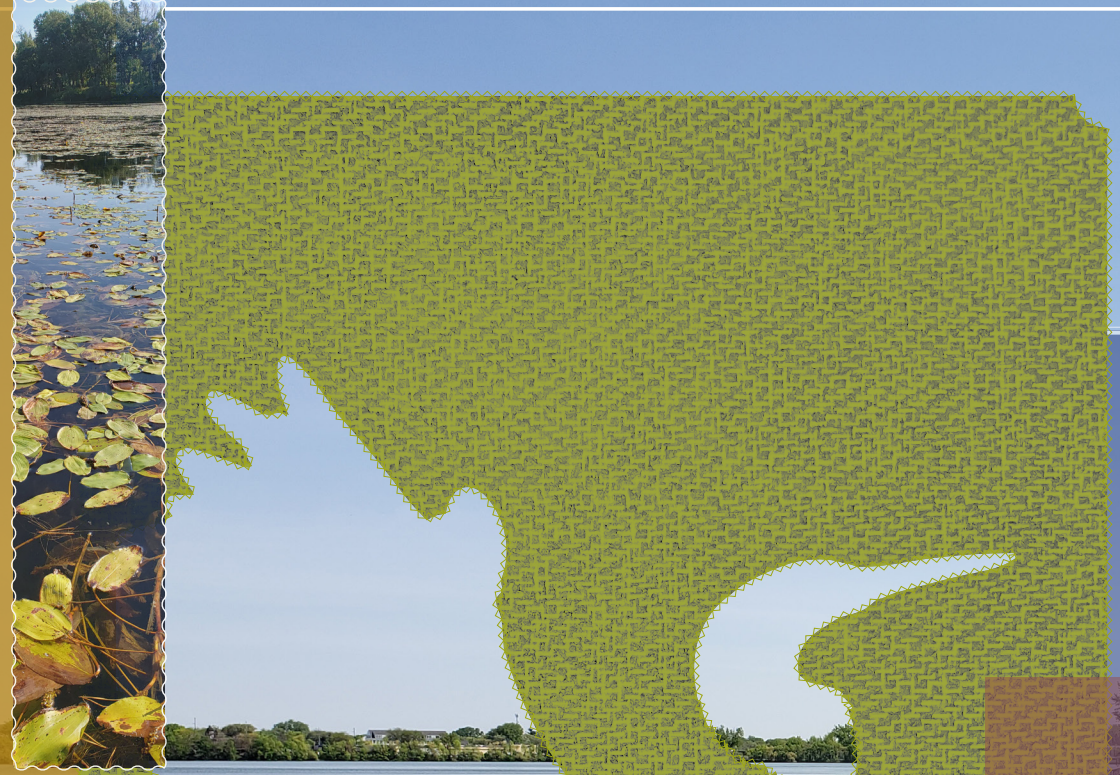


EST 1983
VLAWMO
Vadnais Lake Area
Water Management Organization

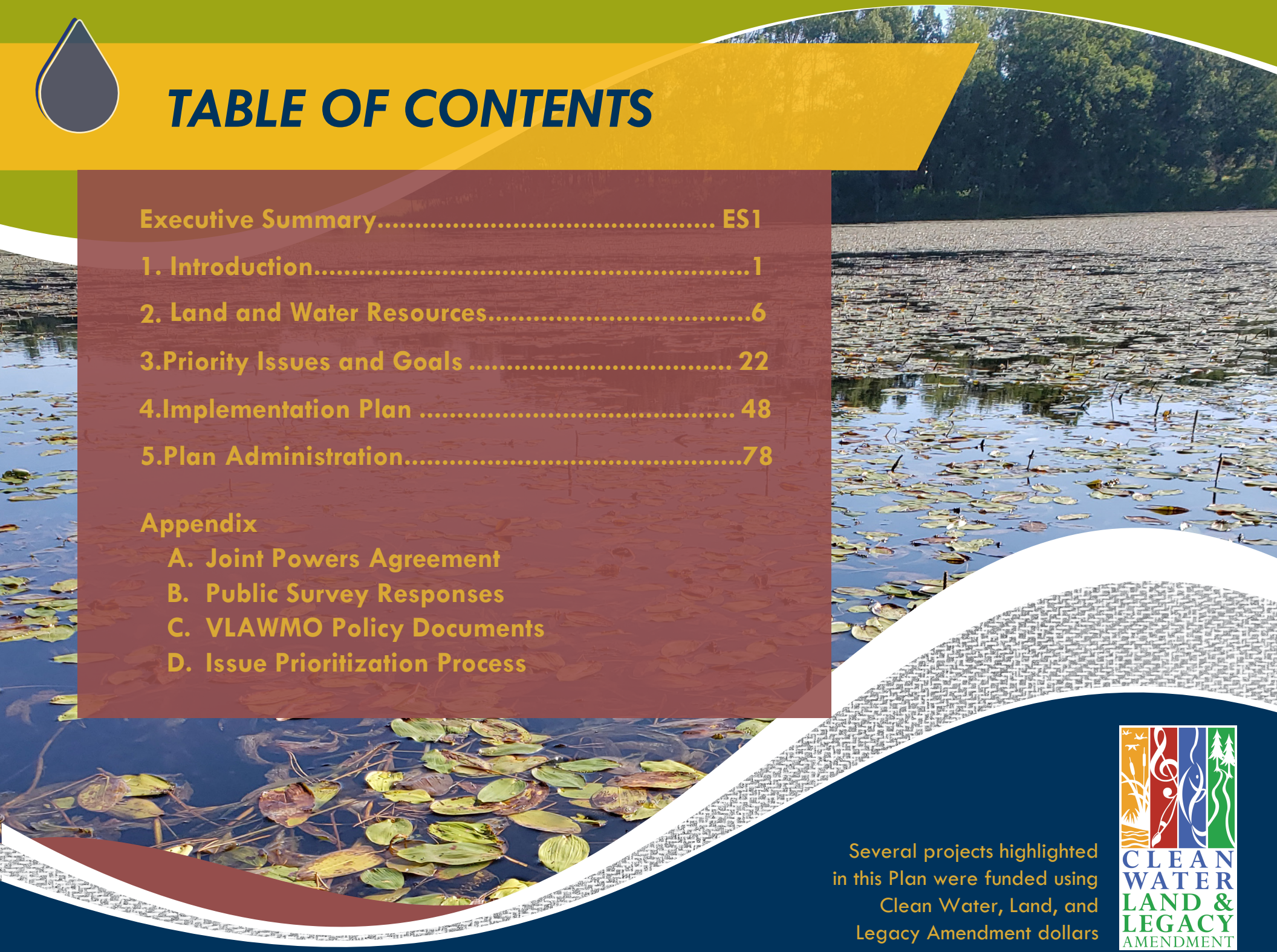
Vadnais Lake Area Water Management Organization

Watershed Management Plan

June 25, 2025

Formal Review Draft

TABLE OF CONTENTS



Several projects highlighted in this Plan were funded using Clean Water, Land, and Legacy Amendment dollars

CLEAN WATER LAND & LEGACY AMENDMENT

ACRONYMS

AIS	Aquatic Invasive Species
BLID	Birch Lake Improvement District
BMP	Best Management Practice
Board	Board of Directors
BWSR	Board of Water and Soil Resources
CAC	Citizen Advisory Committee
CIP	Capital Improvement Project
DNR	Department of Natural Resources
DWSMA	Drinking Water Supply Management Area
EHC	Evaluation of Hydrologic Change
IPAC	Information for Planning and Consultation
JPA	Joint Powers Agreement
LGU	Local Government Unit
LPSS	Lakes of Phosphorus Sensitivity
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer Systems
NHIS	Natural Heritage Information System
NOAA	National Oceanic and Atmospheric Administration
NOHOA	North Oaks Home Owners Association
NPDES	National Pollutant Discharge Elimination System
PFAS	Per- and Polyfluoroalkyl Substances
RCD	Ramsey County Ditch
RCD 13	Ramsey County Ditch 13
RCD 14	Ramsey County Ditch 14
RCSWCD	Ramsey County Soil and Water Conservation Division
SLMPs	Sustainable Lake Management Plans
SPRWS	St. Paul Regional Water Service
SSTS	Subsurface Sewage Treatment Systems
SSU	Storm Sewer Utility
TEC	Technical Commission
TEP	Technical Evaluation Panel
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
TST	Trophic State Index
VLAWMO	Vadnais Lake Area Water Management Organization
WAV	Watershed Action Volunteers
WBIF	Watershed Based Implementation Funding
WBL	City of White Bear Lake
WBLSS	White Bear Lake Storm Sewer
WCA	Wetland Conservation Act
WLA	Wasteload Allocation
WMO	Watershed Management Organization
WWTP	Wastewater Treatment Plan

EXECUTIVE SUMMARY

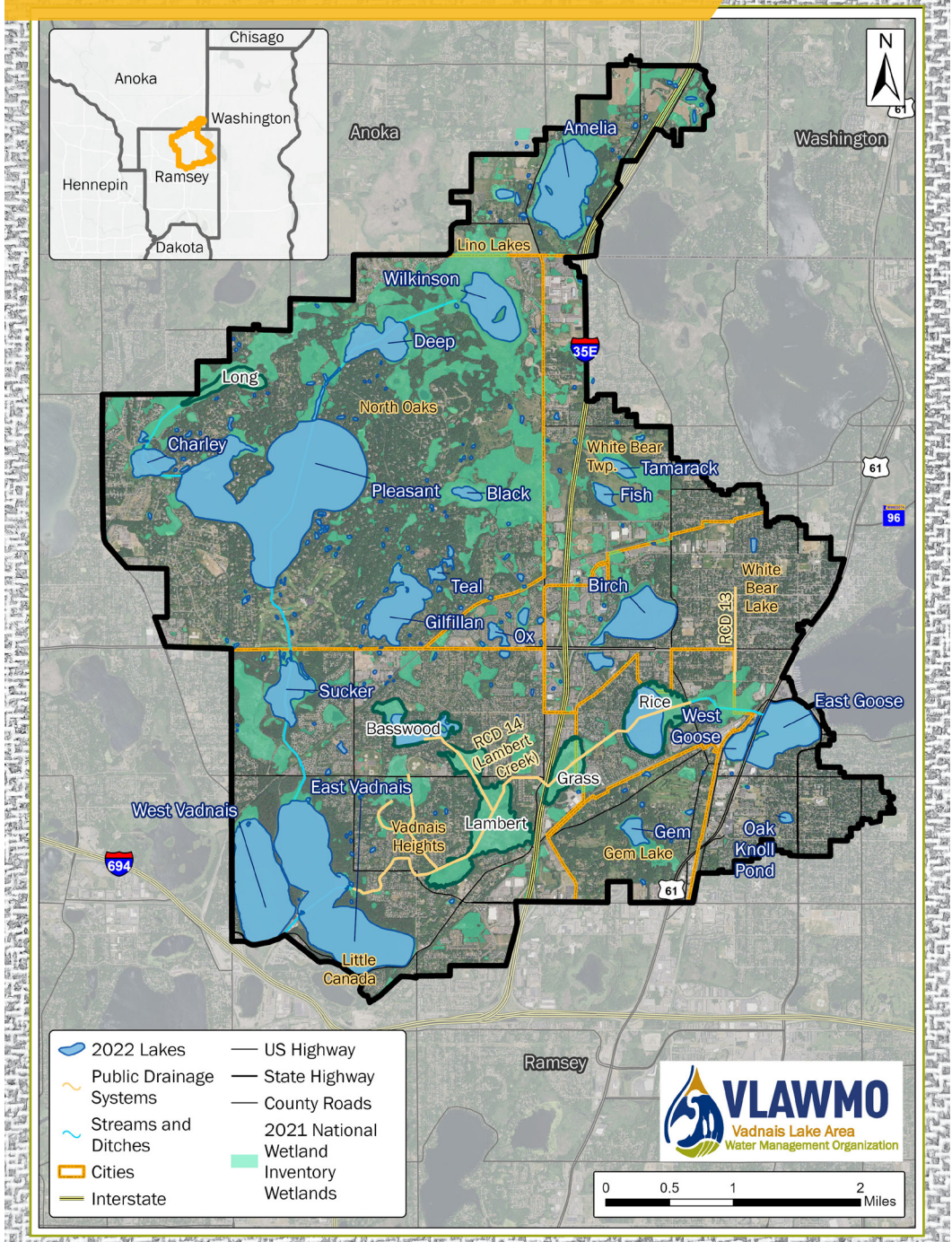
INTRODUCTION

The Vadnais Lake Area Water Management Organization (VLAWMO) covers 24.2 square miles of northern Ramsey County and a small portion of Anoka County in the Twin Cities metropolitan area in Minnesota. VLAWMO encompasses the City of North Oaks, and portions of Gem Lake, Lino Lakes, Vadnais Heights, White Bear Lake, and White Bear Township (Figure ES-1). VLAWMO was formed in 1983.

THE MISSION OF VLAWMO IS TO PROTECT AND ENHANCE THE WATER AND NATURAL RESOURCES WITHIN THE WATERSHED THROUGH WATER QUALITY MONITORING, EDUCATION AND OUTREACH PROJECTS, WETLAND PROTECTION, AND WATER QUALITY ENHANCEMENT PROJECTS AND PROGRAMS.

To achieve its mission of protecting and enhancing water resources in the watershed, VLAWMO has developed this Watershed Management Plan (Plan). This is the fifth Plan which builds on the foundation of goals and achievements of the previous plans, while evolving to meet the issues and goals of the next decade. This Plan was created to be useful for VLAWMO, its agency and local government partners, and its citizens to provide a guiding vision for management of water and natural resources in the watershed from 2027-2036.

Figure ES-1. VLAWMO general location.



LAND AND WATER RESOURCES

Gem Lake.
Photo Credit: www.vlawmo.org

The VLAWMO watershed is a subsection of the larger Mississippi River – Twin Cities Watershed which covers the entire Twin Cities metropolitan area. This larger watershed is further split into smaller watershed units for management purposes. There are 15 watershed districts and management organizations with jurisdiction in the Mississippi River – Twin Cities Watershed, including VLAWMO.

VLAWMO is an urban watershed with abundant parks and natural spaces, providing ecological, recreational, and cultural benefits to its residents and visitors. VLAWMO is especially known for its surface water features. Fifteen public water lakes cover over 14% of the watershed. The watershed also includes 47 public water wetlands, Lambert Creek and its associated tributaries, and a series of minor streams, ditches, and channels. Section 2- Land and Water Resources aims to summarize these valuable resources and their current conditions, so that upcoming efforts can be focused on effectively managing the watershed's resources into the future.

The water quality of VLAWMO lakes is especially important as surface water is used as a drinking water source. VLAWMO has a unique chain of lakes downstream from the Mississippi River that drains into a drinking water reservoir for multiple communities. VLAWMO works closely with the St. Paul Regional Water Service (SPRWS) to monitor surface water quality of East Vadnais Lake as well as the lakes that feed into it, as East Vadnais Lake is the drinking water source for over 450,000 people in 14 cities, including the City of St. Paul.

More information about the following can be found in Section 2–Land and Water Resources:

- History
- Land Use
- Geology and Soils
- Lakes
- Streams, Ditches, and Channels
- Wetlands
- Groundwater and Drinking Water
- Stormwater and Wastewater
- Habitat and Species
- Climate
- Flooding and Climate Resiliency
- Demographics

PRIORITY ISSUES AND GOALS

In an urban watershed, there is a diverse range of issues that impact resource management. Issues were inventoried after review and considered the following:

- The current VLAWMO Comprehensive Watershed Management Plan
- Existing data; completed feasibility studies, SLMP/Lake Reviews, and internal/partner reports; and agency data and reports
- Responses from the 60-day Plan notification
- Responses from the public, TEC, and Board surveys
- Feedback from the initial planning meeting, held April 24, 2024.

A total of 20 unique issues were identified. Each of the 20 issues was placed into 1 of 7 "resource categories." All 20 inventoried issues are important and merit being addressed. However, due to staff time and financial constraints, not all issues can realistically be addressed in a 10-year timeframe. The inventoried issues were prioritized to better focus VLAWMO's future implementation efforts (Table ES-1).

Each priority issue was then assigned a measurable goal. The "goal" for each priority issue is intended to describe an intended vision or accomplishment for each priority issue. The "measure" is the feature, attribute, characteristic, or quantity which forms the unit by which progress is evaluated toward attaining a goal. In many cases, a goal's measure is grounded in the projects that VLAWMO intends to implement during the lifespan of the plan.

Table ES-1. *VLAWMO Priority Issues.*

Resource Category		Priority Issues
	Surface Water Quality Management	• Surface Water and Drinking Water Quality • Erosion of Shorelines and Streambanks
	Groundwater Management	• Groundwater and Drinking Water Quality • Groundwater Supplies and Conservation
	Data Collection	• Water Monitoring • Chloride and Emerging Contaminants
	Outreach, Education, and Community Engagement	• Outreach and Communication
	Flooding and Water Quantity	• Public Drainage Systems • Infrastructure Partnership Projects • VLAWMO Facilities
	Policy and Facilitation	• Wetland Conservation Act • Stormwater Management Standards
	Community and Ecosystem Health and Resiliency	• Climate Resiliency • Natural Features and Habitat

Examples of goals for priority issues are summarized below. These were selected to highlight the diverse nature of issues and goals. For a full list of all VLAWMO's goals, see Section 3- Priority Issues and Goals.

Figure ES-2. *Section 3 Goal Examples.*

Issue: Surface Water and Drinking Water Quality

- **Issue Statement:** Surface waterbodies need protection and restoration to preserve surface drinking water sources and promote aquatic life and recreational opportunities.
- **Surface Water Quality Goal:** Protect and improve water quality through implementation of capital improvement projects, associated technical work, and VLAWMO programs.

  Partnership/Grant Dependent Measure: Pursue partnership project implementation of up to 12 projects or associated technical work that improve surface water and drinking water quality, including at least three funded by 319 Small, Priority Watershed Program.

  Partnership/Grant Dependent Measure: Continue annual implementation of VLAWMO programs to protect and improve water quality.

Issue: Erosion of Shorelines and Streambanks

- **Issue Statement:** Development along shorelines and streambanks, reduction of riparian buffers, and increased streamflow accelerate erosion and nutrient loading to surface waters.
- **Erosion of Shorelines and Streams Goal:** Reduce and/or prevent shoreline or streambank erosion through implementation of stabilization and restoration capital improvement projects, associated technical work, and VLAWMO programs.

  Partnership/Grant Dependent Measure: Pursue partnership project implementation of up to 4 projects or associated technical work focused on shoreline or streambanks to reduce sediment and nutrient delivery to surface waters.

  Partnership/Grant Dependent Measure: Continue annual implementation of VLAWMO programs to reduce and/or prevent erosion of shorelines and streams.

Figure ES-2. Section 3 Goal Examples.

Issue: Outreach and Communication

- **Issue Statement:** An engaged and educated watershed community is critical for increasing understanding of and engagement in VLAWMO efforts and policies, leading to improvements in watershed resources.
- **Outreach and Communication Goal:** Enhance public understanding of water-related issues and improve watershed conditions through effective communication and outreach. Specific measurable goals are shaped by conversations with partners and community members, then shared with key stakeholders in biennial Work Plans.

  Partnership/Grant Dependent Measure: Continuously monitor and maintain current website; annually complete at least 2 articles or press releases for local press, plus 1 annual newsletter; coordinate at least 2 community events or workshops each year.

Issue: Climate Resiliency

- **Issue Statement:** Climatic changes can potentially overwhelm the capacity of existing stormwater management systems, impact water quality, and make drought more likely which threatens groundwater supplies.
- **Outreach and Communication Goal:** Pursue implementation of partnership projects that result from completed resiliency studies to build resiliency to changing rainfall and runoff events. Future studies would utilize Atlas 15 as available to model target areas for projects to build resiliency to future storm events

  Partnership/Grant Dependent Measure: Pursue technical work and partnership project implementation of 4 projects to improve climate resiliency

IMPLEMENTATION PLAN

Implementation actions address issues and goals listed in Section 3- Priority Issues and Goals. Actions that VLAWMO will focus on during the next ten years are summarized in an Implementation Table, with estimated annual costs for each.

VLAWMO implementation actions operate within one of four core activities:

Administration: Activities associated with running the organization, including managing the budget

VLAWMO Implementation Programs: This core activity is the most expansive, as it is inclusive of the following programs: Aquatic Invasive Species Management; Communication, Outreach, and Education; Monitoring; Capital Improvements - Early Coordination; Operations and Maintenance; Regulatory and Policy; General Analysis and Technical Work; and VLAWMO Grants and Partnerships.

Project Technical Work: Technical work includes feasibility studies, stormwater retrofit analyses, modeling, etc., to inform project scope

Capital Improvement Projects: A capital improvement project is a physical improvement or structure built to last at least 25 years (with continued maintenance) and a total cost typically over $50,000.

Descriptions of each core activity and associated programs are detailed throughout Section 4- Implementation Plan.

Resource Prioritization

Prioritizing resources provides direction on where to target efforts. VLAWMO identified four criteria that are used to identify priority resources:

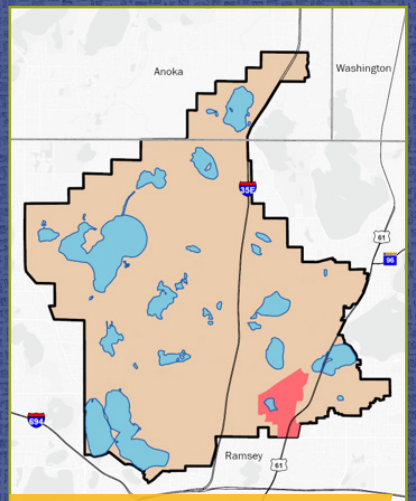
1. If the resource is part of a priority subwatershed as defined by VLAWMO's Nine Key Element document (NKE) and participation in the MPCA administered Clean Water Act, Section 319 grant program as a small, priority watershed for funding
2. If the resource is in the chain of lakes used for drinking water
3. If a resource is VLAWMO's administered grant program priority zones
4. If a resource is impaired, nearly impaired, barely impaired, or a lake of high biological significance

No one criteria will outrank another; VLAWMO staff will review all when determining and prioritizing projects. The list of resources and priority criteria will be used when pursuing and funding projects.

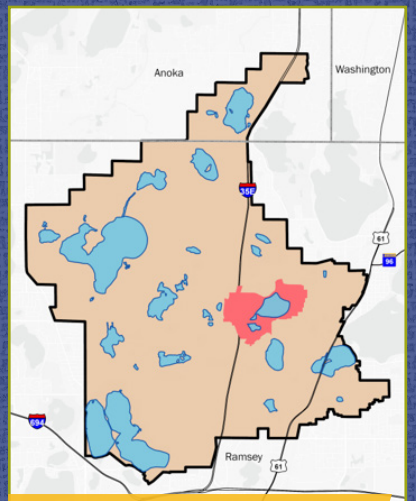
Implementation Table

For planning purposes, VLAWMO is organized into seven smaller subwatersheds, which allows detailed focus and targeting of specific areas and issues. Section 4-Implementation Plan contains summaries for each subwatershed that include a description of the subwatershed, quick facts, a map, and past project highlights. Technical work and capital improvement projects are also summarized for each subwatershed, and are further detailed in the Implementation Table.

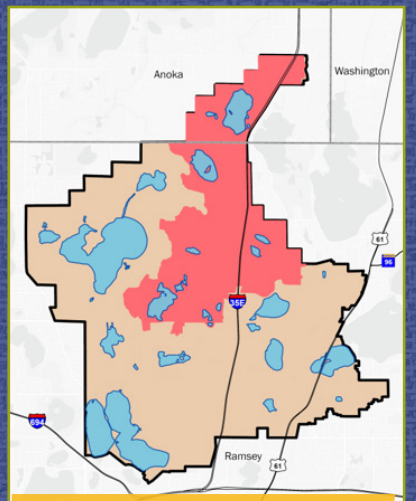
Figure ES-3. VLAWMO subwatersheds.



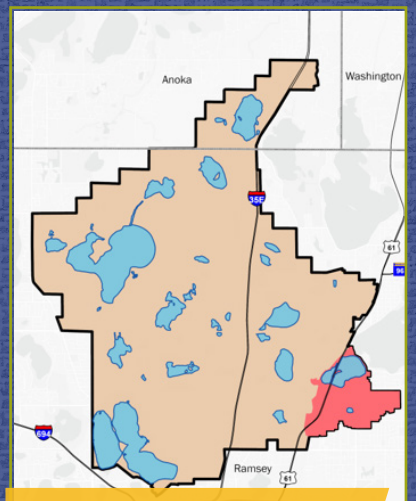
Birch Lake Subwatershed



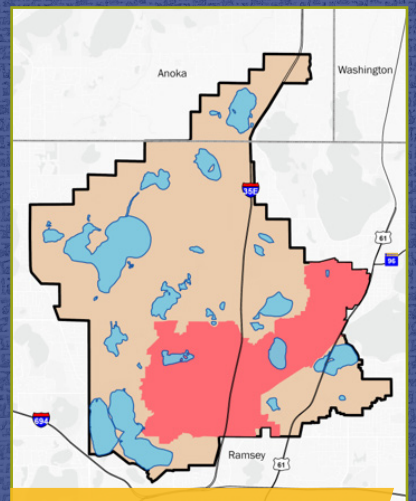
Gem Lake Subwatershed



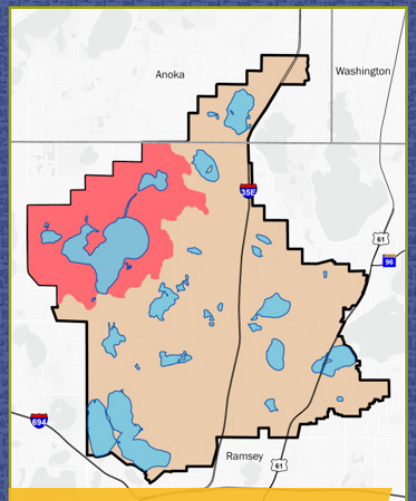
Gilfillan-Tamarack-Black-Wilkinson-Amelia Subwatershed



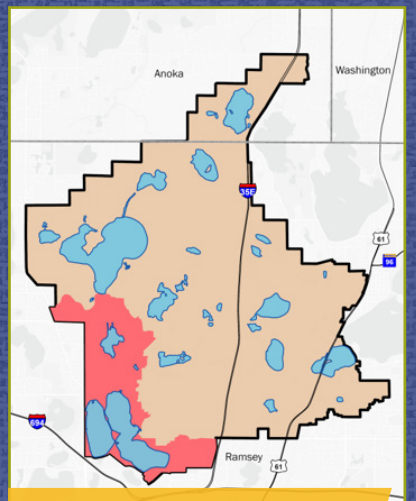
Goose Lake Subwatershed



Lambert Creek Subwatershed



Pleasant-Charley Subwatershed



Sucker-Vadnais Subwatershed

The Implementation Table includes the programs, technical work, and projects for VLAWMO from 2027-2036. Projects within each subwatershed align with those described in the subwatershed pages. The Implementation Table includes:

- A description of the activity
- Goals that it addresses
- Priority level
- Partners for implementation and
- Estimated cost by year

Costs in the Implementation Table are high-level estimates for the portion of the estimated cost VLAWMO will be responsible for, adjusted annually for inflation. In many cases, estimated project costs are much higher and anticipate local partner funding and/or outside grant funding. All projects listed are partnership and/or grant dependent. These are a best estimate and may change or fluctuate leading up to or during project implementation.

Projects were identified in coordination and collaboration with municipalities and partner organizations with knowledge at the time of plan writing. Planned projects and funding may shift from what is listed based on changing resource conditions, funding availability, ability for partnership, or staff capacity.

Programs, technical work, and projects in the Implementation Table are visually and directly connected back to the goals they address. If an activity is listed as part of a goal measure, the goal toggle icon is switched to 'on'. If a program, technical work, or project indirectly benefits a goal, the toggle is switched 'off'. The applicable goals that are addressed are listed next to the toggle.

*Indicates program, technical work, or project **directly** relates to a measurable goal*

*Indicates a program, technical work, or project **indirectly** benefits a measurable goal, but is not used to measure it*

PLAN ADMINISTRATION

VLAWMO operates under a Joint Powers Agreement, which allows for a variety of funding mechanisms. Funding for projects will primarily be driven by Storm Sewer Utility (SSU) fees, but many projects VLAWMO implements are funded fully or in part through grants, including grants awarded directly to VLAWMO or received by partnering organizations.

As a joint powers watershed management organization (WMO), VLAWMO has specific responsibilities that are mandatory or discretionary. Examples of mandatory roles include preparing an annual report, appointing an advisory committee, and reviewing and approving local water management plans. VLAWMO does not exercise land use or permitting authority. A member community must adopt the standards identified in the VLAWMO Water Management Policy into its official controls. VLAWMO may provide "advisory" comments upon request from a member community.

Section 5 – Plan Administration outlines additional roles and responsibilities of VLAWMO, including:

- Local Watershed Plans and municipalities responsibilities
- MS4 Responsibilities
- Enforcement and regulation responsibilities

The programs, technical work, and projects summarized in the plan will likely evolve over time as new information, priorities and as funding sources shift. To stay current with these potential changes, annual work planning, annual reporting and biennial progress assessments will be used and will guide changes as needed. If a change is needed, the amendment process will be used to update the plan.

1 INTRODUCTION

1. INTRODUCTION

The Vadnais Lake Area Water Management Organization (VLAWMO) covers 24.2 sq miles of northern Ramsey County and a small portion of Anoka County in the Twin Cities metropolitan area in Minnesota. VLAWMO encompasses the City of North Oaks, and portions of Gem Lake, Lino Lakes, Vadnais Heights, White Bear Lake, and White Bear Township. The watershed is bordered by the Rice Creek Watershed District to the north and the Ramsey-Washington Metro Watershed District to the south. While VLAWMO is predominately urban, the watershed is known for numerous green and natural spaces, including over a thousand wetlands and 15 lakes (Figure 1-1).

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VLAWMO was formed in 1983 to protect the Vadnais Lake watershed area. To achieve its mission of protecting and enhancing water resources in the watershed, VLAWMO has developed this Watershed Management Plan (Plan). This is the fifth Plan which builds on the foundation of goals and achievements of the previous plans, while evolving to meet the issues and goals of the next decade. This Plan was created to be useful for VLAWMO, its agency and local government partners, and its citizens to provide a guiding vision for management of water and natural resources in the watershed from 2027-2036.

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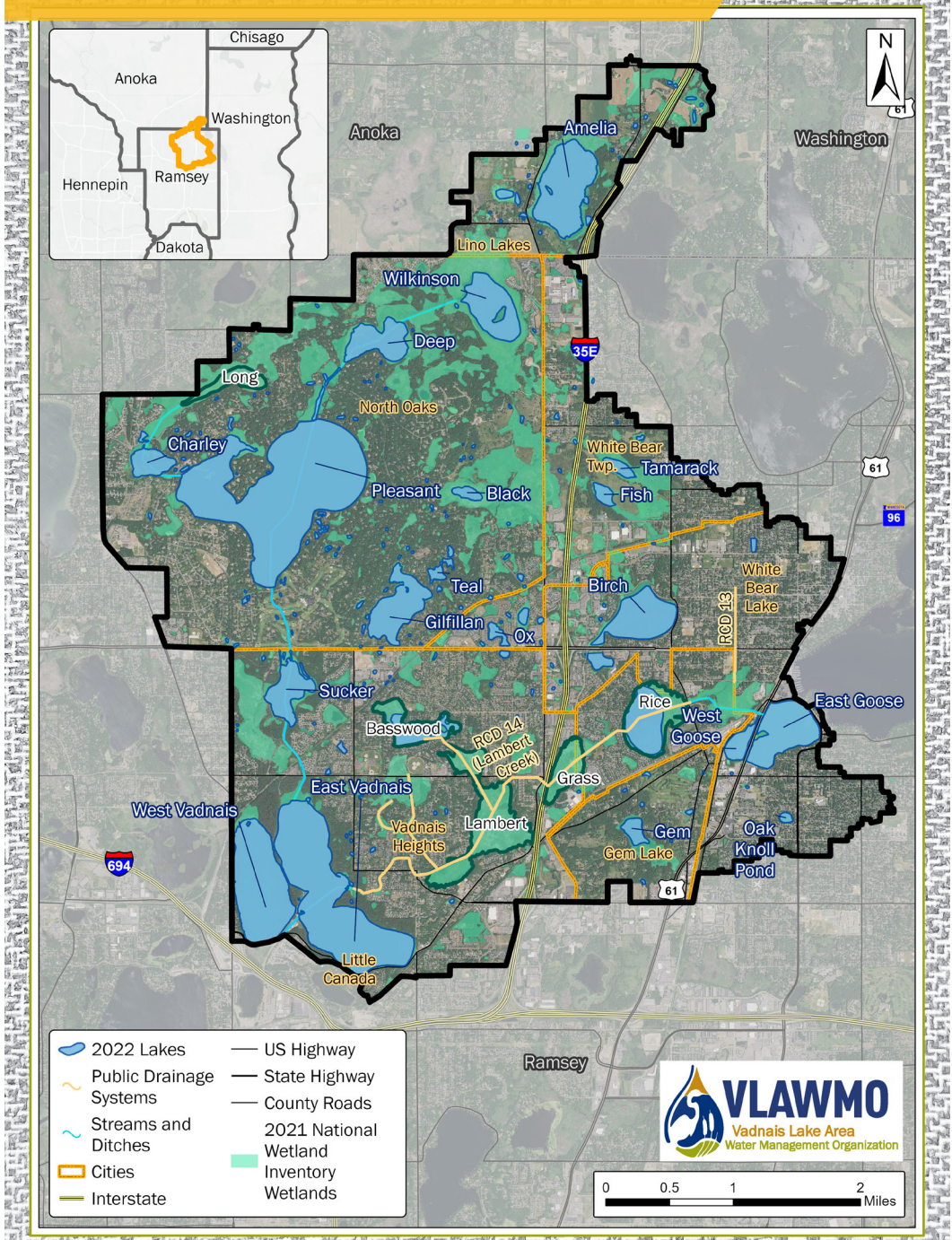


1.1 VLAWMO Administration

In 1982, the Minnesota Legislature directed metro-area watersheds to develop watershed management plans through the Metropolitan Area Surface Water Management Act. Minnesota Statute 103B.201 outlines the purpose of WMOs:

1. protect, preserve, and use natural surface and groundwater 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; and
8. secure the other benefits associated with the proper management of surface and groundwater.

VLAWMO was organized in 1983 through a Joint Powers Agreement (JPA) between the cities of Gem Lake, Lino Lakes, North Oaks, Vadnais Heights, and White Bear Lake and White Bear Township, collectively referred to as the "members."

Pleasant Lake. Photo Credit: www.vlawmo.org

The JPA was developed under authority granted by Minnesota Statues Sections 471.59 and 103B.201, and established a two-tier governance system consisting of a Board of Directors (Board) and a Technical Commission (TEC):

- The Board consists of one elected member from each of the six member communities and meets every two months. The Board is responsible for reviewing and voting on VLAWMO policies and larger scale projects and programs and oversees the VLAWMO budget.
- The TEC is comprised of one representative assigned by each member community and meets monthly. The TEC considers monthly watershed business, votes on small scale projects, and makes recommendations to the Board on large projects. The TEC, through the VLAWMO administrator and other staff members, fulfills its State-mandated purpose via its programs and projects.

In addition to the Board and TEC, VLAWMO organizational structure also includes two committees. The Citizen Advisory Committee (CAC) is comprised of community volunteers and meets twice yearly to advise on watershed projects. The VLAWMO Board Subcommittee is made up of Board representatives to review and recommend actions related to finance, policies, and personnel.

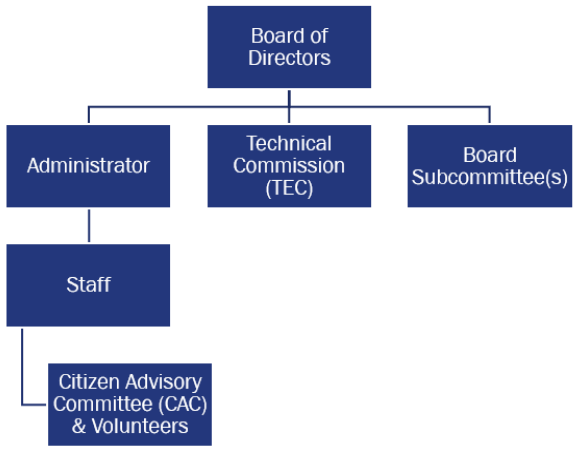


Figure 1-2. *VLAWMO Organizational Chart.*

1.2 Summary of Implementation Success

This is VLAWMO's fifth generation Plan. The first Plan was written in 1985, when key issues were flood control and water-quality protection, through watershed-scale development review and wetland protection. The second Plan, adopted in 1997, expanded VLAWMO's activities to include an annual monitoring program. Implementation of stream and wetland restoration strategies on Lambert Creek and the assessment and protection of wetlands were VLAWMO's priorities. VLAWMO and partners designed and installed projects that mitigated flooding by restoring wetlands along Lambert Creek and conducted a comprehensive wetland assessment for some wetland complexes.

With the third Plan in 2007, VLAWMO added staff, instituted cost-share programs and an enhanced education and outreach program, installed capital projects, and expanded its monitoring program. A funding mechanism (a storm sewer utility fee) was established in 2008 with special permission from the legislature, which provided financial stability for the watershed. During this time, an assessment of VLAWMO's lakes and streams resulted in the inclusion of several waterbodies on the Minnesota Impaired Waters List. A TMDL was developed in 2013/2014 that included nutrient impairments for Gem, Gilfillan, East Goose, West Goose, and Wilkinson Lakes, and a bacteria impairment for Lambert Creek. Additional impairments were listed after the TMDL was completed. Those included nutrient impairments for Pleasant, Tamarack, and West Vadnais Lakes.

The fourth Plan in 2017 recognized issues of groundwater aquifer concerns, fluctuating lake levels, new sources of potable water, and climate change. Goals of the Plan included feasibility efforts and installation of

Birch Lake. Photo Credit: www.vlawmo.org

capital projects to work toward addressing impairments. Projects included construction of a meander and biochar filter on Lambert Creek, an invasive common carp removal program on the Pleasant Lake chain, a constructed wetland to improve Wilkinson Lake, initiation of an alum treatment on Tamarack Lake, and others. A comprehensive effort to build Sustainable Lake Management Plans (SLMPs) was completed. SLMPs have transitioned to Lake Reviews. Lake Reviews compile standardized surveys, monitoring, and results of feasibilities to build, compile, and maintain trends and current information for ongoing management of VLAWMO lakes.

In the fifth Plan beginning in 2027, VLAWMO will continue working with its partners to focus on increased implementation of capital projects to continue improving impaired lakes and protecting lakes with good water quality. Locations VLAWMO intends to focus on include the Pleasant Lake chain, Wilkinson Lake, Tamarack Lake, and ongoing efforts to improve Lambert Creek. Maintenance of completed projects, with project partners, is a high priority to protect gains made to date. All of VLAWMO's projects are undertaken through a lens of climate resiliency and environmental justice. See Section 3.3 Planning Lenses for further explanation on resiliency and environmental justice as a planning lens.

1.3 Looking Ahead to the Next 10 Years

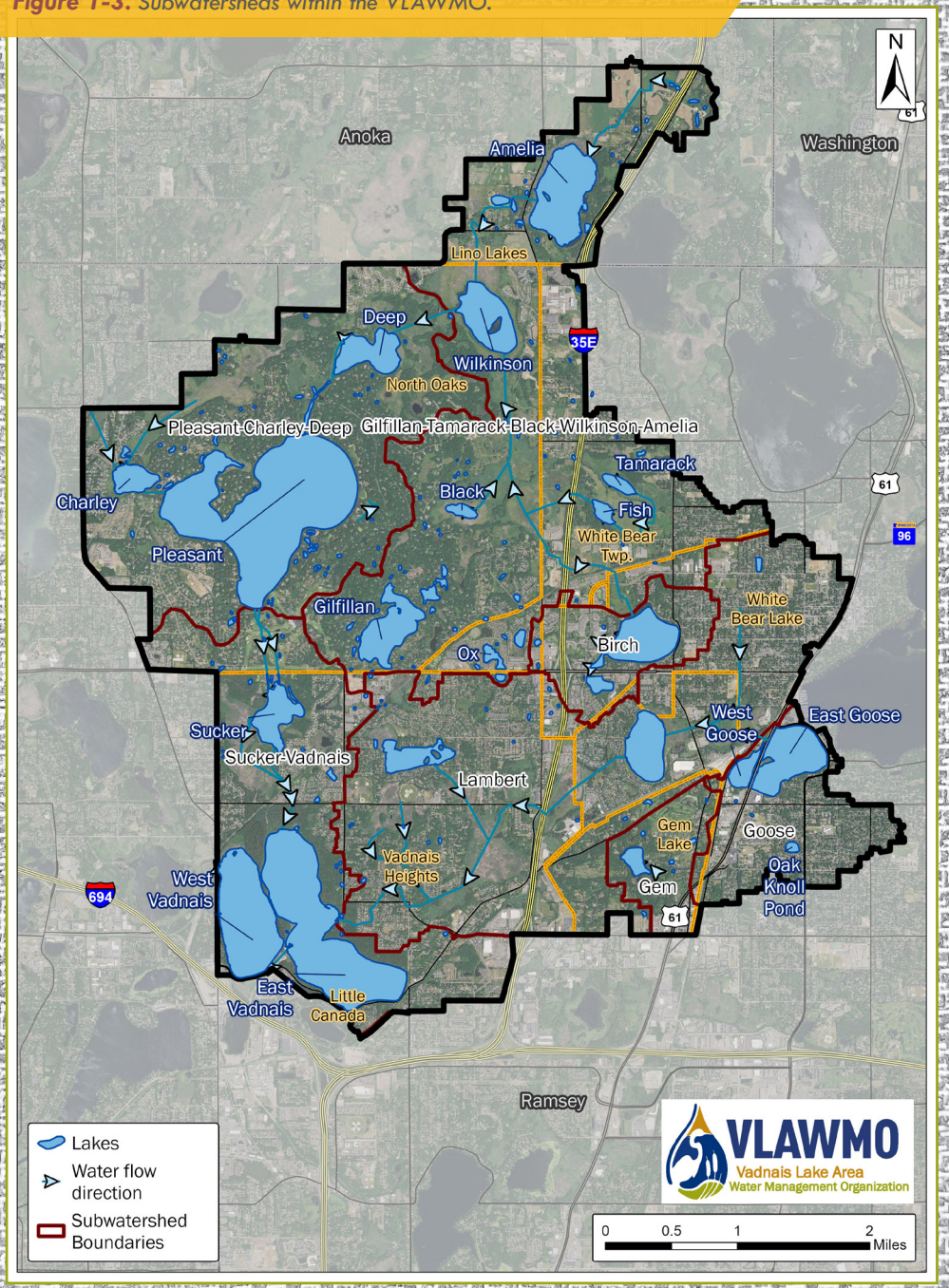
This Plan builds upon the success of previous plans and implementation efforts and sets a guiding vision for management of water and natural resources in the watershed from 2027-2036. To meet this vision, this Plan provides a summary of current conditions in the watershed (Section 2- Land and Water Resources Narrative), describes the issues and goals that are the focus of the Plan (Section 3- Priority Issues and Goals), and identifies the actions that will be implemented to make progress towards goals (Section 4- Implementation Plan).

The prominence of issues may shift based upon the location and associated conditions in a given area of the watershed, due to presence of resources (e.g. wetlands, lakes) or magnitude of issues (e.g. nutrient loading, flooding). Because of this, subwatersheds are referenced throughout this Plan to organize issues, actions, and potential projects at a finer management scale, while maintaining a watershed-wide focus.

1.3.1 Subwatersheds

There are seven smaller subwatersheds within the larger VLAWMO boundary (Figure 1-3). Most of the water in VLAWMO flows into East Vadnais Lake, with the exception of the self-contained Gem Lake subwatershed and West Vadnais Lake. There has been no detectable surface nor subsurface connection between West Vadnais and East Vadnais Lakes. In the Lambert Creek Watershed, in the southeastern section of the watershed, water drains into ditches which connect to Lambert Creek and drain to East Vadnais Lake. Along the western side of the watershed, water drains south through Amelia, Deep, Pleasant, and Sucker Lakes into East Vadnais Lake. The centrally located lakes, Birch, Gilfillan, Black, Tamarack, and Fish Lakes, flow north through

Figure 1-3. Subwatersheds within the VLAWMO.



Wilkinson Lake and into Deep Lake. Subwatershed-scale planning can target projects to a specific area and lakeshed. Both watershed-wide and subwatershed activities are included in this Plan. As can be seen in Figure 1-3, the political boundary of VLAWMO does not perfectly align with the hydrologic subwatershed boundaries.

1.4 Plan Development and Community Engagement

The initial phases of this Plan update began by conducting engagement and gathering feedback from the public and stakeholders. The engagement phase provided avenues for VLAWMO to hear from stakeholders, convene engagement activities, and incorporate what was heard into this resulting Plan. Engagement activities included:

- Three virtual "coffee chats" (February 13, 20, and 27, 2024)
- Overview at the VLAWMO Grants Program 101 (March 7, 2024)
- Initial Planning Meeting (April 24, 2024)

To bolster these activities, VLAWMO conducted a public survey for those who live, work, and visit the watershed. The public survey was open from February 5, 2024 to March 13, 2024. The survey was available for digital submission and in-person at survey stations at local Ramsey County libraries and Tamarack Nature Center.

Two additional surveys were developed and administered. One of those surveys was targeted to VLAWMO partner organization representatives and the VLAWMO Technical Commission. The other incorporated feedback received from the public and partner surveys and was administered to the VLAWMO Board of Directors.

The findings from all three surveys as well as responses from Plan review agencies were used to form the Plan's priority issues, which are summarized in Section 3- Priority Issues and Goals. Public survey results are also available for viewing in Appendix B.

2

LAND AND WATER RESOURCES

2. LAND AND WATER RESOURCES

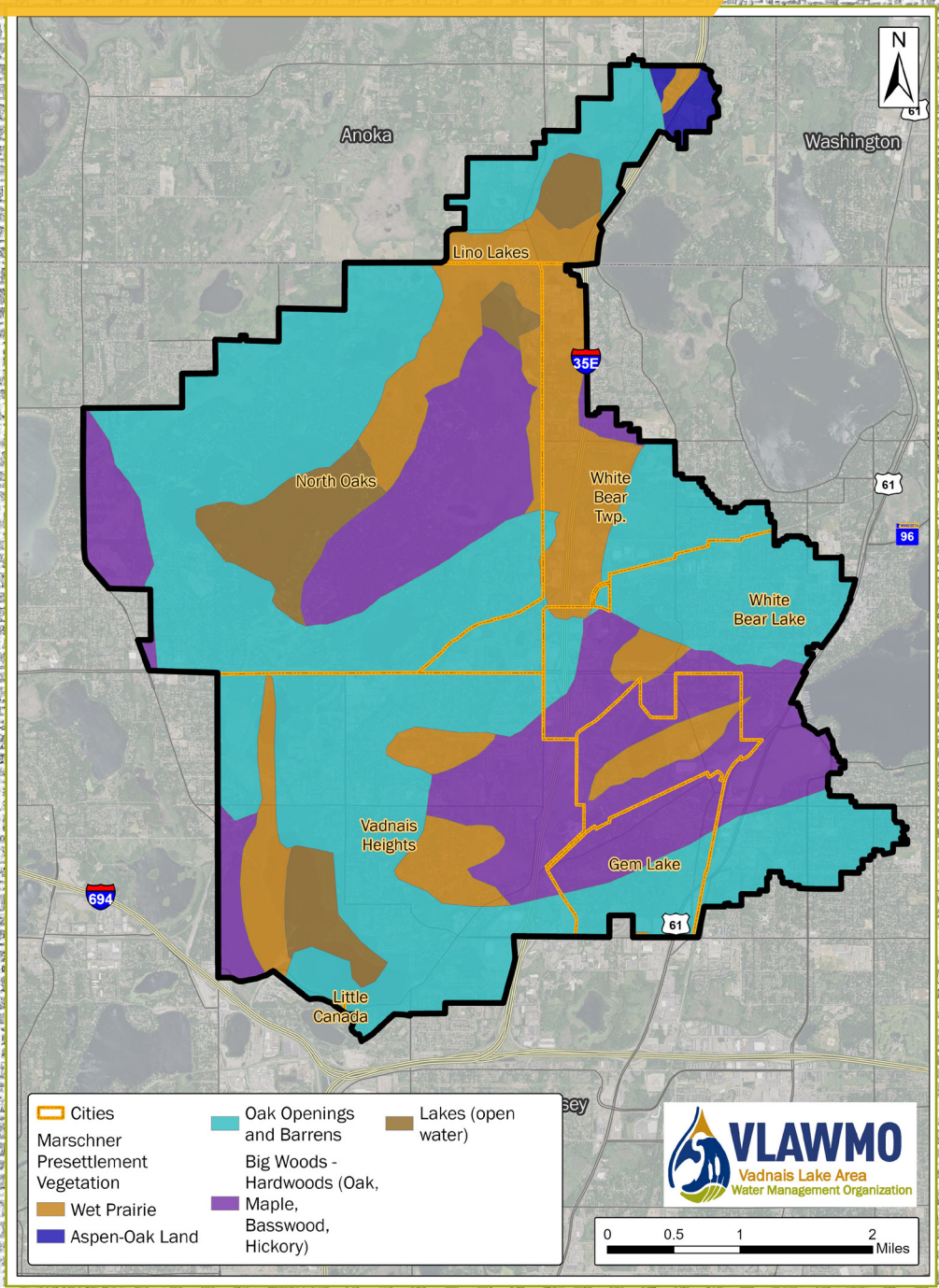
The Vadnais Lake Area Water Management Organization (VLAWMO) watershed covers 24.2 square miles of northern Ramsey County and a small portion of Anoka County in the Twin Cities metropolitan area. It encompasses the City of North Oaks and part of Gem Lake, Lino Lakes, Vadnais Heights, White Bear Lake, and White Bear Township. The watershed is a subsection of the larger Mississippi River – Twin Cities Watershed which covers the entire Twin Cities metropolitan area. This larger watershed is further split into smaller watershed units for management purposes. There are 15 watershed districts and management organizations with jurisdiction in the Mississippi River – Twin Cities Watershed, including VLAWMO.

VLAWMO is an urban watershed with abundant lakes, streams, parks, and natural spaces, providing ecological, recreational, and cultural benefits to its residents and visitors. This section of the Plan aims to summarize these valuable resources and their current conditions, so that upcoming efforts can be focused on effectively managing the watershed's resources into the future. More detailed information than what is included here is used in watershed planning and project development. This summary is intended

2.1 Past and Present

VLAWMO's landscape today looks much different than it did prior to European settlement. Historically, the land was predominately covered by maple-basswood forests that were interspersed with wetlands. Marschner's pre-settlement vegetation map (Figure 2-1) shows big woods, oak openings, wet prairie, and open water covering what is now VLAWMO (DNR, 2022). About 16% of the watershed area was wet prairie. The first inhabitants of the region were Native Americans that lived near the Mississippi River. Early settlers established Fort Snelling

Figure 2-1. Marschner's pre-settlement vegetation map.



in the early 1800s to support the fur trade, and the development of St. Paul and surrounding areas followed. The location along the river allowed settlers to arrive to the new territory via steamboat, and later railroad. Many people settled outside of the city to farm the land in what is now the suburbs and VLAWMO. Over time, and with the development of infrastructure, the area became increasingly developed with homes and businesses replacing farmland. This residential, suburban, and industrial development continues today. In the late 1800s, wetlands were drained to accommodate farming and suburbanization, which eventually grew into a blend of residential, commercial, and industrial development.

VLAWMO staff visits a classroom at Birch Lake Elementary School. Source: www.vlawmo.org

Now, in present-day, VLAWMO is estimated to be home to close to 30,000 people (US Census, 2021; see Section 2.8). Over half of the watershed is developed; however, nearly 30% of the watershed remains as forested land or wetlands. This is a fairly large percentage for its location in the Twin Cities metropolitan area, compared to neighboring watersheds. A breakdown of watershed land uses and land cover is shown in Figure 2-2, Figure 2-3, and Table 2-1. Figure 2-2 shows the land cover in the National Land Cover Database based on satellite imagery. Table 2-1 and Figure 2-3 shows the land use in the metropolitan area which the Metropolitan Council developed based on aerial imagery. Each dataset is useful in its own way but should be interpreted separately from each other.

VLAWMO partners are required to develop local ordinances that are in compliance with VLAWMO's Water Management Policy (Appendix C). The land in VLAWMO is nearly fully developed or used as parks and open space. Most of the undeveloped land is either protected or not suitable for development. Current and future land use changes are primarily through redevelopment or retrofit projects. Land use regulations and upcoming planning is described in each of the member community comprehensive plans, which are linked below:

- Vadnais Heights **2040 Comprehensive Plan**
- North Oaks **2040 Comprehensive Plan**
- Gem Lake **Comprehensive Plan**
- Lino Lakes **2040 Comprehensive Plan**
- White Bear Lake 2040 Comprehensive Plan
- White Bear Township **2040 Comprehensive Plan**

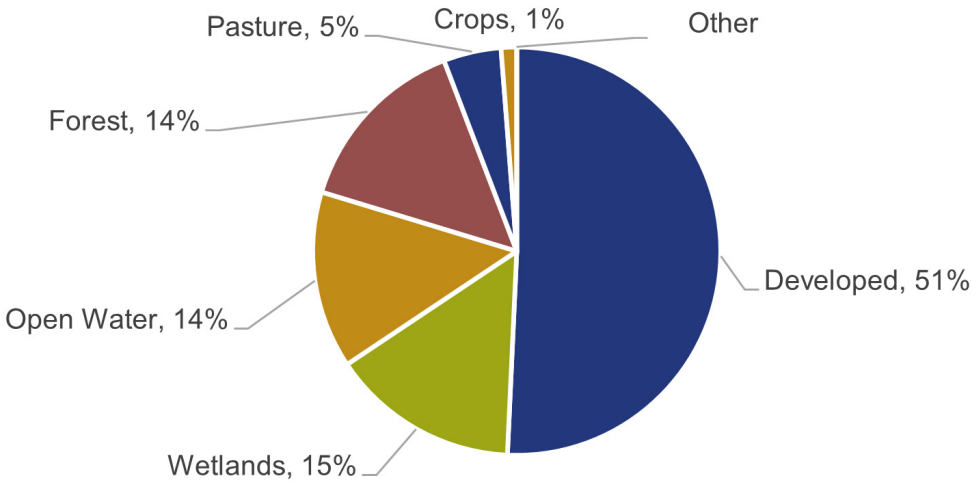


Figure 2-2: *Land cover breakdown in VLAWMO (USGS, 2021).*

Description	Watershed Area
Single Family Detached	37%
Park, Recreational, or Preserve	16%
Open Water	14%
Undeveloped	14%
Single Family Attached	3%
Industrial or Utility	3%
Agricultural	2%
Retail and Other Commercial	2%
Major Highway	2%
Institutional	2%
Golf Course	2%
Multifamily	1%
Other (office, mixed industrial, farmstead)	1%

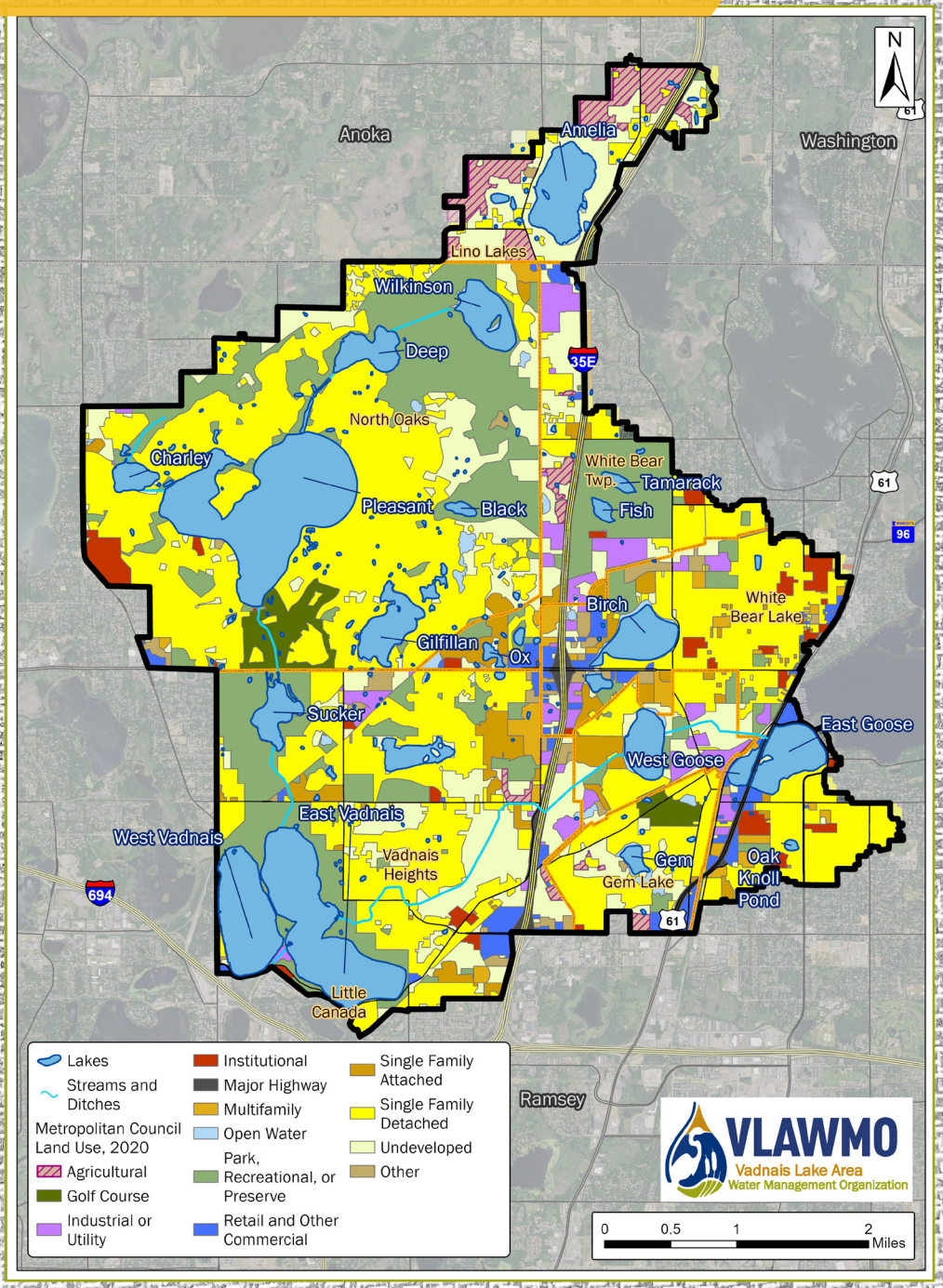
Table 2-1: *Land use in VLAWMO (Metropolitan Council, 2020).*

2.2 Geology and Soils

The geology and topography of the watershed is a result of thousands of years of glacial advance and retreat. The most recent glacial deposits that now form the sand, gravel, till, and lake sediment are from the movement of the Grantsburg and Superior glacial sublobes between 12,000 and 20,000 years ago. The glaciers left behind the relatively level or gently rolling topography that is present today. The highest elevation is 1,014 feet near Gem Lake and the lowest is 880 feet near the watershed outlet (DNR, 2011).

The Department of Natural Resources (DNR) developed an Ecological Classification System for categorizing regions across the state on various scales according to ecology, geology, and hydrology. Subsections in the system are defined by glacial depositions, surface bedrock, climate, topography, and plants. Most of VLAWMO is in the St. Paul-Baldwin Plains ecological subsection, with the southwestern edge in the Anoka Sand

Figure 2-3. *Land use in VLAWMO (Metropolitan Council, 2020).*



Plain subsection (a flat, sandy lake plain). The St. Paul-Baldwin subsection is composed of moraine material (debris, glacial till) deposited by the Superior lobe of a glacier and is bordered by flat outwash plains created by glacial streams (DNR, n.d.).

There are many types of soil found in the watershed, but sandy loam and sandy till are widespread. Detailed soil units can be seen on the Web Soil Survey. Soils are classified into hydrologic groups based on soil permeability. The soil survey shows a mix of all four hydrologic soil groups (A, B, C, & D) scattered around the watershed, which indicates that the infiltration capacity varies. Group A is the most prevalent, which are characterized as having high infiltration rates and are typically sand and gravel. In group C or D areas, the soil is less permeable, and heavy precipitation is more likely to result in overland runoff. Knowledge of native soil types and characteristics is useful for understanding how development can impact infiltration. Development can compact soils and increase impervious surface area, leading to more runoff.

Bedrock, the solid rock beneath soils and glacial deposits, that is closest to the surface in the watershed is from marine sedimentary rocks from the Paleozoic Era. Aquifers can be found within glacial deposits and bedrock. The aquifers commonly used for water supply in the watershed include buried sand and gravel (glacial) aquifers, the St. Peter Sandstone, and the Prairie du Chien Group. More information on the geology of the region can be found in the Ramsey County Geologic Atlas, accessible **here**.

2.3 Surface Water

The VLAWMO watershed area is known for its surface water features. VLAWMO's lakes cover 14% of the watershed. VLAWMO waters consist of 15 public water basins (lakes), 47 public water wetlands, Lambert Creek with its associated tributaries, and a series of minor streams, ditches, and channels. There are no dams in VLAWMO, however there is a network of weirs on Lambert Creek. This section highlights the prominence and condition of these surface water features.

2.3.1 Lakes

VLAWMO has a unique chain of lakes downstream from the Mississippi River that drains into a drinking water reservoir for multiple communities. Because VLAWMO includes East Vadnais Lake, which is the drinking water source for St. Paul and surrounding communities, more than 450,000 people (in 2024) receive their drinking water from this watershed. The 15 public water lakes in the watershed along with Lambert Creek are summarized in Table 2-2. The table includes a summary of each lake's size, impairment status (MPCA, 2024a), trophic status index (which rates waterbodies based on biological productivity and provides insight into water quality), if it is a shallow lake (DNR, 2019b), trend in total

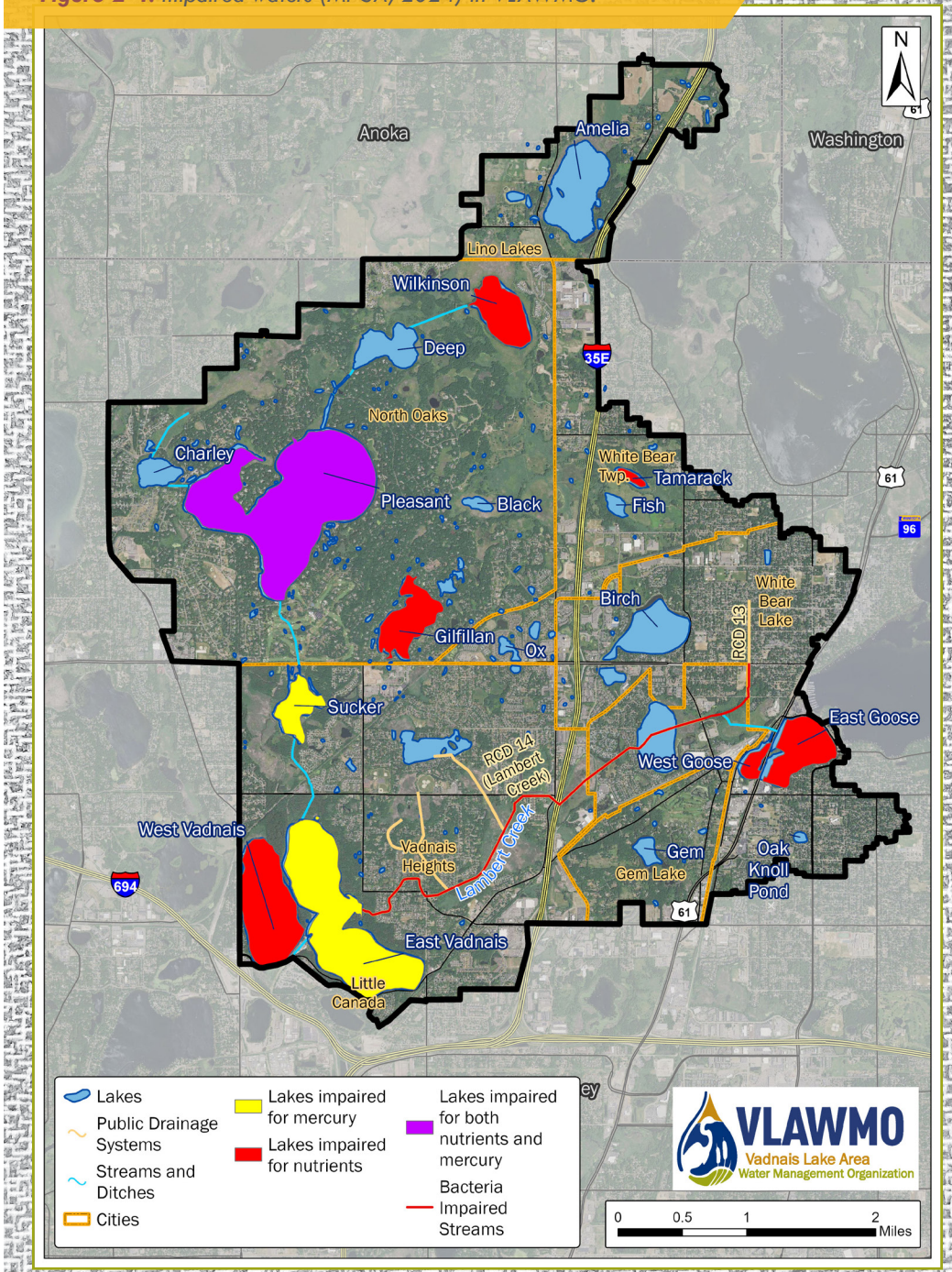
Gilfillan Lake (above) and East Goose Lake (right). Photos: https://www.vlawmo.org/waterbodies/

phosphorus (TP) and chlorophyll-a (Chl-a), and any invasive species detected and reported. The shallow lake status is included as shallow lakes (under 15 feet deep) are important for wildlife. These lakes are thus are managed with increased attention to water and habitat quality. VLAWMO monitors waterbodies and releases an annual monitoring report, which was used to inform trend data in Table 2-2. VLAWMO also monitors once annually for chloride after ice-off. Birch and East Goose Lake have the highest chloride concentrations, which is expected given their proximity to roads with salt application.

The Federal Clean Water Act requires states to adopt water quality standards to protect surface waters. These standards define how much of a pollutant can be in a waterbody while still allowing it to meet its designated uses, such as drinking water, fishing, and swimming. The Clean Water Act requires states to publish an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list or the Impaired Waters list, is based on those water quality standards. Given that the surface water in VLAWMO is a critical drinking water source, the Safe Drinking Water Act regulates public water suppliers in the watershed.

The Minnesota Pollution Control Agency (MPCA) monitors waterbodies statewide and classifies a resource as impaired if it does not support the designated use set for the resource. There are 10 aquatic life or recreation impairments on 9 VLAWMO lakes due to nutrients or mercury in fish tissue (Figure 2-4). While there are no public water (boating) access points in VLAWMO, there is a public park and fishing pier along Sucker and East and West Vadnais Lakes, and VLAWMO's many lakes are enjoyed by residents and visitors for recreation. Visitors and residents value boating, swimming, fishing, and wildlife watching in the watershed's lakes.

Figure 2-4. Impaired waters (MPCA, 2024) in VLAWMO.



2.3.2 Streams, Ditches, and Channels

Lambert Creek and its associated tributaries are defining features of VLAWMO. Lambert Creek, in addition to being a public watercourse, is also designated as a portion of Ramsey County Ditch 14 (RCD 14).

Ramsey County transferred two public drainage systems, RCD 13 and RCD 14, to VLAWMO in 1986. RCD 13 consists entirely of a storm sewer system beginning at 5th Street and flowing south to Whitaker Pond in White Bear Lake. RCD 14 consists of primarily open channel (with some storm sewer). It includes a Main Trunk (i.e. Lambert Creek) and five branches that span from White Bear Lake to Vadnais Heights, flowing east to west or southwest. RCD 13 and 14 are the only public ditches in the watershed. RCD is also called Lambert Creek.

Lambert Creek is assessed as a creek for water quality standards and is listed as impaired for aquatic recreation due to bacteria. While it is not officially impaired due to nutrients, the creek does have high nutrient concentrations and may be at elevated risk of becoming impaired in the future.

2.3.3 Wetlands

Wetlands make up 15% of the land area of the VLAWMO watershed (USGS, 2021). There are 47 public water wetlands in the watershed (DNR, 2024b) and over 1,000 wetlands in the watershed, with the majority being a freshwater emergent wetland type with a Simplified Plan Community Classification of shallow marsh or non-vegetative aquatic community (DNR, 2019b2019a). The land was more heavily forested and covered in wetlands prior to settlement, and many wetlands were drained to accommodate agriculture and land development.

VLAWMO is the Wetland Conservation Act (WCA) local government unit for the watershed (excluding Minnesota Department of Transportation (MnDOT) projects) and is involved whenever there is development or other activities which occur near or in a wetland. VLAWMO's formal role and responsibility in regulatory review is limited to only the administration of the Wetland Conservation Act (WCA).

VLAWMO partners with the Technical Evaluation Panel (TEP) and encourages early communication to ensure WCA is adhered to. Information on WCA and VLAWMO's role is available on the VLAWMO website.

Rotary Nature Preserve Wetland. Source: www.vlawmo.org

Table 2-2. Summary of VLAWMO waters.

Name (AUID)	Acres	Impairment(s)	Trophic State Index (TSI)	DNR Shallow Lake	Fish Identified in Fish Survey	Infested with AIS	5-year TP and Chl-a Average*	Other
Amelia (02-0014-00)	217		59	X	No survey	Eurasian water-milfoil, **Flowering rush	TP: 40 µg/L Chl-a: 12 µg/L	DNR lake of outstanding biological significance. Classified by DNR as the highest priority class for Lakes of Phosphorus Sensitivity (LPSS).
Birch (62-0024-00)	127		51	X	Black Bullheads, Bluegills, Black Crappies, Largemouth Bass, Northern Pike, Pumpkinseeds	Curly-leaf pondweed, Eurasian watermilfoil	TP: 21 µg/L Chl-a: 28 µg/L	
Black (62-0019-00)	10		51	X	No survey		TP: 33 µg/L Chl-a: 5 µg/L	Only VLAWMO lake with wild rice.
Charley (62-0062-00)	37		59		Common carp, Sunfish, Northern Pike, Walleye***	Curly-leaf pondweed, Eurasian watermilfoil, Zebra mussels	TP: 53 µg/L Chl-a: 10 µg/L	High LPSS priority class.
Deep (62-0018-00)	80		60	X	Common carp, Walleye, Bass, Sunfish, Northern pike***	Curly-leaf pondweed, Eurasian watermilfoil	TP: 73 µg/L Chl-a: 11 µg/L	High LPSS priority class.
East Goose (62-0034-00)	115	Nutrients	80	X	Black bullhead, Black crappies, Bluegills, Fathead minnows, Golden shiner, Green sunfish, Hybrid sunfish, Pumpkinseed, Yellow perch****	Curly-leaf pondweed	TP: 170 µg/L Chl-a: 138 µg/L	
East Vadnais (62-00038-01)	393	Mercury in fish tissue	45		Black bullhead, Black Crappie, Bluegill, Brown bullhead, Channel catfish, Green sunfish, Hybrid sunfish, Largemouth bass, Northern pike, Pumpkinseed, Rock bass, Smallmouth bass, Walleye, White bass, White crappie, Yellow bullhead, Yellow perch, Bowfin, Common carp, White sucker, Golden shiner	Curly-leaf pondweed, Eurasian watermilfoil	TP: 23 µg/L Chl-a: 4.5 µg/L	Higher LPSS priority class.
Gem (62-0037-00)	48		49		Black Crappie, minnow		TP: 35 µg/L Chl-a: 10 µg/L	Classified as public water wetland. Delisted for nutrient impairment in 2018.
Gilfillan (62-0027-00)	110	Nutrients	62	X	Walleye, Sunfish***	Curly-leaf pondweed	TP: 54 µg/L Chl-a: 38 µg/L	Water has been pumped from Pleasant to Gilfillan to increase water levels.

Table 2-2. Summary of VLAWMO waters.

Name (AUID)	Acres	Impairment(s)	Trophic State Index (TSI)	DNR Shallow Lake	Fish Identified in Fish Survey	Infested with AIS	5-year TP and Chl-a Average*	Other
Fish (62-0021-00)	12		N/A		No survey		N/A	Classified as public water wetland
Lambert Creek (07010206 -656)	N/A	Bacteria	N/A		N/A		TP: 212 µg/L Chl-a: 24 µg/L	Partially RCD 14
Pleasant (62-0046-00)	607	Nutrients, Mercury in fish tissue	53		No survey, common carp present	Curly-leaf pond-weed, Eurasian watermilfoil, Rusty crayfish, Zebra mussels	TP: 46 µg/L Chl-a: 13 µg/L	
Sucker (62-0028-00)	63	Mercury in fish tissue	50		Black crappie, Bluegill, Bowfin, Brown Bullhead, Common carp, Green sunfish, Hybrid sunfish, Largemouth bass, Northern pike, Pumpkinseed, Walleye, Yellow bullhead, Yellow Perch	Curly-leaf pond-weed, Eurasian watermilfoil, Rusty crayfish, Zebra mussels	TP: 38 µg/L Chl-a: 10 µg/L	
Tamarack (62-0022-00)	86	Nutrients	75		No survey		TP: 162 µg/L Chl-a: 175 µg/L	Classified as public water wetland.
West Goose (62-0126-00)	24	Nutrients	81		Black bullhead, Black crappies, Blue-gills, Fathead minnows, Golden shiner, Green sunfish, Hybrid sunfish, Pump-kinseed, Yellow perch****	Curly-leaf pond-weed	TP: 174 µg/L Chl-a: 153 µg/L	Classified by DNR as an unnamed public water wetland.
West Vadnais (62-0038-02)	212	Nutrients	68		Bullhead, Common carp, Pan fish***	Curly-leaf pond-weed, Eurasian watermilfoil, Zebra mussels	TP: 98 µg/L Chl-a: 85 µg/L	
Wilkinson (62-0043-00)	93	Nutrients	66	X	Black bullhead, Black crappies, Blue-gills, Golden shiner, Green sunfish, Hybrid sunfish, Largemouth bass, Pumpkinseed, Yellow perch	Curly-leaf pond-weed	TP: 100 µg/L Chl-a: 16 µg/L	

**For more information, see the 2023 Monitoring Report on the VLAWMO web site. This data is only for the years identified in the 2023 Monitoring Report and will change over the life of the plan. Lambert Creek averaged between 6 sampling sites.*
***Flowering rush is being treated in a nearby wetland, but it has not been detected in the lake in recent years.*
****No fish survey done – common species only.*
*****Fish survey combines East and West Goose.*

2.4 Groundwater and Drinking Water

Within VLAWMO, protection of both groundwater and surface water features are critical for protecting public drinking water and therefore public health. This section summarizes sources of drinking water and potential risks to be managed, both for groundwater and surface water.

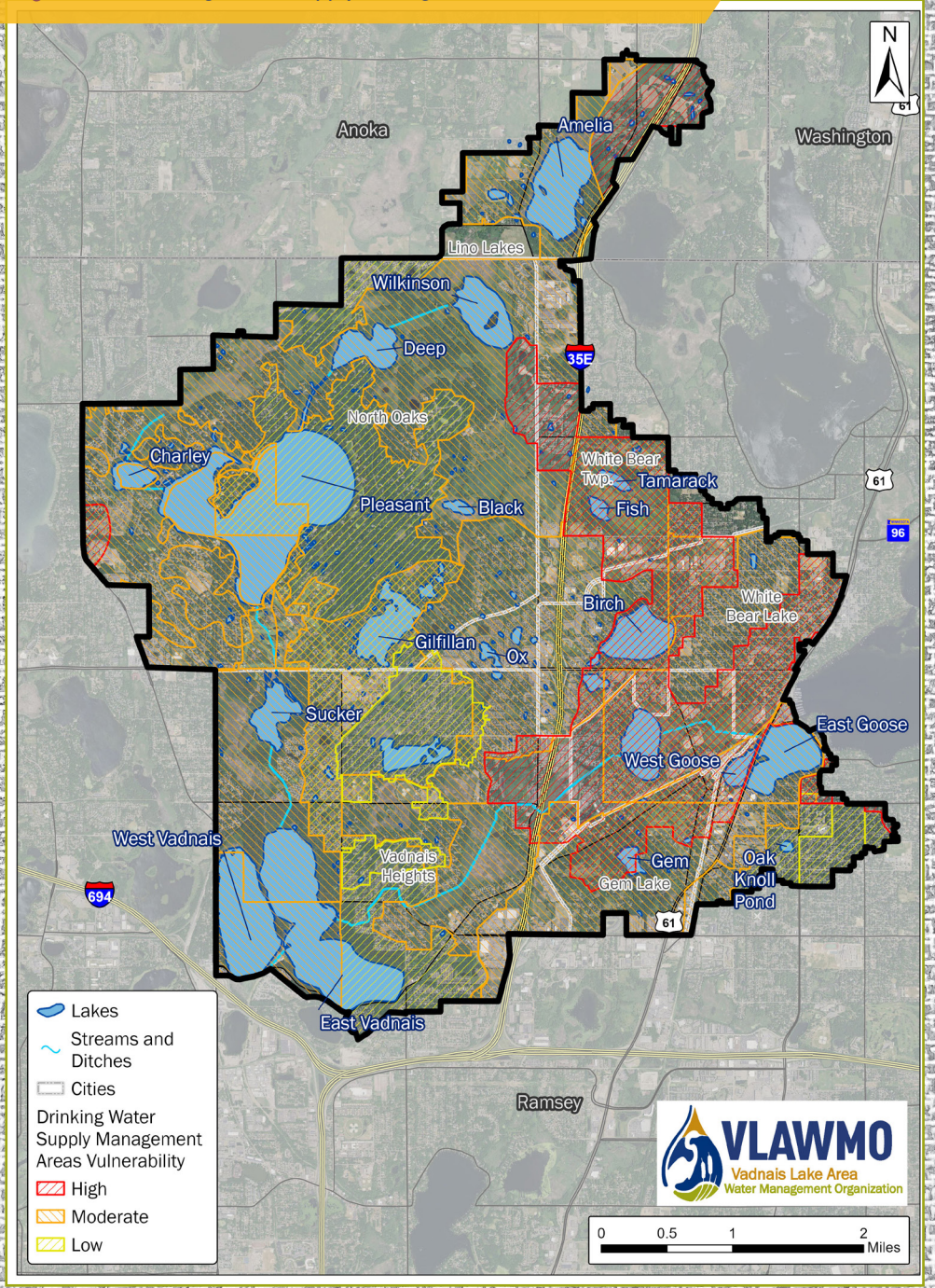
2.4.1 Groundwater Resources

The Minnesota Department of Health (MDH) works with public water systems to identify and manage potential threats around public drinking water sources. Part of this effort includes defining a protection area for drinking water sources, known as a Drinking Water Supply Management Area (DWSMA). Within DWSMAs, contamination on the land surface or in water can affect the drinking water supply, making the areas important to consider for managing threats to drinking water and public health.

Nearly the entire VLAWMO watershed overlaps with one or more groundwater DWSMAs, ranging from low to high vulnerability, with the majority (by area) being of moderate vulnerability (MDH, 2022) (Figure 2-5). Most of the watershed is covered by the Saint Paul Regional Water Services DWSMA, Vadnais Heights North DWSMA, Vadnais Heights South DWSMA, and White Bear Township DWSMA. Other DWSMAs in the watershed include the Lino Lakes, White Bear Lake, and Five Star Mobile Home Park DWSMAs. Additionally, there are many private drinking water wells in the watershed, especially in the community of North Oaks.

DWSMAs are given a vulnerability rating based on the susceptibility of the aquifer(s) used by the public water supply system to contamination from or near the surface. Most of the watershed has a moderate vulnerability to contamination, but there are areas of low vulnerability from north to south along the center of the watershed and high vulnerability in the

Figure 2-5. Drinking Water Supply Management Areas in VLAWMO.



eastern half of the watershed (Figure 2-5). The pollution sensitivity of near-surface materials, which evaluates the time it takes for water to infiltrate 10 feet, varies from low to high throughout the watershed. The pollution sensitivity of near surface materials can be viewed on the **Watershed Health Assessment Framework tool**. Groundwater is sourced from both buried sand and gravel (glacial) and bedrock aquifers. The most commonly used aquifers in the watershed for water supply are buried sand and gravel aquifers, the St. Peter Sandstone, and the Prairie du Chien Group.

As of 2022, there are 22 surface water and groundwater use permits in the watershed (Figure 2-6). Further information on DNR water use permits is available on the DNR **Water Permitting and Reporting System webpage**. In order of volume used, the permits are for public water supply, agricultural or food processing, golf course irrigation, private water supply, pollution containment, industrial water supply, lake level maintenance, and landscaping irrigation. Figure 2-7 shows groundwater uses. Surface water uses are largely for water supply and far outweigh groundwater use in the watershed. Groundwater withdrawals have been generally decreasing in the watershed since the late 1980s (as far as the DNR records go) and in 2022, 1,073,000 million gallons of groundwater was withdrawn. The decrease may be due to water conservation efforts made by partner communities. The vast majority of groundwater is used for the public water supply (DNR, 2023b).

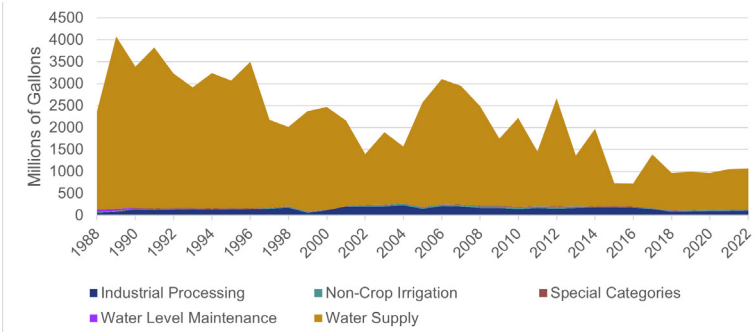
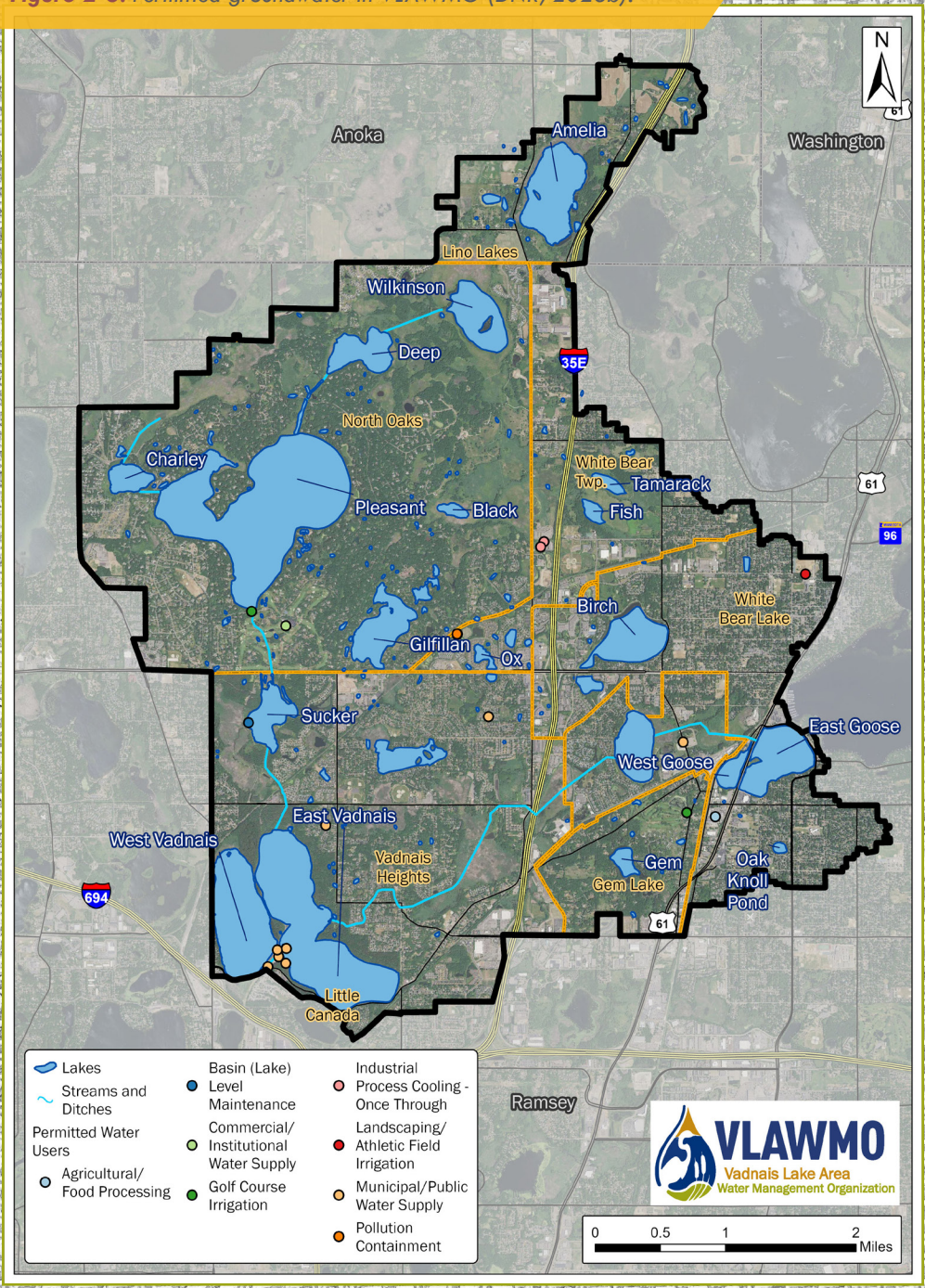


Figure 2-7. VLAWMO groundwater use categories.

Figure 2-6. Permitted groundwater in VLAWMO (DNR, 2023b).



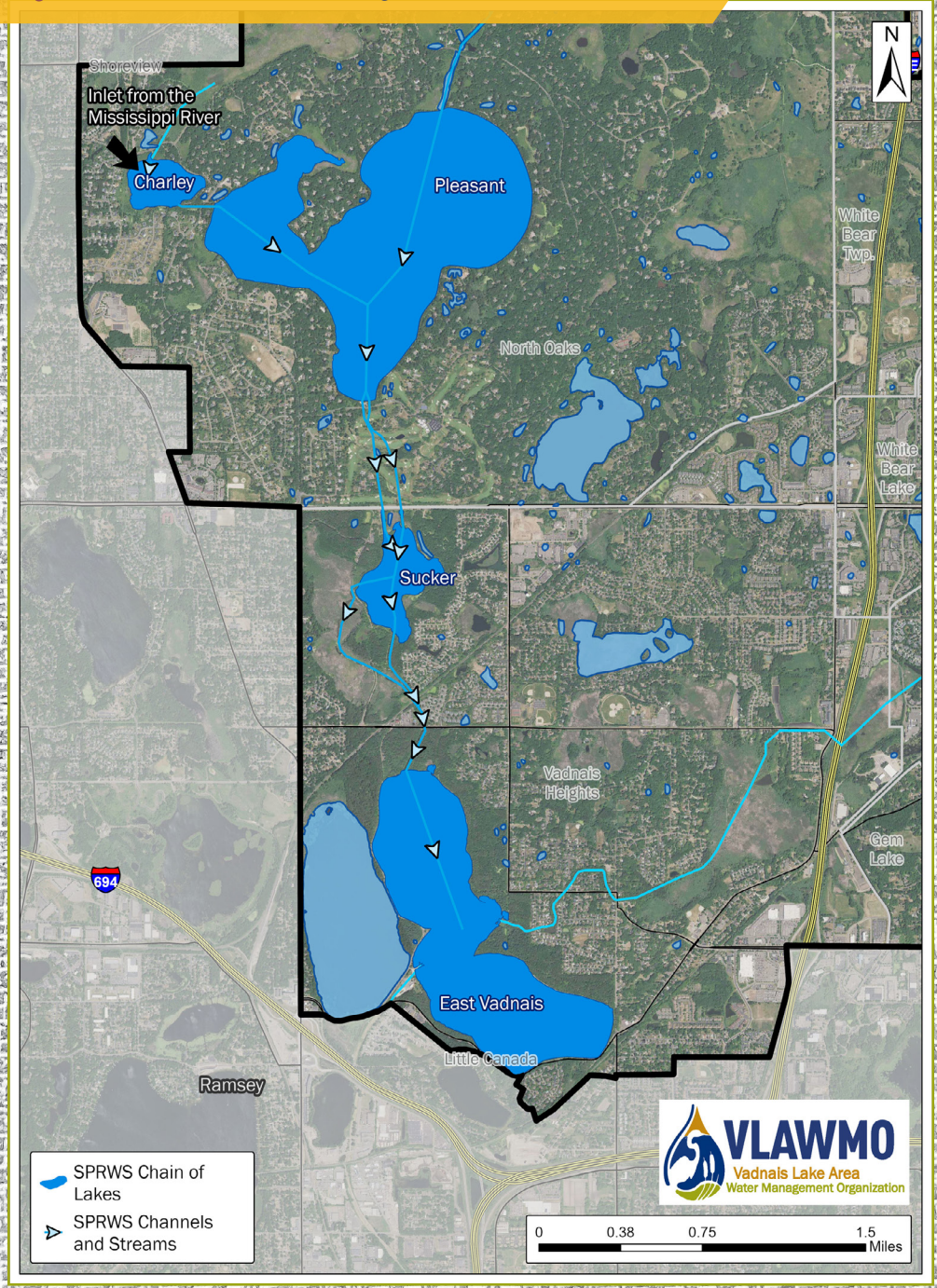
2.4.2 Surface Drinking Water

Almost the entirety of the VLAWMO watershed is within Priority Area A of the surface water DWSMA for the Saint Paul-Chain of Lakes public water supply system. MDH is in the process of updating Priority A and B delineations as Emergency Response Areas and Spill Management Areas. The Surface Water Protection Web Map Viewer can be accessed **here** for the most up-to-date management areas.

VLAWMO works closely with the St. Paul Regional Water Service (SPRWS) to monitor surface water quality of East Vadnais Lake as well as the lakes that feed into it, as East Vadnais Lake is the drinking water source for over 450,000 people in the 14 cities, including the City of St. Paul. Water from the Mississippi River is pumped into Charley Lake, where it enters Pleasant Lake, Sucker Lake, then East Vadnais Lake (Figure 2-8). Monitoring and protecting surface water quality is essential for these lakes due to the use for drinking water. Algae blooms are a particular concern in the drinking water chain of lakes (e.g. Pleasant and Vadnais) because they can produce toxins and alter the taste of the water. SPRWS monitors for algae blooms, especially in the late summer and early fall.

East Vadnais Lake. Photo Credit: vlawmo.org

Figure 2-8. Surface water for drinking water in VLAWMO.



2.5 Stormwater and Wastewater

Bridgewood Park Rain Garden. Photo Credit: @vlawmo

Stormwater is runoff in urban areas. In a natural landscape, water infiltrates into the soil during a rain event and runs overland when infiltration capacity is reached. Construction of impervious land such as roads and buildings reduces the ability of the land to store water. Urban contaminants such as road salt, sediment, yard runoff, pet waste, and more are picked up by stormwater as it moves over urban areas. Stormwater is typically directed along gutters and curbs into the city's storm sewer system, which discharge into streams or ditches without filtration.

A Municipal Separate Storm Sewer System (or MS4) is a network of catch basins, gutters, roads, and storm drains that drain stormwater and are publicly owned. VLAWMO's six member communities, Anoka County, Ramsey County, and MnDOT are covered by the MPCA MS4 general permit (MPCA, 2024b). MS4s are required to reduce the amount of sediment and pollutants in stormwater where possible and each has a stormwater pollution prevention program. VLAWMO actively supports MS4s in the watershed by providing education and outreach materials.

Member community MS4s are required to meet the standards of the VLAWMO Water Management Policy, last updated in 2022 (Appendix C). The Water Management Policy details WMO-specific regulations on erosion and sediment control, floodplain and drainage alteration, groundwater and stormwater management, shoreline and streambank alteration, stream and lake crossing, and wetlands and buffers.

There are two active wastewater treatment facilities in the watershed, one privately owned for industry and the other owned by White Bear Township. Subsurface sewage treatment systems (SSTS) are present in North Oaks, Vadnais Heights, Lino Lakes, and White Bear Township. MPCA's What's in My Neighborhood map shows sites of interest for potential contamination, permits, licenses, registrations, inspections, and other enforcement activities. In VLAWMO, there are 187 sites in MPCA's hazardous waste program, 122 stormwater sites, 94 in the investigation and cleanup sites, and 6 SSTS sites (MPCA, 2024c).

2.6 Habitat, Endangered, and Invasive Species

The DNR identifies lakes of biological significance due to the presence of unique plants or animals. There is one lake of biological significance in the watershed (Amelia) and multiple lakes and wetlands that the Minnesota Biological Survey (MBS) identifies as sites of biodiversity significance. Outstanding biodiversity sites include the North Oaks Natural Area (which covers Deep Lake, Black Lake, and Wilkinson Lake) and Sucker Lake Natural Area west of Sucker Lake. There is one site with high significance (Long Lake wetlands on the western edge of VLAWMO) and nine sites of moderate significance (DNR, 2024a).


A pair of area otters shared by watershed residents. Photo Credit: vlawmo.org

VLAWMO conducts aquatic plant surveys with partners (i.e., Ramsey County Soil and Water Conservation Division) to assess aquatic communities and manages invasive species.

Aquatic plant surveys are available for all of VLAWMO's lakes. Eurasian watermilfoil, curly-leaf pondweed, rusty crayfish, and zebra mussels are invasive species found in the watershed. One infestation of flowering rush was detected in a wetland adjacent to Amelia Lake. That infestation is currently being treated (2024).

VLAWMO conducted frog and toad call surveys, remote-camera surveys, and otter monitoring including a citizen-science Otter Spotter online tool that all contribute to understanding about wildlife and habitat quality watershed-wide. VLAWMO considers fish and wildlife habitat in projects and does work with habitat protection and restoration in mind.

There are 55 native plant communities identified by the DNR in 12 different community categories (DNR, 2014). Most are congregated around Deep, Wilkinson, Sucker, and Black Lakes. Table 2-3 includes a list of the state and federal endangered species found within the VLAWMO boundary.

Tubercled Rein Orchids.
Photo Credit: minnesotawildflowers.info

A napping Rusty Patched Bumble Bee.
Photo Credit: @vlawmo

Table 2-3. *Species that are threatened, special concern, watchlist, proposed endangered, or endangered in VLAWMO.*

Scientific Name	Common Name	Category	Status
State: Threatened, Special Concern Species, Watchlist, or Endangered (NHIS)			
Emydoidea blandingii	Blanding's Turtle	Vertebrate Animal	Threatened
Buteo lineatus	Red-shouldered Hawk	Vertebrate Animal	Special Concern
Platanthera flava var. herbiola	Tubercled Rein Orchid	Vascular Plant	Threatened
Bombus affinis	Rusty Patched Bumble Bee	Invertebrate Animal	Watchlist
Anguilla rostrata	American Eel	Vertebrate Animal	Special Concern
Decodon verticillatus	Water-willow	Vascular Plant	Special Concern
Platanthera clavellata	Small Green Wood Orchid	Vascular Plant	Special Concern
Sterna forsteri	Forster's Tern	Vertebrate Animal	Special Concern
Perimyotis subflavus	Tricolored Bat	Vertebrate Animal	Special Concern
Cygnus buccinator	Trumpeter Swan	Vertebrate Animal	Special Concern
Rubus multifer	Kinnickinnick Dewberry	Vascular Plant	Special Concern
Empidonax virescens	Acadian Flycatcher	Vertebrate Animal	Special Concern
Juncus articulatus	Jointed Rush	Vascular Plant	Endangered
Federal: Endangered, Proposed Endangered, or Proposed Threatened (IPAC)			
Myotis septentrionalis	Northern Long-eared Bat	Mammals	Endangered
Perimyotis subflavus	Tricolored Bat	Mammals	Proposed Endangered
Simpsonaias ambigua	Salamander Mussel	Clams	Proposed Endangered
Danaus plexippus	Monarch Butterfly	Insects	Proposed Threatened
Bombus affinis	Rusty Patched Bumble Bee	Insects	Endangered
Argynnis idalia occidentalis	Western Regal Fritillary	Insects	Proposed Threatened

2.7 Climate

The watershed experiences a wide range of temperatures, from hot humid summers to cold snowy winters. The average annual temperature is 45 degrees Fahrenheit, with an average of 18 degrees in the winter and 70 degrees in the summer. The temperature has been increasing; specifically, it is getting less cold at night and in the winter. Since 1895, the watershed has been warming by an average of 0.22 degrees per decade (Figure 2-9, DNR, 2024c).

As the climate shifts, so too does the water cycle. Ice-out dates are occurring earlier, plant hardiness zones have changed (UMN, 2023), and heavier rainstorms are occurring. While annual precipitation is expected to continue increasing, periods of drought in between heavy rain events is projected to be more common (UMN, n.d.). Seasonal climate impacts have implications for local watershed management- a shorter winter can result in increased algae blooms and invasive aquatic plant densities. VLAWMO considers the current and projected future climate when planning, especially potential impacts on water quality, peak flows, and terrestrial and aquatic habitat. Tangible climate impacts to recreation including ice fishing, gardening, and summer recreation on lakes. VLAWMO intends to continue its efforts to educate residents on and gain support for VLAWMO programs and projects that build climate resiliency.

An increase in extreme rain events can be a burden on infrastructure. Stormwater infrastructure was designed for 10-100 year rain events, which are occurring more often. NOAA Atlas 14 rainfall depth for a 100-year, 24-hour storm in the watershed is 7.25 inches of rain. The watershed receives an average of 31 inches of rain a year, which is more than it historically received (DNR, 2024c). NOAA is revising national rainfall frequency data in Atlas 15 to account for climate change. Atlas 15 is expected to be available in 2026 and will be useful in designing infrastructure.

Ring-necked ducks. Photo Credit: vlawmo.org

The MN DNR reviewed climate and hydrology data in the Mississippi River – Twin Cities Watershed and published the Evaluation of Hydrologic Change (EHC) report, summarizing how precipitation and flow have changed in the watershed. The impacts of more precipitation and heavier rain events are compounded by changes in land use that reduce the natural capacity of the land to store water. Hydrologic change can impact stream volume, flooding, erosion, and in-stream habitat. The EHC found that the mid-1970s could be identified as marking a shift in hydrology in the watershed, with statistically different streamflow and precipitation prior to and after the point of change. The report found the watershed receives an additional 4 inches of annual precipitation after the mid-1970s when compared to the decades before (DNR, 2023a).

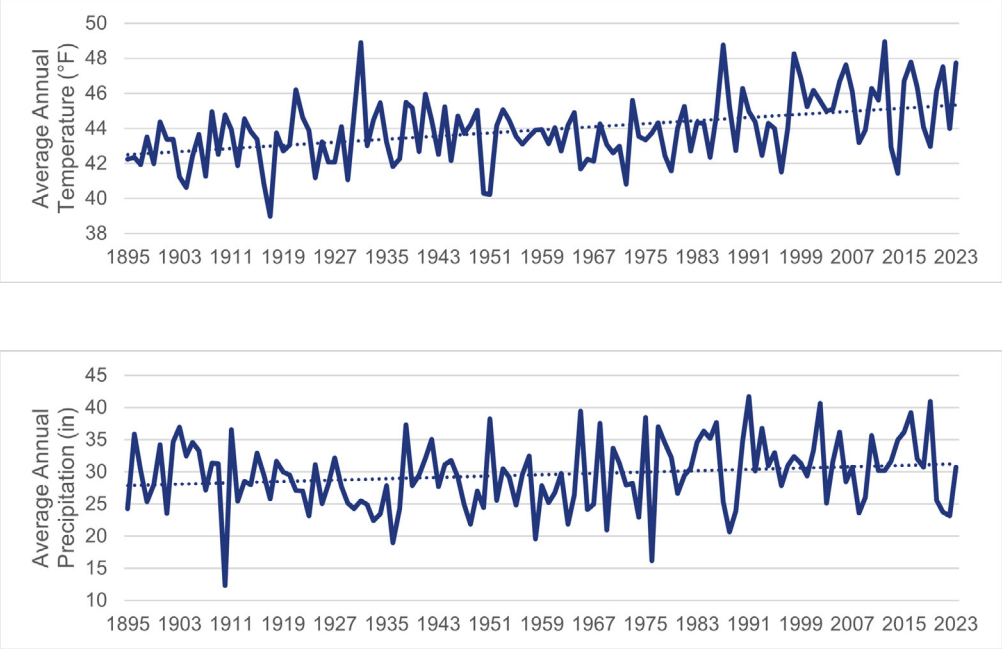


Figure 2-9. *Annual temperature and precipitation in the Mississippi River-Twin Cities Watershed 1895-present.*

2.7.1 Flooding, Peak Discharge, and Climate Resiliency

Changing precipitation trends can have profound impacts on water resources management, including flooding. Flood-prone areas within VLAWMO are centered primarily on roadway intersections where storm sewers are inadequately siwzed to accommodate modern runoff events. The Metropolitan Council developed the Localized Flood Map Screening Tool, with a **web viewer** for members of the public to see potential flooding locations in a high intensity rain event. With increasing precipitation and heavier rain events, there is a pressing need for increasing climate resiliency to combat changing climate patterns. Section 4, Implementation, describes how VLAWMO will incorporate resiliency into the watershed, including analyzing locations in the watershed for increased water storage and infiltration, and partnering with communities when infrastructure is replaced.

County Road F Flume Going West. Photo Credit: vlawmo.org

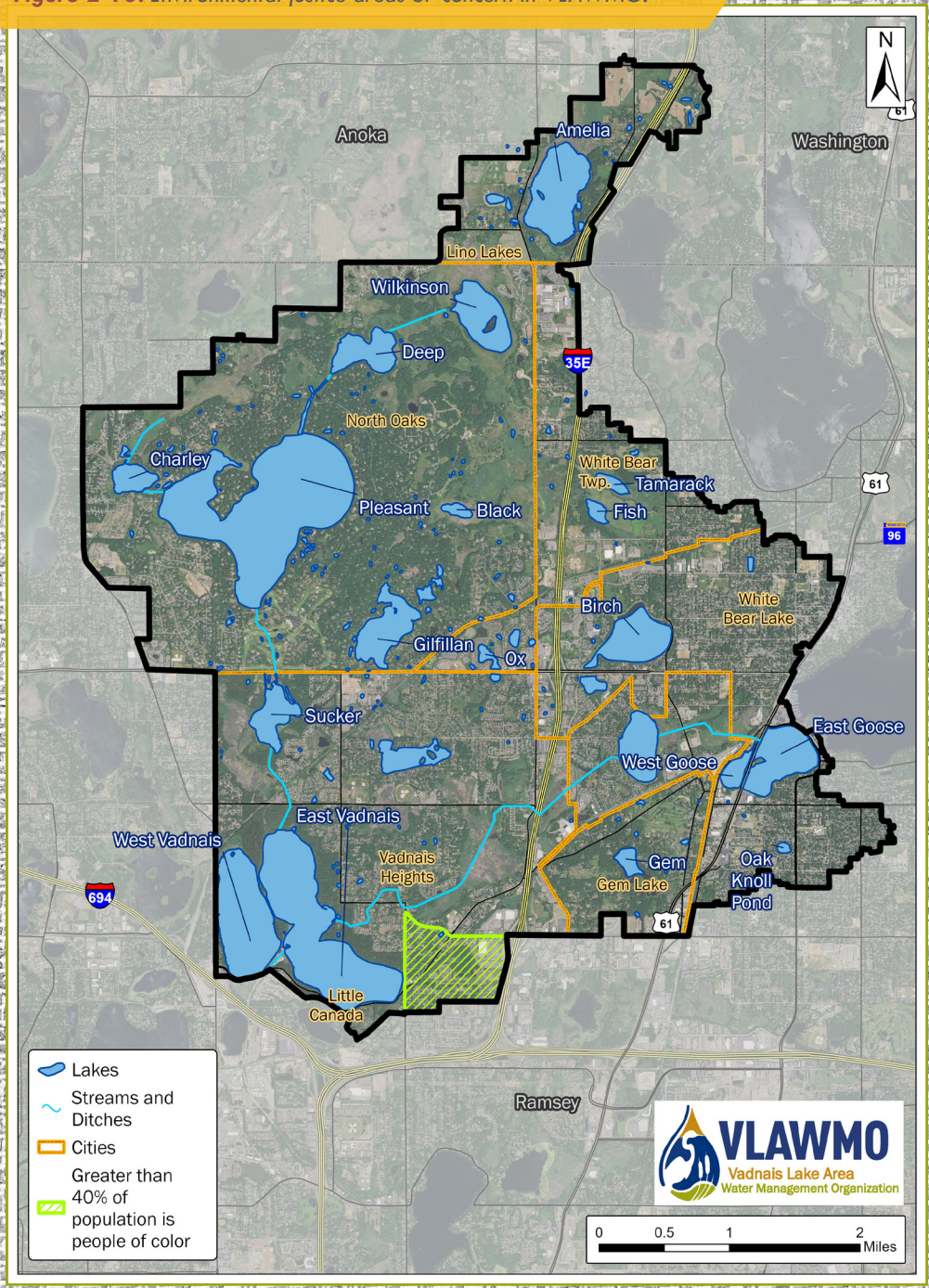
2.8 Demographics

Using census data, an estimate of watershed demographics can be made by weighing each city's data by the proportion that is in the watershed. The estimated population in the watershed is 28,600, with an average age of 44. 86% of the population identified as White, 5% Asian, 5% Hispanic, and 2% Black. Approximately 60% of residents have a household income of over $100,000 per year, while 18% have a household income under $50,000 a year. An estimated 40% of residents over age 25 have an associate or bachelor's degree, 24% have a graduate degree, and 33% have a high school diploma, 16% of which have some college education without a degree (US Census, 2021). The population of Ramsey County is expected to shrink in the upcoming decade (DEED, 2024).

The MPCA designated areas of concern for environmental justice, which includes land where over 35% of people are below 200% of the federal poverty line, over 40% of people have limited English proficiency or are people of color, and in census tribal areas. In VLAWMO, a part of Vadnais Heights is an area of concern with over 40% of the population being people of color (Figure 2-10). For more information or an up-to-date map, please visit https:// www.pca.state.mn.us/about-mpca/environmental-justice (MPCA, 2024d).

Birch Lake Elementary Field Day at the Birch Lake Rotary Nature Preserve. Photo Credit: Instagram @vlawmo

Figure 2-10. *Environmental justice areas of concern in VLAWMO.*



3 PRIORITY ISSUES AND GOALS

3. PRIORITY ISSUES AND GOALS

In this section of the Plan, priority issues are detailed with measurable goals set for each priority issue to specifically indicate how VLAWMO will address issues and measure progress. Each goal has at least one 'measure' component that will be carried out within the 10-year timeframe of this plan. Specific projects planned to meet goals and priority resources are outlined in the next Plan section (Section 4- Implementation).

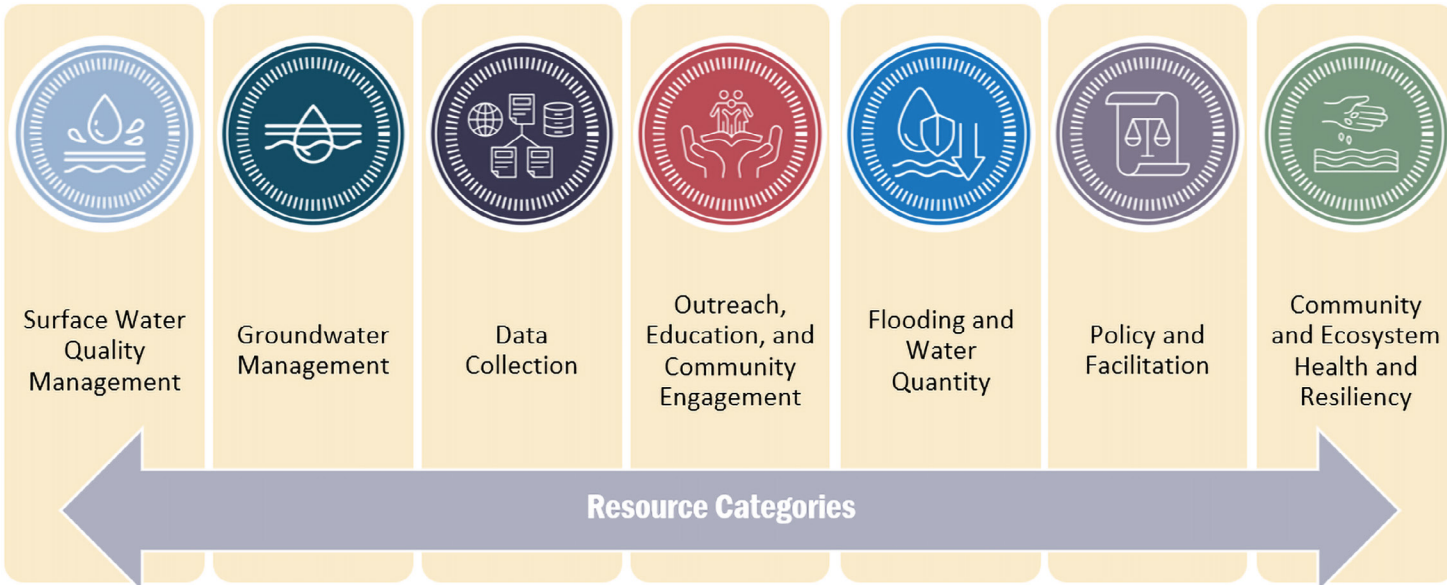
Westfield Park Bioswale. Photo Credit: www.vlawmo.org

3.1 Issue Identification

An inventory of issues impacting VLAWMO resources was developed after review and consideration of the following:

- The current VLAWMO Comprehensive Watershed Management Plan
- Existing data; completed feasibility studies, SLMP/Lake Reviews, and internal/partner reports; and agency data and reports
- Responses from the 60-day Plan notification
- Responses from the public, TEC, and Board surveys
- Feedback from the initial planning meeting, held April 24, 2024

A total of 20 unique issues were identified. Each of the 20 issues was placed into 1 of 7 "resource categories." These categories will be used to organize issues throughout this section.



3.2 Prioritizing Issues

All 20 inventoried issues are important and merit being addressed. However, due to staff time and financial constraints, not all issues can realistically be addressed in a 10-year timeframe. The inventoried issues were prioritized to better focus VLAWMO's future implementation efforts.

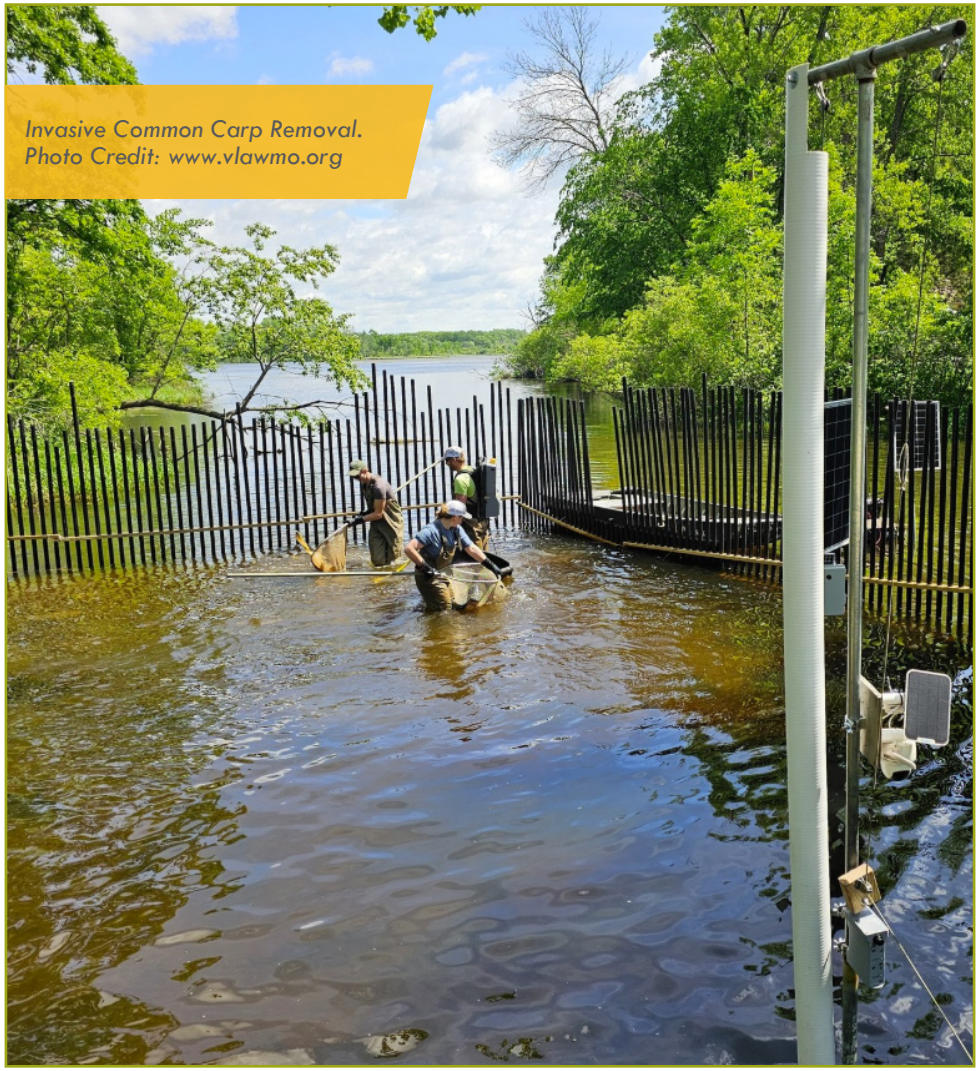
Three factors were used to prioritize VLAWMO issues:

- Prominence in 60-day response letters
- Relevance to future partner projects
- Feedback from the public, TEC, and Board

Results from this prioritization process are summarized in Appendix X. Of the 20 inventoried issues, 14 emerged as "high" or "medium" priority issues. These issues will be the focus of VLAWMO implementation efforts over the next 10 years (Table 3-1). Six of the inventoried issues were not prioritized as high or medium priorities. These issues remain important to VLAMWO's mission and are summarized in Section 3.3 as "plan themes." Specific resources were also considered in the prioritization process. VLAWMO's approach to resource prioritization is summarized in Section 4- Implementation Plan.

60-Day Response Letters

According to MN Statutes 103B.231, watershed management organizations must send notification to the required review agencies of Plan initiation and request comments. Plan review agencies are given 60 days to respond. VLAWMO received 60-day response letters from the Board of Water and Soil Resources (BWSR), the City of White Bear Lake (WBL), Minnesota Department of Agriculture (MDA), Minnesota Department of Health (MDH), Metropolitan Council, Minnesota Department of Natural Resources (DNR), Minnesota Department of Transportation (MnDOT), and Minnesota Pollution Control Agency (MPCA). Responses were used to identify and assist in prioritizing Plan issues. The prominence of each issue, as included in 60-day response letters, was used to inform overall Plan issue priority, with a higher prominence indicating an issue was identified by multiple Plan review agencies.



Invasive Common Carp Removal. Photo Credit: www.vlawmo.org

Tamarack Lake Alum Project. Photo Credit: www.vlawmo.org

Partner Project Table

VLAWMO annually works with partners to identify collaborative project opportunities over the next five years in a project table. This table is updated yearly to maintain vision and adaptability, as projects enter implementation phases or are no longer pursued by partner organizations. A given project may address one or more VLAWMO priority issues.

The current five-year table was used as a metric to rank projects according to draft priority issues. The prominence of each issue, addressed by cumulated project ranks in the partner table, was used to inform overall Plan issue priority. Issues that were more frequently addressed by planned partner projects received a higher overall priority.

Feedback from the Public, TEC, and Board

As summarized in Section 1- Introduction, VLAWMO solicited stakeholder input through several engagement opportunities including open houses and in-person program events and workshops, a VLAWMO WMP webpage, and in-person and digital surveys offered to the public, TEC, and the Board. The primary purpose of the surveys was to better understand which issues and resources each stakeholder reported were most important for VLAWMO to focus on in the next 10 years. The issues surveyed as highest priority were sorted and ranked to inform Plan issue prioritization efforts.

Priority Issues

The final ranking for all "High" and "Medium" priority issues is shown in Table 3-1. These issues are the focus of VLAWMO's efforts over the next 10 years. Other important inventoried issues are summarized in "Plan Themes" on the following pages.

Table 3-1. Issue Table.

Resource Category	Issue	Issue Statement	VLAWMO Current Role	Priority
Surface Water Quality Management 	Surface Water and Drinking Water Quality	Surface waterbodies need protection and restoration to preserve surface drinking water sources and promote aquatic life and recreational opportunities.	VLAWMO supports and works to improve surface and drinking water quality through its programs.	High
	Erosion of Shorelines and Streambanks	Development along shorelines and streambanks, reduction of riparian buffers, and increased streamflow accelerate erosion and nutrient loading to surface waters.	VLAWMO works to reduce and prevent erosion of shorelines and streambanks through its programs.	High
Groundwater Management 	Groundwater and Drinking Water Quality	Surface water/groundwater interactions and groundwater contaminants have the potential to impact groundwater quality.	VLAWMO supports groundwater quality protection through partnerships and technical assistance.	High
	Groundwater Supplies and Conservation	Groundwater supplies are vulnerable to overuse and require aquifer recharge to replenish.	VLAWMO supports groundwater quantity protection through partnerships and technical assistance.	High
Data Collection 	Water Monitoring	Surface water monitoring is needed to provide an overview of current water quality and quantity conditions and trends, and inform future implementation efforts.	VLAWMO conducts surface water monitoring.	High
	Chloride and Emerging Contaminants	Road salt application results in the addition of chlorides to pavement, lakes, and streams, where they corrode infrastructure, are toxic to roadside vegetation, and impact aquatic life. Urban sources of chloride include road salt, water softeners, and septic systems. In addition to chloride, other emerging contaminants have been detected in surface water and groundwater.	VLAWMO staff monitor chloride and engage/inform the community on chloride and emerging contaminants through outreach efforts including communication and education.	Medium

Resource Category	Issue	Issue Statement	VLAWMO Current Role	Priority
Outreach, Education, and Community Engagement 	Outreach and Communication	An engaged and educated watershed community is critical for increasing understanding of and engagement in VLAWMO efforts and policies, leading to improvements in watershed resources.	VLAWMO staff engage the community through events (e.g., demonstration sites of projects, experiential learning) and general outreach efforts (e.g., promotion, communication, marketing).	Medium
Flooding and Water Quantity 	Public Drainage Systems	Public drainage systems need continued inspection and maintenance to preserve their capacity and function and minimize downstream sediment delivery.	VLAWMO currently conducts public drainage system inspection and maintenance per the Public Drainage Policy.	Medium
	Infrastructure Partnership Projects	Aging infrastructure and/or current infrastructure need replacement, retrofit, or expansion to minimize flood hazards associated with a high amount of impervious surfaces and changing precipitation patterns.	VLAWMO collaborates with partners managing infrastructure to build, repair, and/or retrofit infrastructure, reduce stormwater volume, maintain base stream flow, and reduce peak flow.	Medium
	VLAWMO Facilities	VLAWMO-built facilities must be inventoried, inspected, and maintained as needed to preserve VLAWMO's investments in resource management.	VLAWMO inspects and maintains facilities as needed.	Medium
Policy and Facilitation 	Wetland Conservation Act	Many original wetlands in VLAWMO have been filled or drained for development. Remaining wetlands need protection to promote their water storage and flood control, groundwater recharge, and water quality benefits.	VLAWMO, as the local government unit (LGU), administers the Wetland Conservation Act (WCA) per Water Management Policy and State requirements by ensuring no net loss of wetland quantity, quality, and biological diversity within the major watershed.	High
	Stormwater Management Standards	Stormwater needs management to protect receiving surface waterbodies, while also balancing community needs in a developed watershed.	VLAWMO does not regulate stormwater management nor erosion and sediment control but provides advisory review and support upon request to member communities that enforce associated ordinances and VLAWMO's water standards (Water Management Policy).	Medium

Resource Category	Issue	Issue Statement	VLAWMO Current Role	Priority
Community and Ecosystem Health and Resiliency	Climate Resiliency	Climatic changes can potentially overwhelm the capacity of existing stormwater management systems, impact water quality, and make drought more likely which threatens groundwater supplies.	VLAWMO considers and prioritizes climate resiliency benefits when planning and designing projects.	Medium
	Natural Features and Habitat	Well-functioning native vegetation, forests, floodplains, and upland habitat need protection and enhancement.	VLAWMO partners with landowners to promote natural features and habitat within capital improvement project/grant areas.	High

Wilkinson Lake Deep-Water Wetland.

3.3 Plan Themes

Additional issues were identified as part of the issue identification process that are not summarized in Table 3.1. These issues support and help define priority issues established in Table 3.1 but are not priority issues themselves. Three of these support priority issue implementation (Section 3.3.1) and two are incorporated as plan lenses (Section 3.3.2), including climate resiliency which is both a planning lens and priority issue.

3.3.1 Supporting Implementation

- Staff Professional Development and Training
- Community Education and Communications
- Collaboration and Engagement

Plan themes that support implementation include staff professional development and training, community education and communications, and collaboration and engagement.

To meet the needs of VLAWMO communities and improve watershed issues, staff capacity must be adequate to accomplish Plan goals. Additionally, staff need access to professional development and training opportunities. VLAWMO invests in staff through professional development and training.

While professional development is important to provide staff with the resources and knowledge that equip them to best serve the communities, education opportunities for community members are also vital to supporting implementation. VLAWMO provides education opportunities (e.g., partnerships on school curricula development and programming) and engages in various communication, marketing, and outreach efforts to enhance community knowledge of watershed stewardship.

As goals and actions were determined for this Plan, opportunities and needs for staff development, communications, and local collaboration were considered. Local collaboration and engagement with partners can increase the benefits and sustainability of water resource projects and initiatives. VLAWMO identifies and strengthens existing partnerships between member communities and forms new relationships to achieve mutual water resource goals.

NOHOA Bioswale.
Photo Credit: www.vlawmo.org

3.3.2 Planning Lenses

- Climate Resiliency
- Environmental Justice

VLAWMO has incorporated climate resiliency and environmental justice themes throughout this Plan. VLAWMO and partners have identified a need for increased consideration of climate resiliency and environmental justice in project planning and programming. As of 2024, 2% of the watershed is in an area of environmental justice concern as modeled by the MPCA and determined by U.S. census data (Figure 2-8). The environmental justice area of concern within VLAWMO is located in Vadnais Heights. VLAWMO is intentional about considering areas of environmental justice to encourage meaningful involvement and increase engagement with underrepresented community groups, recognizing that these communities are often disproportionately impacted by negative environmental impacts such as flooding. Strategic community engagement in environmental justice area will be incorporated into implementation of communication and outreach programs and projects where applicable to ensure community needs are reflected in programming.

In addition to climate resiliency being a priority issue, VLAWMO would like to recognize that a changing climate brings challenges to the watershed and should be understood as a planning lens. Increases in annual precipitation amounts, precipitation variability, and extreme storm events are stressors to infrastructure that was designed for more moderate precipitation events. Additional community-level impacts can include an increase in algal blooms, eroding riparian banks due to higher flows, and changing ecosystems. Plan partners acknowledge the impact of climate on the watershed and seek to build resiliency to climate impacts through planning and projects.

Blue-green algae and curly-leaf pondweed along the southern border of West Goose Lake Photo Credit: vlawmo.org

Climate resilience includes built infrastructure and social resilience to the impacts of climate change. Social resilience involves community and organizational preparation and response to climate change. VLAWMO intentionally chooses projects that incorporate the goals of improving community resiliency. VLAWMO provides assistance to residents seeking information on how to adapt to and prevent flooding, minimize impacts of drought, and reduce streambank and shoreline erosion. VLAWMO also considers climate resiliency in grants and projects.

3.3.3 Supporting Plan Themes

- Aquatic Invasive Species
- Data Gaps

Aquatic Invasive Species (AIS) and data gaps are two plan themes that support other issues. AIS in the watershed can be referenced in Table 2-2.

AIS are commonly transported via boats and equipment used in infested waters and brought to new waterbodies. AIS, specifically common carp and curly-leaf pondweed, contribute to declining water quality. More

broadly, AIS frequently outcompete native species and threaten the ecological function of lakes.

Invasive plants have undesirable environmental impacts outside of their native range, including outcompeting native plants, forming dense mats of vegetation, and reducing dissolved oxygen needed for aquatic life. Rusty crayfish can displace and replace native crayfish while competing with fish and consuming fish eggs. Zebra mussels can outcompete native mussels and filter out algae, removing the base of the food web. Purple loosestrife, yellow iris, and other wetland invasive plants can outcompete native plants and inhibit wetland function.

Zebra Mussel clean-out at Sucker Channel. Photo Credit: vlawmo.org

VLAWMO's work with AIS is directly connected to the high priority issue "Surface Water and Drinking Water Quality" and emphasizes providing monitoring and survey data, as described in the Aquatic Plant Management Policy (Appendix X). VLAWMO supports partner organizations that lead AIS management efforts and recognizes that some AIS impact water quality issues. VLAWMO has an established common carp removal program that has been ongoing since 2019 in the Pleasant Lake chain of lakes, and has partnered with Ramsey County SWCD for AIS management and conducting plant surveys.

In addition to common carp removal, VLAWMO has historically conducted management efforts on rough fish (e.g. black bullhead). These fish are not AIS, and are native to Minnesota. This effort was conducted on a strategic basis. Additional work to manage rough fish may be pursued in the future.

VLAWMO recognizes additional data acquisition, analysis, surveys, and reports may be needed to close data gaps and better inform Plan actions. VLAWMO runs a robust water quality monitoring program and would like to expand monitoring datasets, as identified and needed, to better understand water resource status, trends, and dynamics. Additionally, VLAWMO intends to enhance capital improvement project (CIP) evaluation and monitoring to better understand CIP impact. Examples of future studies and data gaps VLAWMO is interested in exploring are summarized in Section 4-Implementation Plan.

3.4 Plan Goals

The following section introduces the measurable goals for each high and medium priority issue. Goals are summarized by resource category, with each summary providing:

- Background information on the priority issue
- A measurable goal
- A measure for how the goal will be evaluated.

The "goal" for each priority issue is intended to describe an intended vision or accomplishment for each priority issue. The "measure" is the feature, attribute, characteristic, or quantity which forms the unit by which progress is evaluated toward attaining a goal. These can be evaluated every two years. The measure is provided to meet requirements of a goal established in Minnesota Rules 8410.

In many cases, a goal's measure is grounded in the projects that VLAWMO intends to implement during the lifespan of the plan. Section 4- Implementation Plan introduces the Implementation Table (Table 4-6), which includes a summary of programs, technical work, and projects VLAWMO intends to implement in the next 10 years. To connect goals to planned implementation activities, some goals include a magnifying glass icon that indicates projects (identified in Table 4-6) that are assumed to be implemented to meet a goal's measure. Similarly, in Table 4-6, plan implementation activities that connect directly to a measurable goal are related back to that goal through a toggle icon.

It is noted that programs, technical work, and projects in the Implementation Table were identified in coordination and collaboration with municipalities and partner organizations with knowledge at the time of plan writing. Planned projects and funding may shift from what is listed based on changing resource conditions, funding availability, ability for partnership, or staff capacity. Changes to a planned project may therefore impact VLAWMO's ability to meet goal measures identified in this section.

*Indicates that a program, technical work, or project **directly** relates to a measurable goal*

*Indicates that a program, technical work, or project **indirectly** benefits a measurable goal, but is not used to measure it*

Lambert Creek Headwaters.
Photo Credit: vlawmo.org

3.4.1 Surface Water Quality Management

- Surface Water and Drinking Water Quality
- Erosion of Shorelines and Streambanks

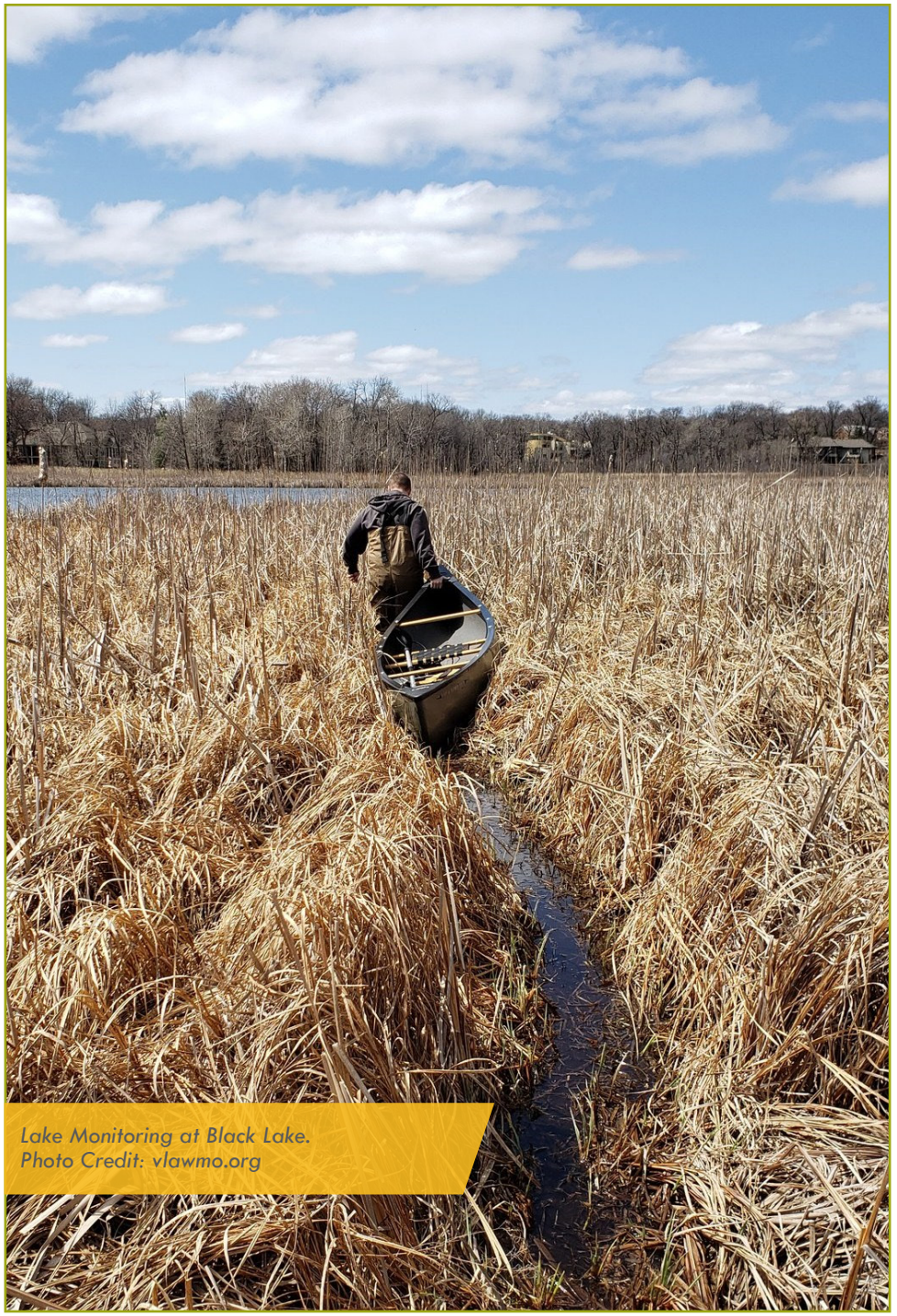
Surface Water and Drinking Water Quality

As summarized in Section 2-Land and Water Resources, VLAWMO residents and visitors are drawn to the watershed's surface waters for aesthetic values, boating, swimming, fishing, and wildlife watching. The chain of lakes draining to East Vadnais Lake also serves as a drinking water source for St. Paul and surrounding communities. VLAWMO's core mission is to work to restore impaired waters that do not meet their designated use and to protect unimpaired waterbodies to support their designated use.

Section 2-Land and Water Resources provides an inventory of impaired and unimpaired waters in VLAWMO with current conditions and trends (Table 2-2). Impaired waters in VLAWMO are further summarized in Table 3-2. Lake impairments include excess nutrients and mercury in fish tissue. Lambert Creek is impaired due to fecal coliform. AIS can degrade surface water quality, as discussed in Section 3.3.3.

VLAWMO works to improve water quality through various programs such as its communication and outreach program (Section 3.4.4). VLAWMO also works to improve water quality in impaired and unimpaired waters through projects, as summarized in Section 4-Implementation Plan.

The focus for the Plan's water quality management goals is on continued implementation of projects to make progress towards TMDL targets for



Lake Monitoring at Black Lake.
Photo Credit: vlawmo.org

impaired resources (Table 3-2) and protect unimpaired resources (Table 2-2). TMDLs that apply to VLAWMO waters include the Statewide Mercury TMDL and a Vadnais Lake Area Watershed TMDL and Protection Study.

Table 3-2. Impairments.

Lake or Stream	Impairment	Year Listed	Year TMDL Approved by Environmental Protection
East Vadnais	Mercury in fish	1998	2008
Gilfillan Lake	Nutrients	2010	2014
East Goose Lake	Nutrients	2010	2014
Pleasant Lake	Nutrients, Mercury	2002	No TMDL for
Sucker Lake	Mercury in fish	1998	2007
West Vadnais	Nutrients	2014	No TMDL
Wilkinson Lake	Nutrients	2010	2014
Tamarack Lake	Nutrients	2014	No TMDL
West Goose Lake	Nutrients	2010	2014
Lambert Creek	Fecal coliform	2008	2014

Lake Monitoring. Photo Credit: vlawmo.org

Improving surface water and drinking water quality through the protection of groundwater and the chain of lakes is an important goal for VLAWMO. Most of the watershed is within Priority A of the St. Paul Chain of Lakes public water supply DWSMA. As such, VLAWMO partners with SPRWS to protect surface water quality, which helps SPRWS minimize drinking water treatment costs and protect public health. Throughout the watershed, groundwater is also a drinking water source for several communities. Substrate and soils determine groundwater vulnerability in some areas. Scattered high permeability of surface materials, especially in the east, leaves groundwater vulnerable to surface contamination.

The surface water and drinking water quality goal includes pursuing projects funded by the Clean Water Act Section 319 grant program, especially through the Section 319 Small, Priority Watersheds focus funding, which is administered by the MPCA. VLAWMO's outreach and communication efforts support surface and drinking water quality by

increasing community awareness of actions people can take to conserve water and improve water resources. The success of the Surface Water and Drinking Water Quality Goal is tied to the success of engaging the public in the Outreach and Communications Goal.

Erosion of Shorelines and Streambanks

In addition to the Surface Water and Drinking Water Quality issue, streambank and lake shoreline erosion is a concern in the watershed. Streambank erosion can occur in Lambert Creek or within ditches during periods of high flow. Lake shore erosion can be worsened by waves from boats and a lack of shoreline buffer. Streambanks can be protected by vegetated bank stabilization or hard armoring practices, and lake shorelines can be protected from erosion by planting native shoreline vegetation and minimizing development and landscaping near shorelines. Riparian buffers provide wildlife and pollinator habitat, stabilize soils, and slow and filter overland runoff prior to entering a waterbody. VLAWMO encourages streambank and lakeshore landowners to plant native vegetation riparian buffers through partnership projects and VLAWMO's landscape grant programs.

- **Surface Water Quality Goal:** Protect and improve water quality through implementation of capital improvement projects, associated technical work, and VLAWMO programs.

  Partnership/Grant Dependent Measure: Pursue partnership project implementation of up to 12 projects or associated technical work that improve surface water and drinking water quality, including at least three funded by 319 Small, Priority Watershed Program.

  See Implementation Table: 403A, 403B, 403C, 403D, 403J, 401G, 401A, 305E, 405E, 306B, 306F, 307B

  Partnership/Grant Dependent Measure: Continue annual implementation of VLAWMO programs to protect and improve water quality.

  See Implementation Table: 200A, 200B, 200C, 200D, 200E, 200F, 200G, 200H

- **Erosion of Shorelines and Streams Goal:** Reduce and/or prevent shoreline or streambank erosion through implementation of stabilization and restoration capital improvement projects, associated technical work, and VLAWMO programs.

  Partnership/Grant Dependent Measure: Pursue partnership project implementation of up to 4 projects or associated technical work focused on shoreline or streambanks to reduce sediment and nutrient delivery to surface waters.

  See Implementation Table: 301F, 304A, 305I, 306C

  Partnership/Grant Dependent Measure: Continue annual implementation of VLAWMO programs to reduce and/or prevent erosion of shorelines and streams.

  See Implementation Table: 200B, 200D, 200F, 200G

3.4.2 Groundwater Management

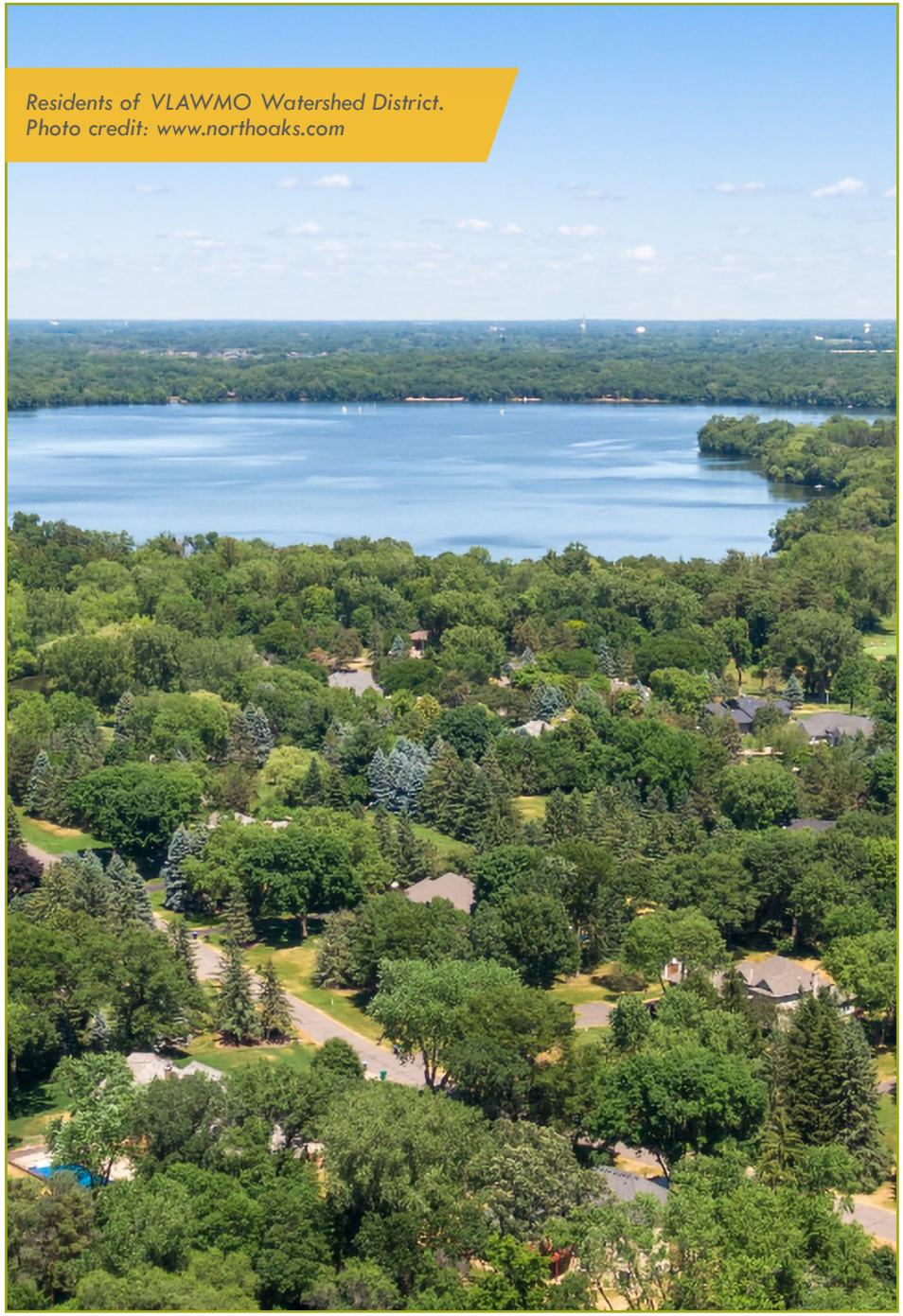
- Groundwater and Drinking Water Quality
- Groundwater Supplies and Conservation

Groundwater Supplies and Conservation

Many residents within the watershed obtain drinking water from groundwater wells. Several agencies and organizations are responsible for managing various aspects of groundwater within VLAWMO. Member communities, counties, the MDH, and the MPCA all have responsibility for managing groundwater used as drinking water. Groundwater withdrawals are permitted by the DNR. Although member communities (rather than VLAWMO) take a lead role in monitoring and managing drinking water supply, the watershed is engaged in groundwater conservation education, grant programs, and technical assistance to protect groundwater supplies.

Aquifers in the watershed are estimated to have a recharge rate of 6.1 inches/year (Smith and Westenbroek, 2015). VLAWMO is located within the North and East Metro Groundwater Management Area, which the DNR identified as at-risk and set sustainability goals for permit holders. It is crucial to use groundwater responsibly and maintain groundwater supplies for future generations. Water-use data shown in Figure 2-4 shows groundwater withdrawals decreasing in VLAWMO from the late 1980s to 2022.

In 1987, metropolitan counties were given the authority to prepare and adopt groundwater plans through MS 473.8785 (now MS 103B.255). That statute provided a mechanism for counties to set priorities, address issues, and build local capacity for the protection and management



Residents of VLAWMO Watershed District. Photo credit: www.northoaks.com

of groundwater. VLAWMO typically serves in an advisory capacity when a plan is developed. The Ramsey Conservation District (RCD, which is now the Ramsey County Soil and Water Conservation Division (RCSWCD)) prepared updates to the 1995 groundwater plan in 2009, but the county board declined to submit the draft for BWSR approval. Anoka County, though declining to prepare an official groundwater management plan, has incorporated water management (surface and groundwater) into its 2020 Water Resources Report.

Groundwater and Drinking Water Quality

Common groundwater contaminants include arsenic, bacteria, lead, manganese, and nitrate. Additional contaminants in the metro area include, but are not limited to, per- and polyfluoroalkyl substances (PFAS) from industrial contamination and chloride. VLAWMO partners with local and state organizations to protect groundwater quality through education and outreach.

Surface contamination can influence groundwater through unsealed wells that act as conduits or sandy soils that cover shallow groundwater supplies. MDH recommends contaminant source management such as sealing wells, safe salt storage, erosion control measures at construction sites, and application of fertilizer and pesticides following best practices.

- **Groundwater and Drinking Water Quality and Groundwater Supplies and Conservation Goal:** Protect groundwater quality and quantities through partnership with member communities, education, grant programs, and technical assistance.

  Partnership/Grant Dependent Measure: Collaborate with partners to share groundwater conservation data as acquired and/or promote groundwater conservation best practices. *See Implementation Table: 200B*

  Partnership/Grant Dependent Measure: Pursue implementation of 1 partnership project focused on conservation, technology enhancement, or protecting quality. *See Implementation Table: 403K, 200G*

A sundog over Lambert Lake Pond.
Photo Credit: vlawmo.org

3.4.3 Data Collection

- Water Monitoring
- Chloride and Emerging Contaminants

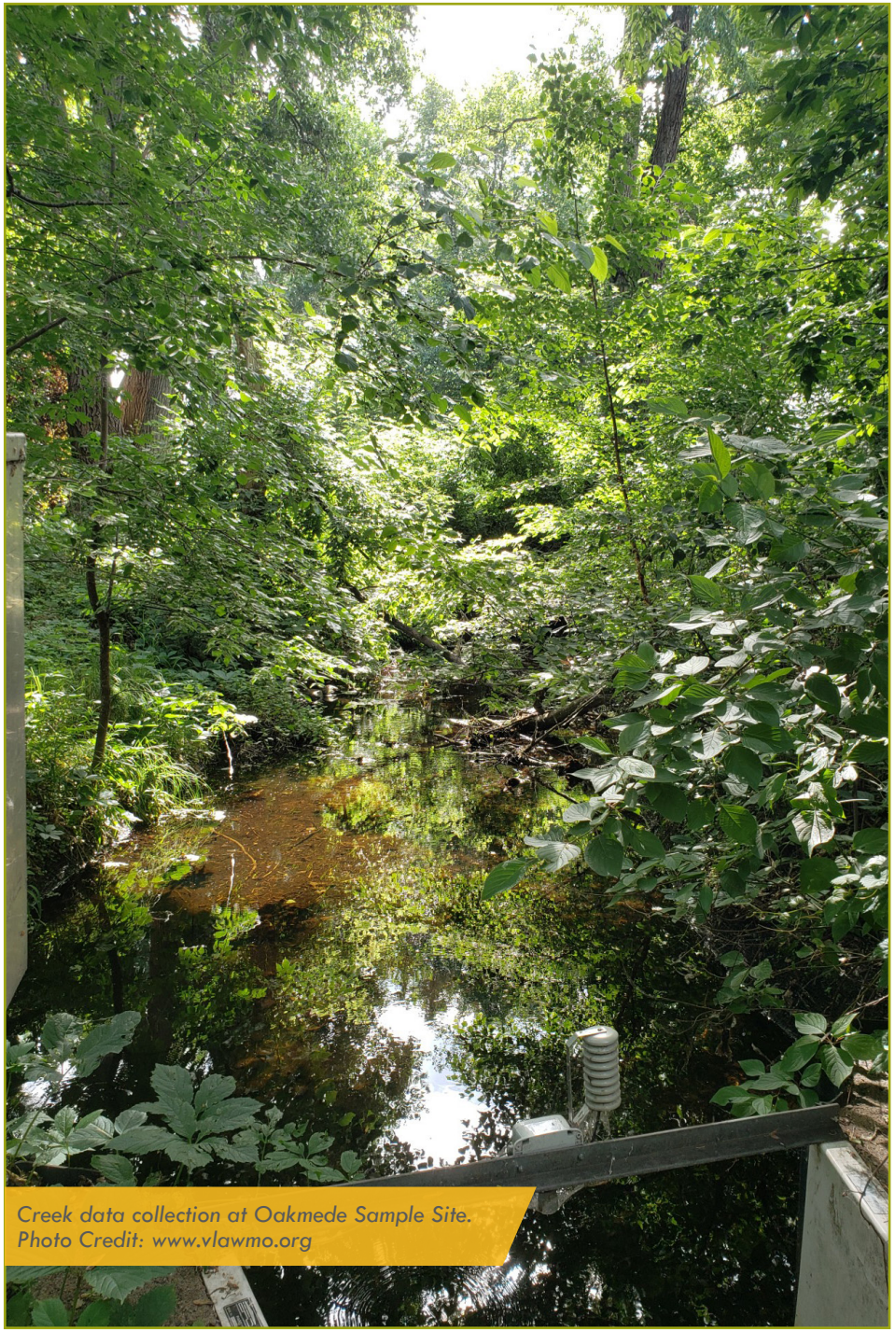
Water Monitoring

VLAWMO has been monitoring local lakes since 1997. Annual reports are posted on its website. VLAWMO collects data on its lakes and Lambert Creek for phosphorus, chlorophyll-a, iron, nitrogen, nitrate, total suspended solids, and chloride. Special attention is given to monitoring the chain of lakes. The SPRWS conducts increased monitoring of Pleasant, Sucker, and East Vadnais Lake. VLAWMO monitors 15 lakes in the watershed and Lambert Creek.

Water quality monitoring provides insight into resource conditions and trends, which is critical for informing projects and programs. Monitoring is a part of VLAWMO's mission statement. VLAWMO's water quality monitoring efforts provide information that can be used in planning and implementing projects and communication and outreach program efforts.

Chloride and Emerging Contaminants

Chloride is a contaminant of concern in the watershed. In Minnesota, the largest source of chloride is road salt, followed by fertilizer, WWTP effluent (mainly water softeners), livestock waste, and residential septic systems (Overbo, 2021). Chloride is toxic to aquatic life and in sufficiently high concentrations can impact lake turnover. VLAWMO has shallow urban lakes in close proximity to roadways, making a reduction in chloride an important issue.



Creek data collection at Oakmede Sample Site. Photo Credit: www.vlawmo.org

Because there is no economically feasible way to remove chloride from surface waters, monitoring, education and outreach efforts, and MS4 support work to reduce application amounts are especially important. VLAWMO began monitoring for chloride in 2009 and typically takes one surface sample after ice-off in lakes. As Birch Lake has been monitored for chloride and increasing concentrations have been detected, Birch Lake will be a priority for chloride management. Continued monitoring of chloride and other emerging contaminants will be an important part of VLAWMO's monitoring program to guide and assess ongoing efforts. VLAWMO will engage in outreach efforts to reduce chloride pollution and will consider opportunities to be engaged in management efforts.

- **Chloride and Emerging Contaminants Goal:** Seek additional funding and/or partners to expand the monitoring program for chloride and emerging contaminants and conduct engagement activities to expand community knowledge of chloride and/or emerging contaminants.

  Partnership/Grant Dependent Measure: Collaborate or partner to annually develop at least 2 Smart Salting educational materials for residents, participate in events, and notify municipal partners of at least 1 relevant chloride workshop per year to expand community knowledge of chloride reduction strategies. Identify priority areas with municipal partners and focus educational efforts on priority groups (e.g. private applicators). Annually report any collected chloride monitoring results to EQuIS.

  See Implementation Table: 200C

- **Water Monitoring Goal:** Continue monitoring the watershed lakes and rivers and analyze data to understand trends that inform future projects.

  Partnership/Grant Dependent Measure: Monitoring results posted to MPCA EQuIS database and monitoring report and summary posted to VLAWMO website on an annual basis.

  See Implementation Table: 200C

3.4.4 Outreach, Education, and Community Engagement

- Outreach and Communication

Outreach and Marketing

Outreach and communication are a crucial aspect of VLAWMO's work. Efforts focus in four areas: MS4 program assistance, education and continued learning, volunteer programs, and organizational and project communication. VLAWMO engages in a wide range of activities aimed at enhancing public understanding of water-related issues and ultimately improving watershed conditions through behavior change and enhanced participation in watershed stewardship (see summary in Table 3-3).

VLAWMO seeks to build an engaged citizenry that protects the watershed and has environmental literacy, assist MS4 partners with planning and implementing best practices, and continue to develop programming for its many stakeholders. VLAWMO orchestrates the WAV (Watershed Action Volunteers) volunteering program, which engages residents in watershed outreach activities. VLAWMO also recruits Minnesota Water Stewards and offers grants for local groups to implement water-centered programming in the watershed through the Community Blue program. Partnerships and programs that arise from VLAWMO outreach are discussed in Section 4 – Implementation Plan.

VLAWMO's Communication, Outreach, and Education Program is only one of eight VLAWMO programs, but it influences every part of VLAWMO operations and programs. An effective communication and outreach program educates the public and partners on environmental issues and empowers them to engage in behaviors that protect natural resources and water resources.

Youth Education Event. Photo Credit: vlawmo.org

- **Outreach and Communication Goal:** Enhance public understanding of water-related issues and improve watershed conditions through effective communication and outreach. Specific measurable goals are shaped by conversations with partners and community members, then shared with key stakeholders in biennial Work Plans.

  Partnership/Grant Dependent Measure: Continuously monitor and maintain current websit; annually complete at least 2 articles or press releases for local press, plus 1 annual newsletter; coordinate at least 2 community events or workshops each year.

See Implementation Table: 200B

Table 3-3. Summary of Outreach and Communication Efforts.

Category	Activities	Target Audience
MS4 Outreach Assistance	• VLAWMO will collaborate with LGUs to provide learning opportunities and resources that help partners meet MS4 regulatory requirements. • VLAWMO may target specific topics to assist MS4 partners including but not limited to: chloride reduction, volume management and infiltration, turf management, pet waste management, erosion and sediment control, and illicit discharge.	MS4 partners
Education and Continued Learning	• VLAWMO may develop, facilitate, or coordinate workshops, trainings, and public events or presentations that engage audiences in watershed topics of interest. • VLAWMO may partner with educators or volunteers to teach youth and adult learners about water resource issues and equip them with skills and knowledge to be good watershed stewards.	Watershed residents, students and educators, community groups
Volunteer Coordination	• VLAWMO may support or coordinate efforts that combine hands-on learning with service opportunities for the public. • VLAWMO may target various water topics through volunteer opportunities. These could include community cleanups, development of supplementary educational materials, support with communication materials, or citizen science activities such as macroinvertebrates monitoring or aquatic invasive species detection.	Watershed residents and community groups
Organizational and Project Communication	• VLAWMO will maintain communication channels such as its website and educational materials to ensure they are clear, accessible, and up to date. • When possible, VLAWMO will craft communication materials that support project development and implementation, collaborating with project partners when feasible.	Watershed residents and municipal partners

3.4.5 Flooding and Water Quantity

- Public Drainage Systems
- Infrastructure Partnership Projects
- VLAWMO Facilities

Public Drainage Systems

Ramsey County Ditch (RCD) 13 and RCD 14 were first created in the early 1900s to make the adjacent land more suited to agriculture. Following urbanization, RCD 13 and 14 are now managed as outlets for urban stormwater conveyances systems. VLAWMO collaborates with member communities to maintain drainage under Minnesota Statute 103B. Within VLAWMO, drainage is accomplished through storm sewer systems and ditches that convey water downstream. VLAWMO's policies state that owners of storm sewer systems are responsible for their maintenance. Consistent with this policy, VLAWMO entered into an agreement in 2023 with the City of White Bear Lake to transfer responsibility of maintaining the CD 13 stormsewer to the City. The main trunk of RCD 14 is an open channel system (also referred to as "Lambert Creek"), receiving drainage from five branches which primarily consist of storm sewer systems that are owned and maintained by others (cities and county). RCD 14 bisects several large wetland complexes and outlet via an alteration of Lambert Creek. Currently, about half of the watershed is drained by these two systems.

Stormwater drain. Photo Credit: vlawmo.org

These systems were formerly managed by Ramsey County but passed onto VLAWMO in 1986. As such, VLAWMO manages these systems for multiple purposes including water quality and flood reduction. While VLAWMO manages these ditches under Statute 103B, road authorities maintain the responsibility to manage system crossings under 103E. In 2022, VLAWMO adopted a Public Drainage Management Policy that identifies VLAWMO's approach in utilizing its Chapter 103B authorities in conjunction with its municipal partners to manage these systems and identifies that owners or operators of stormsewer systems/crossings within the public drainage system shall be responsible for maintenance. The Public Drainage Management Policy can be found in Appendix X.

Ditches can fill with sediment and need structural repair, which can degrade water quality and reduce the utility of the system as a stormwater outlet. Vegetation management (trees and brush) within the right-of-way is critical to maintaining access for inspection and maintenance of the system and to prevent deadfalls from blocking the ditch. To address these issues, VLAWMO has been active in collaborating with partners in maintaining the systems via tree removal, sediment removal, and bank and gully stabilization. A Public Drainage System Inspection Protocol was developed in 2023 to ensure predictable monitoring of the systems.

Infrastructure Partnership Projects

VLAWMO's location in the Twin Cities metro area places it in an urban setting with just over half of the land area as developed land use. This amount of impervious surface impacts drainage and runoff, as precipitation is routed directly into roads and the storm sewer network. The changing precipitation patterns seen in Minnesota are stressing existing infrastructure. Historically, the watershed has had few extreme flooding events, likely due to VLAWMO and its regional partners and member communities' active work in historic flood storage creation and stormwater and drainage management. However, extreme rain events still pose a flooding hazard to the community. The Metropolitan Council developed the Localized Flood Map Screening Tool, which identifies areas throughout the watershed that are vulnerable to potential flooding. Much

of the storm sewer and road infrastructure was built for a past climate, and current extreme rain events can result in localized flooding.

VLAWMO has a long history of partnering with local communities to build infrastructure and flood reduction work and plans to pursue future resiliency studies to identify specific vulnerabilities. VLAWMO actively partners with communities on stormwater BMPs concurrent with retrofit or redevelopment projects to help reduce flooding.

VLAWMO Facilities

VLAWMO facilities are constructed projects managed and partially maintained by VLAWMO, which includes structures such as sedimentation basins, iron enhanced sand filters, lake/wetland outlet structures, and other stormwater filters (Table 3-4). VLAWMO projects span the watershed and protect habitat, improve water quality, and provide water storage. Continual inspection to ensure projects are maintaining the built purpose is important to maintain VLAWMO's investment. Public works or facilities within VLAWMO area are the responsibility of local municipalities if not maintained by VLAWMO.

- **Public Drainage Systems Goal:** Complete annual inspection process and provide documentation in accordance with the VLAWMO Public Drainage Policy and inspection protocol to identify potential needs related to drainage function.

  Partnership/Grant Dependent Measure: Conduct technical work to ensure RCD14 is inspected annually and documented in compliance with Public Drainage Policy in order to ensure ongoing maintenance and functionality.

  See Implementation Table: 305H, 305I, 200H

- **Infrastructure Partnership Projects Goal:** Collaborate with partners to identify infrastructure that would benefit from repair, retrofit, or expansion.

  Partnership/Grant Dependent Measure: Conduct annual meetings with municipal partners to coordinate opportunities for infrastructure improvements that increase water quality and/or promote reduction of peak flows downstream beyond stormwater standard requirements.

  See Implementation Table: 200D, 200G

  Partnership/Grant Dependent Measure: Provide advisory comments (as requested) in accordance with VLAWMO Water Management Policy which incorporates current standards for volume, peak rate, and imperviousness for Local Water Plan adoption.

  See Implementation Table: 200E

- **VLAWMO Facilities Goal:** Create a policy to inspect all inventoried VLAWMO facilities relevant to current agreements.

  Partnership/Grant Dependent Measure: Create a policy to inspect all inventoried VLAMWO facilities; Inspect 100% of all inventoried facilities and share results with project partners to promote effective and ongoing maintenance of facilities and functionality.

  See Implementation Table: 200H

Table 3-4. Summary of VLAWMO facilities with agreement timeline.

Project Name	City	Purpose	Constructed	Agreement Timeframe	Maintenance Partners
Birch Lake Shoreline Restoration	White Bear Lake	Protect shoreline from erosion and establish native plant community	2011	MOU renewed; current agreement is 2024-2034	City of WBL
Birch Lake Iron-Enhanced Filter	White Bear Lake	Filter pollutants	2020	25 years; runs through 2045	City of WBL, Ramsey County
East Goose Lake Boat Launch	White Bear Lake	Access	2020	10 years; runs through 2030	City of WBL
Lambert Creek Meander	Vadnais Heights	Slow water, reconnect floodplain, filter pollutants	2021	Part of Public Drainage Inspection Program	
Whitaker Biochar Filter	White Bear Township	E. coli removal	2022	10 years; runs through 2032	SPRWS for lab analysis of E. coli samples
Wilkinson Deep-Water Wetland	North Oaks	Storage and filtration	2023	10 years; runs through 2033	North Oaks Company

3.4.6 Policy and Facilitation

- Wetland Conservation Act
- Stormwater Management Standards

Wetland Conservation Act

Wetlands provide water storage, flood damage reduction, water quality, and groundwater recharge benefits. The watershed includes about 850 acres of public water wetlands. Many original wetlands have been drained, but remaining ones are managed by the Wetland Conservation Act (WCA), which requires no net loss of wetlands. VLAWMO is the WCA local government unit (LGU) for the watershed (excluding MnDOT projects) and administers WCA.

Stormwater Management Standards

Urban stormwater is discharged or drains into surface waters, making rate control and runoff water quality an important concern. Member community MS4s are required to incorporate the standards of the VLAWMO Water Management Policy in their local water plans. The Policy is included in Appendix X and was last updated in 2022 and planned for an update in 2025/26. The 2025/26 update is expected to require member communities to follow Minnesota Law regarding stormwater, erosion, wetlands, and buffers without placing additional regulatory requirements on communities beyond what is required by state law. Municipalities are able to develop stricter standards in their jurisdiction if desired, and they are responsible for issuing permits, variances, and violations regarding regulations and ordinances. VLAWMO is not a permitting or enforcement entity. VLAWMO provides advisory technical review support to its member communities upon request.

Tamarack Nature Center.
Photo credit: www.vlawmo.org

Local infrastructure was designed using TP-40 or Atlas-14 rainfall events to generate design rainfalls, with storm sewers typically designed for 10-year rainfall event capacity under gravity flow, and floodplain management designed for 100-year rainfall events. As discussed in Section 2 – Land and Water Resources, much of the infrastructure in Minnesota was designed for climate conditions (i.e. rainfall patterns) that have changed and continue to change. The release of Atlas 15, expected in 2026, will inform future ditch, stormwater, and drainage design and management.

- **Stormwater Management Standards Goal:** Update VLAWMO Water Management Policy as needed to be consistent with local resource needs while better aligning with state and federal requirements (e.g. MS4).

  Partnership/Grant Dependent Measure: Water Management Policy reviewed, updated, and authorized by the Board as needed.

  See Implementation Table: 200E

- **Wetland Conservation Act Goal:** As the LGU, pursue the goal of no net loss of wetlands per WCA, recognizing the fundamental relationship between wetland management and land use.

  Partnership/Grant Dependent Measure: Administer the WCA as the LGU. Submit annual report to BWSR as WCA LGU.

  See Implementation Table: 200E

3.4.7 Community and Ecosystem Health and Resiliency

- Climate Resiliency
- Natural Features and Habitat

Climate Resiliency

Climatic changes have increased the frequency of high-magnitude rainfall and runoff events, which can potentially overwhelm the capacity of existing stormwater management infrastructure. As discussed in Section 2 - Land and Water Resources, Minnesota's climate is changing in many ways. Temperature and precipitation are increasing, impacting watering demand, algae blooms, ice cover, and snow amount. Heavier rains stress infrastructure, which is a major concern of VLAWMO. The overarching impacts of climate led VLAWMO to consider climate resiliency a medium priority issue in addition to including it as a planning lens. VLAWMO is committed to partnering with member communities, local and state agencies, and other stakeholders to build resiliency in communities. VLAWMO intends to continue investing ways to assess watershed vulnerabilities and incorporate resiliency into watershed programs and programs.

Natural Features and Habitat

VLAWMO partners with landowners within capital improvement project areas to protect and manage native vegetation in forests, floodplains, and upland habitat. Urbanization removes and fragments natural habitats that support native plant communities, pollinators, rare species, and wildlife. Habitat fragmentation is a major stressor to wildlife populations and providing land for wildlife is especially important in the

An example of a wetland buffer in the VLAWMO watershed. Photo credit: www.vlawmo.org

metro area. In the watershed, DNR has recognized over 3,000 acres as ecologically significant terrestrial and wetland areas. Protection of natural features benefits watershed residents by providing green spaces in which they can recreate. Protecting and expanding natural areas can also help reduce the impacts of stormwater runoff on downstream waters and improve water quality. Lastly, natural areas can also act as a carbon 'sink', contributing to improved resilience to climate change.

- **Climate Resiliency Goal:** Pursue implementation of partnership projects that result from completed resiliency studies to build resiliency to changing rainfall and runoff events. Future studies would utilize Atlas 15 as available to model target areas for projects to build resiliency to future storm events.

  Partnership/Grant Dependent Measure: Pursue technical work and partnership project implementation of four projects to improve climate resiliency.

  See Implementation Table: 200G, 200D, 305G, 405G, 307A, 407A

- **Natural Features and Habitat Goal:** Partner on habitat enhancements or restoration projects within capital improvement project areas that protect natural areas and habitat.

  Partnership/Grant Dependent Measure: At least 30 capital improvement and/or grant program projects implemented that benefit natural resources.

  See Implementation Table: 401G, 303E, 306C, 200G

4 IMPLEMENTATION PLAN

4. IMPLEMENTATION PLAN

4.1 Introduction

This section summarizes the implementation actions that VLAWMO will focus on during the next ten years. Implementation actions were strategically developed in coordination and collaboration with municipalities and partner organizations and are updated to stay current through annual partner meetings. These actions address issues and goals listed in Section 3- Priority Issues and Goals. A detailed list with estimated annual costs for implementation actions are included in the Implementation Table at the end of this section (Table 4-5).

Actions in the Implementation Table are organized into one of four core activities with an associated code: Administration (100), VLAWMO Implementation Programs (200), Project Technical Work (300), and Capital Improvement Projects (400) (Table 4-1). Codes are used for internal budgeting and implementation purposes, and are also used to connect goal measures and plan narrative to actions and activities in the Implementation Table. Descriptions of each core activity and associated programs are detailed throughout this section.

4.2 Administration - 100

Administration activities are associated with running the watershed, including but not limited to: office rent; office supplies; equipment; information technology purchases and support; financial, legal, audit, and bookkeeping costs; workers' compensation insurance; and staff training. Duties such as storm sewer utility fee assessment, preparing the annual budget, preparing for Board and TEC meetings, and human resources activities also fall within this category.

Administration -100	VLAWMO Implementation Programs - 200
• Office space, supplies, and training • Staff training • Equipment • Human resources	• Aquatic Invasive Species Management • Communication, Outreach, and Education • Monitoring • Capital Improvements – Early Coordination • Regulatory and Policy • General Analysis and Technical Work • VLAWMO Grants and Partnerships • Operations and Maintenance
Project Technical Work - 300	**Capital Improvement Projects - 400**
• Modeling, feasibility studies, etc., related to specific projects and organized by subwatershed	• Larger partnership projects, organized by subwatershed

Figure 4.1: *Core activities of VLAWMO.*

4.3 VLAWMO Implementation Programs - 200

The VLAWMO Implementation Programs core activity is the most expansive, as it is inclusive of the following programs: Aquatic Invasive Species Management; Communication, Outreach, and Education; Monitoring; Capital Improvements - Early Coordination; Operations and Maintenance; Regulatory and Policy; General Analysis and Technical Work; and VLAWMO Grants and Partnerships.

4.3.1 Aquatic Invasive Species Management Program – 200A

VLAWMO adopted an Aquatic Plant Management Policy (Appendix C) in 2022. VLAWMO's aquatic plant management role is summarized as:

- Lead or partner for aquatic plant monitoring and education, treatment or removal of curly-leaf pondweed for water quality benefits, or native plant introduction
- Technical support and/or partner for management of other Aquatic Invasive Species (AIS) besides curly-leaf pondweed
- Lead for in-lake treatment or removal of other AIS to support ecological health and/or water quality on a project-by-project basis.

The issue of AIS in VLAWMO is discussed in Section 3.3.3. In addition to monitoring the presence of AIS and working to reduce and/or control in some cases (e.g., the common carp removal program), VLAWMO serves as a resource for interested residents to learn more about AIS. VLAWMO has facilitated citizen-science AIS programming, trainings, webinars, and workshops intended to reduce the spread of AIS. These are expected to continue into the future in partnership with other groups such as counties, lake associations, the University of Minnesota, and MN DNR AIS prevention programs.

Program Summary: Aquatic Invasive Species Management (200A)

Example Activities

- AIS workshops
- Common carp removal
- Sampling for hybrid Eurasian watermilfoil

Primary Issues Addressed

- Surface Water and Drinking Water Quality

Estimated Annual Funding

- $64,000-$82,000

4.3.2 Communication, Outreach, and Education Program – 200B

The Communication, Outreach, and Education Program includes activities such as volunteer coordination, stakeholder partnerships, educational materials and workshops, and newsletters and annual reports. VLAWMO recognizes that a cornerstone of sustainable watershed resources management is delivering programs that are effective in developing stakeholders' understanding of natural resources and encouraging stewardship behaviors. Communication and outreach with project stakeholders enable project success.

Activities through this program leverage existing partnerships and create new ones that initiate and support project implementation throughout the watershed. As such, VLAWMO provides resources and funding for community outreach and educational projects. VLAWMO updates its communication, outreach, and education program work plan as needed to continue advancing VLAWMO's broader organizational goals.

Communication, Outreach, and Education Objectives

- **Support and enhance an informed citizenry that understands natural resource protection and responsible use.**
- **To observe community members demonstrating watershed protection behaviors.**
- **To observe resident volunteers educating their fellow watershed residents.**
- **To confirm that MS4 partners are collaborating, using resources, and making progress on MS4/SWPPP reporting.**
- **To provide active programs and foster partnerships that build participation and are relevant to residents and VLAWMO's mission.**
- **To observe that community members are knowledgeable and engaged in VLAWMO's direction, policies, meetings, and projects.**

Partnerships are an important component of VLAWMO's work to conduct outreach activities that align with its mission. VLAWMO partners with community groups, non-profit organizations, and community members in engagement activities that align with watershed conservation and public outreach and support independent learning.

Another important aspect of this program is supporting member communities' public education and outreach requirements outlined in the MS4 general permit. VLAWMO collaborates with its member communities - MS4 permittees - to provide outreach support and education to assist with meeting regulatory requirements. For example, VLAWMO provides education and outreach on chloride reduction by providing educational resources to community members on salt application, sharing relevant event and learning opportunities, and directing interested parties to MPCA Smart Salting training. These efforts support MS4 permittees with reporting requirements, and they ensure the broader watershed community is informed on important stormwater topics.

Program Summary: Aquatic Invasive Species Management (200A)

Example Activities

- Coordination of volunteer programs
- Installation of educational signage at notable project sites and other capital improvement projects

Primary Issues Addressed

- Communication and Outreach

Estimated Annual Funding

- $83,000-$109,000

4.3.3 Monitoring Program – 200C

VLAWMO carries out a robust data collection and analysis program on 15 lakes in the watershed, 6 sites on Lambert Creek, and through stand-alone studies or special projects. A summary of lake and creek sampling is shown in Figure 4-1. The purpose of the monitoring program is to track long-term water quality trends; provide a scientific basis to identify, target, and design programs and projects to meet goals; and to evaluate project and program effectiveness and progress towards water quality goals.

The monitoring program relies on baseline monitoring by VLAWMO staff, in addition to monitoring efforts from partners. SPRWS conducts increased monitoring of Pleasant and East Vadnais Lake, and VLAWMO monitors Lambert Creek which flows into East Vadnais Lake. The bulk of water samples are collected between May and September each year.

Figure 4.1: *VLAWMO surface water quality monitoring efforts*

Summarized in Annual Monitoring Report

Lake Monitoring

- **Biweekly monitoring: Secchi disk, total phosphorus, chlorophyll-a**
- **Once in spring: chloride**
- **Lake levels are monitored at Birch, East Goose, Gilfillan, and Wilkinson Lakes**

Lambert Creek Monitoring

- **Biweekly monitoring at all six sites: chlorophyll-a, total phosphorus, total suspended solids (TSS), pH, conductivity, dissolved oxygen, temperature**
- **Once in spring: chloride**
- **Creek flow at three sites**

Water samples are collected and analyzed following VLAWMO's quality assurance/quality control protocols identified in its Water Quality Sampling and Monitoring Quality Assurance Project Plan. SPRWS analyzes E. coli samples for special projects. VLAWMO uses contract labs for sample analysis. Data collected by VLAWMO are shared with partners and with the MPCA through annual submission into the Environmental Quality Information System (EQuIS). Data help inform possible project implementation and demonstrate progress toward water quality goals.

An important deliverable of the monitoring program is the Annual Monitoring Report, which includes the current year monitoring data and provides historical trends. The report is posted annually to VLAWMO's website. VLAWMO periodically reviews and updates its monitoring program to meet ongoing and developing needs for data.

Other monitoring and data collection efforts VLAWMO conducted include:

- Automated Monitoring: VLAWMO monitoring is largely done through grab sampling. In addition, four automated samplers are in place along Lambert Creek to provide continuous flow data.
- Fish, Invertebrate, and Aquatic Plant Surveys: VLAWMO lakes have aquatic plant surveys available on the website. Plant surveys may include AIS delineations. Delineations are used to map AIS polygons to inform potential treatment options and adaptive management. Additionally, some lakes have fish and invertebrate reports available. Surveys are updated as needed and completed to track outcomes of specific projects. These are only done with partners and on a special project basis.

*Figure 4.2: Sampling parameters. Sampling begins in early May and continues biweekly until late September. Parameters, waterbodies, and schedule are subject to change year-over-year. * Each lake has one monitoring location- see current monitoring report on VLAWMO website for map / ** White Bear Lake Storm Sewer*

Waterbodies*	Sechi Depth	Total Phosphorus	SRP	Chlorophyll-a	Chloride	Lake Level	Stream Flow	TSS
Amelia Lake	✓	✓	✓	✓	✓			
Black Lake	✓	✓	✓	✓	✓			
Birch Lake	✓	✓	✓	✓	✓	✓		
Charley Lake	✓	✓	✓	✓	✓			
Deep Lake	✓	✓	✓	✓	✓			
East and West Goose Lakes	✓	✓	✓	✓	✓	✓		
East and West Vadnais Lake	✓	✓	✓	✓	✓			
Gem Lake	✓	✓	✓	✓	✓			
Gilfillan Lake	✓	✓	✓	✓	✓	✓		
Pleasant Lake	✓	✓	✓	✓	✓			
Sucker Lake	✓	✓	✓	✓	✓			
Tamarack Lake	✓	✓	✓	✓	✓			
Wilkinson Lake	✓	✓	✓	✓	✓	✓		
Lambert Creek: Goose		✓		✓	✓			✓
Lambert Creek: Whitaker		✓	✓	✓	✓			✓
Lambert Creek: WBLSS**		✓	✓	✓	✓			✓
Lambert Creek: Oakmede		✓		✓	✓		✓	✓
Lambert Creek: County Rd F		✓		✓	✓		✓	✓
Lambert Creek: Koehler		✓		✓	✓		✓	✓

- Cyanobacteria (Blue-green Algae): VLAWMO uses a contract lab to analyze blue-green algae samples that are collected by VLAWMO staff as needed. This testing is done on an as needed basis per specific project needs.
- Bathymetry: Bathymetry and biovolume surveys are available for VLAWMO lakes. Biovolume provides a measure of aquatic plant density which can be used to inform AIS efforts. For example, surveys can be conducted at the height of curly-leaf pondweed density and then after senescence to document the extent of infestations. Plant density can also be used to provide data that demonstrate plant response to water quality improvement (e.g., common carp removal program and alum treatments). These surveys are done on an as needed basis per special project needs and not done on all areas, nor as part of the annual monitoring program.

Program Summary: Monitoring (200C)

Example Activities

- Annual monitoring report
- Chloride monitoring
- Lake and stream monitoring

Primary Issues Addressed

- Water Monitoring
- Chloride and Emerging Contaminants

Estimated Annual Funding

- $89,000-$116,000

4.3.4 Capital Improvement Projects – Early Coordination Program – 200D

VLAWMO recognizes the work required to identify and develop capital improvement projects. This program maintains relationships with partners and seeks ideas and opportunities for municipal capital improvement projects. This requires early coordination between VLAWMO and stakeholders. Directing funds and staff capacity to partner with municipalities to identify future projects ensures smooth operations toward VLAWMO's mission. Projects may be identified as stand-alone projects or combined with planned construction or redevelopment work.

Program Summary: Capital Improvement Projects – Early Coordination (200D)

Example Activities

- Coordination meetings
- Inventory of potential projects

Primary Issues Addressed

- Stormwater Management
- Erosion of Shorelines and Streambanks
- Infrastructure Partnership Projects
- Surface Water and Drinking Water Quality

Estimated Annual Funding

- $30,000-$39,000

4.3.5 Regulatory and Policy Program – 200E

VLAWMO does not operate a regulatory program for development review, with the exception of being the Local Government Unit (LGU) for the Wetland Conservation Act (WCA). All member cities and township are MS4s with approved permits to discharge stormwater, and they, along with MS4s Ramsey County, Anoka County, and the Minnesota Department of Transportation (MnDOT), are responsible for ensuring that development, redevelopment, and construction meets National Pollutant Discharge Elimination System (NPDES) requirements and local zoning regulations. Member cities and the township are required to operate a permitting program and have local controls consistent with the VLAWMO Water Management Policy (Appendix C).

4.3.5.1 Watershed Management Plan

VLAWMO must update its Watershed Management Plan every ten years. The previous Plan was approved in 2017. Thus, this fifth version of a VLAWMO Watershed Management Plan will be applicable from 2027-2036. The Plan revision process gives VLAWMO the opportunity to assess Plan progress, identify changes in watershed conditions and goals, and affirm organizational roles and mission. The Plan is intended to be a tool to guide operations and efforts. Plan amendments may be pursued as part of this program (see Section 5). Additionally, adjustments to the VLAWMO jurisdictional boundary may be pursued.

4.3.5.2 Wetland Conservation Act

VLAWMO is the LGU for WCA and administers the WCA for member communities. VLAWMO provides information on wetland requirements and resources for any activity that may be regulated by WCA. VLAWMO's role in administering WCA is described in the Water Management Policy (Appendix C).

Program Summary: Regulatory and Policy (200E)

Example Activities

- Assisting member communities in adherence to Water Management Policy

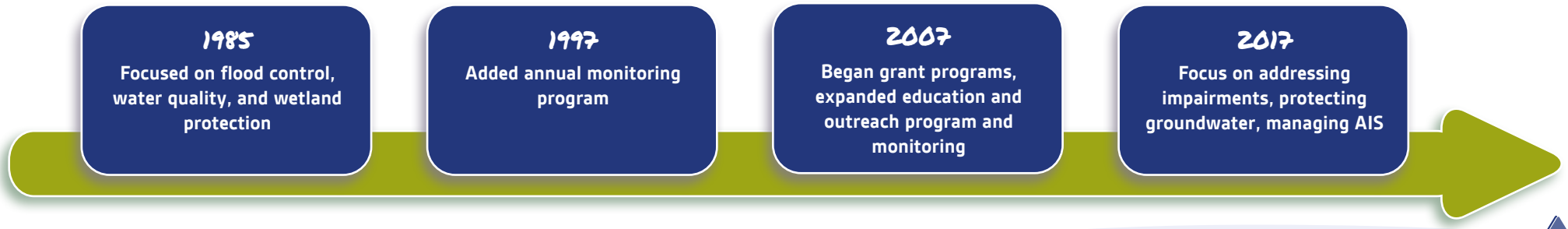
Primary Issues Addressed

- Wetland Conservation Act
- Stormwater Management Standards

Estimated Annual Funding

- $90,000-$117,000

Figure 4.2: *Previous versions of VLAWMO Watershed Management Plan*



4.3.6 General Analysis and Technical Work Program – 200F

Studies, modeling, and project feasibilities are vital components of VLAWMO's work. Studies and modeling are used to inform effective management decisions and are critical components of planning and implementing larger capital projects (e.g., feasibility studies, stormwater retrofit studies). VLAWMO relies on studies to adapt to changing conditions and incorporate new information. For example, VLAWMO completed an East Vadnais Lake Subwatershed Resiliency Study and intends to do similar resiliency studies in the Lambert Creek Subwatershed to continue adapting to climate change. Resiliency studies identify opportunities to mitigate flooding, protect source water, and improve surface water quality. Modeling work and feasibility studies are needed to fully understand issues, design projects to create effective solutions, and build projects suited for the location and future storm events.

Program Summary: General Analysis and Technical Work (200F)

Example Activities

- Lambert Creek Resiliency Study
- East Vadnais Lake Subwatershed Resiliency Study
- Wetland assessment planning

Primary Issues Addressed

- All

Estimated Annual Funding

- $100,000-$130,000

4.3.7. VLAWMO Grants and Partnerships Program – 200G

VLAWMO offers funding and assistance through grant programs to support public and private landowners in implementing projects to improve water quality. These grant programs are funded by VLAWMO's allocated budget and contain eligibility requirements specific to each program. Past projects have included rain barrels, rain gardens, shoreline stabilizations, pollinator gardens and native plantings, turf replacement and bee lawns, permeable pavement, and more. VLAWMO offers the following programs:

Birch Lake Shoreline restoration. Photo Credit: VLAWMO

- **Rain Barrel Grant Program:** VLAWMO supports landowner installation of rain barrels to conserve water.
- **Soil Health Grant Program:** VLAWMO supports small-scale projects that enhance soil health and water quality, including projects that restore native vegetation.
- **Landscape Level 1 Grant Program:** VLAWMO provides funding for projects that reduce stormwater rate and volume and improve water quality, especially infiltration projects.

- **Landscape Level 2 Grant Program:** VLAWMO provides funding for large-scale projects that reduce stormwater volume and rate, add flood storage, conserve groundwater, or reduce nutrient loading. Priority is given to projects that provide regional benefits, such as those focused on groundwater conservation , stormwater retrofit or reconstruction, and enhanced street sweeping and chloride reduction. External grant funding may provide additional funding sources for Landscape Level 2 projects.

Program Summary: VLAWMO Grants and Partnerships (200G)

Example Activities

- Groundwater conservation projects
- Shoreline and streambank restorations
- Curb cut rain gardens

Primary Issues Addressed

- Stormwater Management Standards
- Groundwater Supplies and Conservation
- Natural Features and Habitat
- Climate Resiliency
- Erosion of Shorelines and Streambanks

Estimated Annual Funding

- $149,000-$194,000

4.3.8 Operations and Maintenance Program – 200H

4.3.8.1 VLAWMO Facilities

VLAWMO is responsible for upkeep and maintenance of infrastructure and some constructed BMPs. This includes stormwater management BMPs such as iron-enhanced sand filters, sedimentation basins, and a boat launch. Maintenance agreements for projects or BMPs are executed prior to installation and may be the responsibility of a landowner, member community, partner organization, or VLAWMO. A goal of this plan (see Section 3.8) is to create an inspection schedule for facilities. See Table 3-4 for a list of VLAWMO facilities.

4.3.8.2 Public Drainage

As detailed in Section 3.8.1, VLAWMO is the local drainage authority and is responsible for inspection of the function of the main stem of Ramsey County Ditch 14 (Lambert Creek) pursuant to MN statute 103B. This consists of inspections and maintenance as identified in the annual inspection report maintenance. A Public Drainage System Inspection Protocol was developed and implemented in 2023. Additionally, VLAWMO adopted a Public Drainage Management Policy that identifies VLAWMO's approach in utilizing its Chapter 103B authorities, in conjunction with its municipal partners, to manage these systems. The policy identifies owners or operators of storm sewer systems/crossings within the public drainage system who are responsible for maintenance.

County Ditch 14 Phase 1 Dredging. Photo Credit: vlawmo.org

4.4 Project Technical Work and Capital Improvement Projects – 300/400

Two of VLAWMO's core activities are completing technical work to inform capital improvement project design (300 level) and implementing capital improvement projects (400 level). VLAWMO's capital improvement program encompasses all capital improvement projects and is described in the JPA.

For purposes of this plan, project "technical work" includes feasibility studies, stormwater retrofit analyses, modeling, etc., to inform project scope. A capital improvement project is a physical improvement or structure built to last at least 25 years (with continued maintenance) and a total cost typically over $50,000. VLAWMO capital improvement projects are generally installed following project technical work.

For planning purposes, VLAWMO is organized into seven smaller subwatersheds, which allows detailed focus and targeting of specific areas and issues. The following pages summarize each subwatershed and the capital improvement projects that are planned within. The Implementation Table organizes each project's technical work and capital improvement project by subwatershed, with additional information including the primary entity leading the effort and estimated grant match or cost from VLAWMO.

Budget numbers in the Implementation Table are high-level estimates for the VLAWMO-only portion of total project costs. In many cases, estimated total project costs are much higher and anticipate local partner funding and/or outside grant funding. All projects listed are partnership and/or grant dependent.

Capital improvement projects in the Implementation Table were identified in coordination and collaboration with municipalities and partner organizations. However, it is important to note that these projects were identified based on information available at the time the Plan was written, and project details and annual costs are likely to change and may fluctuate leading up to and during implementation efforts. Costs and benefits of planned projects are evaluated annually. Specific projects, costs, and partnership details are adjusted as needed. VLAWMO staff communicate with stakeholders regularly in advance of internal planning cycles to assess priorities, needs, and opportunities to collaborate and coordinate efforts.

Projects with the greatest impact on water resources receive the highest priority for implementation. In addition to prioritizing high-benefit projects, VLAWMO considers and supports projects that arise through redevelopment or through partners implementing their Capital Improvement Plans.

Priority Resource Criteria

Prioritizing resources provides direction on where to target efforts. VLAWMO identified four criteria that are used to identify priority resources:

1. If the resource is in a 319 Priority Subwatershed
2. If the resource is in the Chain of Lakes used for drinking water
3. If a resource is in the Grant Program priority zones
4. If a resource is impaired, nearly impaired, barely impaired, or a lake of high biological significance

A summary of these criteria and VLAWMO waterbodies that meet each criteria is shown in Table 4-3. No one criteria will outrank another; VLAWMO staff will review all when determining and prioritizing projects. The list of resources and priority criteria will be used when pursuing and funding projects.

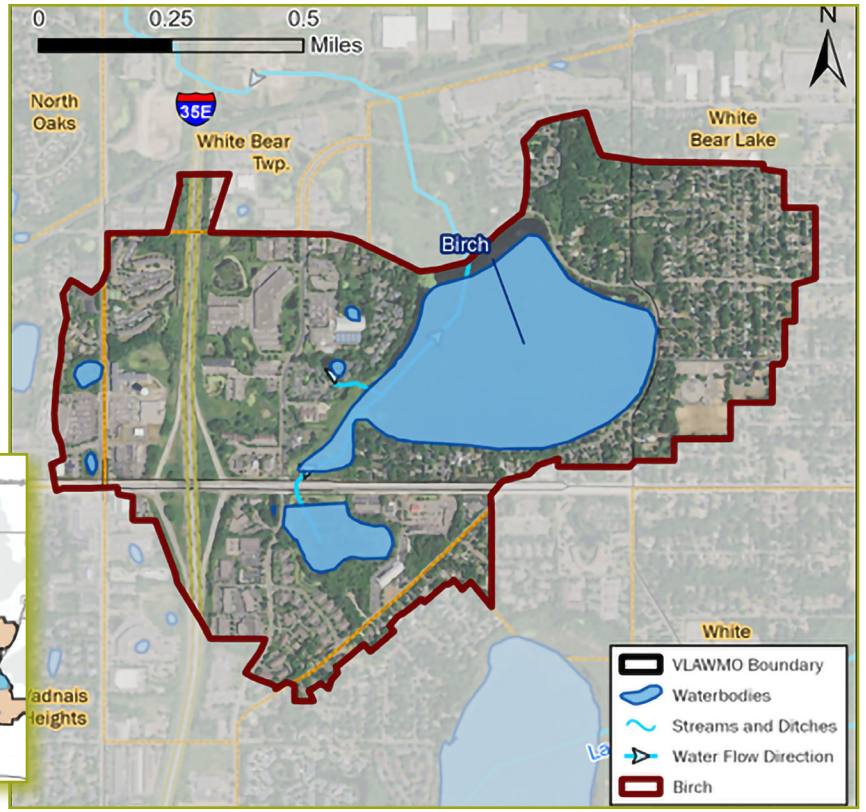
Figure 4.3: *VLAWMO resource prioritization criteria.*

319 Priority Subwatershed Area	Drinking Water Chain of Lakes
• Wilkinson Lake • Tamarack Lake • Fish Lake • Birch Lake	• Charley Lake • Pleasant Lake • Sucker Lake • East Vadnais Lake • Lambert Creek
Grant Program Priority Zones	**Nearly / Barely*, Impaired Waterbodies, or Lakes of Biological**
• Black Lake • Deep Lake • East and West Goose Lake • Lambert Creek • Wilkinson Lake	• Barely Impaired: Deep Lake (TP) • Nutrient Impairment: East and West Goose Lakes, Gilfillan Lake, Pleasant Lake, Tamarack Lake, West Vadnais Lake, Wilkinson Lake • Bacteria Impairment: Lambert Creek • High Biological Significance: Amelia

Nearly impaired resources are defined as within 90-100% of the standard (no VLAWMO lakes qualify) and barely impaired as within 100-125% of the standard.

4.4.1 Birch Lake Subwatershed

Birch Lake is a shallow lake with a walking path for recreation. Birch Lake has high water quality, low nutrient levels, and good clarity, which is distinctive for an urban lake. The Birch Lake Improvement District (BLID) supports VLAWMO's efforts to protect the lake, remove AIS, prevent fish kills, and monitor chloride. County Highway 96 and I-35E pass through this subwatershed, making chloride pollution from road salt a concern. VLAWMO monitors chloride in Birch Lake, which has the highest chloride concentration (average of 99 mg/L) of any VLAWMO lake but does not exceed state standards.



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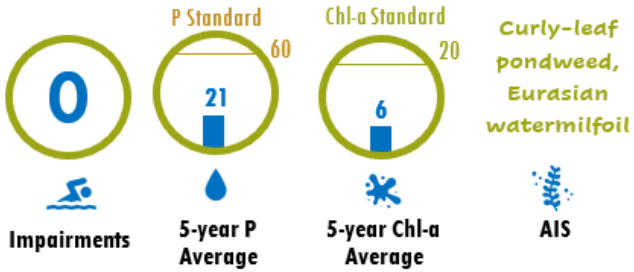


Project Spotlight

✓ Removal of AIS (Begun in 2022)

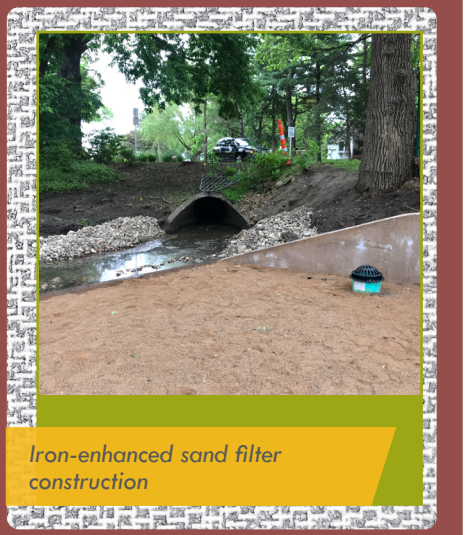
Eurasian watermilfoil and curly-leaf pondweed are manually removed in partnership with BLID and with initial support from a DNR grant.

- Funded through AIS Grant from DNR, with partnership funding support from BLID and VLAWMO

✓ Iron-Enhanced Sand Filter (2020)

A feasibility study determined that the residential development from the area that flows to 4th St and Otter Lake Road was releasing phosphorus and sediment into Birch Lake. An iron-enhanced sand filter was installed, which is estimated to reduce phosphorus loads into the lake by 8 lbs/year.

- Partially funded by a BWSR Clean Water Fund grant, with partnership funding support from VLAWMO, Ramsey County, City of White Bear Lake, and BLID



Iron-enhanced sand filter construction

Birch Lake Subwatershed: Planned Projects and Capital Improvement Projects

Pretreatment BMP – 301A/401A

Determine feasibility, then based on findings implement a pretreatment BMP upstream of the iron-enhanced sand filter to reduce sediment loads entering the filter and decrease filter maintenance.

Birch Lake Outlet Channel Technical Work– 301B

Conduct a feasibility study to identify Birch Lake outlet channel potential repairs and stabilization to improve water quality leading to Wilkinson Lake.

Shoreline, Wetland, or Water Quality Partnership Technical Work – 301C

Partner with the City of White Bear Lake to identify Birch Lake shoreline, upstream wetland, or water quality projects that would reduce nutrient loading to Birch Lake.

Subwatershed Neighborhood Technical Work – 301D

Review opportunities and needs for neighborhood-level BMPs and projects that could include rain gardens or other stormwater BMPs to protect Birch Lake.

AIS Management – 301E

Continue partnership with BLID and manage aquatic invasive plants to improve water quality and ecosystem resilience.

Sports Center Shoreline Technical Work – 301F

Review potential project for Birch Lake shoreline restoration at the White Bear Lake Sports Center, then based on findings implement a BMP.

Rotary Park Restoration – 401G

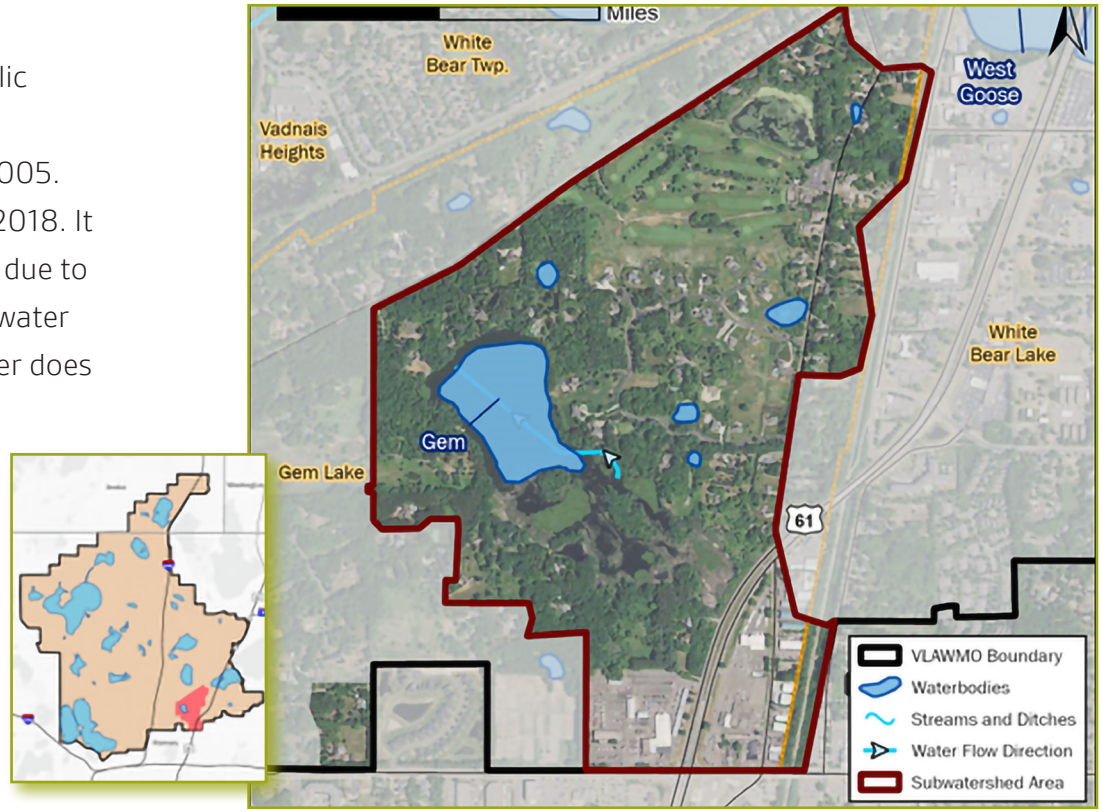
Wetland restoration at Rotary Nature Preserve which will improve water quality upstream in Wilkinson Lake and enhance habitat functions.

Future Technical Work / Capital Improvement Projects – 301H / 401H

VLAWMO will technically and financially support technical work as opportunities arise in the Birch Lake Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

4.4.2 Gem Lake Subwatershed

Gem Lake, within the City of Gem Lake, is 48 acres and has no public access. The area is a mix of residential, industrial, and commercial properties. The lake has been monitored by VLAWMO staff since 2005. Gem Lake was impaired due to nutrients. The lake was delisted in 2018. It is believed that at least part of the improvement in water quality is due to the Highway 61 road reconstruction project, which reduced stormwater inflow to the lake. The Gem Lake subwatershed is landlocked. Water does not drain outside of the subwatershed boundary.



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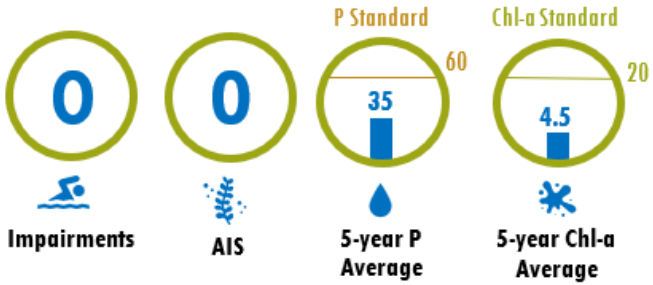


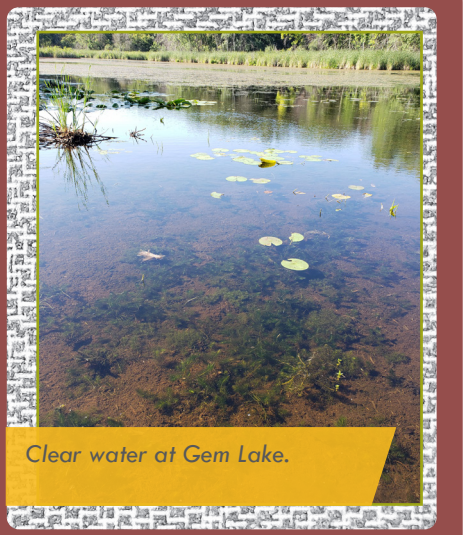
Project Spotlight

✓ Gem Lake

48 acres / 7 ft average depth – the south end of the lake is a wetland and it deepens in the north, with a maximum depth of 14 ft / 183 ac-ft / 363 subcatchment acres / Surrounded by private property

✓ Gem Lake Stormwater Retrofit Assessment

A Stormwater Retrofit Assessment was completed for the Gem Lake subwatershed in 2012. It identifies and ranks BMP options and benefits at the catchment scale.



Clear water at Gem Lake.

Gem Lake Subwatershed: Planned Projects and Capital Improvement Projects

Commercial Area Retrofit – 302A/402A

Partner with the cities of Gem Lake and White Bear Lake to investigate a retrofit project for stormwater management. Based on findings of the technical work, VLAWMO and partners will retrofit commercial areas to improve stormwater quality and/or quantity.

Smart Irrigation and Groundwater Conservation – 302B

Investigate the potential and based on the findings partner with landowners for implementation of smart irrigation principles to conserve groundwater.

Regional, Subwatershed, or Neighborhood BMPs – 302C

As partnerships and technical work allows, work with the City of Gem Lake and/or Ramsey County and private landowners to install BMP projects for stormwater management, reduced sediment and nutrient loading, habitat, and water storage.

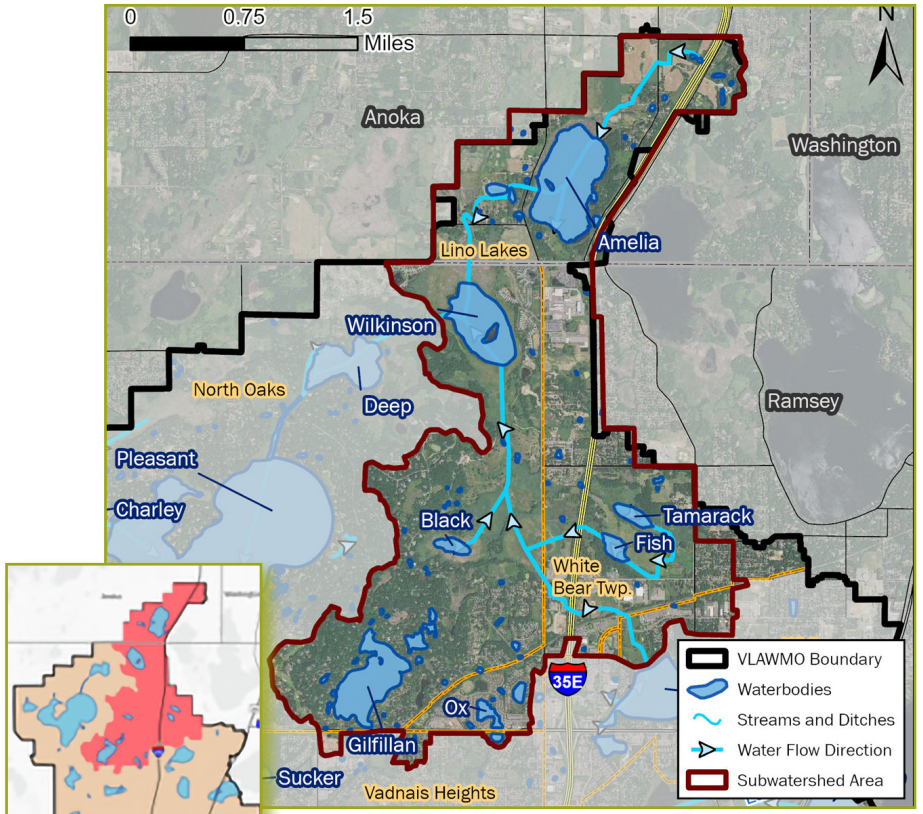
Future Technical Work/Capital Improvements – 302D/402D

VLAWMO will technically and financially support technical work as opportunities arise in the Gem Lake Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

Native hornwort in Gem Lake. Photo Credit: VLAWMO

4.4.3 Gilfillan-Tamarack-Black-Wilkinson-Amelia Subwatershed

VLAWMO monitors five lakes in this subwatershed: Gilfillan, Tamarack, Black, Wilkinson, and Amelia. It also contains Fish and Ox Lakes. This subwatershed includes Centerville Rd and I-35E. The waterbodies are primarily connected by surface water flow. Tamarack flows into Fish; Ox and Gilfillan flow into Black; Fish, Black, and Amelia flow into Wilkinson; and Wilkinson flows into Deep. Gilfillan, Tamarack, and Wilkinson Lakes are impaired due to nutrients. Internal loading, agricultural runoff, and stormwater are the primary sources of nutrients in these lakes. Most of the agricultural land remaining in VLAWMO is in this subwatershed. AIS in the subwatershed include curly-leaf pondweed in Gilfillan and Wilkinson Lakes, Eurasian watermilfoil in Amelia Lake, and flowering rush in a wetland near Amelia Lake.



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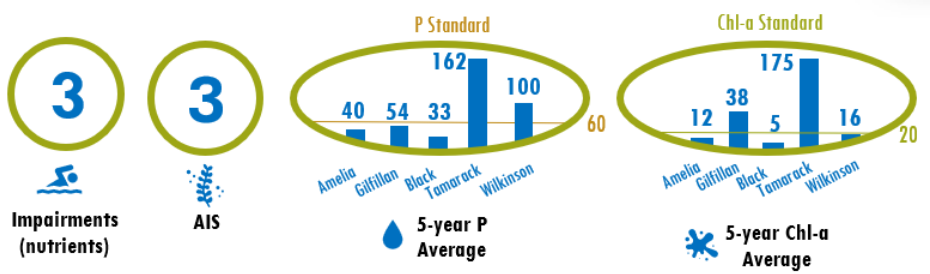


Project Spotlight

✓ Wilkinson Deep-Water Wetland Restoration (2024)

A wetland was installed where water from Birch, Tamarack, Gilfillan, and Black Lakes converge. The wetland converted a straight ditch into an elongated wetland that stores water and supports native vegetation. Vegetation was enhanced with native wetland plants, including submerged vegetation.

- 60% funded through EPA 319 funds administered by MPCA, with a 40% match by VLAWMO and North Oaks Company (landowner)

Wilkinson deep-water wetland.

Gilfillan-Tamarack-Black-Wilkinson-Amelia Subwatershed: Planned Projects and Capital Improvement Projects

Small Watershed Projects – 303B and C/403A, B, and C

Complete technical work for two EPA 319 Small Watershed Grant Program Projects. Based on findings of the technical work, VLAWMO and partners will provide a match to the grant and implement three projects to benefit Wilkinson Lake.

Amelia Drainage Project – 303D/403D

Complete technical work to identify a project that would benefit the drainageway upstream of Amelia Lake. Based on findings of the technical work, VLAWMO and partners will pursue implementation of the project. This could include but is not limited to wetland restoration, streambank restoration, stormwater rate management, or greenway planning.

Wilkinson Lake Wetland Project Maintenance – 303E

Provide ongoing maintenance at the Wilkinson Deep-Water Wetland Restoration site as needed to maintain benefits and enhance resilience.

Local Partnership – Tamarack Nature Center – 303F

Investigate a partnership with Tamarack Nature Center for restoration or protection /management BMP work to improve wetland or lake condition.

Township/City BMP Retrofits – 303G

Determine feasibility, then based on findings, partner with White Bear Township and / or the cities of Lino Lakes, North Oaks, and White Bear Lake to retrofit existing BMPs to enhance stormwater management and reduce maintenance.

Cities/Township /North Oaks Homeowners Association / North Oaks City Partnership Water Quality /Groundwater Conservation Projects– 303H/ 403H

Work with partners to study possible implementation projects that will improve water quality and/or conserve groundwater, which could include but is not limited to rain gardens, shoreline stabilizations, and water reuse projects (where feasible and safe). Then based on findings implement a BMP.

Internal Loading/Alum Treatment – 403I/403J

Address internal loading in Tamarack Lake through projects that could include alum treatment or BMPs to reduce subwatershed loading that contributes to internal loading. Address internal loading in Wilkinson Lake through projects that could include alum treatment or BMPs to reduce subwatershed loading that contributes to internal loading.

Water Reuse Project – 403K

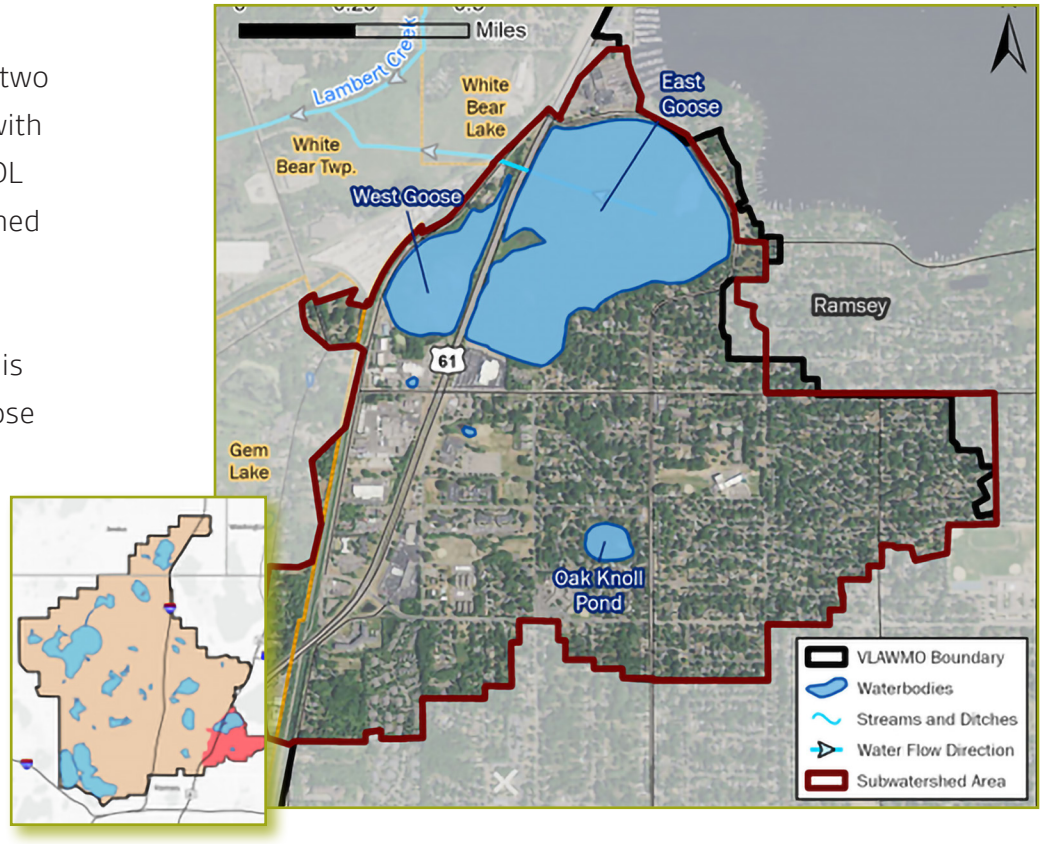
Implement a water reuse project at Polar Lakes Park.

Future Technical Work/Capital Improvement Projects – 303L/403L

VLAWMO will technically and financially support technical work as opportunities arise in the Gilfillan-Tamarack-Black-Wilkinson-Amelia Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

4.4.4 Goose Lake Subwatershed

Highway 61 splits East and West Goose Lakes, which are connected by two culverts under the highway. Both lakes are impaired due to nutrients, with the main source being internal loading, according to the VLAWMO TMDL (Wenck, 2014). Phosphorus loads in the lake originate from subwatershed development and historical wastewater discharge. East Goose Lake is identified by the DNR as a shallow lake. Presently, West Goose is considered a wetland by the DNR, but is locally referred to as a lake. This subwatershed also includes Oak Knoll Pond, which drains into East Goose Lake.



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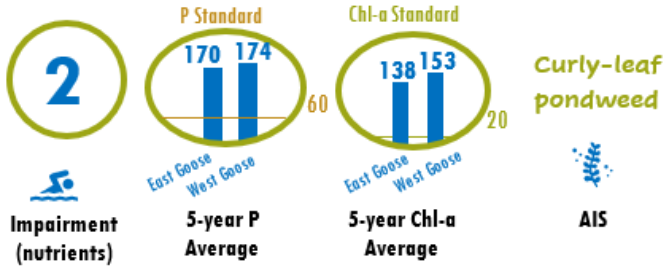


Project Spotlight

✓ Oak Knoll Pond (2024)

Spent lime was applied through a demonstration project at Oak Knoll pond, which reduced TP loading from the pond and improved water clarity.

- Funded through VLAWMO and the City of White Bear Lake

✓ County Road F Rain Gardens (2020)

Six curb cut rain gardens were retrofitted and treat over 1 million gallons of stormwater annually.

- Funded by Ramsey County, City of White Bear Lake, and a VLAWMO Landscape Level 2 grant


Spent-Lime Treatment

Goose Lake Subwatershed: Planned Projects and Capital Improvement Projects

Highway 61 Channel Restoration – 304A/404A

Determine feasibility of channel restoration, erosion/sediment management, and/or sediment removal discharging to East Goose Lake. Based on findings of the technical work, VLAWMO and partners will pursue implementation of a partnership project which is expected to reduce sediment loading and improve water quality entering the Lake.

Goose Lakes Regional BMP Partnership – 304B/404B

Conduct technical work to identify regional BMPs with City of White Bear Lake. Based on findings of the technical work, VLAWMO and partners will implement regional BMPs.

Regional, Subwatershed, or Neighborhood BMPs – 304C

Determine feasibility, then based on findings, partner with the City of White Bear Lake and/or Ramsey County to install BMP projects to reduce nutrient loading to Goose Lakes. Projects may have benefits for stormwater management, reduced sediment loading, habitat, and water storage.

City Street Partnership Projects – 304D

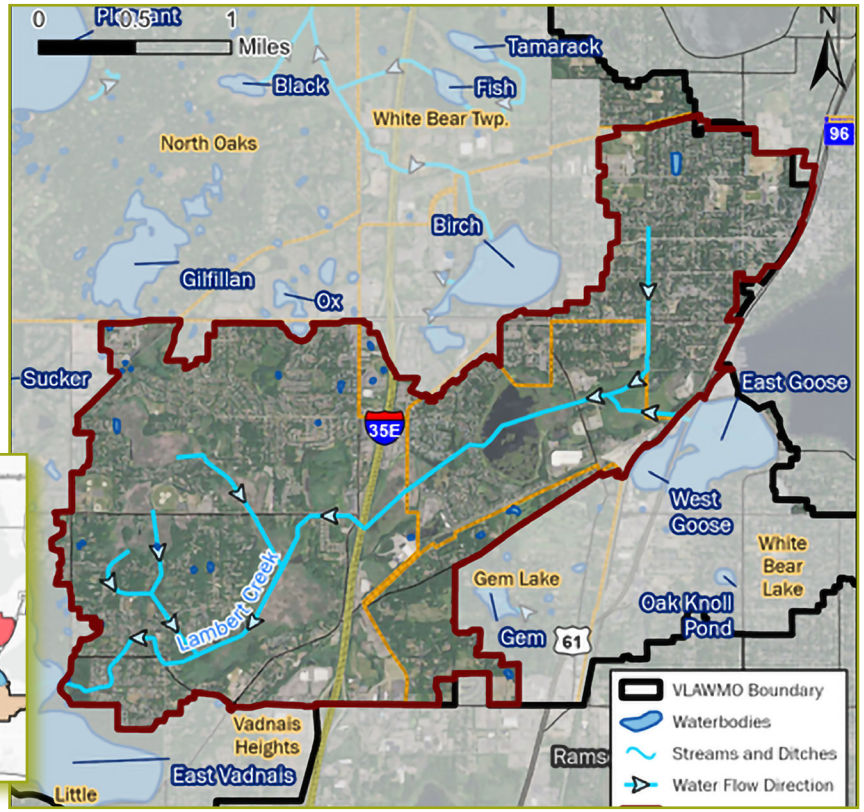
Partner with the City of White Bear Lake to install curb cut rain gardens to improve stormwater quality and reduce volume.

Future Technical Work/Capital Improvement Projects – 304E/404E

VLAWMO will technically and financially support technical work as opportunities arise in the Goose Lake Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

4.4.5 Lambert Creek Subwatershed

Lambert Creek, also known as Ramsey County Ditch 14, flows 4.2 miles through the southern portion of VLAWMO into East Vadnais Lake. Its headwaters are West Goose Lake and Whitaker Pond, and its tributaries include storm sewers from the City of White Bear Lake, City of Vadnais Heights, and White Bear Township. Lambert Creek is impaired due to bacteria. Source assessments have identified birds (e.g., waterfowl) as the likely source of excess bacteria. Lambert Creek passes through remnants of former shallow wetlands and lakes that were drained in the early 1900s.



Quick Stats

- **1** — Impairment (bacteria)
- **6** — Monitoring sites
- **1 ft** — Average Depth
- **Curly-leaf pondweed, common carp** — AIS

Project Spotlight

✓ Meander Project (2021)

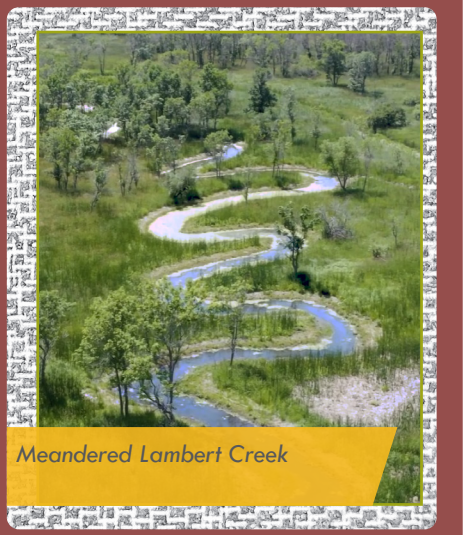
Sheet pile was replaced in Lambert Pond to add water storage, a portion of the creek was meandered to allow for floodplain connectivity and slow flow, and a biochar filter was constructed to remove bacteria.

- Funded through EPA 319 funds administered by MPCA with a cash match from VLAWMO. BWSR WBIF program also supported construction of the biochar filter.

✓ White Bear Lake Street Rehabilitation Project (2024)

Five curb cut rain gardens were installed in concert with the City of White Bear Lake's street project in a residential area that spanned across six streets within VLAWMO. These rain gardens store and treat stormwater and reduce volume and sediment entering Lambert Creek.

- Funded in partnership with the City of White Bear Lake, private residents, and VLAWMO through the Landscape Level 2 Grant program and BWSR WBIF program



Meandered Lambert Creek

Lambert Creek Subwatershed: Planned Projects and Capital Improvement Projects

Whitaker Wetland Retrofit Project – 405A

Continue to investigate, then based on findings, retrofit and/or repurpose Whitaker Wetland to enhance function in Columbia Park.

Lambert Sheet Pile Debt Services – 405B

Debt services on the Lambert Creek sheet pile replacement project.

Water Quality/Wetland Project – 305C/405C

Complete technical work to investigate the feasibility or function of public drainage-associated water quality and wetland projects. Based on findings of the technical work, VLAWMO and partners will pursue projects.

Water Reuse Project– 305D/405D

Complete technical work to identify potential water reuse projects that are feasible and safe. Based on findings of technical work, VLAWMO and partners will implement a water reuse project to reduce the need for groundwater use for irrigation and conserve groundwater.

Green Streets Project – 305E/405E

Complete technical work to determine the feasibility of green street projects and possible BMP options. Based on findings of the technical work, VLAWMO and partners will implement a green streets demonstration project, which may include but is not limited to tree trenches, rain gardens, permeable pavement, or a reduction in impervious surfaces.

Commercial Property Project – 305F/405F

Complete technical work for a retrofit of commercial property to reduce stormwater quantity and improve water quality. Based on findings of the technical work, VLAWMO and partners will implement the retrofit.

Resiliency Plan or Projects – 305G/405G

Complete technical work to develop a Resiliency Plan. Based on technical work, VLAWMO and partners will implement projects from Plan findings to increase resiliency to extreme precipitation events.

Lambert Creek Drainage Partnership Projects – 305H/405H

Complete technical work and based on outcomes, VLAWMO and partners will complete maintenance projects on the main stem of the Creek and/or branch ditches.

Lambert Creek Subwatershed: Planned Projects and Capital Improvement Projects

Lambert Creek Operation and Maintenance – 305I

Operations and maintenance of Lambert Creek facilities as needed to protect Creek water quality.

Municipality/City Street Project Partnership – 305J

continue to explore Partnership with Ramsey County and the municipalities of Vadnais Heights, White Bear Lake, Gem Lake, and White Bear Township for opportunities to implement BMPs as part of street renovation.

Municipality Water Quality in Parks/Public Spaces – 305K

Determine feasibility, then based on findings, partner and implement BMPs to enhance water quality in community parks and public spaces.

Groundwater Conservation Partnership Projects – 305L

Determine feasibility, then based on findings, partner and conduct necessary work to implement water conservation and reuse projects with existing partnerships.

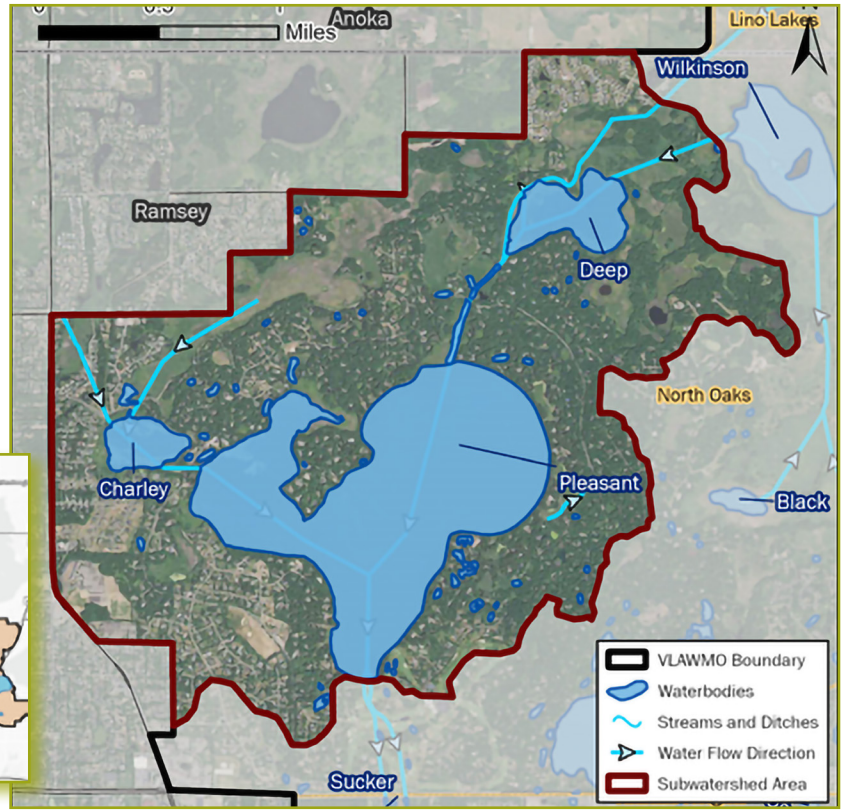
Future Technical Work/Capital Improvements – 305M/405M

VLAWMO will technically and financially support technical work as opportunities arise in the Lambert Creek Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

Iris.
Photo Credit: North Oaks Company

4.4.6. Pleasant-Charley-Deep Subwatershed

This subwatershed includes Pleasant, Charley, and Deep Lakes, part of the SPRWS Chain of Lakes. Charley Lake receives inflow from the Mississippi River via a pipe. Pleasant Lake is impaired due to nutrients and mercury in fish tissue. The largest sources of nutrients are internal loading and the Mississippi River. The common carp removal program has been active since 2019, and this subwatershed remains a priority for AIS removal. AIS in the subwatershed include common carp, curly-leaf pondweed, and Eurasian watermilfoil in Pleasant, Charley, and Deep, zebra mussels in Pleasant and Charley, and rusty crayfish in Pleasant Lake.



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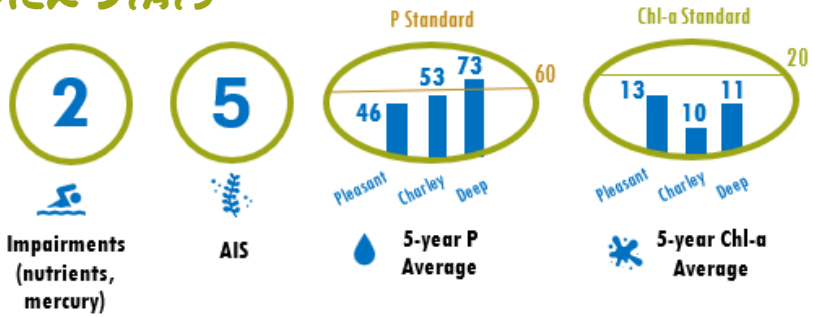


Project Spotlight

✓ Carp Removal (2024)

The common carp removal program was initiated in 2019. Major removals were completed in 2022-2024. The project is ongoing {suggesting this delete since it won't be clear what "time" this is once WMP is adopted].

- Currently funded by VLAWMO. NOHOA and SPRWS have provided funding in data collection years and provide logistical support. NOC also provides collaboration and land access for the program.

✓ Channel Restoration (2015)

The channel between Deep and Pleasant Lakes was restored to reduce bank erosion.

- Funded by VLAWMO and the North Oaks Homeowners Association, with a grant for installation work


Common Carp Removal

Pleasant-Charley-Deep Subwatershed: Planned Projects and Capital Improvement Projects

Nutrient Management Partnership Project – 306A

Conduct technical work to investigate nutrient reduction in Pleasant, Charley, or Deep Lakes, which could include a feasibility study.

Carp Management Program – 306B

Continue carp management actions per ongoing technical work in Pleasant, Deep, and Charley Lakes, which improve water quality and recreation.

Lake Shoreline Management – 306C

Partner with the NOHOA/City of North Oaks to encourage lakeshore landowners to apply for VLAWMO grants for shoreline stabilization and restoration projects, which reduce erosion and nutrient loading and support native vegetation.

Regional, Subwatersheds, or Neighborhood BMPs – 306D

Partner with NOHOA and / or the City of North Oaks and private landowners to explore, study, and identify opportunities and implement projects to conserve groundwater or improve water quality in subwatershed lakes.

Infrastructure or Local Planning Technical Work – 306E

Partner with the NOHOA/City of North Oaks for opportunities to study and identify stormwater BMPs that could be implemented with planned construction or infrastructure work.

Oxygenation System Partnership and Technical Work – 306F

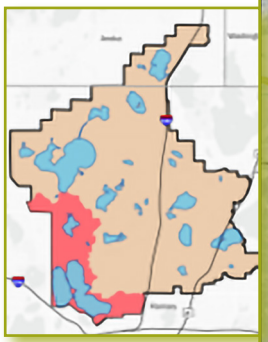
Study and Review technical work, partnership and funding opportunities and based on outcome of findings, pursue implementation as warranted of a potential upgrade to the existing oxygenation system or dosing in Pleasant Lake.

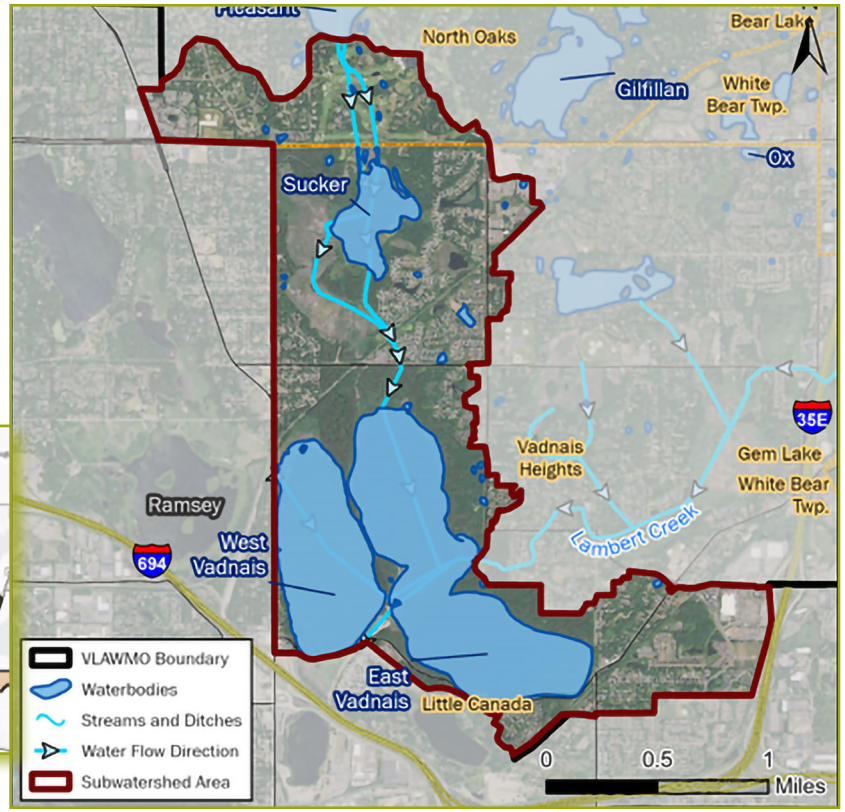
Future Technical Work/Capital Improvement Projects – 306G/406G

VLAWMO will technically and financially support technical work as opportunities arise in the Pleasant-Charley-Deep Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

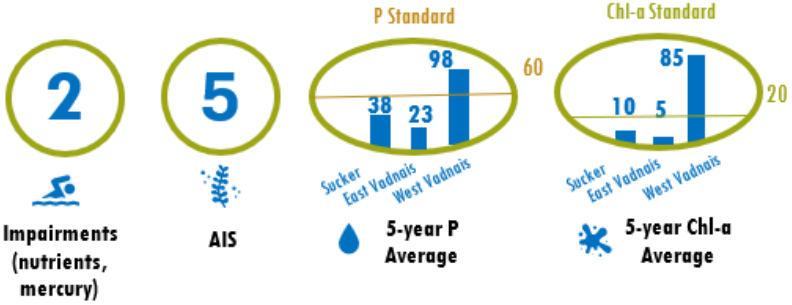
4.4.7 Sucker-Vadnais Subwatershed

This subwatershed contains East Vadnais Lake, used by about 450,000 people as a drinking water source. The west side of the lake has an intake pipe where water is withdrawn to the SPRWS plant in St. Paul. This subwatershed has parkland and protected areas to protect drinking water. West Vadnais Lake is impaired due to nutrients, and East Vadnais is impaired due to mercury in fish tissue. There is no detectable surface nor subsurface connection between East and West Vadnais Lakes. AIS include common carp, curly-leaf pondweed, and Eurasian watermilfoil in East and West Vadnais and Sucker Lakes, zebra mussels in Sucker and East and West Vadnais, and rusty crayfish in Sucker Lake.





Quick Stats



Project Spotlight

✓ Channel Restoration (2018)

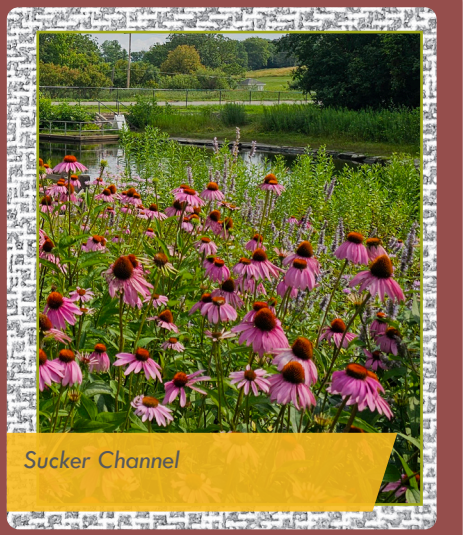
The deteriorating Sucker Lake channel was reconstructed, along with new fishing platforms and native plantings.

- Funded by VLAWMO and the Clean Water Land & Legacy Amendment and Ramsey County Parks

✓ East Vadnais Lake Subwatershed Resiliency Study (2024)

A resiliency study identified priority areas to focus work for adding water storage and reducing flood risk, protecting drinking water, and improving lake water quality.

- Funded by VLAWMO, the City of Vadnais Heights, Ramsey County, and SPRWS.



Sucker Channel

Sucker-Vadnais Subwatershed: Planned Projects and Capital Improvement Projects

Resiliency Project Technical Work – 307A/407A

Determine project feasibility in BMP locations identified in 2024 Resiliency Study. Based on findings of the technical work, VLAWMO and partners will implement projects for flood mitigation, drinking water protection, and water quality improvement.

Trail Restoration Project – 307B / 407B

Complete technical work to investigate possible partnership BMPs/ restoration between Vadnais Blvd and County Road E. Based on findings of the technical work, VLAWMO and partners will implement a restoration project for habitat restoration and improved water quality in East Vadnais Lake.

Park Restoration Technical Work – 307C

Identify partners and investigate potential projects for restoration work in Vadnais – Sucker Lake Regional Park which could improve native vegetation.

City Street Project Partnership – 307D

Determine feasibility, then based on findings, partner with the City of Vadnais Heights to implement city street projects such as rain gardens for stormwater management and groundwater conservation.

City Environment Initiatives – 307E

Determine feasibility, then based on findings, partner with the City of Vadnais Heights for sustainability and environmental project opportunities.

WMO Boundary work – 307F

Necessary technical work on boundary and potential inter-boundary partnerships.

Future Technical Work / Capital Improvement Projects – 307G / 407G

VLAWMO will technically and financially support technical work as opportunities arise in the Sucker-Vadnais Subwatershed. VLAWMO will technically and financially support the design and construction of CIPs identified in technical work or as opportunities arise.

4.5 Implementation Table

Table 4-5 contains the detailed implementation plan for VLAWMO from 2027-2036. Projects within each subwatershed align with those described in the subwatershed pages in Section 4.5. The costs in the table are high-level estimates for the portion of the estimated cost VLAWMO will be responsible for, adjusted annually for inflation. In many cases, estimated project costs are much higher and anticipate local partner funding and/or outside grant funding. All projects listed are partnership and/or grant dependent. These are a best estimate and may change or fluctuate leading up to or during project implementation.

Projects were identified in coordination and collaboration with municipalities and partner organizations with knowledge at the time of plan writing. Planned projects and funding may shift from what is listed based on changing resource conditions, funding availability, ability for partnership, or staff capacity. VLAWMO uses Table 4-5 for annual work planning. Projects with the greatest impact on water resources receive the highest priority for implementation. VLAWMO will also consider the following planning lenses during implementation efforts.

Climate Resiliency

The Implementation Table includes technical work and capital projects that aim to build structural resilience to changing precipitation patterns and extreme storm events. The Table also includes communication and outreach events aimed at building community knowledge about the impacts of a changing climate, and grant programs to assist in voluntary landowner projects that also build resilience. During project prioritization efforts, VLAWMO will consider a project's impact in building climate resiliency.

Environmental Justice

VLAWMO is intentional about considering areas of environmental justice to encourage meaningful involvement and increase engagement with underrepresented community groups. During project prioritization efforts, VLAWMO will consider a potential project's impact to underrepresented community groups as a factor to promote equity in implemented watershed projects.

Table 4-5 has numbers associated with each project. Core activities have the following numbers: Administration (100), VLAWMO Implementation Programs (200), Project Technical Work (300), and Capital Improvement Projects (400). Activities have a letter after the number that serve to order actions (i.e. there are 8 implementation programs, labeled 200A-H). Technical work and CIPs that go together have the same letter. Activities called out in each subwatershed are either the 300 or 400 level. The third digit identifies the subwatershed the activity belongs to (Table 4-4).

Figure 4.4: *Implementation labels*

301/401	302/402	303/304	304/404	305/405	306/406	307/407
Birch Lake	Gem Lake	Gilfillan-Tamarack-Black-Wilkinson-Amelia	Goose Lake	Lambert Creek	Pleasant -Charley-Deep Lakes	Sucker and East & West Vadnais Lakes

Sucker Channel.
Photo Credit: vlawmo.org

VLAWMO
Vadnais Lake Area
Water Management Organization

Table 4-5: VLAWMO Implementation Table

ID	Action Description	Progress Toward Goals (Lists up to four)					Priority	Partners	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Administration - 100																		
Administration									$180,000	$185,000	$191,000	$197,000	$203,000	$209,000	$215,000	$221,000	$228,000	$235,000
100	General Administration						C	N/A										
100	Office Space, Supplies, and Support						C	N/A										
100	Staff Training						C	N/A										
100	Equipment						C	N/A										
100	Office Operations						C	N/A										
VLAWMO Implementation Programs - 200																		
VLAWMO Implementation Programs									$756,000	$779,000	$804,000	$829,000	$854,000	$879,000	$904,000	$930,000	$957,000	$985,000
200A	Aquatic Invasive Species Management Program	✓	**SWQ**	OC			C	Counties, Municipalities, NOHOA, SPRWS	$64,000	$66,000	$68,000	$70,000	$72,000	$74,000	$76,000	$78,000	$80,000	$82,000
200B	Communication, Outreach, and Education Program	✓	**GW**	**SWQ**	**OC**	**ESS**	C	Municipalities, Counties	$83,000	$85,000	$88,000	$91,000	$94,000	$97,000	$100,000	$103,000	$106,000	$109,000
200C	Monitoring Program	✓	**WM**	**CEC**	**SWQ**	GW	C	MPCA, SPRWS, County	$89,000	$92,000	$95,000	$98,000	$101,000	$104,000	$107,000	$110,000	$113,000	$116,000
200D	Capital Improvements - Early Coordination Program	✓	**SWQ**	**ESS**	**IPP**	**CR**	C	Counties, Municipalities, NOHOA, SPRWS	$30,000	$31,000	$32,000	$33,000	$34,000	$35,000	$36,000	$37,000	$38,000	$39,000
200E	Regulatory and Policy Program	✓	**SWQ**	**SMS**	**WCA**	**IPP**	C	Municipalities, Counties, MnDOT	$90,000	$93,000	$96,000	$99,000	$102,000	$105,000	$108,000	$111,000	$114,000	$117,000
200F	General Analysis and Technical Work Program	✓	**SWQ**	**ESS**	CR	SMS	C	Municipalities, Counties	$100,000	$103,000	$106,000	$109,000	$112,000	$115,000	$118,000	$122,000	$126,000	$130,000
200G	VLAWMO Grants and Partnerships Program	✓	**NFH**	**ESS**	**GW**	**SWQ**	C	Municipalities, Counties, Private Entities	$149,000	$153,000	$158,000	$163,000	$168,000	$173,000	$178,000	$183,000	$188,000	$194,000
200H	Operations and Maintenance Program	✓	**VF**	**PDS**	**SWQ**		C	Municipalities, Counties	$151,000	$156,000	$161,000	$166,000	$171,000	$176,000	$181,000	$186,000	$192,000	$198,000
Project Technical Work (300) & Capital Improvement Projects (400)																		
Birch Lake (301/401)									$205,000	$65,000	$90,000	$30,000	$50,000	$100,000	$100,000	$70,000	$60,000	$25,000
301A	Pretreatment BMP Technical Work		SWQ	SMS			I	Municipalities, Counties	$5,000									
301B	Birch Lake Outlet Channel Technical Work		ESS	SWQ			B	Municipalities								$25,000	$15,000	
301C	Shoreline, Wetland, or Water Quality Partnership Technical Work		ESS	SWQ	NFH		I	Municipalities, BLID			$20,000	$5,000	$5,000	$25,000		$20,000	$20,000	
301D	Subwatershed Neighborhood Technical Work		SMS	SWQ			I	Municipalities, Private Entities	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
301E	AIS Management		SWQ				C	Municipalities, BLID	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
301F	Sports Center Shoreline Technical Work and Project	✓	**ESS**	SWQ	NFH		I	Municipalities		$15,000			$15,000					
301H	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, County, Private Entities						$25,000				
401A	Pretreatment BMP (Upstream of Iron Enhanced Sand Filter)	✓	**SWQ**	SMS	IPP		C	Municipalities, County	$150,000		$20,000		$5,000	$25,000				
401G	Rotary Park Restoration	✓	**NFH**	**SWQ**	WCA		C	Municipalities	$30,000	$30,000	$30,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
401H	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW	IPP	I	Municipalities, Counties							$75,000			
Gem Lake (302/402)									$10,000	$10,000	$30,000	$35,000	$160,000	$10,000	$20,000	$35,000	$145,000	$45,000
302A	Commercial Area Retrofit Technical Work		SMS	SWQ			B	Municipalities, County				$25,000						$25,000
302B	Smart Irrigation and Groundwater Conservation		GW				B	Private Entities			$20,000							
302C	Regional, Subwatershed, or Neighborhood BMPs		SWQ	SMS	NFH	CR	I	Municipalities, Private Entities	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
302D	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, Counties								$25,000		
402A	Commercial Area Retrofit Project		SMS	IPP			I	Municipalities, Counties					$150,000		$10,000		$10,000	$10,000
402D	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW		B	Municipalities, Counties									$125,000	
Gilfillan-Tamarack-Black-Wilkinson-Amelia (303/403)									$308,000	$260,000	$560,000	$278,000	$323,000	$270,000	$230,000	$618,000	$298,000	$260,000
303B	Small Watershed Technical Work (3rd 319 Small Watershed Grant)		SWQ				C	Municipalities, NOC, SPRWS, MPCA			$50,000							
303C	Small Watershed Technical Work (4th 319 Small Watershed Grant)		SWQ				C	Municipalities, NOC, SPRWS, MPCA						$20,000	$50,000			
303D	Amelia Drainage Technical Work		SWQ	ESS			I	Municipalities, Counties, Private Entities					$25,000					
303E	Wilkinson Lake Wetland Project Maintenance	✓	**NFH**	WCA	SWQ		C	NOC	$10,000	$10,000	$5,000	$10,000	$10,000	$10,000	$10,000	$5,000	$5,000	$10,000
303F	Local Partnership- Tamarack Nature Center		SWQ	NFH	WCA		I	County							$50,000	$50,000	$50,000	$50,000
303G	Township /City BMP Retrofits		SMS	IPP			I	Municipalities, Township			$25,000		$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
303H	Cities/Township/NOHOA /NOC Partnership Water Quality /Groundwater Conservation Projects		GW	SWQ	ESS		I	Municipalities, NOHOA, NOC	$10,000	$25,000	$10,000	$20,000	$25,000	$30,000	$25,000	$30,000	$30,000	$20,000
303L	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, County, Private Entities						$25,000	$25,000			
403A	Small Watershed Projects (2nd 319 Small Watershed Grant Project)	✓	**SWQ**				C	Municipalities, NOC, SPRWS, MPCA	$113,000	$50,000	$20,000				$20,000			
403B	Small Watershed Projects (3rd 319 Small Watershed Grant Project)	✓	**SWQ**	ESS			C	Municipalities, NOC, SPRWS, MPCA				$113,000	$113,000	$10,000		$20,000		$20,000
403C	Small Watershed Projects (4th 319 Small Watershed Grant Project)	✓	**SWQ**				C	Municipalities, NOC, SPRWS, MPCA								$113,000	$113,000	$60,000
403D	Amelia Drainage Project	✓	**SWQ**	ESS			I	Municipalities, County, Private Entities						$150,000	$25,000		$75,000	$25,000
403H	Cities/Township/NOHOA /NOC Partnership Water Quality /Groundwater Conservation Projects		GW	SWQ	ESS		I	Municipalities, NOHOA, NOC	$50,000	$50,000		$100,000						
403I	Internal Loading /Alum Treatment (Wilkinson)		SWQ				I	NOC, MPCA			$425,000	$35,000				$200,000		
403J	Internal Loading /Alum Treatment (Tamarack)	✓	**SWQ**				C	Municipalities, MPCA					$125,000					$50,000
403K	Water Reuse Project	✓	**GW**				C	Township	$125,000	$125,000	$25,000							
403L	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW		I	Municipalities, County, Private Entities								$175,000		
Goose Lake (304/404)									$135,000	$80,000	$125,000	$150,000	$25,000	$70,000	$25,000	$75,000	$175,000	$0

Table 4-5: VLAWMO Implementation Table

ID	Action Description		Progress Toward Goals (Lists up to four)				Priority	Partners	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
304A	Highway 61 Channel Restoration Technical Work	✓	**ESS**	SWQ			I	Municipalities, Counties, MnDOT, Private Entity	$20,000									
304B	Goose Lakes Regional BMP Partnership Technical Work		SWQ	SMS	NFH		I	Municipalities, Counties			$15,000							
304C	Regional, Subwatershed, or Neighborhood BMPs		SWQ	SMS	NFH	CR	I	Municipalities, Counties, Private Entities	$5,000		$10,000	$10,000	$25,000		$25,000		$25,000	
304D	City Street Partnership Projects		SMS	CEC			I	Municipalities, Private Entities	$10,000			$30,000		$20,000				
304E	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, Counties								$25,000		
404A	Highway 61 Channel Restoration Project		ESS	SWQ			C	Municipalities, Counties, MnDOT, Private Entity	$50,000	$30,000	$50,000	$60,000						
404B	Goose Lakes Regional BMP Partnership		SWQ	SMS			I	Municipalities	$50,000	$50,000	$50,000	$50,000		$50,000		$50,000		
404E	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW		I	Municipalities, County, Private Entities									$150,000	
Lambert Creek (305/405)									**$510,000**	**$495,000**	**$300,000**	**$455,000**	**$540,000**	**$525,000**	**$360,000**	**$115,000**	**$220,000**	**$380,000**
305C	Water Quality / Wetland Project Technical Work		PDS	WCA	SWQ		I	Municipalities										
305D	Water Reuse Technical Work		GW				I	Municipalities, Counties					$25,000					
305E	Green Streets Technical Work	✓	**SWQ**	SMS			C	Municipalities, Counties	$25,000								$50,000	$25,000
305F	Commercial Property Technical Work		SMS	SWQ			B	Municipalities, Counties, Private Entities				$25,000						
305G	Resiliency Planning or Projects Technical Work	✓	**CR**				C	Municipalities, Counties, SPRWS	$30,000				$80,000					
305H	Lambert Creek Drainage Partnership Technical Work	✓	**PDS**	SWQ			I	Municipalities, Counties		$25,000	$25,000							
305I	Lambert Creek Operation and Maintenance	✓	**PDS**	**ESS**	SWQ		C	Municipalities, Counties	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
305J	Municipality / City Street Project Partnership		SMS	SWQ	CEC		I	Municipalities, Counties, Private Entities	$60,000	$30,000		$15,000	$20,000	$60,000	$10,000	$30,000	$30,000	$20,000
305K	Municipal Water Quality in Parks / Public Spaces		SWQ	NFH			I	Municipalities, Counties	$10,000	$25,000	$20,000	$30,000	$20,000	$10,000	$25,000	$20,000	$20,000	$30,000
305L	Groundwater Conservation Partnerships		GW				I	Municipalities, Counties	$10,000	$50,000		$50,000						
305M	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, Counties				$25,000					$25,000	
405A	Whitaker Wetland Retrofit Project		WCA	SWQ	NFH		I	Municipalities, Counties, Township	$100,000	$20,000	$10,000	$125,000						
405B	Lambert Sheet Pile Debt Services		PDS				C	Municipalities, Counties, SPRWS	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000				
405C	Water Quality / Wetland Project		PDS	WCA	SWQ		I	Municipalities	$20,000	$40,000	$40,000	$20,000	$30,000	$20,000	$40,000	$40,000	$40,000	$20,000
405D	Water Reuse Project		GW				I	Municipalities, Counties						$30,000	$110,000		$30,000	$110,000
405E	Green Streets Project	✓	**SWQ**	SMS			C	Municipalities, Counties, Private Entities	$100,000	$150,000					$150,000			
405F	Commercial Property Project		SMS	SWQ	IPP		B	Municipalities, Counties, Private Entities					$175,000					
405G	Resiliency Plan or Projects	✓	**CR**				I	Municipalities, Counties, SPRWS, Private Entities	$100,000	$100,000	$50,000	$10,000	$10,000	$250,000	$10,000	$10,000	$10,000	$10,000
405H	Lambert Creek Drainage Partnership Projects		PDS	SWQ			I	Municipalities			$100,000	$100,000		$100,000				
405M	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW		I	Municipalities, County, Private Entities					$125,000					$150,000
Pleasant-Charley-Deep Lakes (306/406)									**$120,000**	**$105,000**	**$85,000**	**$95,000**	**$150,000**	**$120,000**	**$105,000**	**$110,000**	**$210,000**	**$95,000**
306A	Nutrient Management Partnership Project Technical Work		SWQ				I	Municipalities, Counties, SPRWS	$20,000	$25,000	$10,000	$20,000	$50,000	$20,000	$25,000	$10,000	$10,000	$20,000
306B	Carp Management	✓	**SWQ**				C	SPRWS, NOHOA	$30,000	$10,000	$5,000	$5,000	$30,000	$30,000	$10,000	$5,000	$5,000	$5,000
306C	Lake Shoreline Management	✓	**ESS**	**NFH**	SWQ		I	SPRWS, NOHOA	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
306D	Regional, Subwatersheds, or Neighborhood BMPs		SWQ	SMS	GW	CR	I	NOHOA, Municipalities, SPRWS, Private Entities	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
306E	Infrastructure or Local Planning Technical Work		SMS	IPP			I	NOHOA, Municipalities, SPRWS	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
306F	Oxygenation System Partnership and Technical Work	✓	**SWQ**				B	SPRWS	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
306G	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, Counties								$25,000		
406G	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW		I	Municipalities, Counties, Private Entities									$125,000	
Sucker-East & West Vadnais Lakes (307/407)									**$240,000**	**$210,000**	**$90,000**	**$70,000**	**$345,000**	**$120,000**	**$160,000**	**$40,000**	**$125,000**	**$205,000**
307A	Resiliency Project Technical Work	✓	**CR**				I	Municipalities, Counties, SPRWS	$25,000			$25,000						
307B	Trail Restoration Technical Work	✓	**SWQ**	NFH			I	Municipalities, Counties	$20,000									
307C	Park Restoration Technical Work		NFH				I	Municipalities, Counties, SPRWS, Non-Profits	$5,000								$10,000	$10,000
307D	City Street Project Partnership		SMS	SWQ	CEC	GW	B	Municipalities			$50,000		$50,000		$50,000		$50,000	
307E	City Environment Initiatives		GW	OC	NFH		B	Municipalities	$20,000	$10,000	$15,000	$20,000	$20,000	$20,000	$10,000	$15,000	$15,000	$20,000
307F	WMO Boundary Work						I	Municipalities, Counties, Watershed Districts	$20,000									
307G	Future Subwatershed Technical Work		SWQ	SMS	GW		I	Municipalities, Counties									$25,000	
407A	Resiliency Projects	✓	**CR**	SWQ			C	Municipalities, Counties, SPRWS, Private Entities	$150,000	$150,000	$25,000	$25,000	$250,000	$50,000	$100,000	$25,000	$25,000	$25,000
407B	Trail Restoration Project		NFH	SWQ			I	Municipalities, Counties		$50,000			$25,000	$50,000				
407G	Future Subwatershed Capital Improvement Projects		SWQ	SMS	GW		I	Municipalities, Counties, Private Entities										$150,000
									$2,464,000	**$2,189,000**	**$2,275,000**	**$2,139,000**	**$2,650,000**	**$2,303,000**	**$2,119,000**	**$2,214,000**	**$2,418,000**	**$2,230,000**

Priority Level: C=Critical, I=Important, B=Beneficial

Progress Toward Goals: Surface Water Quality (SWQ); Erosion of Shorelines and Streams (ESS); Water Monitoring (WM); Chloride and Emerging Contaminants (CEC); Groundwater and Drinking Water Quality & Groundwater Supplies and Conservation (GW); Outreach and Communication (OC); Public Drainage Systems (PDS); Infrastructure Partnership Projects (IPP); VLAWMO Facilities (VF); Climate Resiliency (CR); Wetland Conservation Act (WCA); Natural Features and Habitat (NFH); Stormwater Management Standards (SMS)

5

PLAN ADMINISTRATION

5. PLAN ADMINISTRATION

5.1 Implementation Budget and Funding Sources

The VLAWMO Implementation Table includes an estimated annual cost for each program, technical work activity, or project. Administration (100), VLAWMO Implementation Programs (200), Project Technical Work (300) and Capital Improvement Projects (400) make up the VLAWMO budget.

VLAWMO's Joint Powers Agreement allows for a variety of funding mechanisms. The chief funding method that will continue to be used is the Storm Sewer Utility (SSU) fee. The annual SSU rates are established by the VLAWMO Board of Directors based on the approved VLAWMO budget. Fees are collected by the counties through the property tax collection system. The SSU provides a stable source of funding for the watershed.

Many of the projects VLAWMO implements are funded fully or in part through grants, including grants awarded directly to VLAWMO or grants received by partnering organizations. Examples of these grants include:

- BWSR: Watershed Based Implementation Funding (WBIF), Clean Water Fund Projects and Practices
- EPA/MPCA: Section 319 of the Clean Water Act

These examples are not intended to be all-inclusive.

5.2 Roles and Responsibilities

The Metropolitan Surface Water Management Act defines specific authorities and requirements for different types of watershed management organizations. As a joint powers watershed management organization (WMO), Table 5-1 identifies those responsibilities as mandatory (M) or discretionary (D) and the role VLAWMO will assume in each case.

This plan serves as a guide to identify issues, set goals, and plan activities that will occur in the watershed. Separately from this plan, VLAWMO's Water Management Policy outlines requirements within the watershed that are provided by VLAWMO for adoption and enforcement by the member communities.

Table 5-1. *VLAWMO mandatory and discretionary responsibilities.*

Duties and Responsibilities	Joint Powers WMO	Vadnais Lakes Area WMO
Adopt a Watershed Management Plan	M	Adopts a Watershed Management Plan
Prepare an Annual Report and Monitoring Report	M	Prepares an Annual Report and Annual Monitoring Report (see 5.3.2)
Appoint an advisory committee	M	Appoints a TEC
Manage transferred drainage system	D	VLAWMO manages drainage authority over RCD 14 per 103B and develops annual inspection report
Adopt water management regulations	D	Water management standards for member communities have been adopted in its Water Management Policy
Hire employees	D	Hires employees
Enter into contracts & agreements	D	Enters into contracts and agreements
Administer the Wetland Conservation Act	D	Yes, as WCA Local Government Unit
Initiate capital improvement projects	D	Initiates capital improvement projects with partners / member communities
Review and approve local water management plans	M	Reviews and approves local water management plans
Finance Authority	D	Establishes an annual storm sewer utility fee
Publish Annual Newsletter	M	Prepares and distributes newsletter at least annually

VLAWMO does not exercise land use or permitting authority. A member community must adopt the standards identified in the VLAWMO Water Management Policy into its official controls. VLAWMO may provide "advisory" comments upon request from a member community.

5.2.1 Local Water Management Plans

All municipalities within VLAWMO are required to complete and adopt a local water management plan that conforms to Minnesota Statutes 103B.235 and Minnesota Rules 8410.0160 (Table 5-2). Local water management plans must be approved by VLAWMO before they can be locally adopted and implemented. Municipalities have land use and regulatory responsibilities that impact water quality, and these responsibilities need to align with the current VLAWMO Water Management Policy. Local water management plans need to be reviewed (and updated if necessary) for consistency with this plan. Table 5-2 provides a summary of the status of local water management plan adoption and implementation of activities per Minnesota Rules 8410.0150.

Table 5-2. *Local Water Management Plans*

Community	Plan Last Updated
Gem Lake	2018
Lino Lakes	2018
North Oaks	2008
Vadnais Heights	2018
White Bear Lake	2021
White Bear Township	2019

White Bear Township.
Photo Credit: www.whitebearlake.org

5.2.2. MS4 Responsibilities

Each of the MS4s in VLAWMO are responsible for ensuring local activities meet NPDES and MS4 standards. Waste load allocations are assigned to MS4s within VLAWMO for five lakes with nutrient impairments and Lambert Creek with a bacteria impairment (note that Gem Lake has since been delisted). While VLAWMO protects water quality through plan actions, VLAWMO is not the entity responsible for TMDL compliance. MS4s have waste load allocations applicable to each TMDL and they are responsible for achieving and reporting to the MPCA.

The TMDL and Protection study is available here: Vadnais Lake Area WMO Total Maximum Daily Load (TMDL) and Protection Study.

Table 5-3. *Total Phosphorus (TP) Wasteload Allocations (WLAs) for MS4s* in the 2014 TMDL.*
****See MPCA for current MS4 status / **WLA in addition to load allocation and margin of safety***

	WLA (lbs/year TP) for lakes			
	East Goose	West Goose	Gilfillan	Wilkinson
M-Foods Dairy		24.7		
Anoka County				0.1
City of Gem Lake	2.2	2.8		
City of Lino Lakes				1.2
MnDOT	7.9	3.6		47.2
City of North Oaks			14.7	26.4
Ramsey County	3.9	1.6	0.5	1.8
City of Vadnais Heights			0.1	
City of White Bear Lake	64.7	7.3		35.1
White Bear Township			1.7	67.6
Total WLA by waterbody	78.7	40.0	17.0	179.4
Total TMDL by waterbody**	187.9	224.2	164.7	321.8

Table 5-4. *Bacteria WLA for Lambert Creek.*
****WLA in addition to load allocation and margin of safety***

	WLA (billions of organisms per day) under flow conditions				
	Low Flow	Dry	Mid-Range	Wet	High Flow
City of Gem Lake	0.00	0.04	0.10	0.21	0.68
MnDOT	0.00	0.06	0.17	0.36	1.17
Ramsey County	0.00	0.03	0.08	0.17	0.56
City of Vadnais Heights	0.00	0.45	1.28	2.73	8.78
City of White Bear Lake	0.00	0.19	0.55	1.16	3.74
White Bear Township	0.00	0.02	0.07	0.15	0.45
Total WLA by flow condition	0.00	0.79	2.25	4.78	15.38
Total TMDL in flow condition*	0.00	1.08	3.08	6.54	21.04

5.2.3 Enforcement and Regulation

MPCA is responsible for ensuring MS4 permit and TMDL compliance. Member communities are responsible for enforcement of the VLAWMO Water Management Policy as adopted in the communities' local water management plans. VLAWMO does not conduct enforcement for MS4 permits and TMDL compliance. If standards are not met, VLAWMO defers enforcement to the appropriate state agency. If a member community fails to implement the VLAWMO water management standards within its local water management plan, VLAWMO reserves the right to rescind plan approval and administer its Water Management Policy.

5.3 Annual Work Planning and Adaptive Management

The Implementation Table includes programs, technical work, and projects planned over the next ten years. During this time, new information may evolve, priorities may shift, and funding resources may change, all of which may impact the activities planned. VLAWMO collaborates annually with local partners on the long range project partnership table and annual budgeting process. VLAWMO will evaluate, report on, and adapt its implementation plan to reflect changing conditions through annual work planning, the Annual Report, and assessments (Figure 5-1).

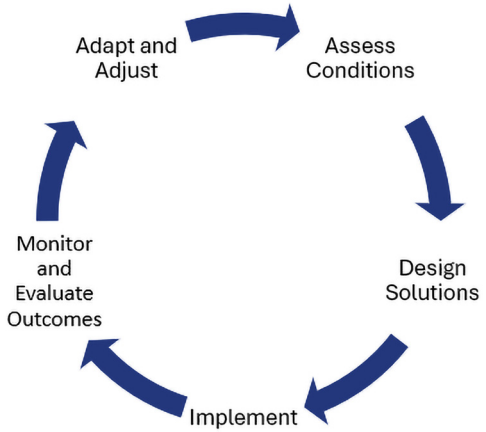


Table 5-1. *Adaptive Management Approach.*

5.3.1 Annual Work Planning

Annual work planning will be undertaken each year to outline planned programs, technical work, and projects over the next year with given data, priorities, and funding.

The Implementation Table will serve as a guide for development of the annual work plan; however, the annual work plan can adjust projects and programs listed in the Implementation Table based on changing factors. Factors that VLAWMO will consider during the development of the annual work plan include, but are not limited to:

- the findings of feasibility studies or new data,
- partner priorities and funding,
- available grants,
- the annual budget, and
- input from the TEC and Board.

Ultimately, the Implementation Table will be used as a statement of intent, given information known at the time of plan writing. Final decisions on implementation activities rest with the Board to budget for and authorize via the annual work plan.

5.3.2 Annual Report

Within the first 120 days of the calendar year, VLAWMO will submit to BWSR and activity report for the previous calendar year, per Minnesota Rules 8410.0150. Information required in the activity report will stem from VLAWMO's Annual Report.

VLAWMO's Annual Report reviews programs, technical work, and projects completed in the past year and sets the work plan for the following year. The report is generated with the intent to be used as an outreach and communication tool, as it provides an overview of what VLAWMO does and how community members can get involved. An overview of the content included in the Annual Report is shown in Figure 5-2.

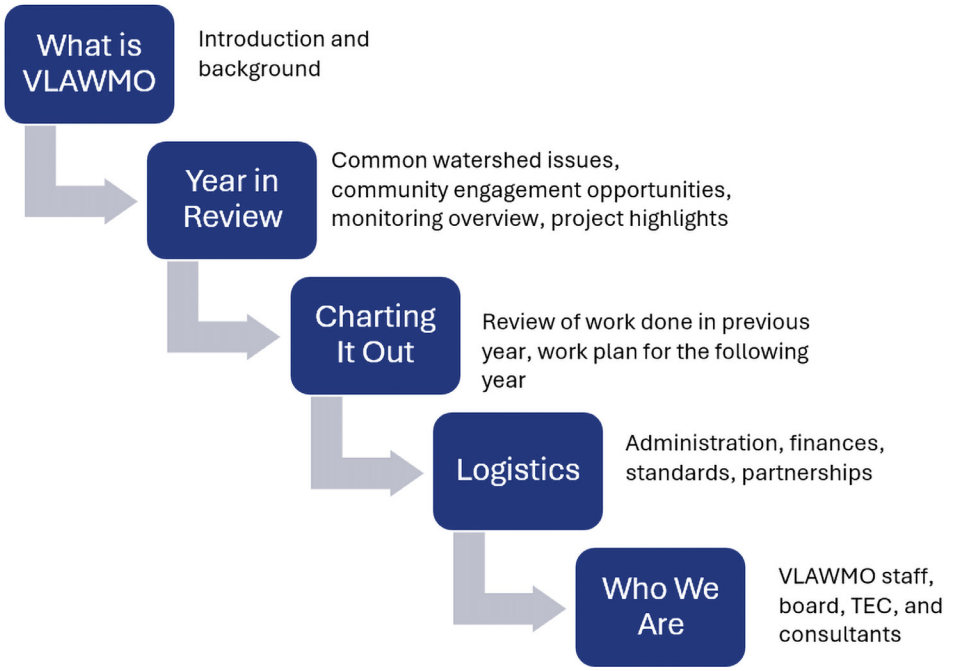


Table 5-2. *VLAWMO Annual Report content overview.*

VLAWMO's Annual Report may be supplemented by additional, program-specific progress reports (e.g., monitoring report). Within 180 days of the calendar year, VLAWMO must submit an audit report of the preceding year's activities.

5.3.3 Progress Assessment

Biennially, VLAWMO will perform a more detailed evaluation to assess the level of progress achieved toward stated goals. This assessment will consider information gathered through the Annual Report, which also takes into consideration the annual water quality monitoring report and evaluation of the success of activities in the Implementation Table. This progress assessment will also build on feedback from local partners during the annual review of the long range project partnership table and annual budgeting process. Completed assessments will help inform annual work planning and will be useful in determining if plan adjustments or amendments are necessary (see Section 5.4).

Rain garden in the City of North Oaks.
Photo Credit: www.vlawmo.org

5.4 Amendments to Plan

This plan is active from 2027-2036, after which the Board will adopt a new plan. During this time, VLAWMO may revise its plan through an amendment procedure, as needed. Amendments to this plan will follow the procedures described in this section and will proceed in accordance with the process provided in Minnesota Rules 8410.0140 and Minnesota Statutes 103B.231.

Plan amendments may be proposed by any person to the Board, but only the Board may initiate the formal amendment process. Recommended plan amendments must be submitted in writing with a statement of the problem and need, the rationale for the amendment, and an estimated cost.

VLAWMO anticipates that only significant changes or additions to goals, issues, administrative procedures, or implementation (i.e., programs, technical work, and capital improvements) will prompt an amendment, although final discretion resides with the Board. Minnesota Rules 8410.0140 subp.1a defines changes that do not require an amendment:

- reformatting/ reorganization of the plan,
- revision of a procedure meant to streamline administration of the plan,
- clarification of existing plan goals or policies,
- inclusion of additional data not requiring interpretation,
- expansion of public process, or
- adjustments to how VLAWMO will carry out program activities within its discretion.

Amendments to this plan are subject to the review process provided in Minnesota Statutes 103B.231 subd.11, except when the proposed amendments are determined to be minor-amendments according to the following provisions:

A. BWSR has either agreed that the amendments are minor or failed to act within five working days of the end of the 30- day comment period specified in item B (unless an extension has been mutually agreed upon);

B. VLAWMO has sent copies of the amendments to the plan review authorities for review and comment allowing at least 30 days for receipt of comments, has identified that the minor amendment procedure is being followed, and has directed that comments be sent to the Board;

C. No county board has filed an objection to the amendments with VLAWMO and BWSR within the comment period specified in item B (unless an extension is mutually agreed upon);

D. VLAWMO has held a public meeting to explain the amendments and published a legal notice of the meeting twice, at least seven days and 14 days before the date of the meeting; and

E. The amendments are not necessary to make the plan consistent with an approved and adopted groundwater plan.

Draft and final amendments will be formatted and distributed consistent with the requirements of Minnesota Rules 8410.0140, subparts 4 and 5, respectively.

Downy Woodpecker at White Bear.
Photo Credit: www.whitebearlake.org

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