61.6				
LC-Goose	7/13/2016	440	77.9	58	4	0.11	ND	
LC-Goose	7/27/2016	250	61.1	75				
LC-Goose	8/3/2016	260	57.7	74	1.4	ND	ND	
LC-Goose	8/24/2016	162	118	68				
LC-Goose	9/14/2016	97	64.9	55	5.9	0.12	ND	
LC-Goose	9/28/2016	166	79.8	57				



Lambert Creek-Whitaker Pond Data

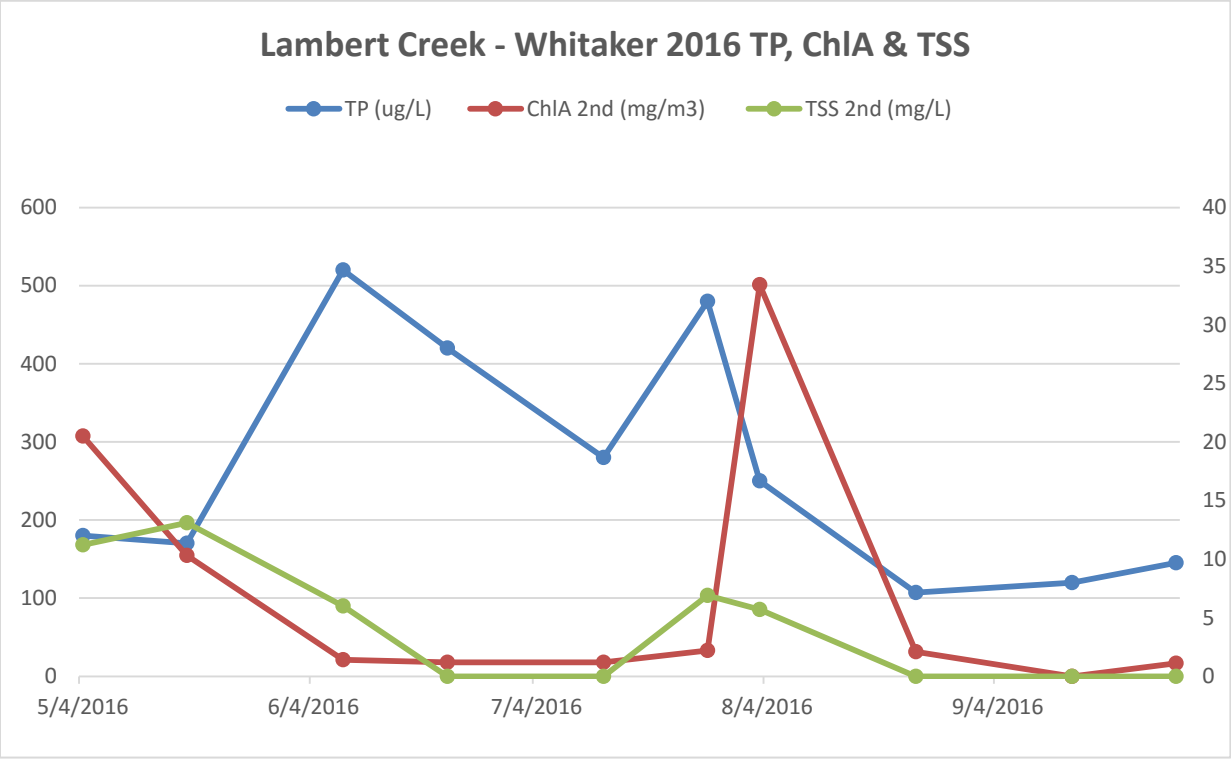


- Whitaker Pond on average for the last 8 years is above state standards for TP. State standard is 130 ug/l. State standard for TSS is 14mg/l. Since the forebay was installed in 2011 TSS has dropped, indicating the forebay is functioning as designed.

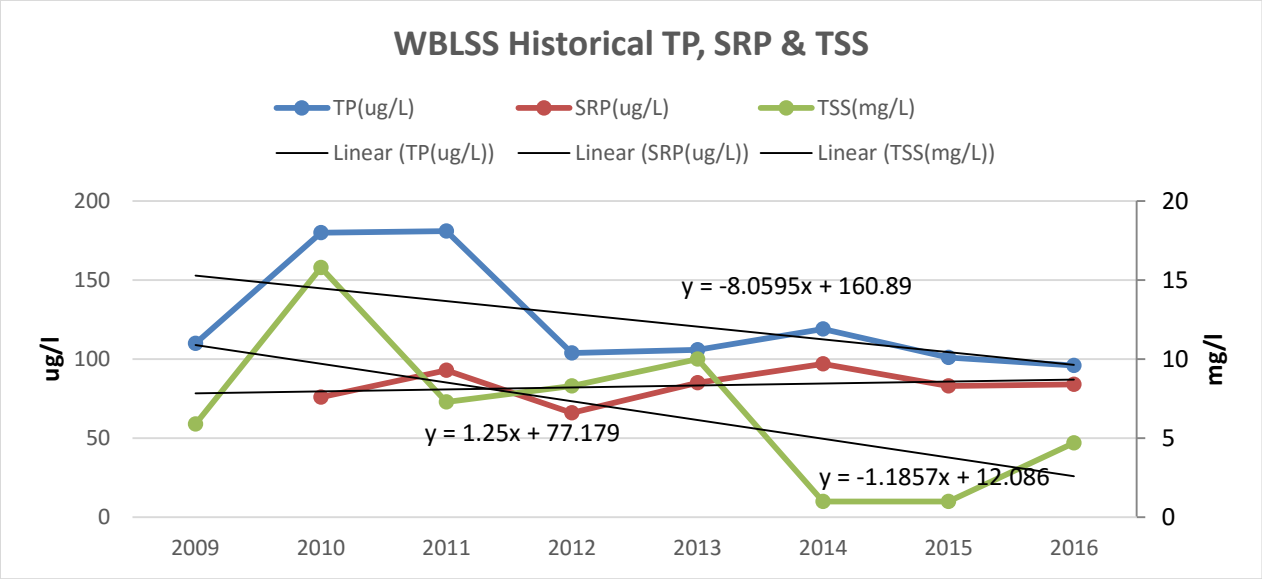
Whitaker					Date	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP(ug/L)	SRP(ug/L)	TSS(mg/L)	ChlA (mg/m3)	5/2/2016	16.66	0.472	5.19	7.94
2009	240		11		6/9/2016	19.8	0.393	2.29	7.51
2010	229	91	19.7		7/19/2016	22.12	0.422	0.45	7.87
2011	157	45	12.7		9/19/2016	19.27	0.459	1.36	7.48
2012	398	103	11.5						
2013	226	71	9						
2014	173	100	1.4						
2015	416	157	3.1						
2016	267	119	8	8					

Whitaker 2016 Raw Data

SITE	DATE	TP (ug/L)	ChlA 2nd (mg/m3)	TSS 2nd (mg/L)	SRP (ug/L)	TKN (mg/L)	NH3 (mg/L)	NO3 mg/L	Cl (mg/L)
Whitaker	3/14/2016								215
Whitaker	3/25/2016								120
Whitaker	5/4/2016	180	20.5	11.2	0.041	1	0.18	0.67	
Whitaker	5/18/2016	170	10.3	13.1	0.081				
Whitaker	6/8/2016	520	1.4	6	0.26	1.7	0.79	ND	
Whitaker	6/22/2016	420	1.2	ND	0.15				
Whitaker	7/13/2016	280	1.2	ND	0.17	1.4	0.74	0.12	
Whitaker	7/27/2016	480	2.2	6.9	0.23				
Whitaker	8/3/2016	250	33.4	5.7	0.05	1.6	0.81	0.11	
Whitaker	8/24/2016	107	2.1	ND	0.086				
Whitaker	9/14/2016	120	ND	ND	0.036	1.2	0.62	0.76	
Whitaker	9/28/2016	145	1.1	ND	0.087				



Lambert Creek-White Bear Lake Storm Sewer (WBLSS) Data



- Since 2012 WBLSS is below state standards for TP. State standard is130 ug/l. State standard for TSS is 14mg/l. SRP is also tested at this site. Both TP and TSS are showing a downtrend, SRP levels have been fairly consistent since monitoring began in 2010 showing a slight uptrend.

White Bear Lake Storm Sewer				
Year	**TP(ug/L)**	**SRP(ug/L)**	**TSS(mg/L)**	**ChlA (mg/m3)**
2009	110		5.9	
2010	180	76	15.8	
2011	181	93	7.3	
2012	104	66	8.3	
2013	106	85	10	
2014	119	97	1	
2015	101	83	1	
2016	96	84	4.7	5

Whitaker Pond Weir Data

In 2010 VLAWMO worked with Ramsey County, White Bear Lake, White Bear Township and the SPRWS to improve the Whitaker Pond site. The WBLSS drains about 640 acres into Whitaker Pond, which eventually flows into East Vadnais Lake, the drinking water reservoir for the SPRWS. A forebay was installed before the pond to help settle out TSS. The weir was rebuilt and sand/iron filing bags were installed to help reduce TP and SRP levels. Monitoring over the last three years since the project was complete has not shown the reductions VLAWMO was hoping for.

- Did not show improvements for TP reduction
- Has shown little improvement for TSS reduction
- Did not show an improvement in SRP reduction

The following graphs will show the TP, TSS and SRP levels entering Whitaker Pond through the WBLSS and leaving Whitaker Pond on the downstream side of the weir. Monitoring data still suggests the pond is not improving water quality, average levels of TP, SRP and TSS are higher downstream of the weir than they are entering the pond at the WBLSS. Only TSS is below state standards, both TP and SRP are close to or above state standards when leaving Whitaker Pond.

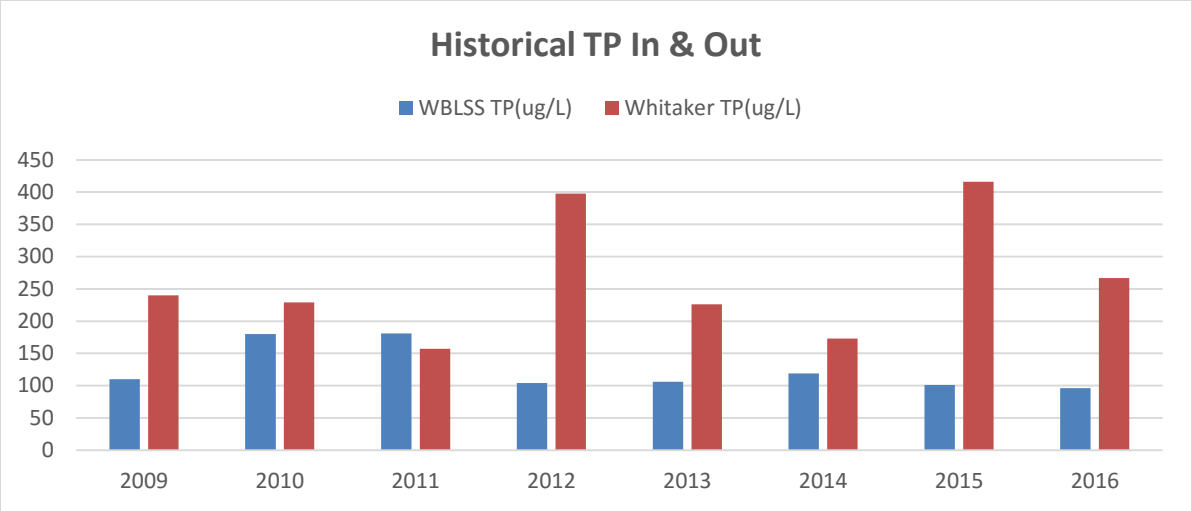
WBLSS 2016 Raw Data

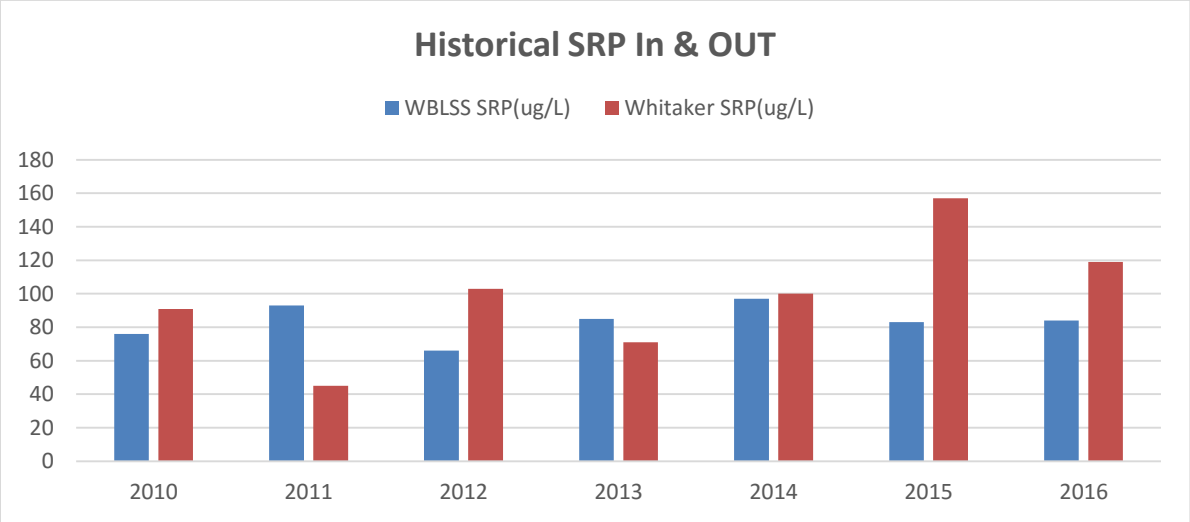
SITE	DATE	TP (ug/L)	ChlA 2nd (mg/m3)	TSS 2nd (mg/L)	SRP (mg/L)	TKN (mg/L)	NH3 (mg/L)	NO3 mg/L	Cl (mg/L)
WBLSS	3/14/2016								110
WBLSS	3/25/2016								116
WBLSS	5/4/2016	97	ND	ND	0.079	ND	ND	5	
WBLSS	5/18/2016	79	ND	2.2	0.081				
WBLSS	6/8/2016	110	ND	8.3	0.13	ND	ND	4.8	
WBLSS	6/22/2016	98	ND	ND	0.077				
WBLSS	7/13/2016	87	1.2	ND	0.082	ND	ND	5.3	
WBLSS	7/27/2016	110	ND	ND	0.085				
WBLSS	8/3/2016	98	8.8	3.8	0.087	ND	ND	5.2	
WBLSS	8/24/2016	79	ND	ND	0.064				
WBLSS	9/14/2016	104	ND	ND	0.081	ND	ND	5.3	
WBLSS	9/28/2016	102	ND	ND	0.076				

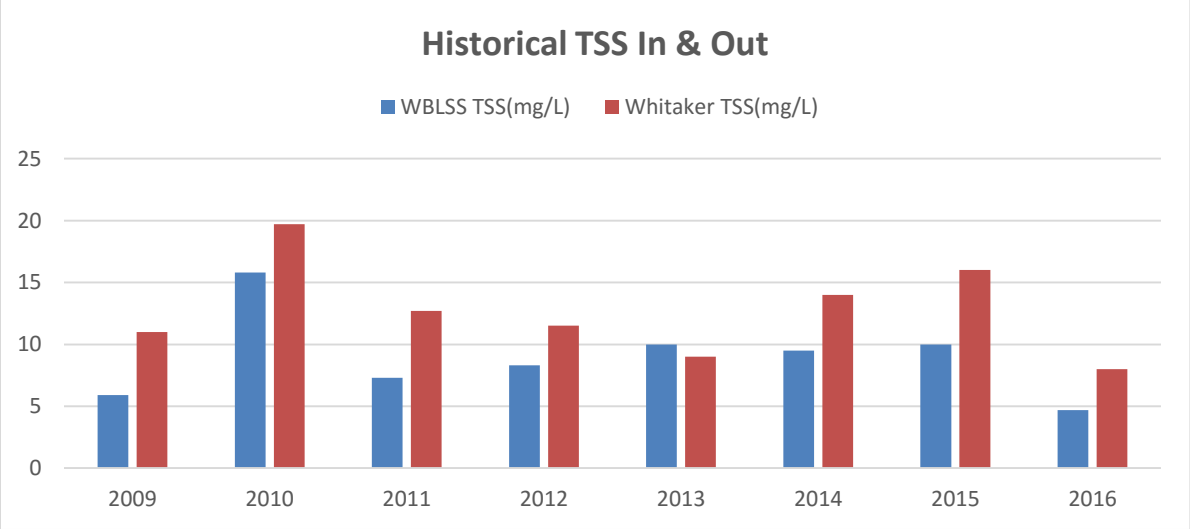
- VLAWMO takes TP, SRP and TSS samples twice a month. Nitrogen samples are taken once a month

	WBLSS TP(ug/L)	Whitaker TP(ug/L)		WBLSS SRP(ug/L)	Whitaker SRP(ug/L)		WBLSS TSS(mg/L)	Whitaker TSS(mg/L)
2009	110	240	**2009**			**2009**	5.9	11
2010	180	229	**2010**	76	91	**2010**	15.8	19.7
2011	181	157	**2011**	93	45	**2011**	7.3	12.7
2012	104	398	**2012**	66	103	**2012**	8.3	11.5
2013	106	226	**2013**	85	71	**2013**	10	9
2014	119	173	**2014**	97	100	**2014**	9.5	14
2015	101	416	**2015**	83	157	**2015**	10	16
2016	96	267	**2016**	84	119	**2016**	4.7	8

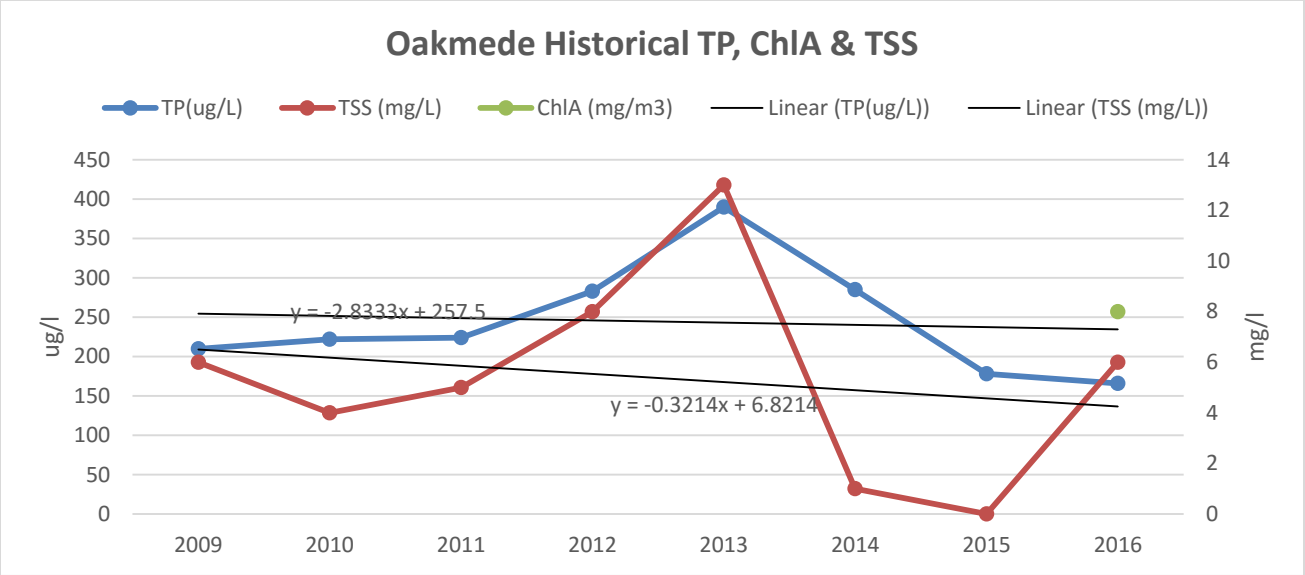
- The above tables are the average year to year comparisons of nutrient levels entering Whitaker Pond from the WBLSS and leaving Whitaker Pond. Below shows graphs of the same data.


Historical TP In & Out
WBLSS TP(ug/L)
Whitaker TP(ug/L)
450
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
2016


Historical SRP In & OUT
WBLSS SRP(ug/L)
Whitaker SRP(ug/L)
180
160
140
120
100
80
60
40
20
0
2010
2011
2012
2013
2014
2015
2016


Historical TSS In & Out
WBLSS TSS(mg/L)
Whitaker TSS(mg/L)
25
20
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016

Lambert Creek - Oakmede Data

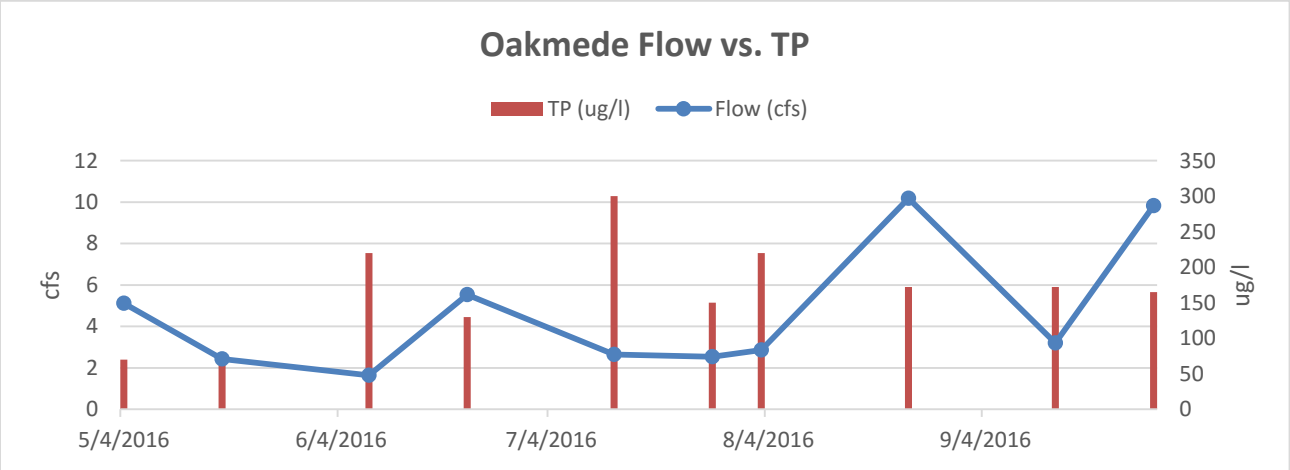


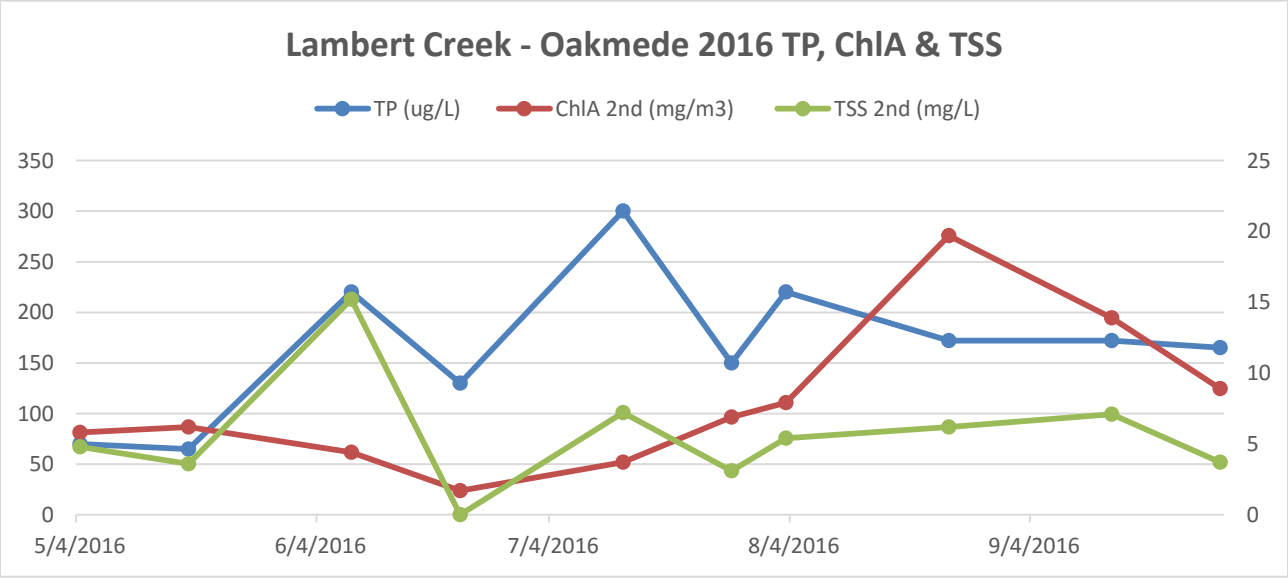
- LC-Oakmede has been well above state standards for TP over the last 8 years of monitoring, but has shown a down trend since 2013. State standard 130 ug/l State standard for TSS is 14mg/l, LC-Oakmede is below state standard for the last 7 years.

Oakmede				Date	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP(ug/L)	TSS (mg/L)	ChlA (mg/m3)	5/2/2016	13.41	0.481	5.49	7.36
2009	210	6		6/9/2016	21.44	0.467	4.56	8
2010	222	4		7/19/2016	25.35	0.403	3.49	7.8
2011	224	5		9/19/2016	20.13	0.34	3.44	4.98
2012	283	8						
2013	390	13						
2014	285	1						
2015	178	0						
2016	166	6	8					

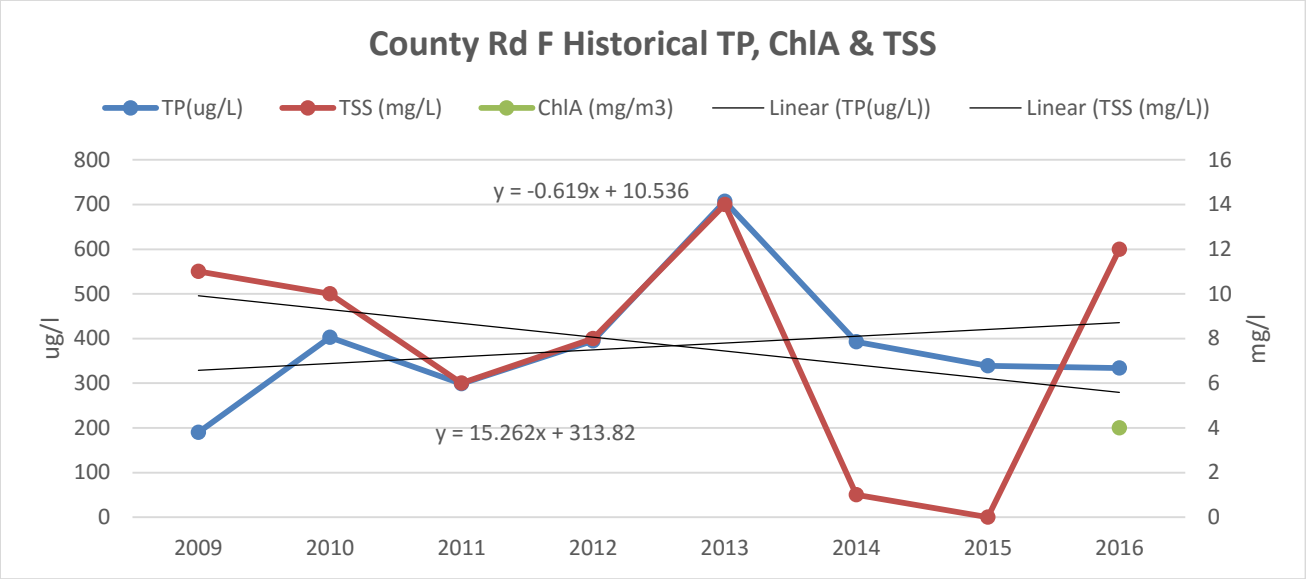
Oakmede 2016 Raw Data

SITE	DATE	TP (ug/L)	ChlA 2nd (mg/m3)	TSS 2nd (mg/L)	TKN (mg/L)	NH3 (mg/L)	NO3 mg/L	Cl (mg/L)
Oakmede	3/14/2016							92
Oakmede	3/25/2016							88
Oakmede	5/4/2016	70	5.8	4.8	0.64	ND	ND	
Oakmede	5/18/2016	65	6.2	3.6				
Oakmede	6/8/2016	220	4.4	15.2	1.1	ND	ND	
Oakmede	6/22/2016	130	1.7	ND				
Oakmede	7/13/2016	300	3.7	7.2	1.6	0.18	ND	
Oakmede	7/27/2016	150	6.9	3.1				
Oakmede	8/3/2016	220	7.9	5.4	0.76	ND	0.021	
Oakmede	8/24/2016	172	19.7	6.2				
Oakmede	9/14/2016	172	13.9	7.1	1.3	ND	0.029	
Oakmede	9/28/2016	165	8.9	3.7				





Lambert Creek - County Rd. F Data

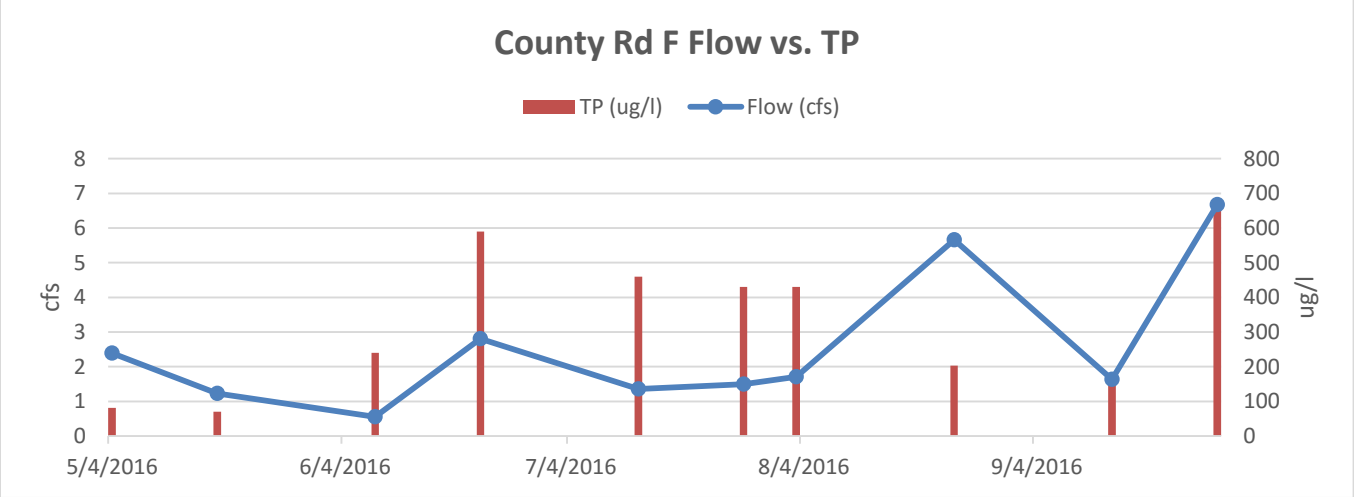


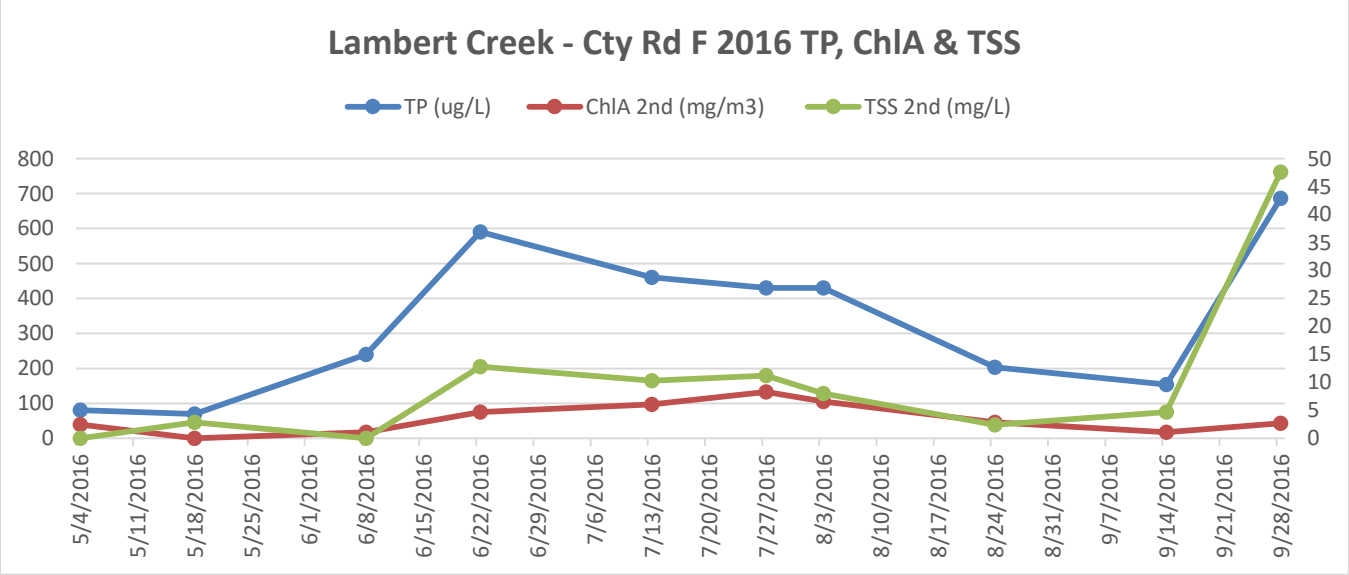
- LC-Cty Rd. F has been well above state standards for TP over the last 8 years of monitoring. This is the highest level of TP out of all six sampling sites on the creek. State standard is 130 ug/l.. State standard for TSS is 14mg/l. MNDOT did work on 35E and the ditch running into the creek during 2016. Ponds and structures were added to the ditch to address flow. Time will tell if this will have an effect on the water quality at this site.

Country Road F				Date	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP(ug/L)	TSS (mg/L)	ChlA (mg/m3)	5/2/2016	14.29	0.5	6.98	7.42
2009	190	11		6/9/2016	19.4	0.47	5.04	7.95
2010	403	10		7/19/2016	22.98	0.502	3.64	7.95
2011	299	6		9/19/2016	17.93	0.375	3.94	4.95
2012	395	8						
2013	707	14						
2014	393	1						
2015	339	0						
2016	334	12	4					

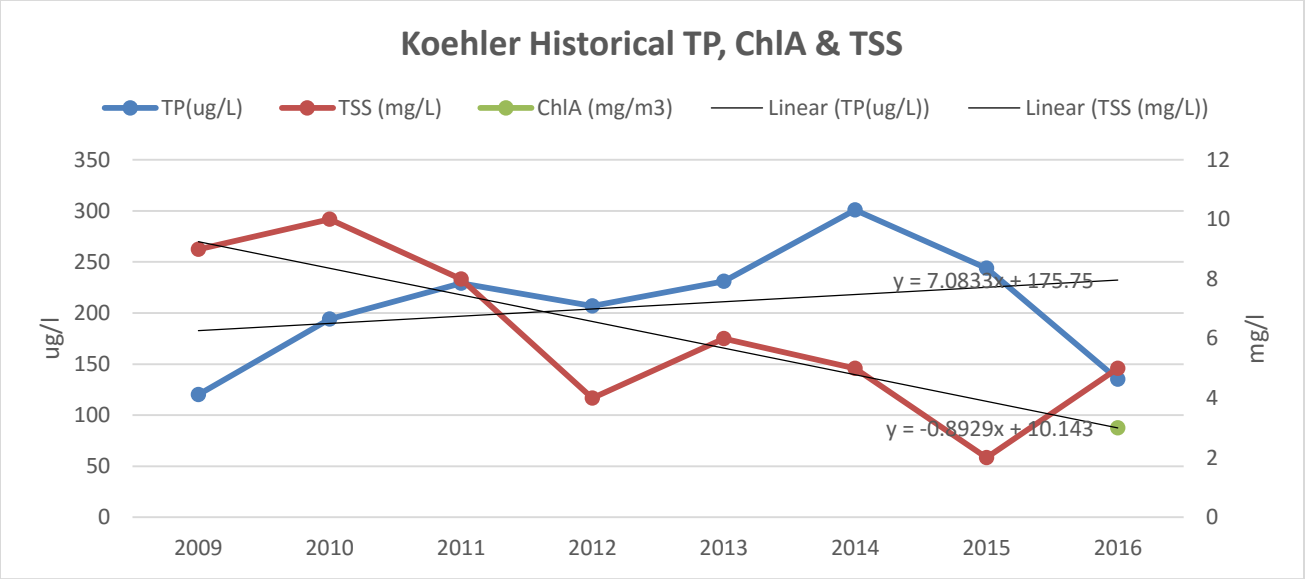
Cty Rd F 2016 Raw Data

SITE	DATE	TP (ug/L)	ChlA 2nd (mg/m3)	TSS 2nd (mg/L)	TKN (mg/L)	NH3 (mg/L)	NO3 mg/L	Cl (mg/L)
Cty Rd F	3/14/2016							80
Cty Rd F	3/25/2016							90
Cty Rd F	5/4/2016	81	2.5	ND	0.64	ND	ND	
Cty Rd F	5/18/2016	70	ND	2.9				
Cty Rd F	6/8/2016	240	1.1	ND	0.81	0.13	0.11	
Cty Rd F	6/22/2016	590	4.7	12.8				
Cty Rd F	7/13/2016	460	6.1	10.3	1.4	0.13	ND	
Cty Rd F	7/27/2016	430	8.3	11.2				
Cty Rd F	8/3/2016	430	6.6	8	0.94	ND	0.055	
Cty Rd F	8/24/2016	203	2.9	2.4				
Cty Rd F	9/14/2016	154	1.1	4.7	0.84	ND	0.036	
Cty Rd F	9/28/2016	686	2.7	47.6				





Lambert Creek - Koehler Rd. Data

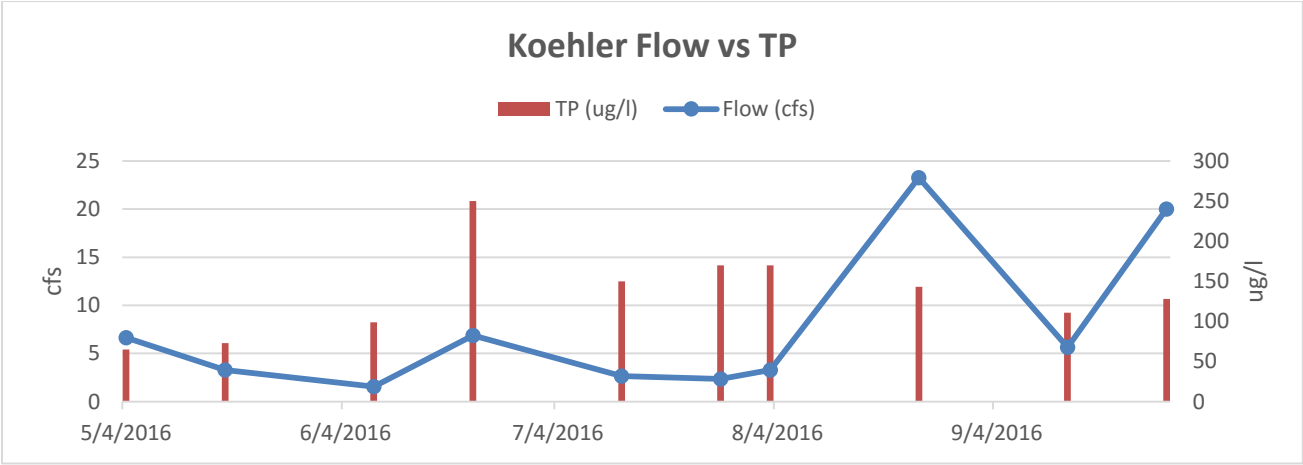


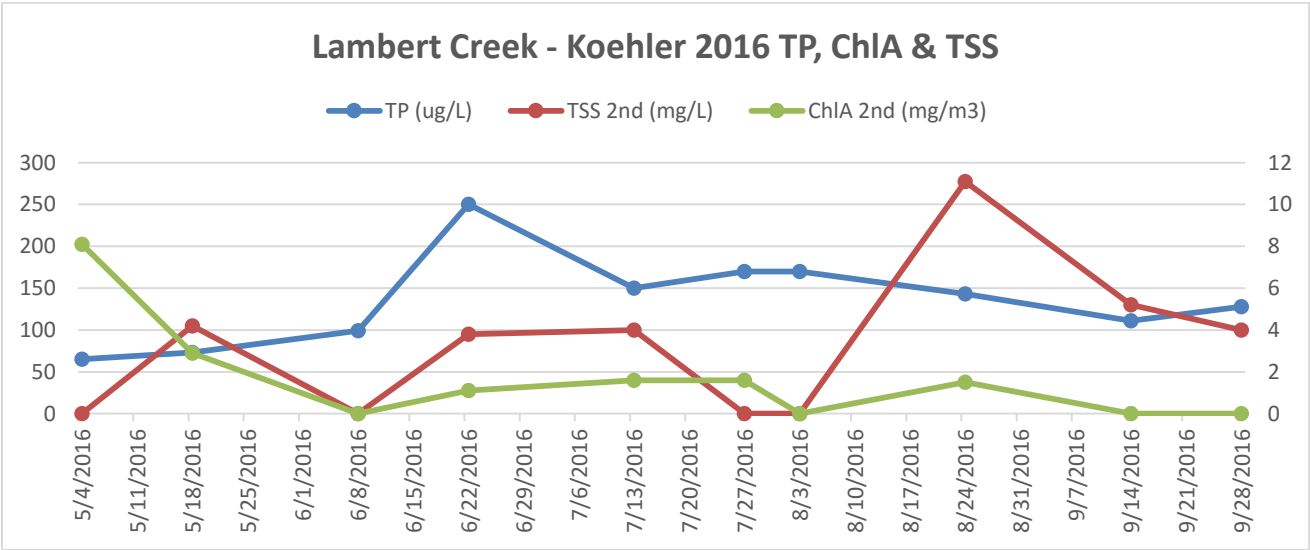
- Koehler has been well above state standards for TP over the last 8 years of monitoring. This is the highest level of TP out of all six sampling sites on the creek. State standard is 130 ug/l.. State standard for TSS is 14mg/l. Stream bank restoration was done in 2011 and have noticed improvement in TSS levels over the years since restoration.

Koehler				Date	Temp °C	Conductivity (mS/cm)	DO (mg/L)	pH
Year	TP(ug/L)	TSS (mg/L)	ChlA (mg/m3)	5/2/2016	11.72	0.567	9.94	6.82
2009	120	9		6/9/2016	18.16	0.628	4.31	7.63
2010	194	10		7/19/2016	21.45	0.633	3.81	8.19
2011	229	8		9/19/2016	17.53	0.515	3.7	4.65
2012	207	4						
2013	231	6						
2014	301	5						
2015	244	2						
2016	135	5	3					

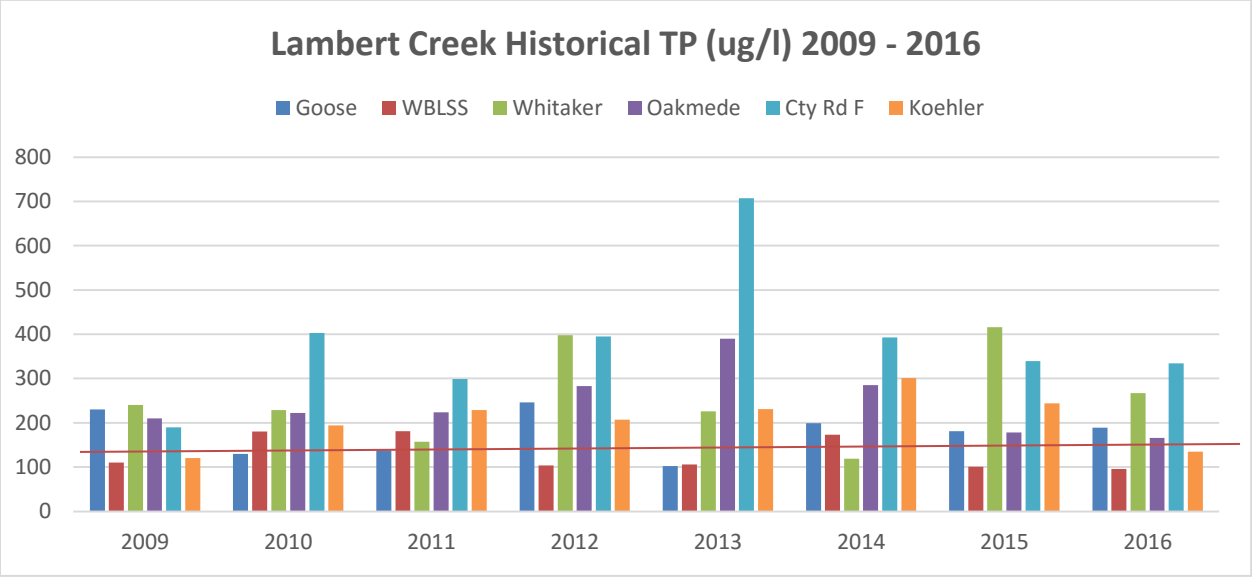
Koehler 2016 Raw Data

SITE	DATE	TP (ug/L)	TSS 2nd (mg/L)	ChlA 2nd (mg/m3)	TKN (mg/L)	NH3 (mg/L)	NO3 mg/L	Cl (mg/L)
Koehler	3/14/2016							102
Koehler	3/25/2016							100
Koehler	5/4/2016	65	ND	8.1	1	0.12	0.18	
Koehler	5/18/2016	73	4.2	2.9				
Koehler	6/8/2016	99	ND	ND	1.1	0.28	0.52	
Koehler	6/22/2016	250	3.8	1.1				
Koehler	7/13/2016	150	4	1.6	1.1	0.12	0.33	
Koehler	7/27/2016	170	ND	1.6				
Koehler	8/3/2016	170	ND	ND	1.1	ND	0.23	
Koehler	8/24/2016	143	11.1	1.5				
Koehler	9/14/2016	111	5.2	ND	1.1	0.21	0.15	
Koehler	9/28/2016	128	4	ND				





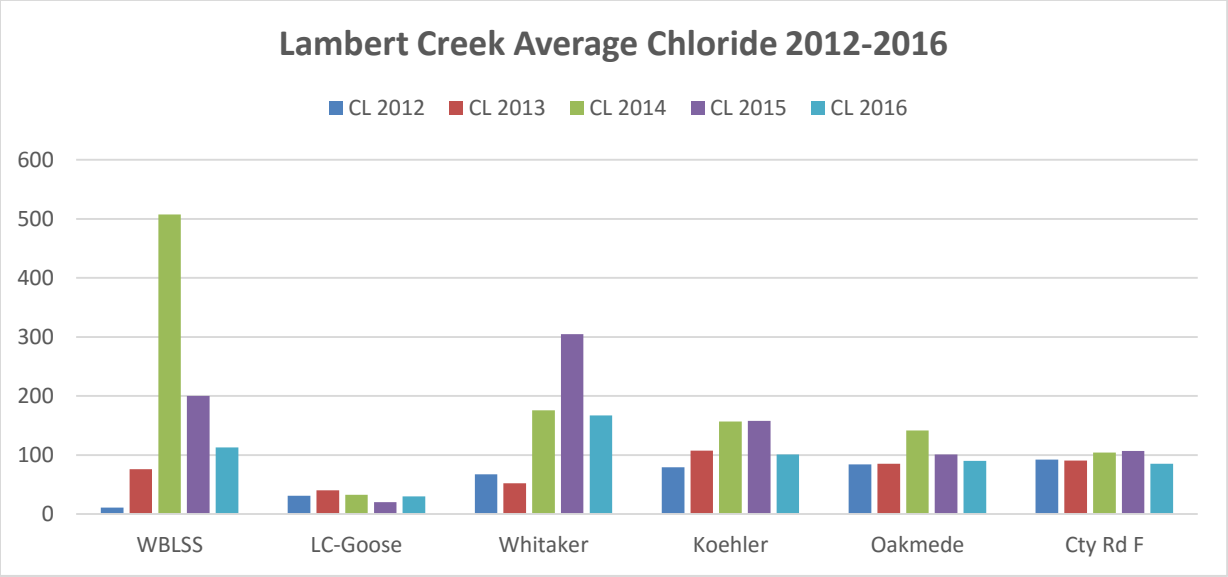
Lambert Creek Average Total Phosphorus



- Current state standard for stream Tp is 130 ug/l. All stream location have averaged over the state standard at least half of the time over the last 8 years with many of the locations over the state standard all eight years. Red line indicates standard.

Lambert Creek Average Yearly Tp (ug/L) 2009-2016								
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Goose	230	130	138	246	102	199	181	189
WBLSS	110	180	181	104	106	173	101	96
Whitaker	240	229	157	398	226	119	416	267
Oakmede	210	222	224	283	390	285	178	166
Cty Rd F	190	403	299	395	707	393	339	334
Koehler	120	194	229	207	231	301	244	135

Lambert Creek Chloride Data



- Lambert Creek Cl levels are below state standards. VLAWMO has been monitoring Cl levels since 2010

Chloride Standards:

Chronic Exposure Standard;

- 4 day average >230 mg/l

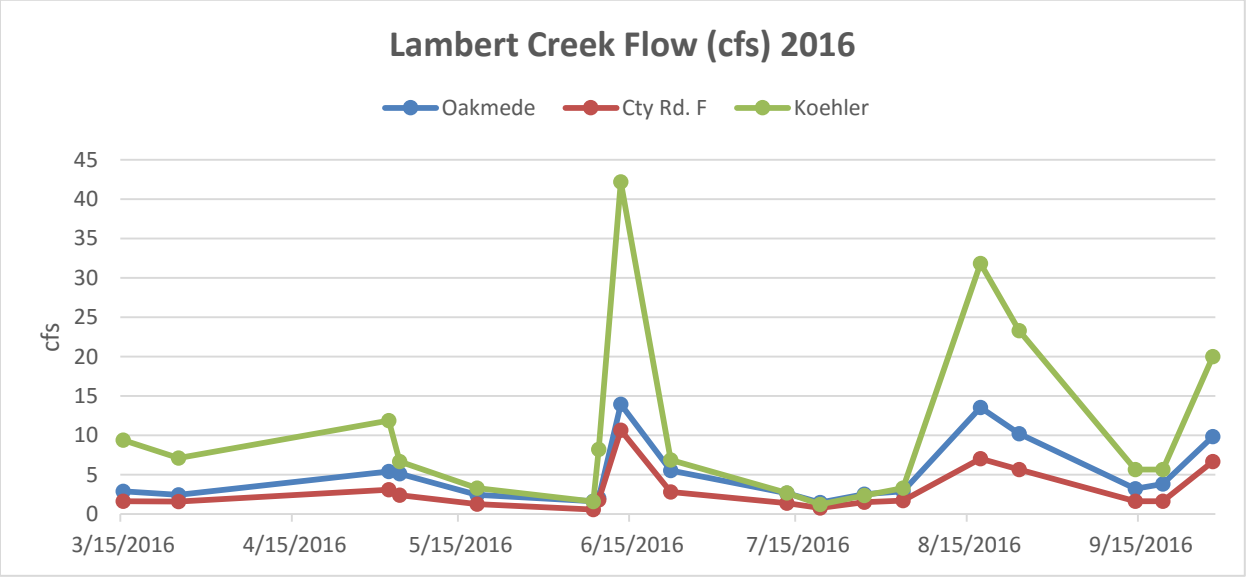
Acute Exposure Standard;

- One hour >860 mg/l

Impairment Threshold;

- Two or more exceedances in a three year period having at least five data points

Lambert Creek Flow



Lambert Creek YSI Data

Reading Location	Date	Temp C	Conductivity	DO (mg/l)	pH
Cty Rd F	5/2/2016	14.29	0.5	6.98	7.42
Cty Rd F	6/9/2016	19.4	0.47	5.04	7.95
Cty Rd F	7/19/2016	22.98	0.502	3.64	7.95
Cty Rd F	9/19/2016	17.93	0.375	3.94	4.95
Koehler	5/2/2016	11.72	0.567	9.94	6.82
Koehler	6/9/2016	18.16	0.628	4.31	7.63
Koehler	7/19/2016	21.45	0.633	3.81	8.19
Koehler	9/19/2016	17.53	0.515	3.7	4.65
LC- Goose	5/2/2016	16.59	0.319	9.33	8.42
LC- Goose	6/9/2016	22.57	0.286	7.81	8.86
LC- Goose	7/19/2016	25.44	0.3	5.22	8.8
LC- Goose	9/19/2016	19.66	0.248	4.97	8.47
Oakmede	5/2/2016	13.41	0.481	5.49	7.36
Oakmede	6/9/2016	21.44	0.467	4.56	8
Oakmede	7/19/2016	25.35	0.403	3.49	7.8
Oakmede	9/19/2016	20.13	0.34	3.44	4.98
Whitaker	5/2/2016	16.66	0.472	5.19	7.94
Whitaker	6/9/2016	19.8	0.393	2.29	7.51
Whitaker	7/19/2016	22.12	0.422	0.45	7.87
Whitaker	9/19/2016	19.27	0.459	1.36	7.48

- The YSI data for all creek sites above are within state standards. One thing to note is the high conductivity levels at the Koehler Rd. site.

2016 E.coli Source Monitoring

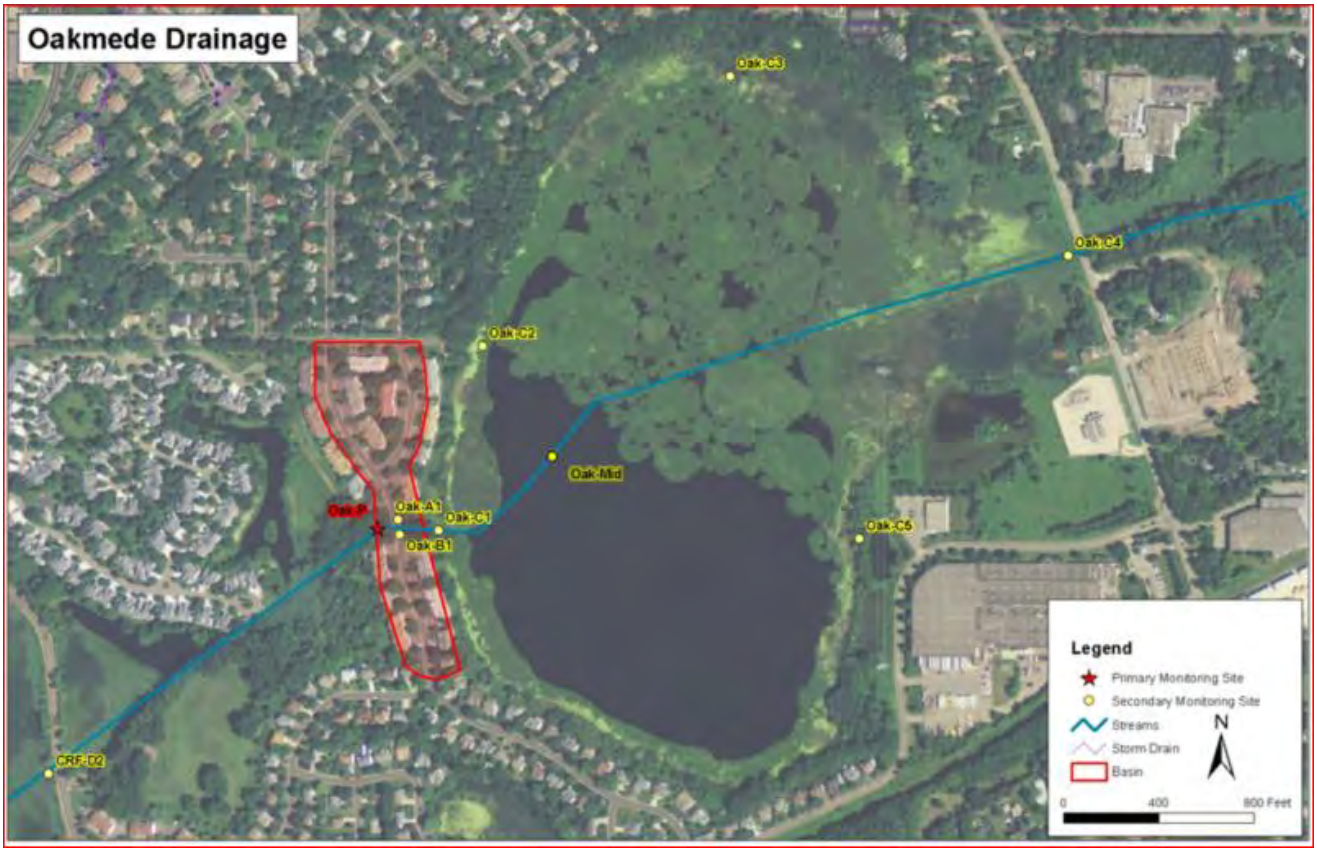
The Bacteria Sourcing study uses and integrated approach to identifying and reducing bacteria loads to meet regulatory requirements, in this case the TMDL MS4 wasteload allocations. The three main sources for the bacteria loading to the creek have been identified as wildlife, human and urban stormwater. The sourcing study has broken the creek into five sub-drainages and each sub-drainage will be monitored first during dry conditions and then during wet conditions.

VLAWMO completed the Oakmede and Cty. Rd F sub-drainages this summer for wet weather conditions. Ecoli concentrations were monitored at a primary site and also possible source sites at both locations which were identified during a creek recon spring of 2014. These sites were also tested for the human, canine and avian genetic markers.

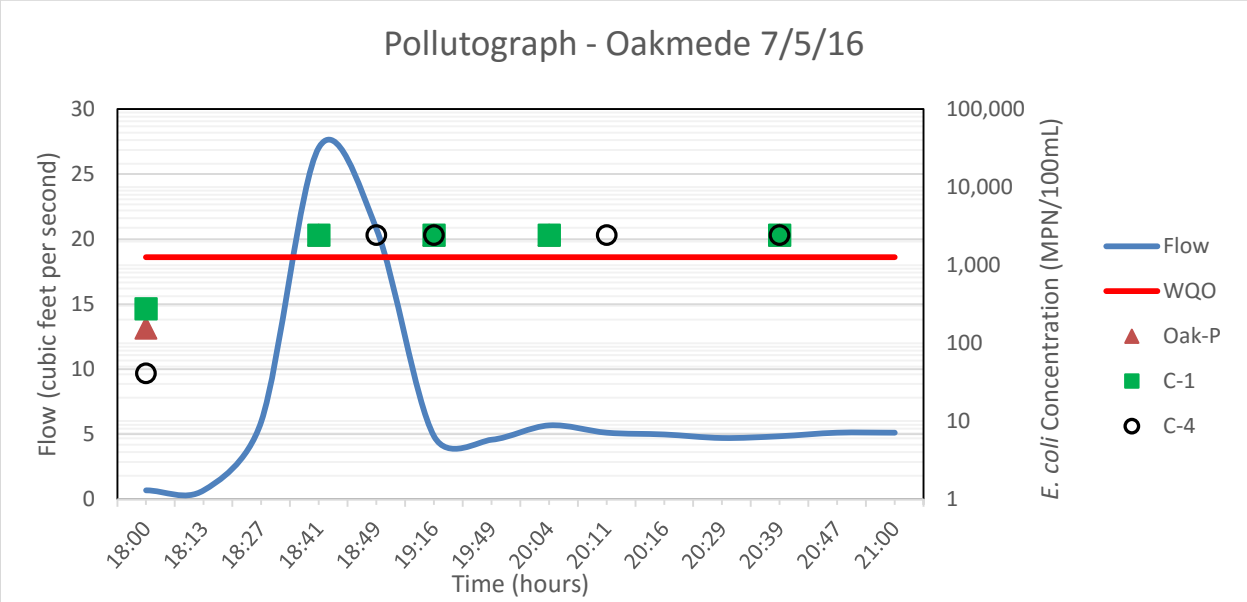
Results at both sites showed above state chronic standard levels of ecoli (less than 126cfu/100ml) which indicates the impairment is wet weather/stormwater runoff related at these sites. Cty Rd f was negative for the human marker and Oakmede had a few positive hits for human marker but they we very close to non-detect and it is common in wet weather conditions to get traces of human ecoli. Both sites were positive for the bird marker suggesting waterfowl have an influence on the bacteria levels in the creek.

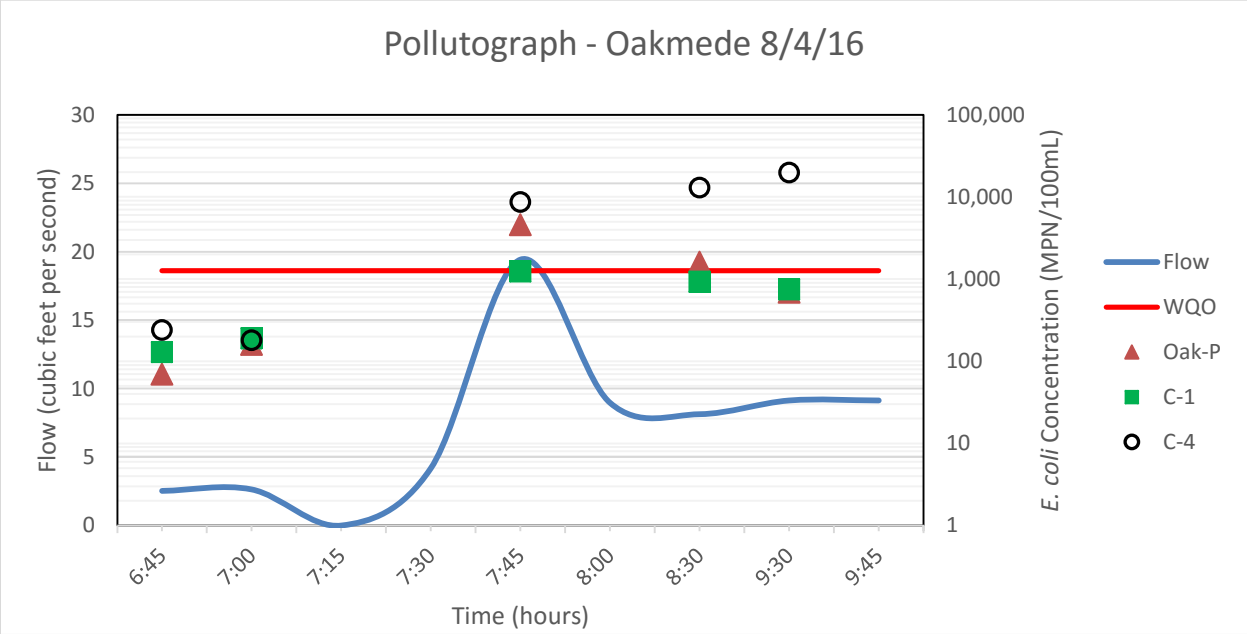
VLAWMO will finish the wet weather monitoring with the Goose and Whitaker sites in 2017.

Oakmede



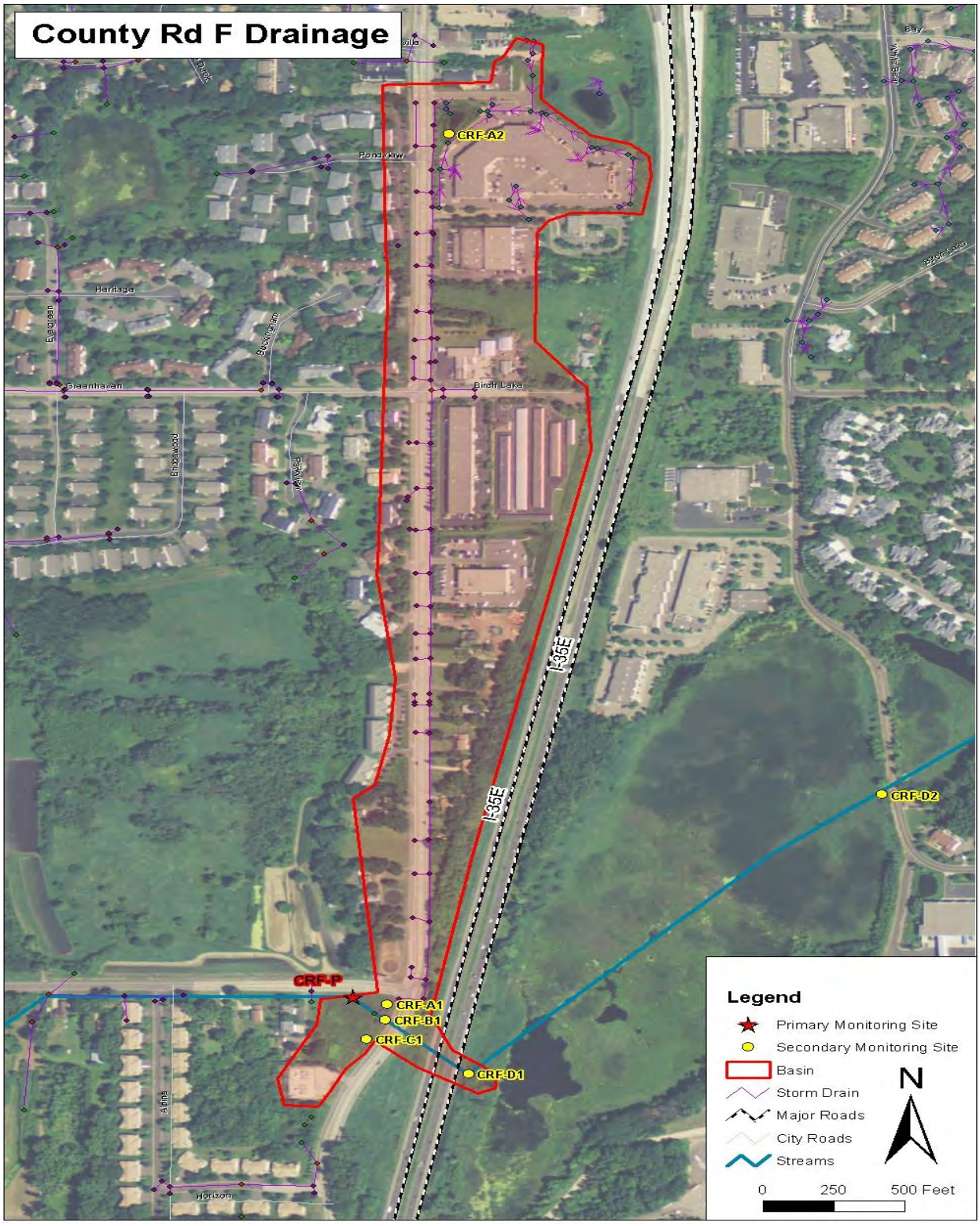
Pollutograph Oakmede



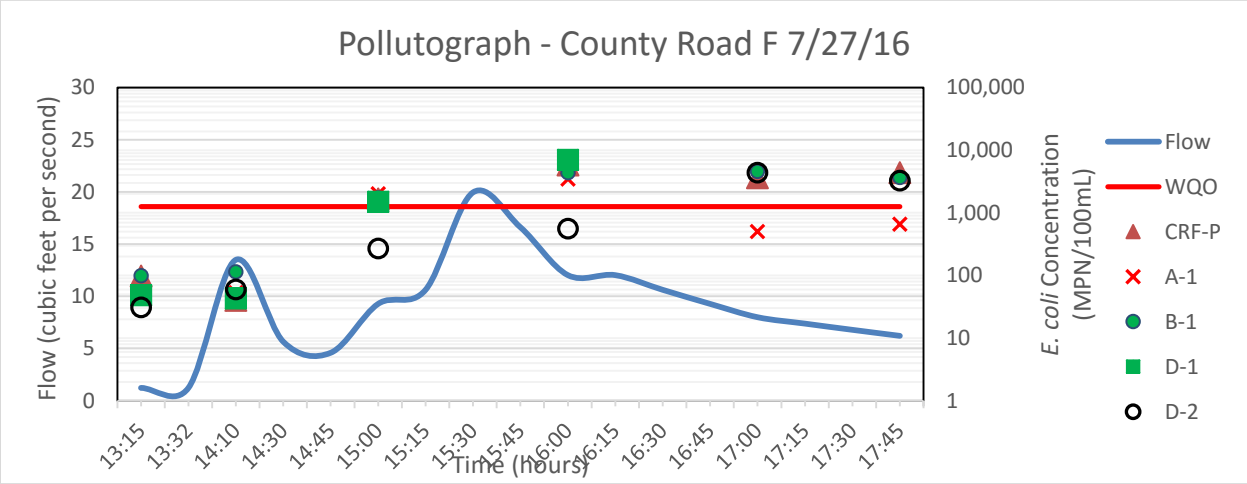


- This data was from a 1.6” and 1.05” storm over a 3hr period. Low ecoli levels before runoff/storm begins, levels shoot up as flows increase from storm and ecoli levels stay high as flow decreases

Cty Rd F


County Rd F Drainage
CRF-A2
CRF-P
CRF-A1
CRF-B1
CRF-C1
CRF-D1
CRF-D2
I-35E
I-35E
Legend
Primary Monitoring Site
Secondary Monitoring Site
Basin
Storm Drain
Major Roads
City Roads
Streams
N
0
250
500 Feet

Pollutograph Cty Rd F



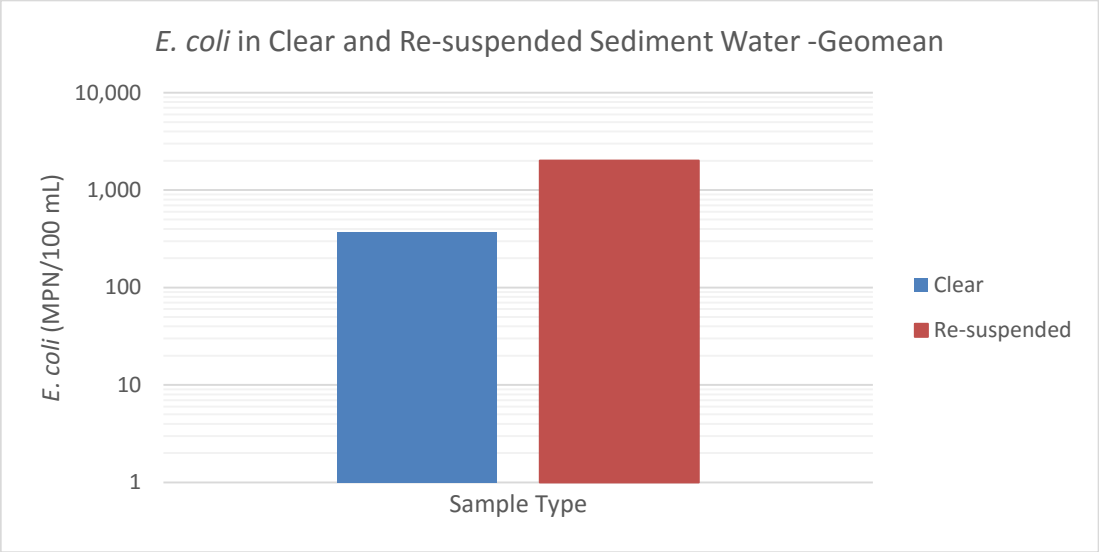
- Similar results as Oakmede, low levels of ecoli until flows begin to increase. High levels of ecoli after flows begin to drop

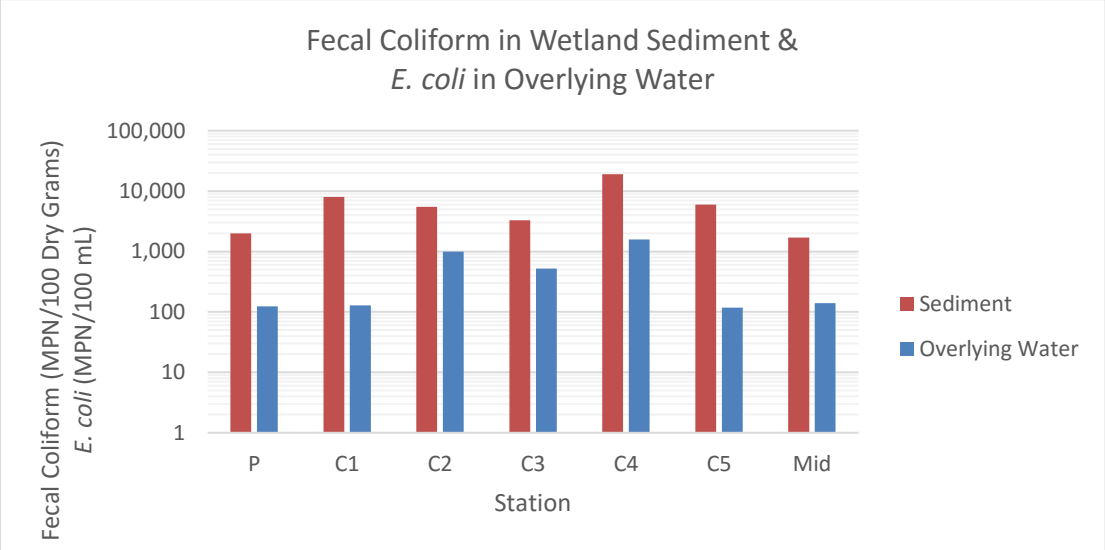
Sample ID	Date Sampled	Human - HF183 Sample Result	Human - HF183 (positive/negative)	Avian - GFD Sample Result	Avian - GFD (positive/negative)	Canine-DogBact Sample Result	Canine-DogBact (positive/negative)
Oakmede Pollutogaph							
MOaKWP-1	7/5/2016	BDL, Equivocal	negative	DNQ	positive	DNQ	positive
MOaKWC4-1	7/5/2016	ND	negative	Detected, ROQ	positive	ND	negative
MOaKWP-2	7/5/2016	DNQ	positive	Detected, ROQ	positive	ND	negative
MOaKWC4-2	7/5/2016	Detected, ROQ	positive	Detected, ROQ	positive	BDL, Equivocal	negative
MOaKWP-3	7/5/2016	BDL, Equivocal	negative	Detected, ROQ	positive	ND	negative
MOaKWC4-3	7/5/2016	Detected, ROQ	positive	Detected, ROQ	positive	DNQ	positive
MOaKWC4-3 Blank	7/5/2016	ND	negative	ND	negative	ND	negative
County Road F Pollutogaph							
MCRFWP-1	7/27/2016	ND	negative	Detected, ROQ	positive	ND	negative
MCRFWD2-1	7/27/2016	ND	negative	Detected, ROQ	positive	ND	negative
MCRFWP-2	7/27/2016	ND	negative	Detected, ROQ	positive	BDL, Equivocal	negative
MCRFWD2-2	7/27/2016	ND	negative	Detected, ROQ	positive	Detected, ROQ	positive
MCRFWP-3	7/27/2016	BDL, Equivocal	negative	Detected, ROQ	positive	ND	negative
MCRFWD2-3	7/27/2016	ND	negative	Detected, ROQ	positive	DNQ	positive
2546MCRFWP-3 Blank	7/27/2016	ND	negative	ND	negative	ND	negative

- Abbreviations: Avg = Average; BDL = Below Detection Limit; cpr = copies per reaction; Cq = quantification (threshold) cycle; DNQ = Detectable But Not Quantifiable; FB = Field Blank; LLOQ = Lower Limit of Quantification; LOD = Limit of Detection; n=number; N/A = Not Applicable; ND = Not Detected; NDsub = substitution value for nondetects; PCR = Polymerase chain reaction; rxs = reactions; StdDev = Standard Deviation; sub = substitution; TSC = Target Sequence Copies; ROQ = Range of Quantification.

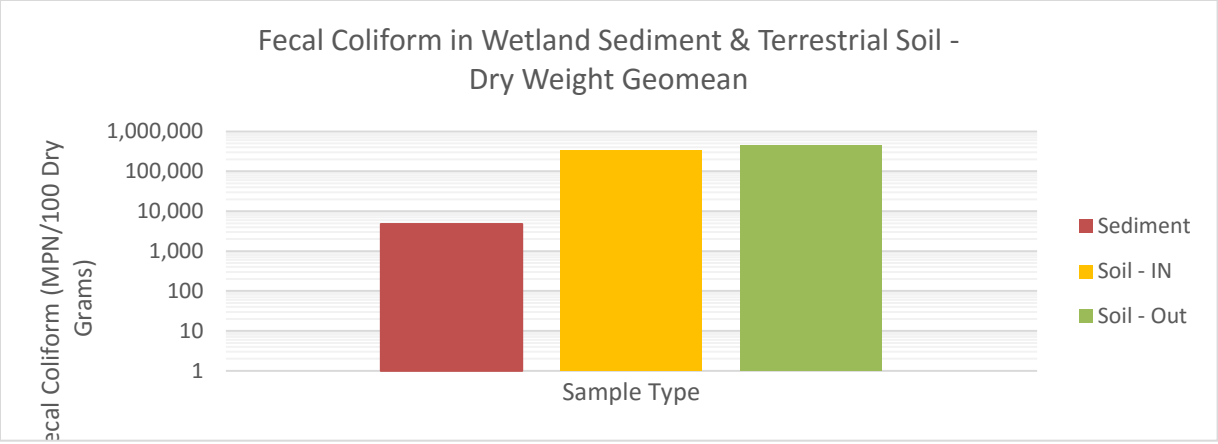
- Molecular results indicate all sites positive for avian ecoli, few hits for canine and a few low detect hits for human which is common during storm events

Special Study – Sediments & Re-suspension Results





- These graphs show that re-suspended/cloudy water column is higher in ecoli than a clear water column, suggesting the increase levels of ecoli during rain/runoff events



- This graph shows that the terrestrial soils both in and out have much higer ecoli concentrations than the wetland sediments indicating that the increase in ecoli levels during rain events has a lot to due with the ecoli washing off of terrestrial soils into waterbodies

Special Study Molecular Results								
Human Marker			Canine			Avian		
Sample ID	Date Sampled	Binary Result (positive/ negative)	Sample ID	Date Sampled	Binary Result (positive/ negative)	Sample ID	Date Sampled	Binary Result (positive/ negative)
SOaK-C2-A1	09/14/16	negative	SOaK-C2-A1	09/14/16	negative	SOaK-C2-A1	09/14/16	positive
SOaK-C2-B1	09/14/16	negative	SOaK-C2-B1	09/14/16	equivocal	SOaK-C2-B1	09/14/16	positive
SOaK-C5-A1	09/14/16	negative	SOaK-C5-A1	09/14/16	negative	SOaK-C5-A1	09/14/16	equivocal
SOaK-C5-B1	09/14/16	negative	SOaK-C5-B1	09/14/16	negative	SOaK-C5-B1	09/14/16	positive
SOaK-C3-A1	09/14/16	negative	SOaK-C3-A1	09/14/16	negative	SOaK-C3-A1	09/14/16	positive
SOaK-C3-B1	09/14/16	negative	SOaK-C3-B1	09/14/16	negative	SOaK-C3-B1	09/14/16	positive
MOaKW-P-1	09/15/16	equivocal	MOaKW-P-1	09/15/16	equivocal	MOaKW-P-1	09/15/16	positive
MOaKW-C1-1	09/15/16	negative	MOaKW-C1-1	09/15/16	negative	MOaKW-C1-1	09/15/16	positive
MOaKW-C1-1 Blank	09/15/16	negative	MOaKW-C1-1 Blank	09/15/16	negative	MOaKW-C1-1 Blank	09/15/16	negative
MOaKW-C4-1	09/15/16	negative	MOaKW-C4-1	09/15/16	equivocal	MOaKW-C4-1	09/15/16	positive
MOaKW-C2-1	09/15/16	negative	MOaKW-C2-1	09/15/16	negative	MOaKW-C2-1	09/15/16	positive
MOaKW-C3-1	09/15/16	negative	MOaKW-C3-1	09/15/16	equivocal	MOaKW-C3-1	09/15/16	positive
MOaKW-C5-1	09/15/16	negative	MOaKW-C5-1	09/15/16	negative	MOaKW-C5-1	09/15/16	positive
Soil samples designated as A were inside the alluvial fan of the outfall								
Soil samples designated as B were outside the alluvial fan of the outfall								
Water samples were collected from the water column containing suspended sediment								

VLAWMO Zebra Mussel Monitoring

VLAWMO placed zebra mussel traps in 4 lakes (Goose Lake, Birch Lake, Gilfillan Lake, Wilkinson Lake), as well as 1 location on Lambert Creek (just below the Koehler flume).

This was VLAWMO's fifth year of Zebra Mussel monitoring and nothing was found in the above lakes and stream location. VLAWMO does have Zebra Mussels in the North Oaks chain of lakes (Charley, Deep, Pleasant, Vadnais, and Sucker) White Bear Lake, just outside our watershed, was confirmed to have zebra mussels fall of 2014.

2016 Monitoring Highlights

- Gem Lake's chemistry has improved over the last 4 years which may coincide with the work that was done on Highway 61 and the reconstructed grass swales flowing into the lake. The MNPCA is currently looking into delisting Gem Lake from the impaired list.
- Gilfillan is another lake that has been on the Impaired List. Since the augmentation system went in to raise the water level, the water quality has improved (most likely due to dilution). We have been told that no augmentation has occurred the last four years so it has been maintaining its level on its own. Nutrient levels look to be slightly rising over the las four years.
- East Goose and West Goose still have very high nutrient levels. Bullhead removal did not make the water quality impact we hoped, but it did reduce nutrient levels a little. More in depth studies will be starting in 2017.
- Wilkinson's phosphorus is over state standards but this year the Chlorophyll A is below or at standard. Wilkinson acts more like a wetland and therefore what goes on in the watershed has a greater effect on the chemistry, MNPCA is looking into changing the lake classification to wetland..
- Tamarack's numbers are still high. The floating wetland has not shown any effect as of yet. This is the third full year of monitoring. Samples were taken right next to the island and compared it to samples taken off the dock. There is no difference between the two spots. So far the water chemistry is similar to what was seen in the past. Monitoring will continue. The floating island currently provides good habitat and educational opportunities and will hopefully help improve water quality over the next few years.
- VLAWMO installed its first automated storm sampler this summer and worked great and provided good results.
- The two cell system at Whitaker continues to export phosphorus. However the pond and forebay has shown a positive effect on suspended solids.
- Chloride levels overall were similar to last year. We have been sampling for 7 years and there have been no significant changes within the lakes. Black Lake has the lowest levels. Birch Lake and East Goose are the highest which makes sense due to the proximity to major roads. All of the lakes are below the current State standards. The creek samples are difficult to catch because it has to be done when water is flowing. Year round chloride sampling on Birch Lake was done for the second year and levels have stayed steady
- Wet weather e. coli study showed that the flow from storm events in the creek has a correlation to the amount of E. coli in the samples. Stormwater runoff seems to be the source of high E. coli levels in the Oakmede and Cty Rd F subwatersheds, mainly from the runoff carrying high levels of e.coli off of terrestrial soils.

- Small study was done on wetland/stream complex connecting Amelia Lake to Wilkinson Lake and it indicated that nutrient loading to Wilkinson Lake is coming from that complex.