8.0 Riley Creek Watershed

The Riley Creek watershed is located in the central part of the District, adjacent to the Bluff Creek watershed to the west and Purgatory Creek watershed to the east (see Figure 5-6). The Riley Creek watershed lies entirely within the cities of Chanhassen and Eden Prairie. The watershed, creek, and lakes within the Riley Creek watershed are summarized in the following fact sheets included in this section:

- Riley Creek Fact Sheet
- Lake Ann Fact Sheet
- Lake Lucy Fact Sheet
- Rice Marsh Lake Fact Sheet
- Lake Riley Fact Sheet
- Lake Susan Fact Sheet

Information provided in District water resource fact sheets include (as applicable):

- Watershed physical characteristics
- Lake and creek physical characteristics
- Watershed land use
- Results of water quality and natural resource assessments
- Invasive species
- Water quality impairments

The most current version of each fact sheet is available from the District website at www.rpbcwd.org.

8.1 Riley Creek Watershed Issues

Table 8-1 summarizes issues identified in the Riley Creek watershed, organized according to the issue categories described in Section 2.3. These issues were identified through the District's public engagement and issue identification process (see Section 2.0) and through past District monitoring and studies. Recent District studies specific to the Riley Creek watershed include:

- *Riley Creek – Creek Restoration Action Strategy* (Barr Engineering Co. & Riley Purgatory Bluff Creek Watershed District, November 2015)

- *Rice Marsh Lake and Lake Riley Use Attainability Analysis Update* (Barr Engineering, January 2016)
- *Lake Lucy Aquatic Plant Management Plan* (Wenck Associates Inc., 2015)
- *Lake Lucy and Lake Ann Use Attainability Analysis Update* (Barr Engineering Co., 2013)
- *Engineer's Report - Lake Lucy Spent Lime Treatment System* (Barr Engineering Co., 2014)
- *Lake Susan Use Attainability Analysis Update* (Wenck Associates Inc., 2013)
- *Engineer's Report - Lake Susan Subwatersheds LS-2.4/LS-2.12 Water Quality Improvement Project* (Barr Engineering Co., 2014)
- *Engineer's Report - Lake Susan Park Pond Watershed Treatment and Stormwater Reuse Enhancements Project* (Barr Engineering Co., 2017)
- *Lake Susan Alum Dosing Cost Estimate* (Wenck Associates Inc,, 2017)
- *Rice Marsh Lake Alum Dosing Cost Estimate* (Wenck Associates Inc., 2017)
- *Lake Riley Alum Dosing Cost Estimate* (Wenck Associates Inc, 2016)
- *Engineer's Report - Lower Riley Creek Stabilization Project - RPBCWD Reach E, Site D3, and LMRWD Reach* (Barr Engineering Co., 2016)
- *Downtown Chanhassen BMP Retrofit Assessment Findings Report* (Barr Engineering Co., 2017)
- *Creek Restoration Action Strategy – Upper Riley Creek Sediment Source Assessment* (Barr Engineering Co., 2017)
- *Historical Water Quality And Ecological Change In Rice Marsh Lake* (Ramstack Hobbs & Edlund, 2014)
- *Stormwater Pond Protocols and Prioritization Report: 2011* (CH2M HILL, 2012)
- *In situ Measurement of Sediment Oxygen Demand Lake Lucy, Lake Susan, Lake Riley, Lake Ann* (HydrO2, Inc., 2009)
- *Aquatic Plant Community of Lakes Ann, Lotus, Lucy, Mitchell, Susan, Riley and Staring within the Riley Purgatory Bluff Creek Watershed: Final Report 2009-2014.* (Jaka & Newman, 2014)
- *Aquatic Plant Community of Lakes Lucy, Mitchell, Susan, Riley and Staring within the Riley Purgatory Bluff Creek Watershed: Annual Report 2015* (Dunne & Newman, 2016)

Table 8-1 Riley Creek Watershed Stakeholder Identified Issues and Opportunities

Water Resource Issue Category (see Section 2.3.6)	Specific Issues in the Riley Creek Watershed	Opportunities to Address Issues
Water Quality (Pollution)	· Water quality impacting public health · Ecological role of algae	· Landowner best practices education · Expanding volunteer network
Water Quality (Habitat)	· Invasive species ecological and public health impacts · Pollutant loading to wetlands	· Invasive species education · Preventative action to reduce future costs
Water Quality (Erosion)	· Creek erosion from development and human activity	· None identified in workshop
Groundwater	· Groundwater-surface water connection	· None identified in workshop
Water Quantity	· Impacts of land development and land use on creek hydrology	· None identified in workshop

Note: Issues based on comments received at the Riley Creek stakeholder meeting. A complete list of stakeholder comments is included in Appendix A.

8.2 Riley Creek Watershed Programs and Projects

Many of the issues present in the Riley Creek watershed are directly or indirectly addressed through consistent implementation of District-wide programs including the District's project review and permitting and education programs (see Section 9.0). Over the past several years, the District has implemented several capital improvement projects within the watershed to address water quality, water quantity, and other issues. Watershed, in-lake, and creek BMPs as well as other management strategies are needed to improve and protect the water resources within the watershed. Proposed projects the District may implement within the Riley Creek watershed are listed in Table 8-2; additional details on selecting projects are provided in the District's overall implementation program (see Sections 9.1 and 9.2). Proposed projects within the Riley Creek watershed are shown in Figure 8-1. The BMPs listed in Table 8-2 are intended to be a guide rather than a prioritization list. Additional data collection, future study efforts and innovation could result in revisions to those shown or additional BMPs being added.

Table 8-2 Proposed Projects in the Riley Creek Watershed

Source of Identified Project	City	Major Watershed	Resource	Project	Project Description	Goal Index[1]	Sustainability Index[1]	Volume Management Index[1]	Pollutant Management[1]	Stabilization[1]	Habitat Restoration[1]	Partnership[1]	Education[1]	Watershed Benefit[1]	Total Benefit Score[1]	Planning Level Estimated 30 year Cost[2]	Funding Partner Opportunity
RPBCWD	Chanhassen	Riley Creek	Riley Creek	R4	Upper Riley Creek Stabilization and restoration	3	7	1	1	7	5	1	7	7	**39**	$1,725,000	
RPBCWD	Chanhassen	Riley Creek	Lake Lucy	LU-A1.10c	Watershed Phosphorus Load Control	2	5	1	7	1	1	7	3	7	**34**	$350,000	
RPBCWD	Chanhassen	Riley Creek	Lake Ann	Ann In-Lake	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	7	7	**34**	$290,000	
RPBCWD	Chanhassen	Riley Creek	Lake Lucy	LU-A3.4	Watershed Phosphorus Load Control	2	5	1	7	1	1	7	1	7	**32**	$190,000	
RPBCWD	Chanhassen	Riley Creek	Lake Lucy	Lucy In-Lake	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	1	7	**28**	$320,000	
RPBCWD	Chanhassen	Riley Creek	Riley Creek	URC-Upstream Detention	Upper Riley Creek - Upstream Watershed Detention and Phosphorus Load Reduction	3	5	1	7	1	1	1	1	7	**27**	$910,000	
RPBCWD	Chanhassen	Riley Creek	Lake Susan	Lake Susan Park Pond	Watershed Phosphorus Load Control	2	5	1	5	1	1	7	7	5	**34**	$450,000	
RPBCWD	Chanhassen	Riley Creek	Lake Susan	Susan In-Lake	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	7	5	**32**	$560,000	
RPBCWD	Chanhassen	Riley Creek	Lake Susan	Susan Spent Lime	Watershed Phosphorus Load Control	2	5	1	5	1	1	5	7	5	**32**	$250,000	
RPBCWD	Chanhassen	Riley Creek	Lake Susan	Target Pond	Watershed Phosphorus Load Control	2	5	1	3	1	1	1	1	5	**20**	$82,000	
RPBCWD	Chanhassen	Riley Creek	Lake Susan	Lake Drive West Pond	Watershed Phosphorus Load Control	2	5	1	1	1	1	1	1	5	**18**	$27,000	
RPBCWD	Eden Prairie	Riley Creek	Riley Creek	R2	Lower Riley Creek Restoration and Stabilization (excluding Reach D3 & E)	3	7	1	1	7	5	7	3	3	**37**	$2,318,000	
RPBCWD	Eden Prairie	Riley Creek	Lake Riley	Riley In-Lake	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	7	3	**30**	$900,000	
RPBCWD	Chanhassen	Riley Creek	Rice Marsh Lake	Rice Marsh In-Lake	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	5	3	**28**	$300,000	
RPBCWD	Chanhassen	Riley Creek	Rice Marsh Lake	RM_10	Watershed Phosphorus Load Control	2	5	1	5	1	1	7	3	3	**28**	$386,300	
RPBCWD	Chanhassen	Riley Creek	Rice Marsh Lake	RM_12a	Watershed Phosphorus Load Control	2	5	1	3	1	1	7	5	3	**28**	$295,600	
RPBCWD	Chanhassen	Riley Creek	Riley Creek	R3	Creek Restoration and Stabilization	3	7	1	1	5	5	1	1	3	**27**	$954,000	
RPBCWD	Eden Prairie	Riley Creek	Lake Riley	LR_88 and LR_90	Watershed Phosphorus Load Control	2	5	1	3	1	1	3	5	3	**24**	$835,500	
RPBCWD	Eden Prairie	Riley Creek	Riley Creek	Lower Riley Crk	Lower Riley Creek Restoration and Stabilization (Reach D3 and E)	3	7	1	1	7	5	7	7	1	**39**	$1,515,000	
RPBCWD	Eden Prairie	Riley Creek	Riley Creek	R1	Creek Restoration and Stabilization	3	7	1	1	7	5	3	3	1	**31**	$1,424,000	

[1]See Section 4 for additional detials about the RPBCWD prioritization methodology and associated descriptions for the variables used to assess multiple project benefits.

[2]Based on 2017 dollars

RILEY CREEK WATERSHED PROPOSED PROJECTS

FIGURE 8-1

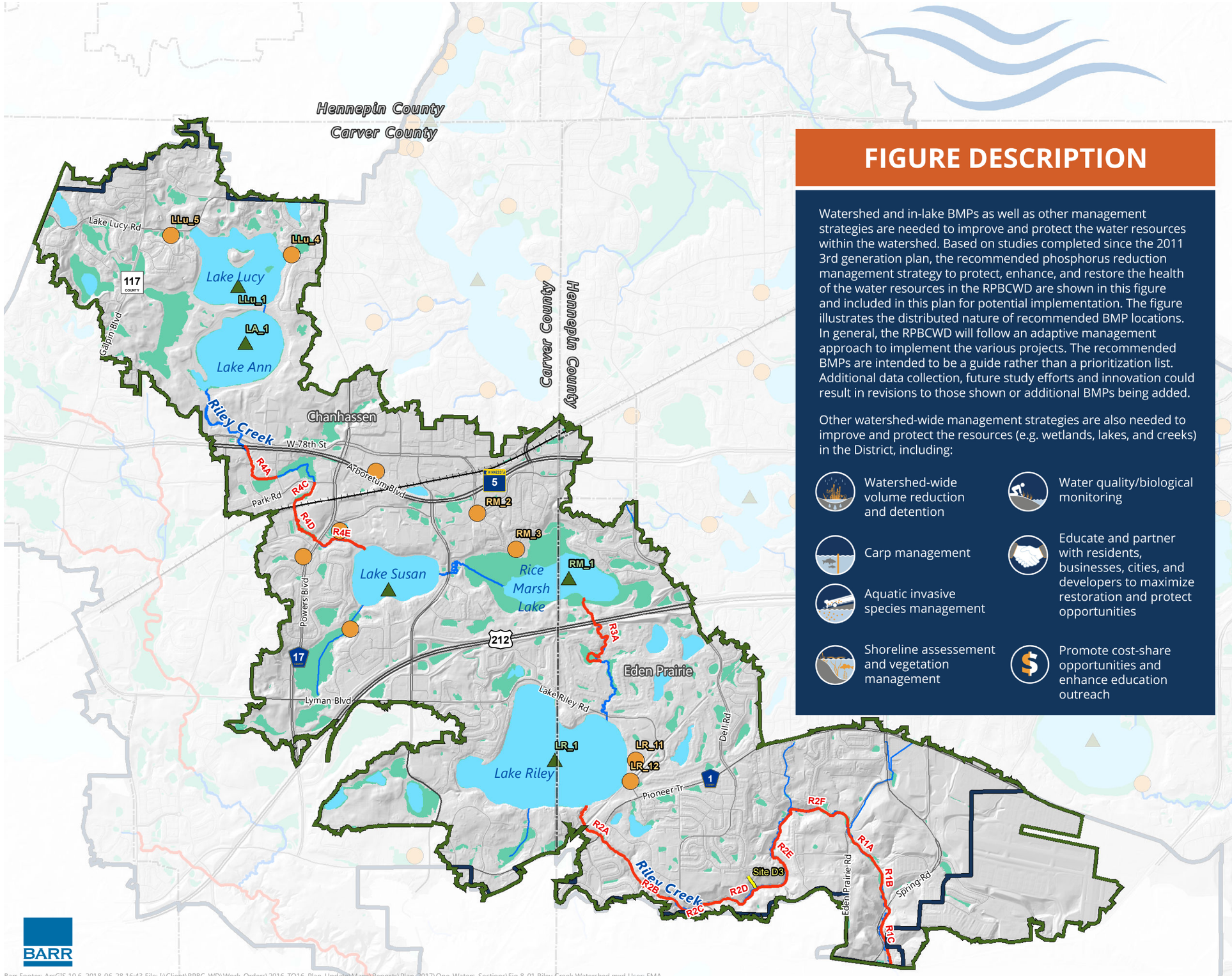

FIGURE DESCRIPTION

Watershed and in-lake BMPs as well as other management strategies are needed to improve and protect the water resources within the watershed. Based on studies completed since the 2011 3rd generation plan, the recommended phosphorus reduction management strategy to protect, enhance, and restore the health of the water resources in the RPBCWD are shown in this figure and included in this plan for potential implementation. The figure illustrates the distributed nature of recommended BMP locations. In general, the RPBCWD will follow an adaptive management approach to implement the various projects. The recommended BMPs are intended to be a guide rather than a prioritization list. Additional data collection, future study efforts and innovation could result in revisions to those shown or additional BMPs being added.

Other watershed-wide management strategies are also needed to improve and protect the resources (e.g. wetlands, lakes, and creeks) in the District, including:

- Watershed-wide volume reduction and detention
- Water quality/biological monitoring
- Carp management
- Educate and partner with residents, businesses, cities, and developers to maximize restoration and protect opportunities
- Aquatic invasive species management
- Shoreline assessement and vegetation management
- Promote cost-share opportunities and enhance education outreach

Recommended Best Managment Practices

- In Lake BMP
- Watershed BMP
- Creek Stabilization
- Ravine Stabilization
- Streams/Creeks
- Lake/Pond
- Wetlands
- Hydrologic Boundary
- District Legal Boundary
- Municipalities

N

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RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

BARR

Barr Footer: ArcGIS 10.6, 2018-06-28 16:43 File: I:\Client\RPBC_WD\Work_Orders\2016_TO16_Plan_Update\Maps\Reports\Plan_2017\One_Waters_Sections\Fig 8-01 Riley Creek Watershed.mxd User: EMA

8.3 Opportunity Projects

The projects identified in Table 8-2 primarily focus on the reduction of phosphorus loading to the resources by implementing BMPs and streambank stabilization to address water quality goal WQual 1 and water quantity goal WQuan 2. Through the public input process, additional goals have been identified as important elements. These goals focus on habitat and ecology, other pollutants, groundwater, and best management practices that infiltrate, conserve groundwater, protect baseflow and reduce stormwater runoff. In addition, three opportunity projects were identified in the Downtown Chanhassen BMP Retrofit Assessment Findings Report (Barr Engineering Co., 2017) , including a stormwater reuse system for downtown Chanhassen, West Village rain gardens and tree trenches at Chanhassen Cinema. Other potential management techniques that address these goals can be identified in Table 8-3. These opportunity projects could be identified through additional data collection, future study efforts and innovation.

Table 8-3 Opportunity Projects in the Riley Creek Watershed

Topic	Sub-topic	Goal	Most Applicable Strategies	Examples of Projects
Habitat & ecology	Habitat protection & establishment	WQual 1. Protect, manage, and restore water quality of District lakes and creeks to maintain designated uses. WQual 2. Preserve and enhance the quantity, as well as the function and value of wetlands. WQual 3. Preserve and enhance habitat important to fish, waterfowl, and other wildlife.	WQual S3. The District encourages cities and developers to seek opportunities to incorporate habitat protection or enhancement into development and redevelopment projects.	Riparian Habitat Restoration Wetland enhancement and restoration Green Corridor Expansion In-stream hydrologic improvements Aquatic plant management Carp management activities Enhance regulatory program
	Buffers & bioengineering		WQual S7. The District will promote the use of natural materials and bioengineering for the maintenance and restoration of shorelines and streambanks where appropriate. WQual S11. The District recognizes the multiple benefits of vegetated buffers and promotes the use of vegetated buffers around all waterbodies.	
	aquatic invasive species		WQual S4. The District will implement measures to manage carp populations in District-managed waterbodies.	

Topic	Sub-topic	Goal	Most Applicable Strategies	Examples of Projects
			WQual S9. The District will partner with other entities to minimize the spread and reduce the adverse ecological impacts of aquatic invasive species.	
Erosion	Erosion & sediment pollution	WQual 1. Protect, manage, and restore water quality of District lakes and creeks to maintain designated uses. WQual 2. Preserve and enhance the quantity, as well as the function and value of wetlands. WQual 3. Preserve and enhance habitat important to fish, waterfowl, and other wildlife.	WQual S1. The District seeks to minimize the negative impacts of erosion and sedimentation through the District's regulatory, education and outreach, and incentive programs. WQual S2. The District will inventory and address areas within the watershed with existing erosion issues and/or areas at high risk for erosion by implementing the District's capital improvement, incentive and regulatory programs.	Shoreline and streambank protection and restoration (e.g., buffers and stabilization efforts) Rainfall abstraction (e.g., rain gardens, reuse, and permeable pavements) Enhance regulatory program
Pollution	Chloride pollution	WQual 1. Protect, manage, and restore water quality of District lakes and creeks to maintain designated uses. WQual 2. Preserve and enhance the quantity, as well as the function and value of wetlands. WQual 3. Preserve and enhance habitat important to fish, waterfowl, and other wildlife.	WQual S12. The District will assist and cooperate with cities, MPCA, MDNR, MnDOT, other watershed and other stakeholders in implementing projects or other management actions based on the Minnesota Pollution Control Agency's Twin Cities Metro Chloride TMDL.	Municipal cost-share projects
	Non-point source pollution		WQual S13. The District will continue to minimize pollutant loading to water resources through implementation of the District's capital improvement, regulatory, education and outreach, and incentive programs. WQual S14. The District will continue to identify opportunities and actions to protect, restore, and enhance District-managed resources.	Watershed BMPs (e.g., iron enhanced sand, ponds, etc.) In-lake water quality treatment projects (e.g., alum treatment) Rainfall abstraction (e.g., rain gardens, reuse, and permeable pavements) Enhance regulatory program
	Emerging topics		WQual S15. The District will cooperate with other entities to investigate treatment effectiveness of emerging practices.	Demonstration and pilot-scale water quality treatment projects

Topic	Sub-topic	Goal	Most Applicable Strategies	Examples of Projects
			WQual S16. The District will work with the state agencies and local governmental units to identify emerging pollutants of concern.	
Groundwater	Groundwater conservation	Ground 1. Promote the sustainable management of groundwater resources.	Ground S1. The District will promote the conservation of groundwater resources through its education and outreach program and will work with cities to encourage conservation practices (e.g. water reuse)	Rainfall abstraction (e.g., rain gardens, reuse, and permeable pavements) Larger scale infiltration practices in targeted locations
	Groundwater-surface water interactions		Ground S3. The District will work to increase the understanding of the interaction between groundwater resources and surface waters within the District and consider those interactions in future management decisions.	
Water Quantity	Baseflow impacts	WQuan 1. Protect and enhance the ecological function of District floodplains to minimize adverse impacts. WQuan 2. Limit the impact of stormwater runoff on receiving waterbodies.	WQuan S2. The District will promote strategies that minimize baseflow impacts.	Larger scale infiltration practices in targeted locations Rainfall abstraction practices (e.g., rain gardens, permeable pavements) LID cost-share projects within municipalities Water reuse projects Stormwater retention and detention (e.g., ponds, filtration) Flood risk mitigation projects Enhance regulatory program
	Infiltration practices		WQuan S3. The District will continue to promote infiltration, where feasible, as a best management practice to reduce runoff volume, improve water quality, and promote aquifer recharge.	
	Low impact development		WQuan S7. The District promotes/encourages cities and developers to implement Low Impact Development (LID) practices and will work with cities to reduce regulatory barriers to LID practices.	
	Conservation practices		WQuan S9. The District will work with cities and other stakeholders to encourage conservation practices (e.g. water reuse) to protect creeks, lakes and wetlands.	
	Flood risk reduction		WQuan S8. The District will develop and implement actions to reduce flood risk within the District	

Placeholder for Riley Creek fact sheet page 1

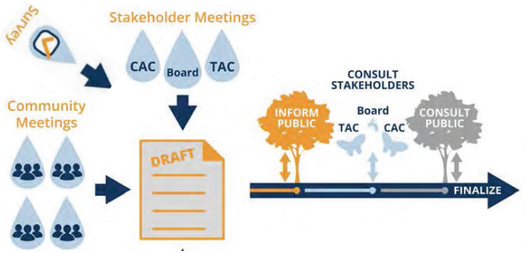
What's happening

WATERSHED MANAGEMENT PLAN

One of the most important projects the watershed worked on in 2017 was updating its Watershed Managment Plan.

This watershed management plan (also called the 10-Year Plan) guides the District's actions for the next 10 years.

The community played an essential role by participating in a public engagement process. Close to 500 stakeholders engaged in this process, making their voices heard about their values for clean water. The graphic to the right highights how the communitry contributed to the planning effort.



The draft plan was relased for public review in late 2017. After comments are addressed, the District will submit a final plan for approval in 2018. Check our website for updates on the process: rpbcwd.org

Thank you! To everyone who shared their thoughts, ideas, hopes and concerns. We truly appreciate you being a part of this process.

YOU CAN HELP

Rainwater runoff, the water that flows across yards, parking lots, and streets into stormdrains, is one of the main causes of pollution in urban areas. You can take simple actions to help protect Riley Creek.

Keep the curb clean
Sweep up leaves, grass clippings and fertilizer from driveways and streets.

Water with care
Grass requires 1-inch of water per week: about one hour of sprinkling per week if it has not rained.

Salt smart
The salt we use to melt ice can pollute our lakes and creeks. Use salt sparingly and always shovel first.

Reuse the rain
Collect and reuse rainwater with a rain barrel.

Build a raingarden
Raingardens soak up water and filter out pollution. Visit our website for help.

Contact us

and find out how you can get involved

DISTRICT OFFICE
18681 Lake Drive East
Chanhassen, MN
55317

CONTACT INFO
952.607.6512
info@rpbcwd.org
rpbcwd.org

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Riley Creek

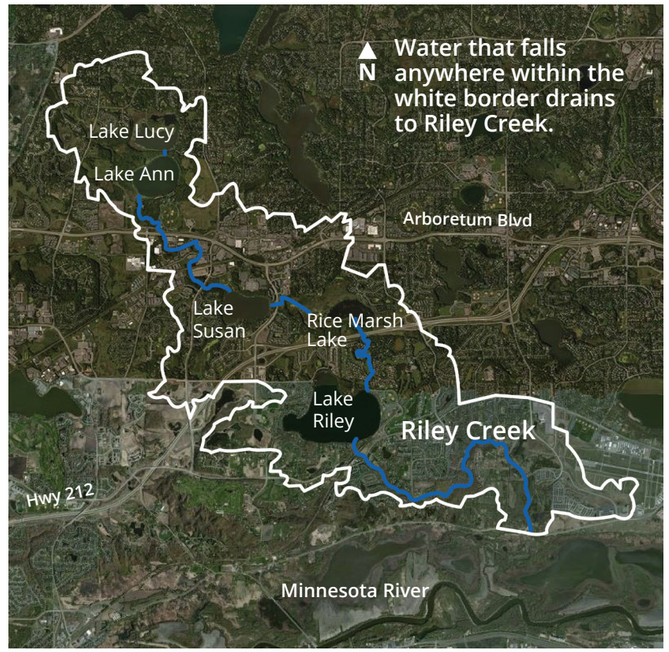
2017

Riley Creek begins at lakes Lucy and Ann in Chanhassen and flows through three, downstream lakes - Susan, Riley, Rice Marsh - before descending to the Minnesota River Valley. The creek has mild topography in the upper and middle portions of the watershed, but below Lake Riley the banks become steep.

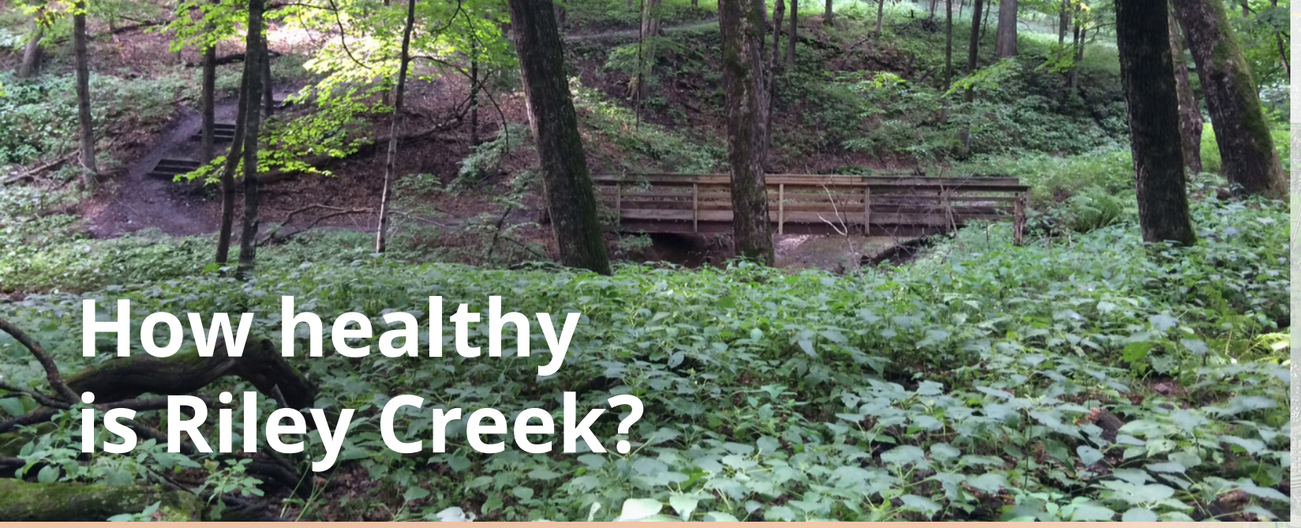
CHARACTERISTICS

Length	9.6 miles
Elevation change	230 ft
Watershed size	10 sq miles
# of cities in watershed	2
# of lakes connected	5
# of monitoring sites	5
# of parks	11
Impairment	Turbidity
Common fish	Green Sunfish, Fathead Minnow, Bluntnose Minnow
Invasive species	Buckthorn, Common Carp

WATERSHED BOUNDARIES



LAND USE in the Riley Creek Watershed



How healthy is Riley Creek?

Keeping Riley Creek healthy requires several tools and strategies. Conducting projects to stabilize the stream banks and restore stretches is one important strategy. Cleaning and slowing rainwater runoff before it reaches the creek is another. But before either of these can be done, we need to understand how the creek is doing and where it needs the most help.

To this end, the watershed district as well as the Metropolitan Council have been monitoring Riley Creek water quality for almost 20 years. Recently, the district developed a new tool to assess the creek: the Creek Restoration Action Strategy (CRAS). The CRAS uses water quality data, as well as information on erosion and habitat to rank which creek sections are doing the best, and which are doing the poorest. Below, the three major types of data used in the assessment are described. On the next page, a creek map shows the results from 2017.

Water quality

District staff take samples at five sites during summer. They gather information about nutrient levels (phosphorus), sediment, pH, and dissolved oxygen. These data let us know how clean the water is, and whether it is healthy for plants, animals, and people.

Erosion

Every year, staff walk along sections of the creek. They note sites with erosion, its severity, and whether any structures like houses or bridges are in danger. Erosion is also a problem because the sediment that erodes into the creek is a pollutant.

Habitat

Creeks are important habitat for insects, plants, fish, birds, and other animals. When staff check for erosion, they also assess the habitat. Reaches receive a score based on the quality of habitat they provide, and whether it needs to be restored.

Dive deeper

Interested in learning more? Explore the following reports on our website.

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

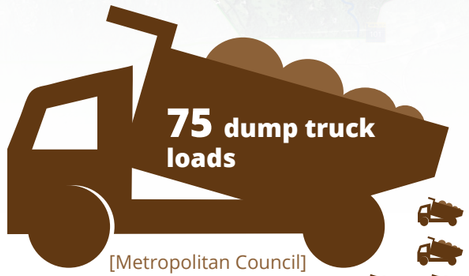
Restoration prioritization
RPBCWD & BARR Engineering. 2017. Creek Restoration Action Strategy.

Carp management
Bajer P.G., Headrick,M., Miller B. D. and Sorensen P. W. 2014. Development and implementation of a sustainable strategy to control common carp in Riley Creek Chain of Lakes. University of Minnesota.

2017 ASSESSMENT RESULTS

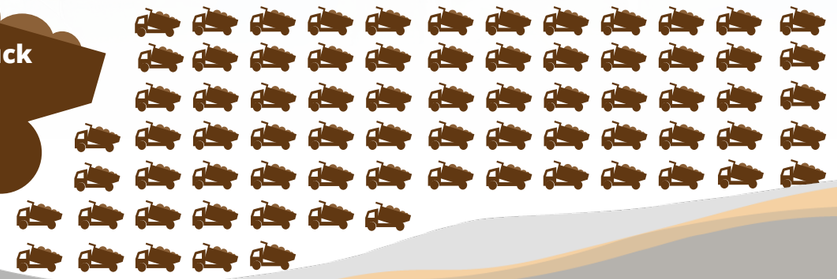
Each section of Riley Creek is coded with one of five colors based on how healthy it is. Blue is the best and red the worst.

There is considerable erosion in lower Riley Creek, below Lake Riley, and the creek is listed as impaired for turbidity by the Minnesota Pollution Control Agency. This means it has too much sediment in its water. The district is working with its partners to improve Riley Creek by conducting restoration projects at the sites in most need.



[Metropolitan Council]

Each year, Riley Creek carries the average equivalent of 75 dump truck loads of **sediment** into the **Minnesota River Valley**



What's happening

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Thank you! To everyone who shared their thoughts, ideas, hopes and concerns. We truly appreciate you being a part of this process.

DIVE DEEPER

Interested in learning more? Explore the following reports on our website.

Aquatic plants

Johnson, J. 2017. 2017 Aquatic Plan Survey: Lake Ann.

JaKa, J. and Newman, R. 2014. Aquatic Plant Community of Lakes Ann, Lotus, Lucy, Mitchell, Susan, Riley and Staring within the Riley Purgatory Bluff Creek Watershed: Final Report 2009 – 2014. University of Minnesota.

Watershed study

BARR Engineering. 2013. Lake Lucy and Lake Ann: Use Attainability Analysis.

Stormwater ponds

RPBCWD. 2013. Stormwater pond project.

Carp management

Bajer P.G., Headrick,M., Miller B. D. and Sorensen P. W. 2014. Development and implementation of a sustainable strategy to control common carp in Riley Creek Chain of Lakes. University of Minnesota.

Contact us

and find out how you can get involved

DISTRICT OFFICE
18681 Lake Drive East
Chanhassen, MN
55317

CONTACT INFO
952.607.6512
info@rpbcwd.org
rpbcwd.org

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Lake Ann

2017

Located in Chanhassen, Lake Ann is at the headwaters of Riley Creek. Over the past 40 years, Lake Ann has consistently met Minnesota Pollution Control Agency clean water standards.

CHARACTERISTICS

Size	119 acres
Volume	2005 acre-ft
Average depth	16.8 ft
Max depth	40 ft
Watershed size	250 acres
Land draining directly into	105 acres
MPCA lake classification	Deep
Impairment listing	Mercury
Trophic status	Mesotrophic
Common fish	Bluegill, White Sucker, Black Crappie, Yellow Perch
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp, Brittle Naiad

WATERSHED BOUNDARIES

LAND USE in the Lake Ann Watershed

How healthy is Lake Ann?

For the past 40 years, Lake Ann has consistently met the clean water standards set by the Minnesota Pollution Control Agency (MPCA). The graphs on the next page show the trends over time. The red line on each graph marks the MPCA standard. The goal is for the average values (the dots) to be below the red line.

During the growing season (June - September), district staff visit Lake Ann every other week to collect water samples and take measurements. The water samples are sent to a lab where they are tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). Staff also measure how clear the water is using a disk that is lowered into the water until it can no longer be seen. All three of these parameters help indicate whether the water is clean. Find out more about each on the next page.

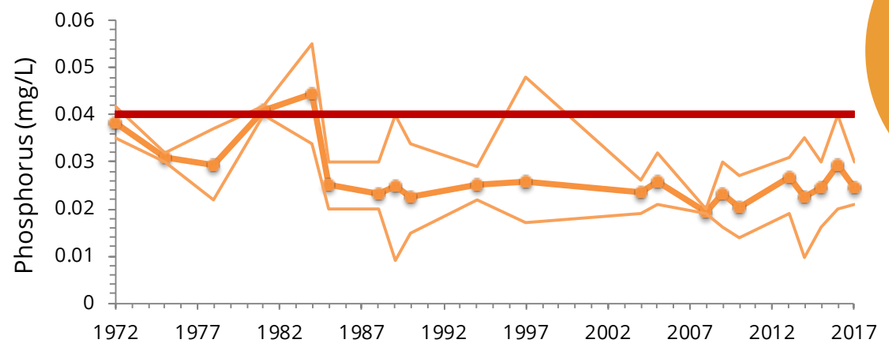
Ann is classified as a “Deep Lake”, which means that it is over 15 feet deep and light can not reach the bottom in most of the lake. To be considered healthy by the MPCA, deep lakes need to be clear enough to see 1.4 meters down, and have very low TP and Chl-a levels. Water quality increased from 2016 to 2017, and remains well below the MPCA standards.

District staff monitoring Lake Ann during the fall.

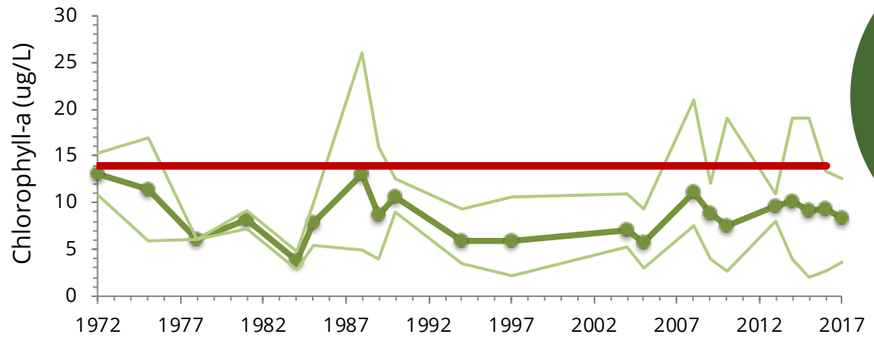
A common loon taking a dip in Lake Ann.

Water quality graphs 1972 - 2017

Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



Phosphorus is a nutrient that plants and algae need to grow. It is often measured as total phosphorus (TP). Too much phosphorous can cause algae blooms.



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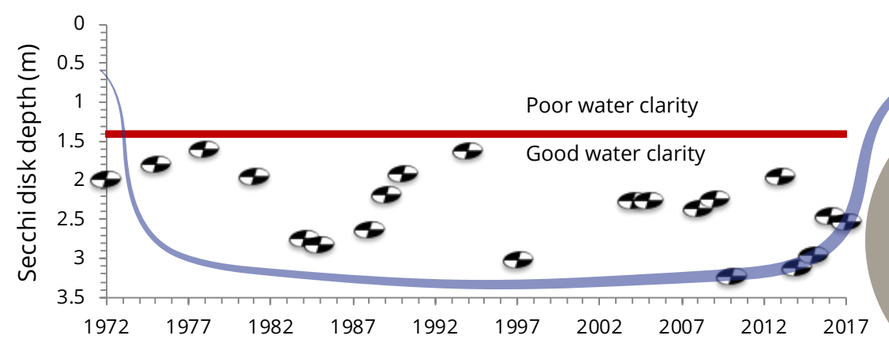

Water clarity is measured using a **Secchi Disk**, a black and white disk the size of a dinner plate. It is lowered into the water, and the depth at which it is no longer visible is recorded.

Summary table

	MPCA standard	1972 - 2016 max	1972 - 2016 min	1972 - 2016 average	2017 max	2017 min	2017 average
TP	<0.04 mg/l	0.055	0.009	0.026	0.03	0.021	0.024
Chl-a	<14 ug/l	26.0	2.0	8.5	12.5	3.56	8.4
Secchi	>1.4 m	6.8	1.0	2.5	3.5	1.8	2.5

In August, the invasive species **Brittle Naiad** was found in Lake Ann. RPBCWD implemented a **rapid response plan** to treat the lake and plans to reassess the lake in early 2018. We remind our community **clean, drain,** and **dry** boats and other equipment after each visit to a lake.

Clean all visible aquatic plants, zebra mussels, and any other invasive species before leaving any water access.

Drain water-related equipment by removing drain plugs, and keep them out while transporting.

Dry your boat, trailer, and all equipment for at least 5 days.

What's happening

WATERSHED MANAGEMENT PLAN

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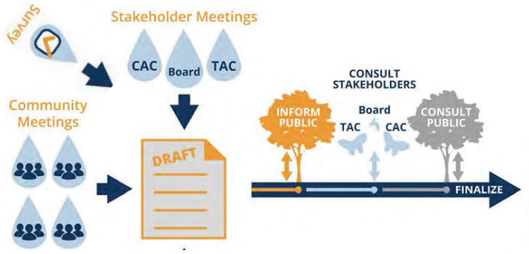

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Wenck Associates Inc. 2015. Lake Lucy Aquatic Plant Management Plan.

Watershed study

BARR Engineering. 2013. Lake Lucy and Lake Ann: Use Attainability Analysis.

Carp management

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RPBCWD. 2013. Stormwater pond project.

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Lake Lucy

2017

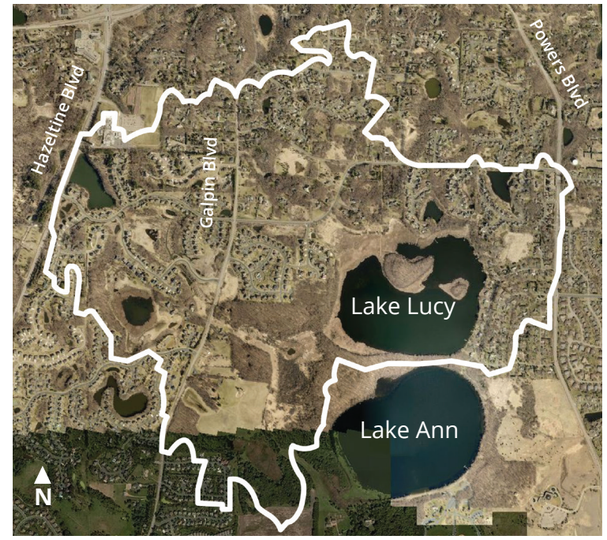
Lake Lucy is the headwaters to Riley Creek. Water flows out of Lucy to Lake Ann and then into Riley Creek. On its way south to the Minnesota River, Riley Creek passes through Lakes Susan, Rice Marsh, and Riley.

CHARACTERISTICS

Size	88 acres
Volume	558 acre-ft
Average depth	6.5 ft
Max depth	20 ft
Watershed size	997 acres
Land draining directly into	111 acres
MPCA lake classification	Shallow
Impairment listing	Mercury
Trophic status	Eutrophic
Common fish	Bluegill, Northern Pike, Yellow Bullhead
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES

Water that falls anywhere within the white border drains to Lake Lucy.



LAND USE in the Lake Lucy Watershed

How healthy is Lake Lucy?

Water quality in Lake Lucy increased from 2016 to 2017, and met two of the clean water standards set by the Minnesota Pollution Control Agency (MPCA). The graphs on the next page show the trends over time. The red line on each graph marks the MPCA standard. The goal is for the average values (the dots) to be below the red line.

During the growing season (June - September), district staff visit Lake Lucy every other week to collect water samples and take measurements. The samples are sent to a lab and tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). Staff also measure how clear the water is using a disk that is lowered into the water until it can no longer be seen. These parameters help indicate whether the water is clean.

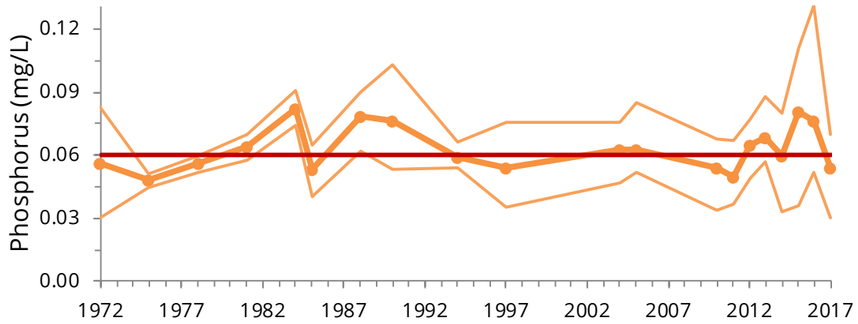
Lucy is classified as a "Shallow Lake", which means that it is generally less than 15 feet deep and light can reach the bottom in most of the lake. This ample light means that shallow lakes often have a lot of aquatic plants, and are habitat to many types of fish and birds. To be considered healthy by the MPCA, shallow lakes need to be clear enough to see one meter down, and have low TP and Chl-a levels.

A volunteer extracting invasive Common Carp from Lake Lucy.

Lake Lucy on a beautiful summer afternoon.

Water quality graphs 1972 - 2017

Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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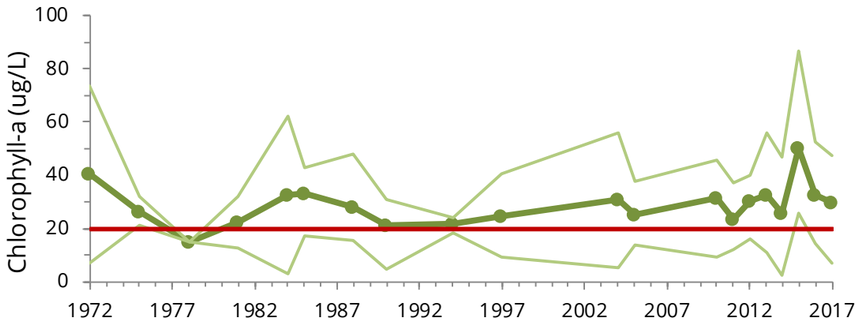

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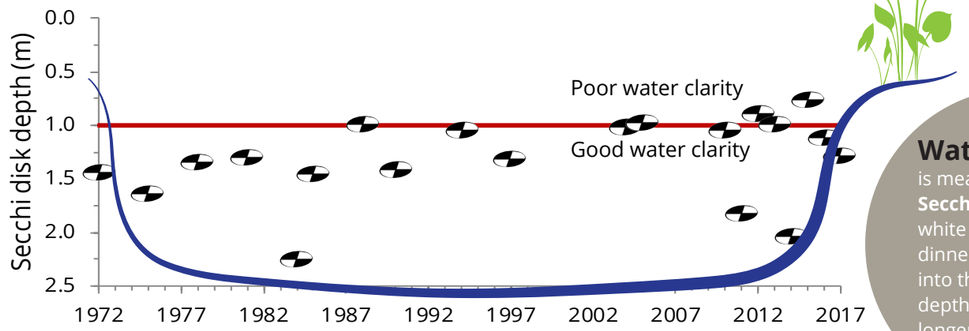

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Summary table

	MPCA standard	1972 - 2016 max	1972 - 2016 min	1972 - 2016 average	2017 max	2017 min	2017 average
TP	<0.06 mg/l	0.11	0.03	0.064	0.07	0.03	**0.05**
Chl-a	<20 ug/l	87	2.7	29.8	47.2	7.12	**30.01**
Secchi	>1 m	6.9	0.5	1.3	3.15	0.8	**1.3**

Rainwater runoff, the water that flows across yards, parking lots, and streets into stormdrains, is one of the main causes of pollution in urban areas. You can take simple actions to help protect Lake Lucy.

Keep the curb clean

Sweep up leaves, grass clippings and fertilizer from driveways and streets.

Water with care

Grass requires 1-inch of water per week: about one hour of sprinkling per week if it has not rained.

Salt smart

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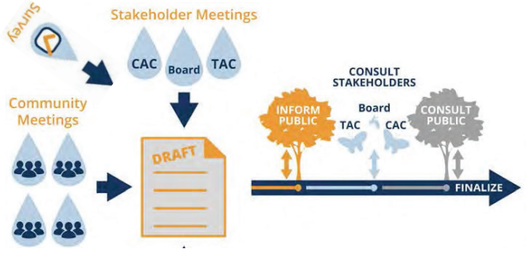

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DIVE DEEPER

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Aquatic plants

Johnson, J. 2017. 2017 Aquatic Plan Survey: Rice Marsh Lake

Blue Water Science. 2014. Aquatic plant survey for Rice Marsh Lake, Eden Prairie.

Carp management

Bajer P.G., Headrick,M., Miller B. D. and Sorensen P. W. 2014. Development and implementation of a sustainable strategy to control common carp in Riley Creek Chain of Lakes. University of Minnesota.

Paleolimnology

Ramstack Hobbs J. M. and M.B. Edlund. 2014. Historical water quality and ecological change in Rice Marsh Lake. St. Croix Watershed Research Station.

Stormwater ponds

RPBCWD. 2013. Stormwater pond project.

Watershed study

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Rice Marsh Lake

2017

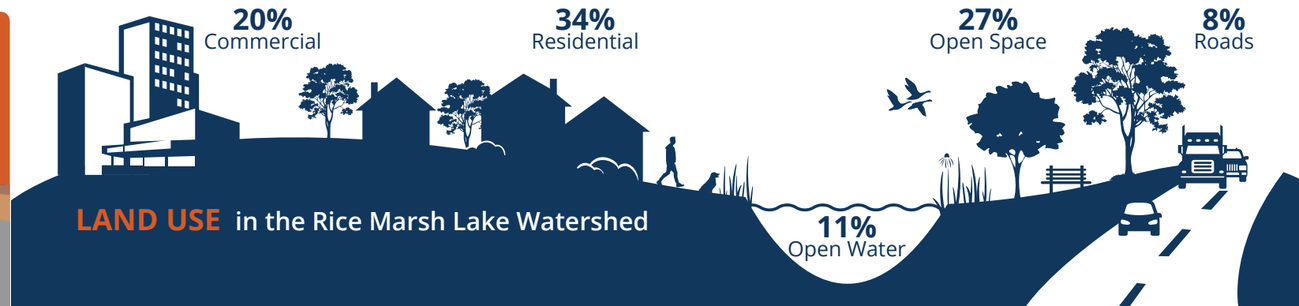
Located in both Eden Prairie and Chanhassen, Rice Marsh Lake is aerated in the winter. This management practice helps keep bluegill sunfish alive so that they can feed on invasive carp eggs in the spring.

CHARACTERISTICS

Size	83 acres
Volume	375 acre-ft
Average depth	5 ft
Max depth	11 ft
Watershed size	966 acres
Land draining directly into	280 acres
MPCA lake classification	Shallow
Impairment listing	Not listed
Trophic status	Hypereutrophic
Common fish	Bluegill, White Sucker, Northern Pike
Invasive species	Curlyleaf Pondweed, Purple Loosestrife. Common Carp

WATERSHED BOUNDARIES

Water that falls anywhere within the white border drains to Rice Marsh Lake.



LAND USE in the Rice Marsh Lake Watershed

How healthy is Rice Marsh Lake?

Water quality in Rice Marsh Lake improved from 2016 to 2017 and met all three parameters for clean water standards set by the Minnesota Pollution Control Agency (MPCA). The graphs on the next page show the trends over time. The red line on each graph marks the MPCA standard. The goal is for the average values (the dots) to be below the red line.

During the growing season (June - September), district staff visit Rice Marsh Lake every other week to collect water samples and take measurements. The water samples are sent to a lab where they are tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). Staff also measure how clear the water is using a disk that is lowered into the water until it can no longer be seen. All three of these parameters help indicate whether the water is clean.

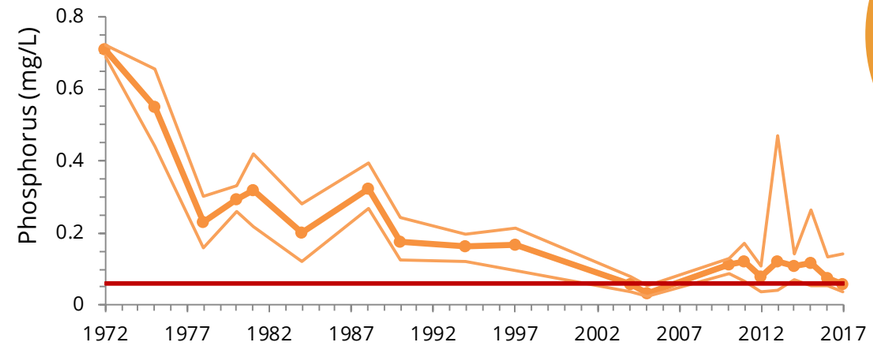
Rice Marsh is classified as a "Shallow Lake", which means that it is generally less than 15 feet deep and light can reach the bottom in most of the lake. This ample light means that shallow lakes often have a lot of aquatic plants, and are habitat to many types of fish and birds. To be considered healthy by the MPCA, shallow lakes need to be clear enough to see one meter down, and have low TP and Chl-a levels.

Motorized boats are not allowed on the shallow Rice Marsh Lake, but it is a popular place to kayak and canoe.

Two Canadian Geese resting on Rice Marsh Lake before preparing themselves for flight.

Water quality graphs 1972 - 2017

Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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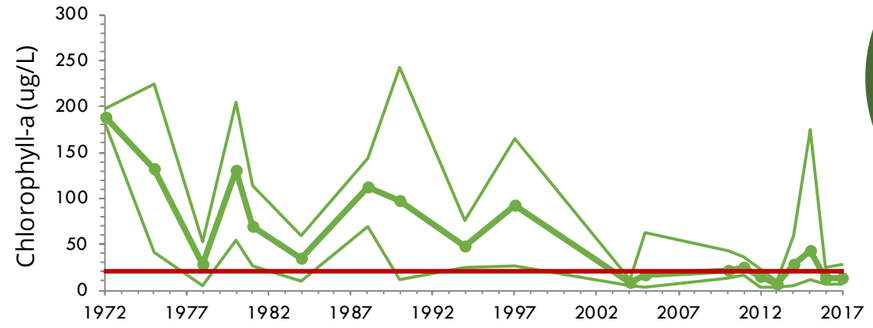

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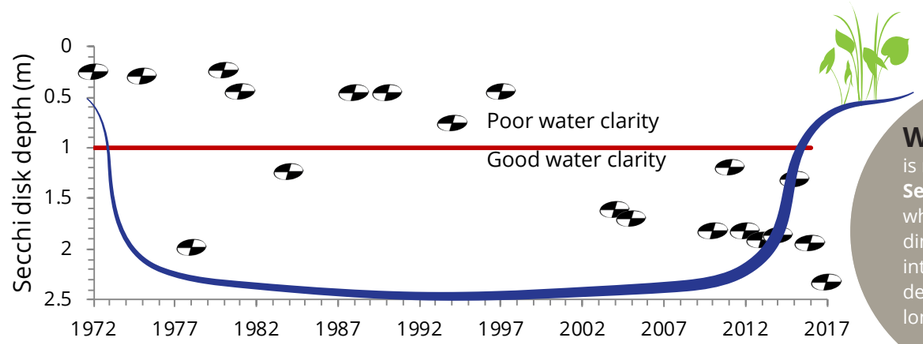

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Summary table

	MPCA standard	1972 - 2016			2017		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.72	0.026	0.15	0.144	0.039	**0.059**
Chl-a	<20 ug/l	242.4	2.7	43.1	28.5	6.23	**13.62**
Secchi	>1 m	3.2	0.1	1.36	2.85	1.4	**2.33**

Rainwater runoff, the water that flows across yards, parking lots, and streets into stormdrains, is one of the main causes of pollution in urban areas. You can take simple actions to help protect Rice Marsh Lake.

Keep the curb clean

Sweep up leaves, grass clippings and fertilizer from driveways and streets.

Water with care

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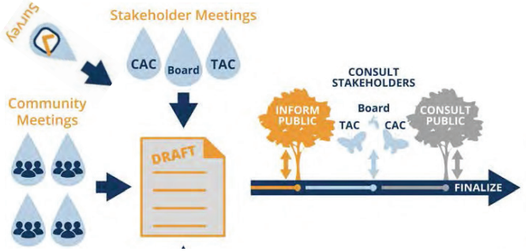

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Alum Fact Sheet
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Lake Riley

2017

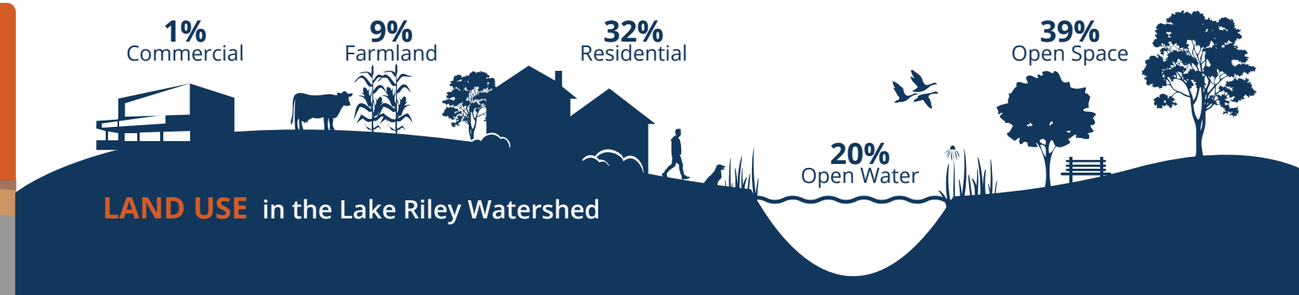
At 297 acres, and with an average depth of 23 ft, Lake Riley is one of the largest lakes in the Riley Purgatory Bluff Creek Watershed District. It is located on the boundary of the cities of Chanhassen and Eden Prairie and is a popular summer recreation stop.

CHARACTERISTICS

Size	297 acres
Volume	6230 acre-ft
Average depth	23 ft
Max depth	49 ft
Watershed size	1776 acres
Land draining directly into	818 acres
MPCA lake classification	Deep
Impairment listing	Mercury & Nutrients
Trophic status	Eutrophic
Common fish	Bluegill, Northern Pike, Yellow Perch, Yellow Bullhead
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES

Water that falls anywhere within the white border drains to Lake Riley.



LAND USE in the Lake Riley Watershed

How healthy is Lake Riley?

Water quality in Lake Riley decreased slightly in 2017, but remained below or near the clean water standards set by the Minnesota Pollution Control Agency (MPCA).

During the growing season (June - September), district staff visit Lake Riley every other week to collect water samples and take measurements. The samples are sent to a lab where they are tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). Staff also measure how clear the water is using a disk that is lowered into the water until it can no longer be seen. All three of these test help indicate if the water is clean.

Riley is classified as a “Deep Lake”, which means that it is over 15 feet deep and light can not reach the bottom in most of the lake. To be considered healthy by the MPCA, it needs to be clear enough to see 1.4 meters down, and have very low TP and Chl-a levels.

The graphs on the next page show the trends over time. The red line on each graph marks the MPCA standard. The goal for each graph is for the average values (the dots) to be below the red line.

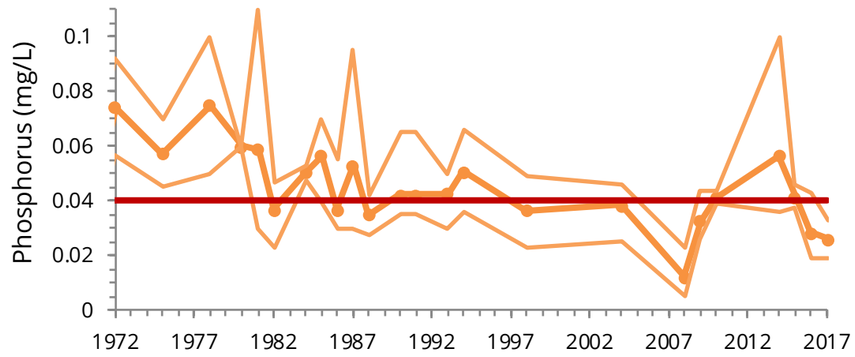
Lake Riley during different times of the year.

Top: Summer, 2017

Bottom: Fall, 2017

Water quality graphs 1972 - 2017

Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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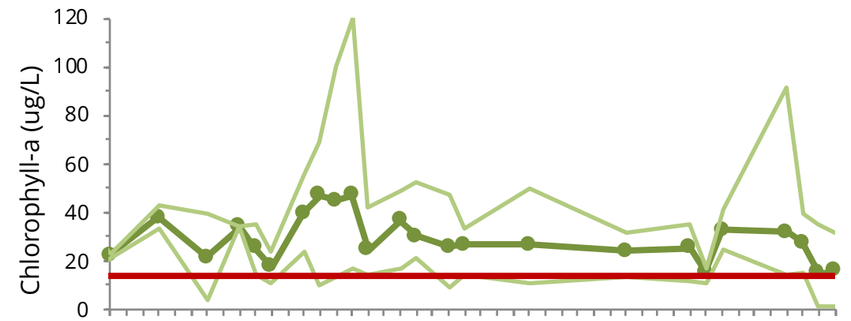

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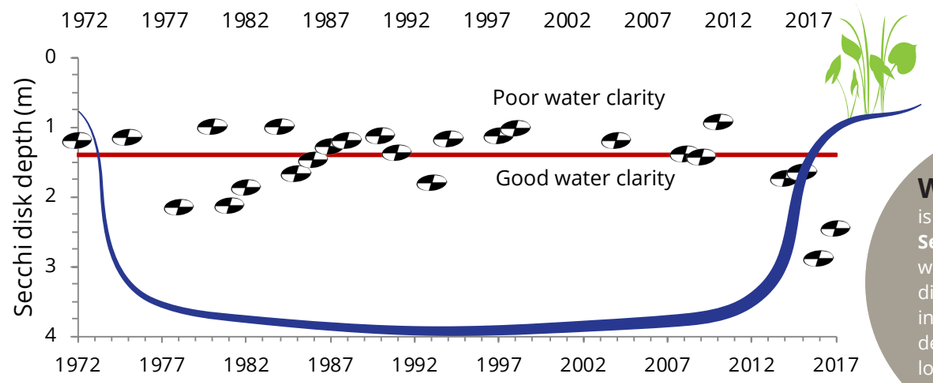

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Summary table

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TP	<0.04 mg/l	0.11	0.005	0.043	0.033	0.019	0.026
Chl-a	<14 ug/l	120	1.0	28.6	32	1.0	15.64
Secchi	>1.4 m	6.0	0.5	1.6	5.25	1.4	2.5

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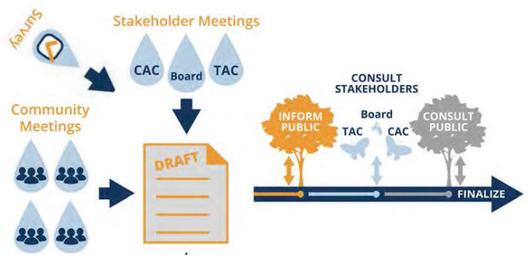

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Lake Susan

2017

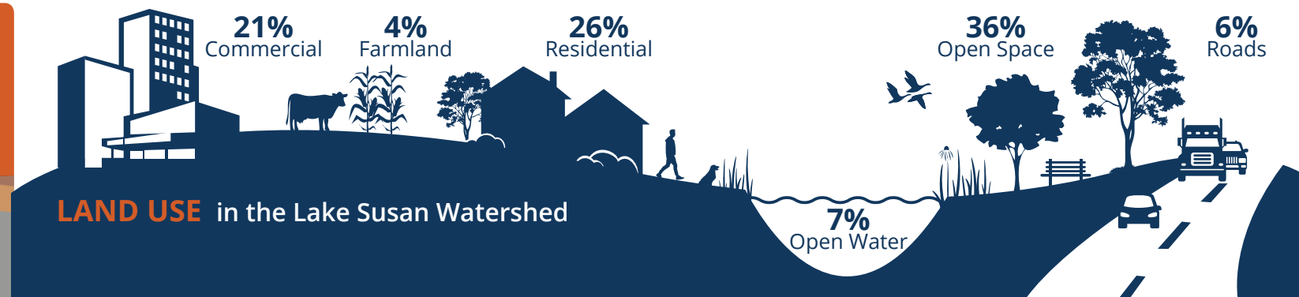
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Chanhassen, Lake Susan is a part of the Riley Creek Chain of Lakes. It is the third lake that Riley Creek flows through as it makes its way to the Minnesota River.

CHARACTERISTICS

Size	88 acres
Volume	885 acre-ft
Average depth	10 ft
Max depth	17 ft
Watershed size	1281 acres
Land draining directly into	66 acres
MPCA lake classification	Shallow
Impairment listing	Mercury & Nutrients
Trophic status	Eutrophic
Common fish	Bluegill, Black Crappie, Northern Pike, Black Bullhead
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES



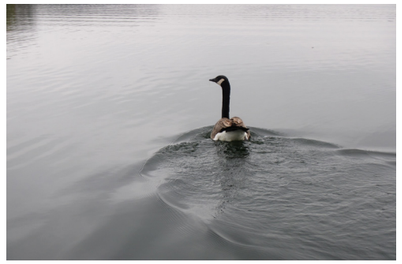
LAND USE in the Lake Susan Watershed

How healthy is Lake Susan?

For the past 40 years, Lake Susan water quality has consistently failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA), and 2017 kept with this trend. The graphs on the next page show the trends over time. The red line marks the MPCA standard. The goal is for the average values (the dots) to fall below the red line.

During the growing season (June - September), district staff visit Lake Susan every other week to collect water samples and take measurements. The water samples are sent to a lab where they are tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). Staff also measure how clear the water is using a disk that is lowered into the water until it can no longer be seen. All three of these parameters help indicate whether the water is clean. Find out more about each on the next page.

Susan is classified as a “Shallow Lake”, which means that it is generally less than 15 feet deep and light can reach the bottom in most of the lake. To be considered healthy by the MPCA, shallow lakes need to be clear enough to see one meter down, and have low TP and Chl-a levels. These shallow lake standards are listed in the summary table.

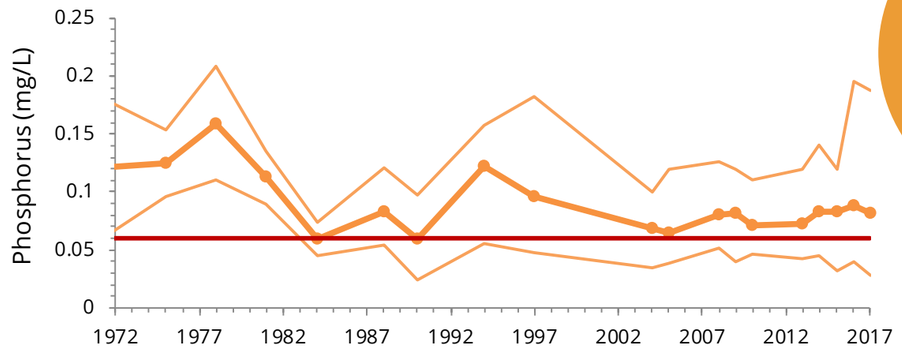


A goose takes a swim in Lake Susan.

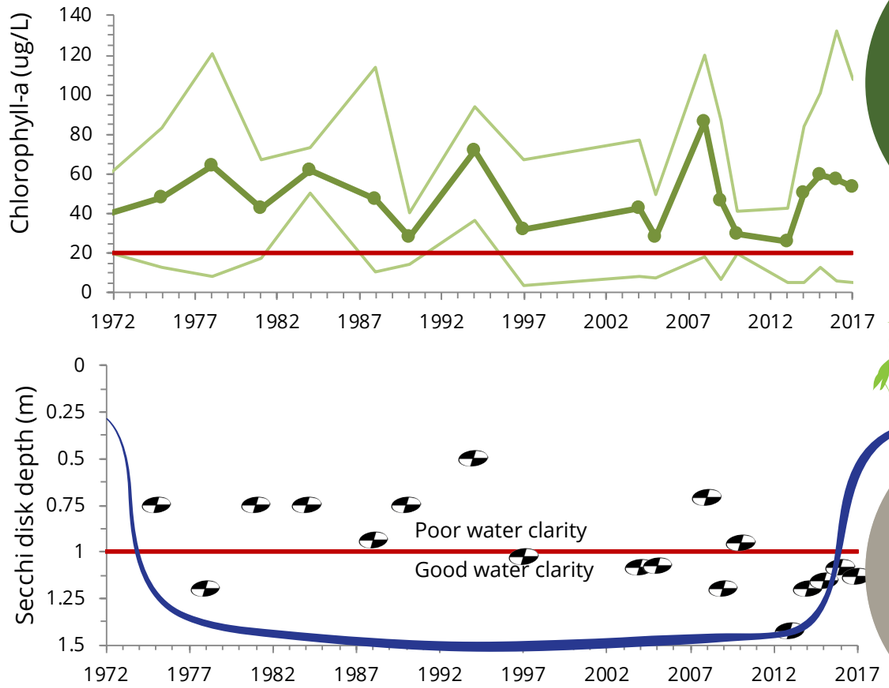
Staff collect water samples on Lake Susan.

Water quality graphs 1972 - 2017

Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



Phosphorus is a nutrient that plants and algae need for growth. It is often measured as total phosphorus (TP). Too much phosphorous can cause algae blooms.



Chlorophyll a is the main pigment in algae, so measuring chl-a can tell us how much algae there is. Too much chl-a means that there are too many nutrients in the water.

Water clarity is measured using a **Secchi Disk**, a black and white disk the size of a dinner plate. It is lowered into the water, and the depth at which it is no longer visible is recorded.

Rainwater runoff, the water that flows across yards, parking lots, and streets into stormdrains, is one of the main causes of pollution in urban areas. You can take simple actions to help protect Lake Susan.

Keep the curb clean

Sweep up leaves, grass clippings and fertilizer from driveways and streets.

Water with care

Grass requires 1-inch of water per week: about one hour of sprinkling per week if it has not rained.

Salt smart

The salt we use to melt ice can pollute our lakes and creeks. Use salt sparingly and always shovel first.

Reuse the rain

Collect and reuse rainwater with a rain barrel.

Build a raingarden

Raingardens soak up water and filter out pollution. Visit our website for help.

Summary table

	MPCA standard	1972 - 2016			2017		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.208	0.024	0.085	0.187	0.028	**0.082**
Chl-a	<20 ug/l	132	3.9	46.6	108	5.34	**53.48**
Secchi	>1 m	3.6	0.3	1	2.85	0.5	**1.1**