7.0 Purgatory Creek Watershed

The Purgatory Creek watershed is located at the eastern edge of the District, adjacent to the Riley Creek watershed to the west (see Figure 5-6). The Purgatory Creek watershed lies primarily within the cities of Eden Prairie and Minnetonka with portions of the watershed also within the cities of Chanhassen, Deephaven, and Shorewood. For management purposes, the District includes the Hyland Lake watershed in the city of Bloomington within the larger Purgatory Creek watershed. Hyland Lake is a landlocked under normal hydrologic conditions and is not tributary to Purgatory Creek. The Hyland Lake watershed outlets into the Minnesota River through a series of City of Bloomington stormwater management systems.

The watershed, creek, and lakes within the Purgatory Creek and Hyland Lake watersheds are summarized in the following fact sheets included in this section

- Purgatory Creek Fact Sheet
- Duck Lake Fact Sheet
- Hyland Lake Fact Sheet
- Lake Idlewild Fact Sheet
- Lotus Lake Fact Sheet
- Mitchell Lake Fact Sheet
- Red Rock Lake Fact Sheet
- Round Lake Fact Sheet
- Silver Lake Fact Sheet
- Staring Lake 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.

7.1 Purgatory Creek Watershed Issues

Table 7-1 summarizes issues identified in the Purgatory 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 Purgatory Creek watershed include:

- *Lotus, Silver, Duck, Round, Mitchell, Red Rock Use Attainability Analysis Update; Lake Idlewild and Staring Lake Use Attainability Analysis; and Lower Purgatory Creek Stabilization Study* (Barr Engineering Co., 2017)
- *Engineer's Report - Purgatory Creek Stabilization at County Roads 101 and 62* (Barr Engineering Co., 2014)
- *Purgatory Creek Restoration Basic Water Management Project* (CH2M HILL, 2009)
- *Purgatory Creek – Creek Restoration Action Strategy* (Barr Engineering Co. & Riley Purgatory Bluff Creek Watershed District, November 2015)
- *Red Rock Lake Aquatic Plant Management Plan* (Wenck Associates Inc., 2015)
- *Curlyleaf pondweed delineation and assessment for Red Rock Lake* (Blue Water Science, 2015)
- *Alum Application Assessment for Round Lake* (Blue Water Science, 2015)
- *Aquatic Plant Community of Red Rock Lake* (Wenck Associates Inc., 2015)
- *Staring Lake Eurasian Watermilfoil Early Detection and Rapid Response* (Fresh Water Scientific Services, 2015)
- *Mitchell Lake Aquatic Plant Management Plan* (Wenck Associates, Inc., 2014)
- *Aquatic Plant Surveys for Duck Lake* (Blue Water Science, 2013)
- *Aquatic Plant Surveys and Water Quality for Round Lake and Key Tributary Pond* (Blue Water Science, 2014)
- *Aquatic Plant Surveys for Silver Lake* (Blue Water Science, 2013)
- *Aquatic Plant Surveys for Idlewild Lake* (Blue Water Science, 2015)
- *Development and implementation of a sustainable strategy to control carp in Purgatory Creek Chain of Lakes* (Sorensen, Bajer, & Headrick, 2015)
- *Operations and Maintenance Plan for the Purgatory Creek Conservation Area* (Barr Engineering Co., 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.* (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)
- *Round Lake Calcium Nitrate Pilot Test* (Ch2M HILL, 2011)
- *Silver Lake Outlet, Flood Potential and MCES Interceptor* (CH2M HILL, 2010)
- *Mitchell Lake Phosphorus Management Study Report* (CH2M HILL, 2010)
- *Measurement of In situ Sediment Oxygen Demand Lake Mitchell, Lotus Lake, and Round Lake, MN* (HydrO2, Inc., 2008)
- *Historical Water Quality and Ecological Change of Three Lakes in the Riley-Purgatory-Bluff Creek Watershed District* (Ramstack & Edlund, 2011)
- *Paleolimnological Analysis of Silver Lake* (Ramstack Hobbs & Edlund, 2015)
- *Purgatory Creek Assessment Erosion site* (Riley Purgatory Bluff Creek Watershed District, 2014)
- *Purgatory Creek Assessment Lotus Lake Branch* (Riley Purgatory Bluff Creek Watershed District, 2014)
- *Purgatory Creek Assessment Silver Lake Branch* (Riley Purgatory Bluff Creek Watershed District, 2014)
- *Mobile P-Alum Dosing Study* (Barr Engineering Co., 2005)

Table 7-1 Purgatory Creek Watershed Stakeholder Identified Issues and Opportunities

Water Resource Issue Category (see Section 2.3.6)	Specific Issues in the Purgatory Creek Watershed	Opportunities to Address Issues
Water Quality (Pollution)	• Lake water quality • Stormwater pond monitoring • Red Rock Lake water quality	• Lake and other local associations • Volunteer opportunities • Cost share
Water Quality (Habitat)	• Invasive species management • Wetland identification • Wetland sediment accumulation	• Focused education about wetlands
Water Quality (Erosion)	• Areas of severe streambank erosion on Purgatory Creek	• None identified in workshop
Groundwater	• Withdrawal by City and private wells • Regulatory roles	• None identified in workshop
Water Quantity	• Allowable land uses adjacent to creek	• None identified in workshop
Note: Issues based on comments received at the Purgatory Creek stakeholder meeting. A complete list of stakeholder comments is included in Appendix A.		

7.2 Purgatory Creek Watershed Programs and Projects

Many of the issues present in the Purgatory 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 (see Section 9.0). Over the past several years, the District has implemented several capital improvement projects; watershed, in-lake, and creek BMPs as well as other management strategies, within the watershed to address water quality, water quantity, and other issues.

The District has also identified and prioritized proposed capital projects to address watershed issues over the life of this plan. Proposed projects the District may implement within the Purgatory Creek watershed are listed in Table 7-2; additional details are provided in the District's overall implementation program (see Table 9-1). Proposed projects within the Purgatory Creek watershed are shown in Figure 7-1.

The BMPs listed in Table 7-2 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 7-2 Proposed Projects in the Purgatory Creek Watershed

Source of Identified Project	City	Major Watershed	Resource	Project	Project Description	Goal Index	Sustainability Index	Volume Management Index	Pollutant Management	Stabilization	Habitat Restoration	Partnership	Education	Watershed Benefit	Total Benefit Score	Planning Level Estimated 30 year Cost	Funding Partner Opportunity
RPBCWD	Minnetonka	Purgatory Creek	Purgatory Creek	Scenic Heights	Scenic Heights Habitat Restoration	3	7	1	1	3	7	7	7	7	**43**	$300,000	
RPBCWD	Eden Prairie	Purgatory Creek	Purgatory Creek	P7	Creek Restoration and Stabilization	3	7	1	1	5	5	7	5	7	**41**	$247,000	
RPBCWD	Eden Prairie	Purgatory Creek	Purgatory Creek	Staring Lake StL_21	Creek Restoration and Stabilization	3	7	1	1	1	3	7	5	7	**35**	$450,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_6	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	5	7	**32**	$1,258,000	
RPBCWD	Chanhassen	Purgatory Creek	Silver Lake	Silver Lake SiL_2	Watershed Phosphorus Load Control	2	5	1	5	1	1	7	3	7	**32**	$535,000	
RPBCWD	Shorewood	Purgatory Creek	Silver Lake	Silver Lake SiL_1	Watershed Phosphorus Load Control	3	5	3	7	1	1	3	1	7	**31**	$811,000	
RPBCWD	Chanhassen	Purgatory Creek	Silver Lake	Silver Lake SiL_7	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	1	7	**28**	$332,000	
RPBCWD	Chanhassen	Purgatory Creek	Silver Lake	Silver Lake SiL_3	Slope Stabilization	3	3	1	5	1	5	1	1	7	**27**	$86,000	
RPBCWD	Chanhassen	Purgatory Creek	Silver Lake	Silver Lake SiL_5	Slope Stabilization	3	3	1	5	1	5	1	1	7	**27**	$80,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_1	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	5	7	**26**	$186,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_3	Watershed Phosphorus Load Control	2	5	1	5	1	1	3	1	7	**26**	$390,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_7	Watershed Phosphorus Load Control	2	5	1	5	1	1	3	1	7	**26**	$586,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_3 & LL_7	Watershed Phosphorus Load Control	2	5	1	5	1	1	3	1	7	**26**	$975,000	
RPBCWD	Chanhassen	Purgatory Creek	Silver Lake	Silver Lake SiL_4	Slope Stabilization - Stabilization of an eroding slope	3	3	1	3	1	5	1	1	7	**25**	$80,000	
RPBCWD	Shorewood	Purgatory Creek	Silver Lake	Silver Lake SiL_6	Slope Stabilization - Stabilization of an eroding slope	3	3	1	3	1	5	1	1	7	**25**	$52,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_8	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	1	7	**22**	$142,000	
RPBCWD	Chanhassen	Purgatory Creek	Lotus Lake	Lotus Lake LL_9	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	1	7	**22**	$556,000	
RPBCWD	Eden Prairie	Purgatory Creek	Duck Lake	Duck Lake DL_3	Watershed Phosphorus Load Control	3	5	3	7	1	3	3	7	5	**37**	$213,000	
RPBCWD	Minnetonka	Purgatory Creek	Purgatory Creek	P4	Creek Restoration and Stabilization	3	7	1	1	7	5	1	3	5	**33**	$1,005,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_2	Watershed Phosphorus Load Control	3	5	5	1	1	3	3	5	5	**31**	$253,000	

Table 7-2 Proposed Projects in the Purgatory Creek Watershed

Source of Identified Project	City	Major Watershed	Resource	Project	Project Description	Goal Index	Sustainability Index	Volume Management Index	Pollutant Management	Stabilization	Habitat Restoration	Partnership	Education	Watershed Benefit	Total Benefit Score	Planning Level Estimated 30 year Cost	Funding Partner Opportunity
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_1	Creek Restoration and Stabilization	3	7	1	1	5	5	1	1	5	**29**	$1,173,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_8	Watershed Phosphorus Load Control	2	5	3	1	1	1	3	7	5	**28**	$629,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_11	Watershed Phosphorus Load Control	3	3	5	3	1	1	3	3	5	**27**	$5,100,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_12	Watershed Phosphorus Load Control	3	3	5	1	1	1	3	1	5	**23**	$270,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_3	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	1	5	**20**	$270,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_4	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	1	5	**20**	$203,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_5	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	1	5	**20**	$926,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_7	Watershed Phosphorus Load Control	2	5	1	1	1	1	1	3	5	**20**	$207,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_10	Watershed Phosphorus Load Control	2	1	3	1	1	1	3	3	5	**20**	$852,000	
RPBCWD	Eden Prairie	Purgatory Creek	Lake Ildewild	Lake Idlewild LI_4	Watershed Phosphorus Load Control	3	5	5	7	1	3	3	7	3	**37**	$0	
RPBCWD	Eden Prairie	Purgatory Creek	Round Lake	Round Lake RL_1	Watershed Phosphorus Load Control	3	5	3	7	1	3	3	7	3	**35**	$118,000	
RPBCWD	Eden Prairie	Purgatory Creek	Round Lake	Round Lake RL_4	Watershed Phosphorus Load Control	3	5	3	7	1	3	3	7	3	**35**	$362,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring lake	Staring Lake Outlet	Outlet modifications at Staring Lake	3	5	1	1	3	5	7	7	3	**35**	$400,000	
RPBCWD	Eden Prairie	Purgatory Creek	Round Lake	Round Lake RL_2	Watershed Phosphorus Load Control	3	3	3	7	1	3	3	3	3	**29**	$245,000	
RPBCWD	Eden Prairie	Purgatory Creek	Red Rock Lake	Red Rock Lake RRL_2	Watershed Phosphorus Load Control	3	5	3	7	1	3	3	1	3	**29**	$90,000	
RPBCWD	Eden Prairie	Purgatory Creek	Lake Ildewild	Lake Idlewild LI_2a & LI_2b	Watershed Phosphorus Load Control	3	5	3	7	1	3	3	1	3	**29**	$667,000	
RPBCWD	Eden Prairie	Purgatory Creek	Red Rock Lake	Red Rock Lake RRL_1	Watershed Phosphorus Load Control	2	5	1	7	1	1	3	5	3	**28**	$306,000	
RPBCWD	Eden Prairie	Purgatory Creek	Red Rock Lake	Red Rock Lake RRL_6	Watershed Phosphorus Load Control	2	5	1	7	1	1	3	5	3	**28**	$194,000	
RPBCWD	Eden Prairie	Purgatory Creek	Red Rock Lake	Red Rock Lake RRL_7	Watershed Phosphorus Load Control	2	5	1	7	1	1	3	5	3	**28**	$441,000	

Table 7-2 Proposed Projects in the Purgatory Creek Watershed

Source of Identified Project	City	Major Watershed	Resource	Project	Project Description	Goal Index	Sustainability Index	Volume Management Index	Pollutant Management	Stabilization	Habitat Restoration	Partnership	Education	Watershed Benefit	Total Benefit Score	Planning Level Estimated 30 year Cost	Funding Partner Opportunity
RPBCWD	Eden Prairie	Purgatory Creek	Purgatory Creek	Staring Lake StL_18	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	5	3	**28**	$812,000	
RPBCWD	Eden Prairie	Purgatory Creek	Purgatory Creek	Staring Lake StL_15a & StL_15b	Watershed Phosphorus Load Control	3	5	5	1	1	3	3	3	3	**27**	$894,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_17	Creek Restoration and Stabilization	3	7	1	1	1	3	3	7	3	**29**	$550,000	
RPBCWD	Eden Prairie	Purgatory Creek	Mitchell Lake	Mitchell Lake ML_2	In-Lake Phosphorus Load Control	2	3	1	7	1	3	3	1	3	**24**	$518,000	
RPBCWD	Eden Prairie	Purgatory Creek	Mitchell Lake	Mitchell Lake ML_3	Watershed Phosphorus Load Control	2	5	1	7	1	1	3	1	3	**24**	$579,000	
RPBCWD	Eden Prairie	Purgatory Creek	Red Rock Lake	Red Rock Lake RRL_4	Watershed Phosphorus Load Control	2	5	1	7	1	1	3	1	3	**24**	$980,000	
RPBCWD	Eden Prairie	Purgatory Creek	Mitchell Lake	Mitchell Lake ML_1	Watershed Phosphorus Load Control	2	5	1	5	1	1	3	1	3	**22**	$133,000	
RPBCWD	Eden Prairie	Purgatory Creek	Mitchell Lake	Mitchell Lake ML_4	Watershed Phosphorus Load Control	2	3	3	5	1	1	3	1	3	**22**	$315,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	Staring Lake StL_16	Watershed Phosphorus Load Control	2	5	1	1	1	1	3	3	3	**20**	$500,000	
RPBCWD	Eden Prairie	Purgatory Creek	Purgatory Creek	P1	Creek Restoration and Stabilization	3	7	1	1	7	5	7	7	1	**39**	$4,173,000	
RPBCWD	Bloomington	Purgatory Creek	Hyland Lake	Hyland In-Lake	In-Lake Phosphorus Load Control	2	3	1	7	1	3	7	7	1	**32**	$300,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	PC_1	Creek Restoration and Stabilization - Restoration and stabilization of 10 locations (725 feet) downstream of Pioneer Trail (Group 1)	3	7	1	7	1	3	3	5	1	**31**	$265,000	
RPBCWD	Eden Prairie	Purgatory Creek	Staring Lake	PC_2	Creek Restoration and Stabilization - Restoration and stabilization of 6 locations (380 feet) downstream of Pioneer Trail (Group 2)	3	7	1	7	1	3	3	5	1	**31**	$185,000	

PURGATORY CREEK WATERSHED

PROPOSED PROJECTS

FIGURE 7-1

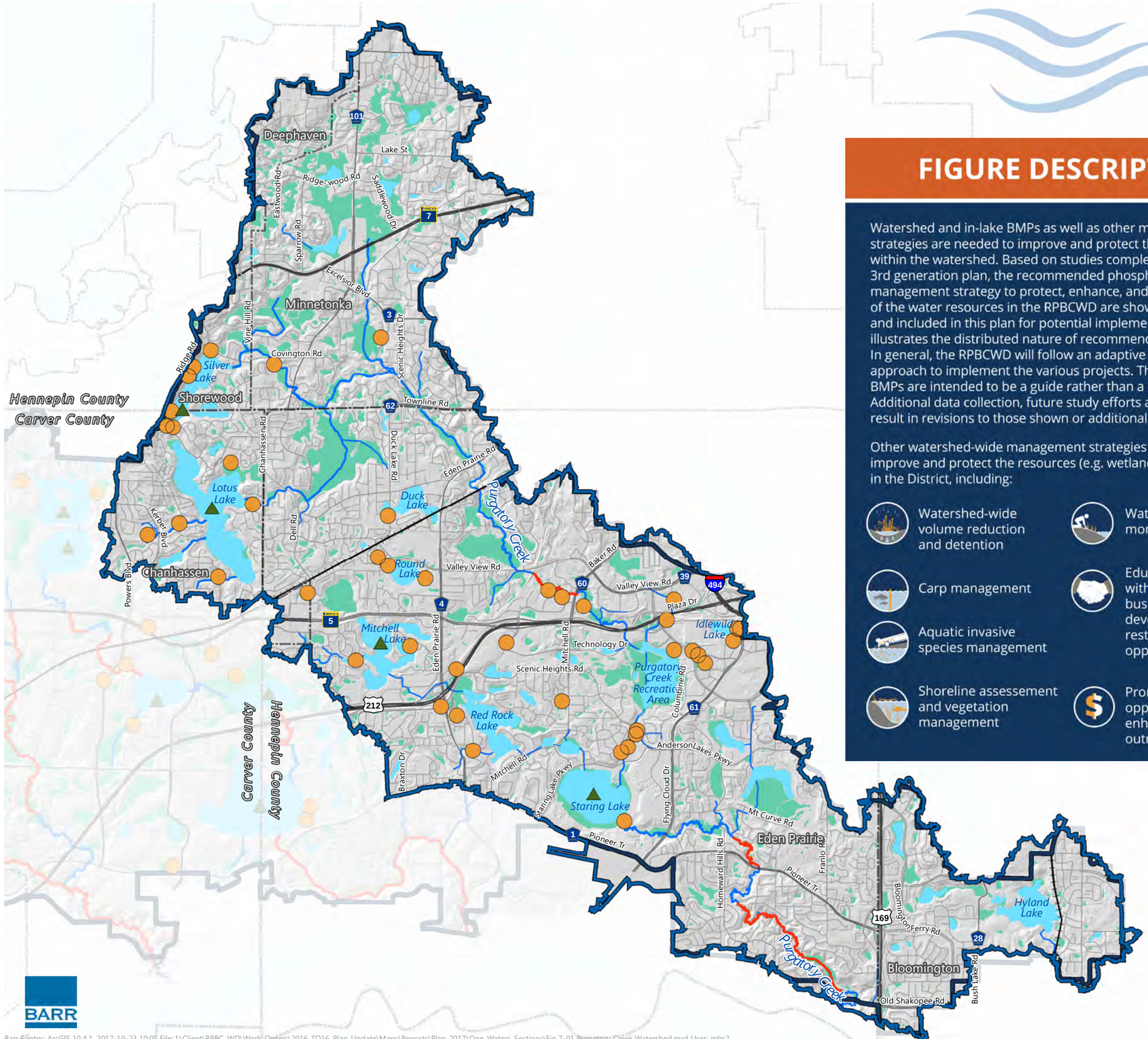

FIGURE DESCRIPTION

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 assessment and vegetation management
- Promote cost-share opportunities and enhance education outreach

Recommended Best Managment Practices

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

N

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Feet

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Barr Footer: ArcGIS 10.4.1, 2017-10-23 10:05 File: I:\Client\RPBC_WD\Work_Orders\2016_TO16_Plan_Update\Maps\Reports\Plan_2017\One_Waters_Sections\Fig 7-01 Purgatory Creek Watershed.mxd User: mbs2

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

7.3 Opportunity Projects

The projects identified in Table 7-2 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. Other potential management techniques that address these goals can be identified in Table 7-3. These opportunity projects could be identified through additional data collection, future study efforts, and innovation.

Table 7-3 Opportunity Projects in the Purgatory 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
	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.	
			WQual S9. The District will partner with other entities to minimize the spread and reduce the adverse ecological impacts of aquatic invasive species.	

Topic	Sub-topic	Goal	Most Applicable Strategies	Examples of Projects
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	Shoreline and streambank protection and restoration (e.g., buffers and stabilization efforts) Rainfall abstraction (e.g., rain gardens, reuse, and permeable pavements)
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 watersheds and 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 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)
	Emerging topics		WQual S15. The District will cooperate with other entities to investigate treatment effectiveness of emerging practices. WQual S16. The District will work with the state agencies and local governmental units to identify emerging pollutants of concern.	Demonstration and pilot-scale water quality treatment projects

Topic	Sub-topic	Goal	Most Applicable Strategies	Examples of Projects
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 programs 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
	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	

Purgatory Creek

2016

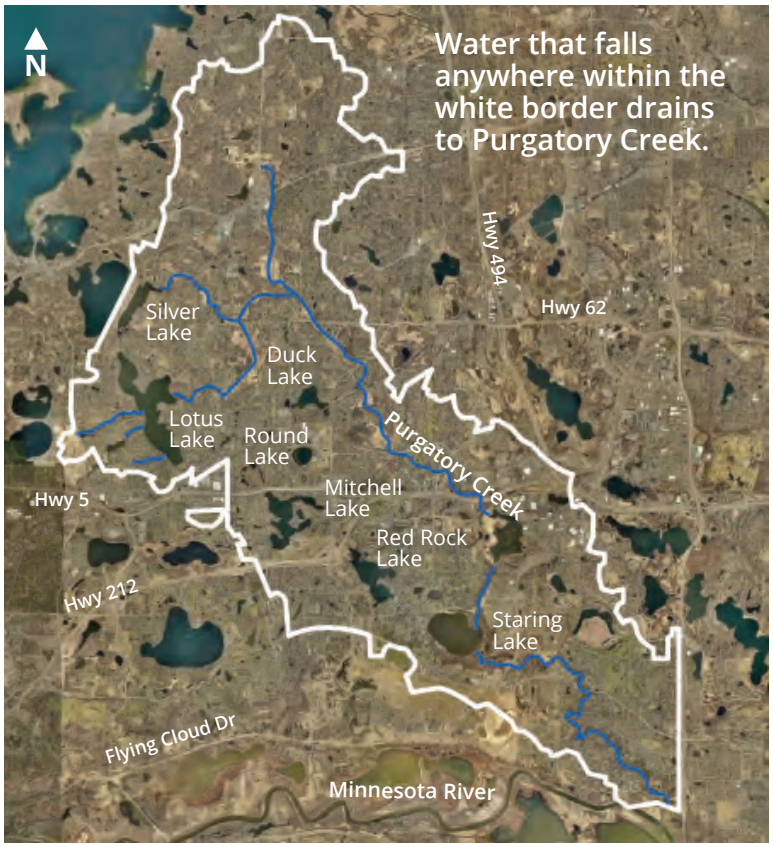
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

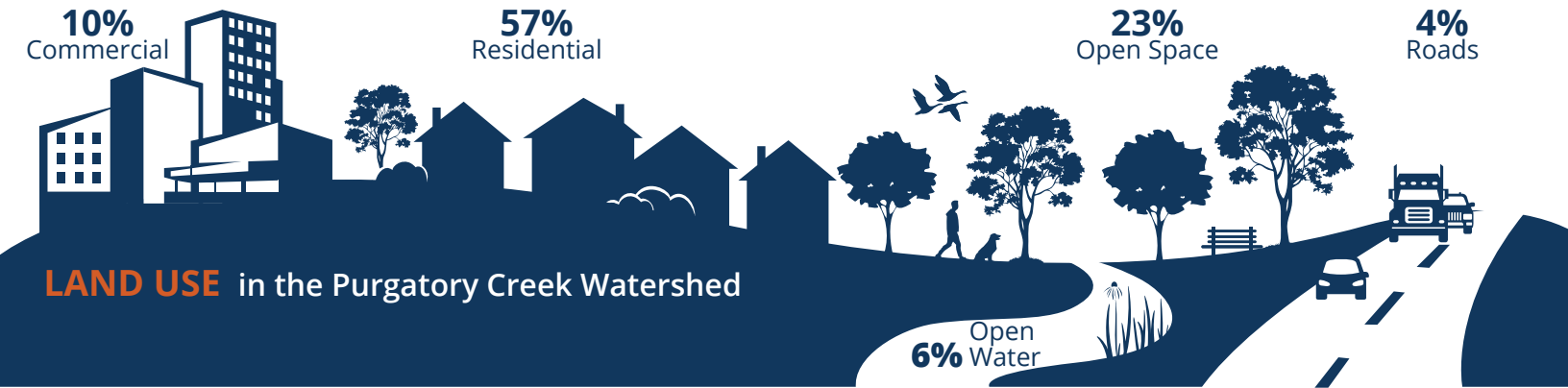
Purgatory Creek has three headwaters: Lotus Lake in Chanhassen, Silver Lake in Shorewood, and wetlands in Minnetonka. After these forks join, the creek flows through the Purgatory Recreation Area and Staring Lake before eventually reaching the Minnesota River.

CHARACTERISTICS

Length	12 miles
Elevation change	178 ft
Watershed size	30 sq miles
# of cities in watershed	4
# of lakes connected	8
# of monitoring sites	10
# of parks	27
Impairment	Not listed
Common fish	Bluegill, White Sucker, Black Crappie, Yellow Perch
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES





LAND USE in the Purgatory Creek Watershed

How healthy is Purgatory Creek?

Keeping Purgatory 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.

The watershed district has been monitoring Purgatory Creek since the 1970s. 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 2016.

Water quality

District staff take samples at eight 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.

Assessment

BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

RPBCWD & BARR Engineering. 2015. Creek Restoration Action Strategy.

BARR Engineering. 2013. Purgatory Creek Watershed: Total Maximum Daily Load Implementation Plan.

Carp management

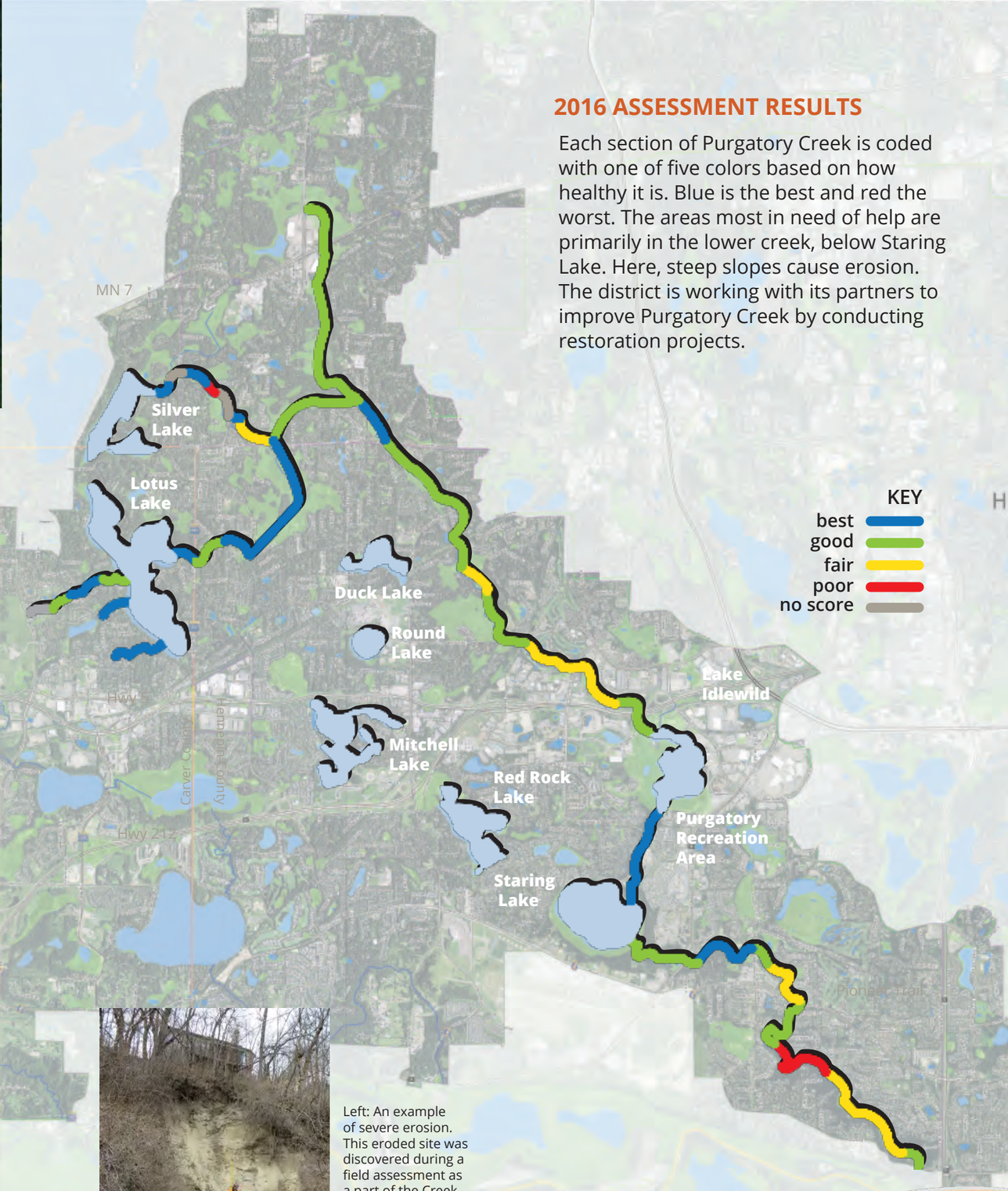
Sorensen P, Bajer P and M Headrick. 2015. Development and implementation of a sustainable strategy to control common carp in the Purgatory Creek chain of Lakes. University of Minnesota.

Stormwater ponds

RPBCWD. 2013. Stormwater Pond Project.

2016 ASSESSMENT RESULTS

Each section of Purgatory Creek is coded with one of five colors based on how healthy it is. Blue is the best and red the worst. The areas most in need of help are primarily in the lower creek, below Staring Lake. Here, steep slopes cause erosion. The district is working with its partners to improve Purgatory Creek by conducting restoration projects.



Left: An example of severe erosion. This eroded site was discovered during a field assessment as a part of the Creek Restoration Action Strategy.

What's happening

UPDATING THE WATERSHED MANAGEMENT PLAN

The plan guides district actions for a decade, and is currently being updated.

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PURGATORY CREEK REACH RESTORED

In partnership with the City of Minnetonka, the district conducted its first-ever creek restoration in 2016. Near the intersection of County Road 101 and Townline Road, the partners stabilized eroding banks along close to 2000 feet of Purgatory Creek. The goal of the restoration is to improve water and habitat quality, and overall creek health. Staff will be returning in the spring of 2017 to check on the project and plant some additional native vegetation.

YOU CAN HELP

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

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Duck Lake

2016

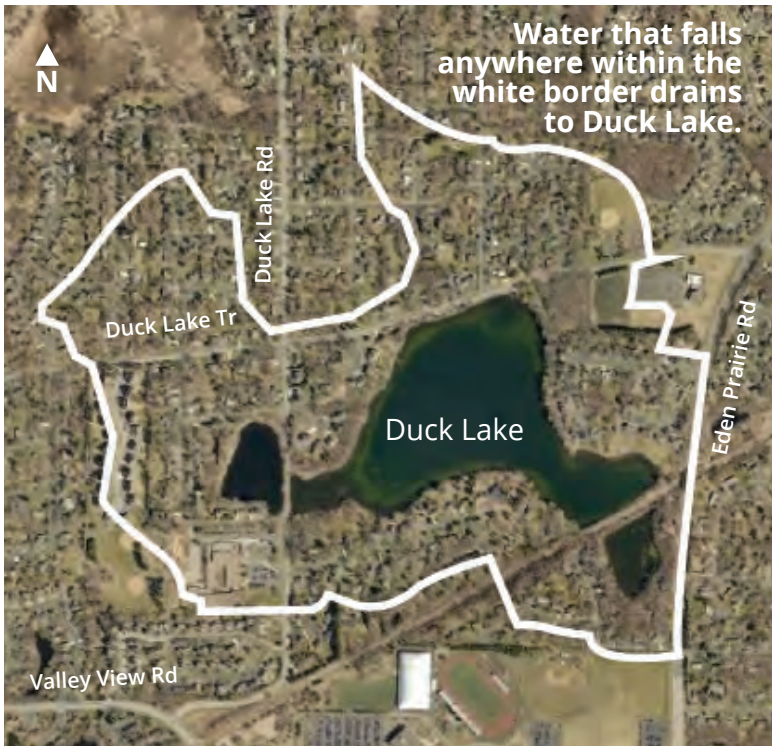
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Eden Prairie, Duck is one of the district's shallow lakes. Since 2011, it has seen improvement in water quality, and has met the Minnesota Pollution Control Agency's clean water standards for several years.

CHARACTERISTICS

Size	41 acres
Volume	131 acre-ft
Average depth	3.4 ft
Max depth	8 ft
Watershed size	233 acres
Land draining directly into	174 acres
MPCA lake classification	Shallow
Impairment listing	Not listed
Trophic status	Eutrophic
Common fish	Bluegill, Black Crappie, Bullhead
Invasive species	Curlyleaf Pondweed, Common Carp

WATERSHED BOUNDARIES



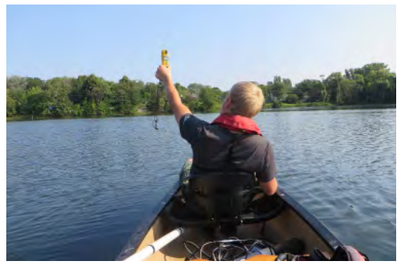
LAND USE in the Duck Lake Watershed

How healthy is Duck Lake?

2016 saw some of the clearest water since records began on Duck Lake in 1975. Until 2011, Duck Lake had failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). For the past six years however, water quality has improved. Continued monitoring will track whether this continues, and help us understand why.

During the growing season (June - September), district staff visit Duck 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.

Duck 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.

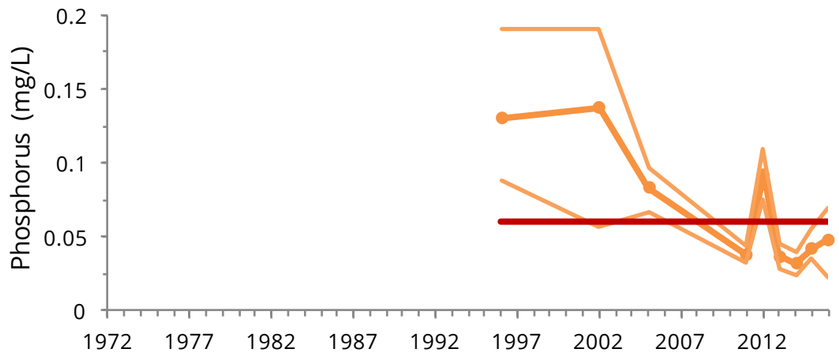


District staff collect environmental and water quality data at Duck Lake.

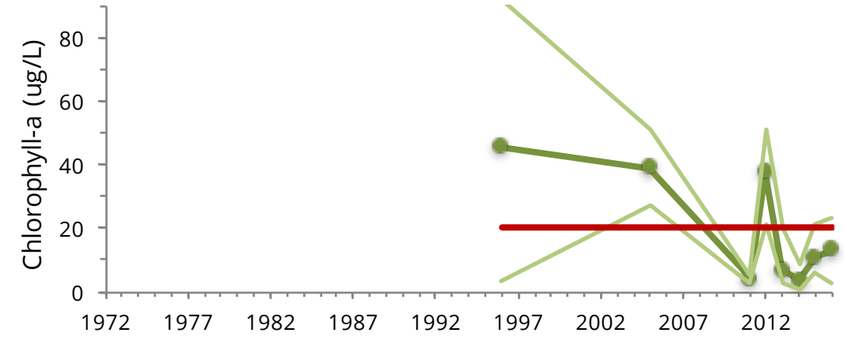
Motorized boats are not allowed on shallow Duck Lake, but it is a popular place to kayak and canoe.

Water quality graphs 1975 - 2016

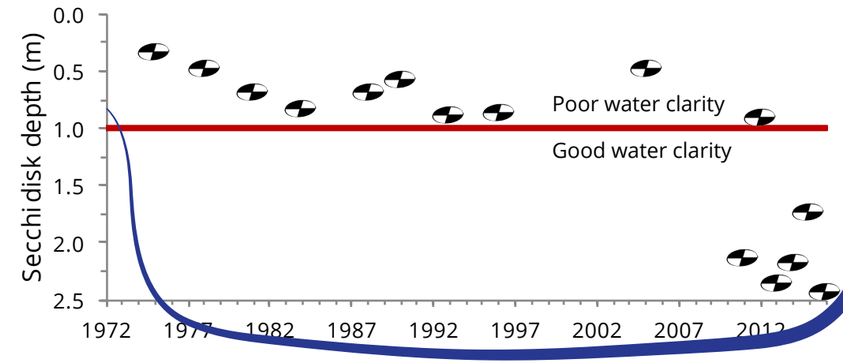
Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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 Duck Lake.

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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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	Since 1975 or 1996			2016		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.191	0.24	0.067	0.069	0.023	**0.049**
Chl-a	<20 ug/l	92.3	1.0	17.8	23.1	2.67	**13.1**
Secchi	>1 m	2.7	0.2	1.4	2.6	2.3	**2.5**

What's happening

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GRANTS AVAILABLE FOR PROJECTS THAT HELP PROTECT CLEAN WATER

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Awards: up to $3000
(25% homeowner match)

Technical help available

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mjordan@rpbcwd.org

Dive deeper

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Stormwater ponds
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Watershed study
BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

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Hyland Lake

2016

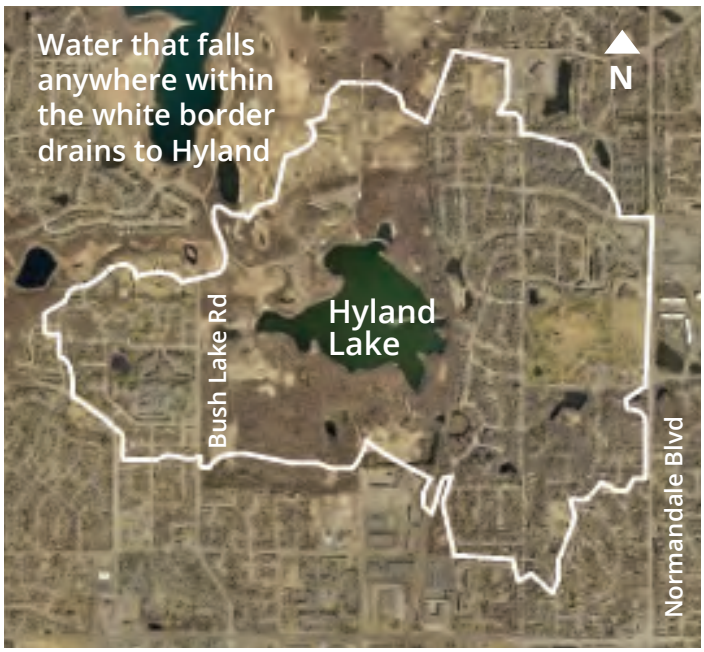
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Bloomington, Hyland Lake is surrounded by Hyland Lake Park Reserve, a Three Rivers Park District facility. Visitors can paddle the lake in the summer, hike nearby trails, and ski in the winter.

CHARACTERISTICS

Size	84 acres
Volume	780 acre-ft
Average depth	7.5 ft
Max depth	12 ft
Watershed size	922 acres
MPCA lake classification	Shallow
Impairment listing	Nutrients
Trophic status	Eutrophic
Common fish	Bluegill, Black Crappie, Walleye, Black Bullhead
Invasive species	Curlyleaf Pondweed

WATERSHED BOUNDARIES



LAND USE in the Hyland Lake Watershed

How healthy is Hyland Lake?

After a substantial decrease in 2015, water quality in Hyland Lake improved in 2016. However, it still failed to meet 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), Three Rivers Park District staff visit Hyland Lake every other week to collect water samples and take measurements. The samples 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.

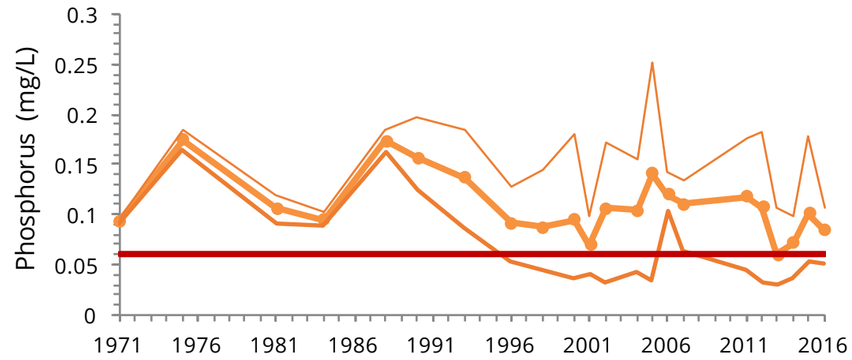
Hyland is classified as a "Shallow Lake", which means that it is generally less than 15 feet deep and light can reach the bottom in most of the lake. This ample light means that shallow lakes often have a lot of aquatic plants, and are habitat to many types of fish and birds. To be considered healthy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

Staff install a water level sensor on Hyland Lake. The sensor tracks how high the lake gets.

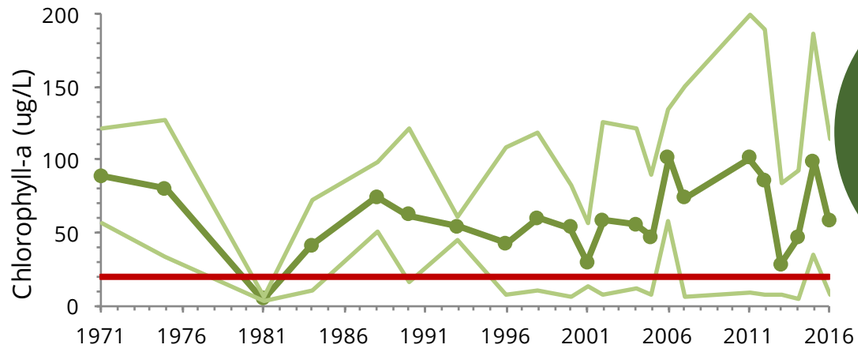
A skier enjoys a winter outing in Hyland Lake Park.

Water quality graphs 1971 - 2016

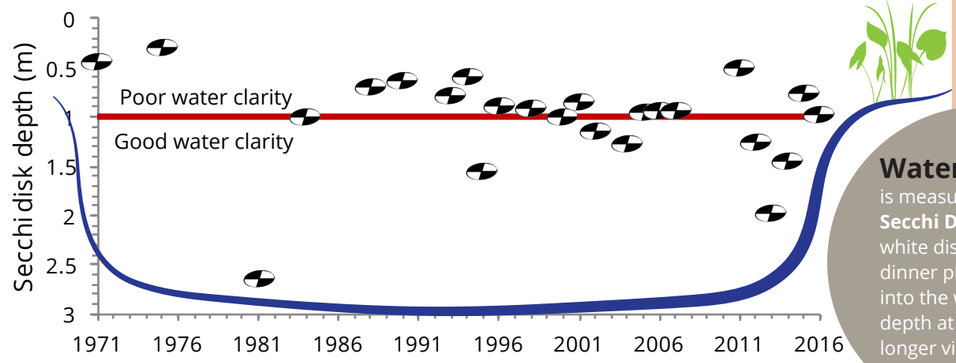
Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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.

Summary table

	MPCA standard	Since 1971			2016		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.252	0.031	0.105	0.107	0.05	0.085
Chl-a	<20 ug/l	200	3.5	64.5	113.6	7.4	57.4
Secchi	>1 m	3.7	0.2	1.0	1.98	0.44	0.99

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

Keep the curb clean

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

Water with care

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Awards: up to $3000
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Technical help available

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Dive deeper

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Watershed study

BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

Updated Parks & Trails Map

Explore the watershed through our updated parks and trails map. Want a printed copy? Stop by our office!

Contact us

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Lake Idlewild

2016

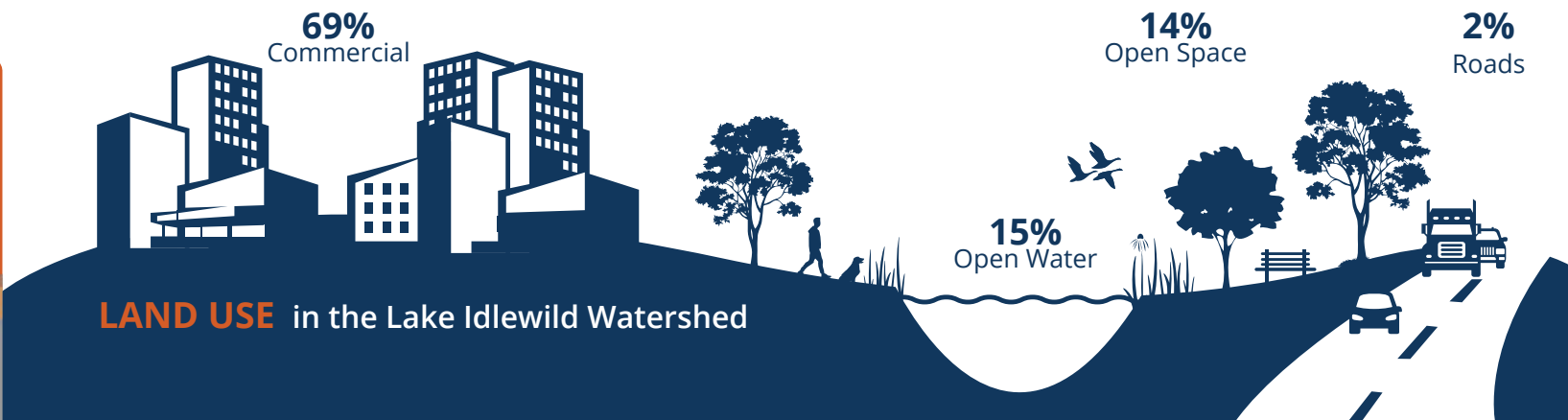
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Eden Prairie, Idlewild is a part of the Purgatory Creek Watershed. Painted turtles are a common sight in this small basin, which is completely surrounded by commercial development.

CHARACTERISTICS

Size	12 acres
Volume	51 acre-ft
Average depth	4 ft
Max depth	8.2 ft
Watershed size	89 acres
MPCA lake classification	Not classified
Impairment listing	Not listed
Trophic status	Hypereutrophic
Common fish	Bluegill, Black Crappie, Black Bullhead, Golden Shiner
Invasive species	None Listed

WATERSHED BOUNDARIES



LAND USE in the Lake Idlewild Watershed

How healthy is Lake Idlewild?

Lake Idlewild was first monitored in 2014. All three years water quality has met, or been near to 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 (dots) to be below that line.

During the growing season (June - September), the city of Eden Prairie or the watershed district visits Lake Idlewild every other week to collect water samples and take measurements. The samples are sent to a lab to be tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). Staff also measures 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.

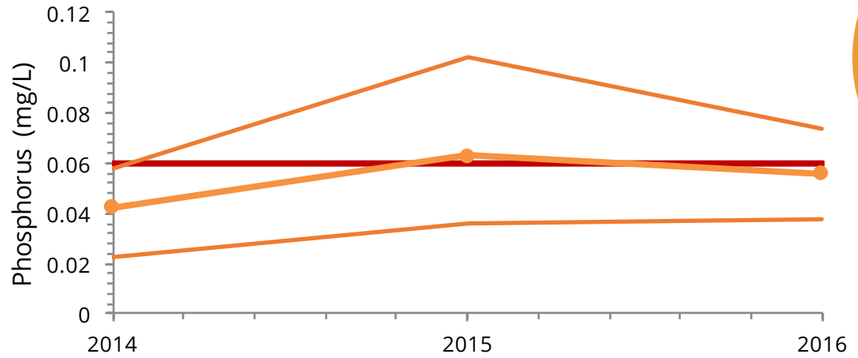
Idlewild was recently reclassified from a “Shallow Lake” to a wetland. However it continues to be monitored for water quality, and using the shallow lake water standards can be a useful bench mark for seeing how the lake health changes over time.

Collecting water samples on Lake Idlewild.

Painted turtles sun themselves on a log.

Water quality graphs 2014 - 2016

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



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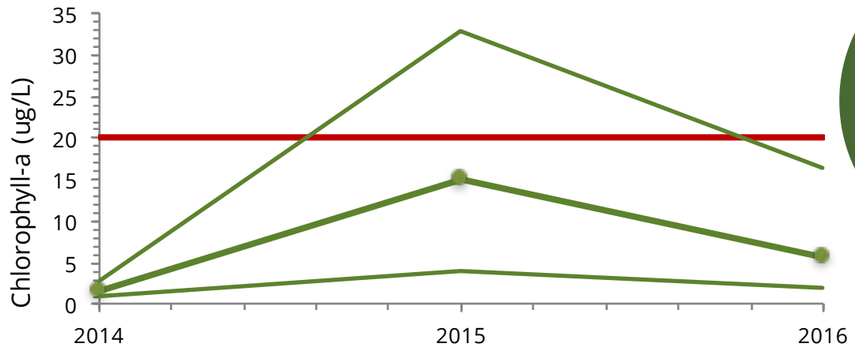

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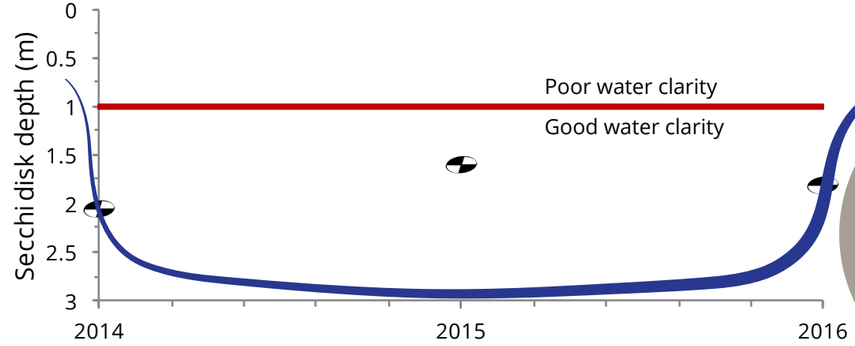

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Summary table

	MPCA standard	2014-2016			2016		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.102	0.038	0.056	0.074	0.038	0.056
Chl-a	<20 ug/l	33	1.1	9.1	16.4	2.1	5.75
Secchi	>1 m	2.6	1.1	1.9	2.4	1.5	1.8

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Lotus Lake

2016

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

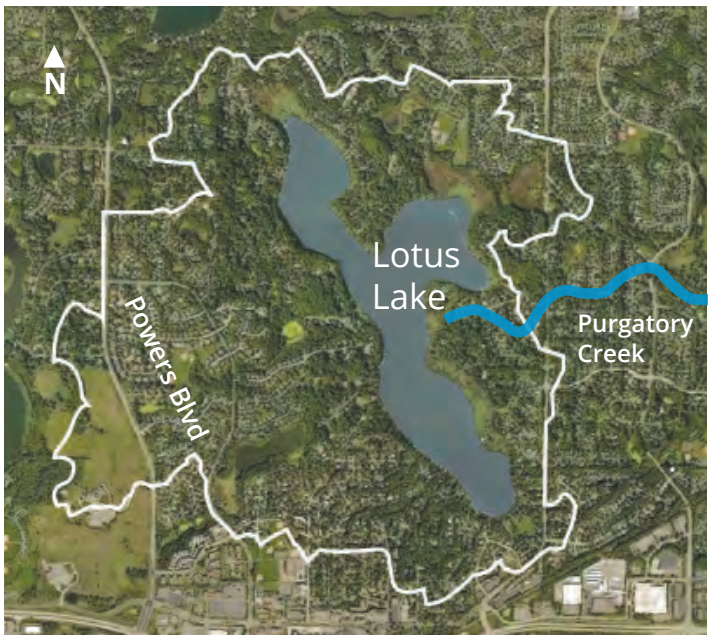
Located in eastern Chanhassen, Lotus Lake is one of three headwaters for Purgatory Creek. Water flows out of Lotus into the south fork of Purgatory Creek which eventually meets up with two other forks.

CHARACTERISTICS

Size	248 acres
Volume	2500 acre-ft
Average depth	16 ft
Max depth	31 ft
Watershed size	1397 acres
Land draining directly into	316 acres
MPCA lake classification	Deep
Impairment listing	Mercury & Nutrients
Trophic status	Hypereutrophic
Common fish	Bluegill, Yellow Perch, Walleye
Invasive species	Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES

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



LAND USE in the Lotus Lake Watershed

How healthy is Lotus Lake?

Water clarity improved slightly from 2015 to 2016, but Lotus Lake still failed to meet 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 for each graph is for the average values (the dots) to be below the red line.

During the growing season (June - September), district staff visit Lotus Lake 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 parameters help indicate whether the water is clean.

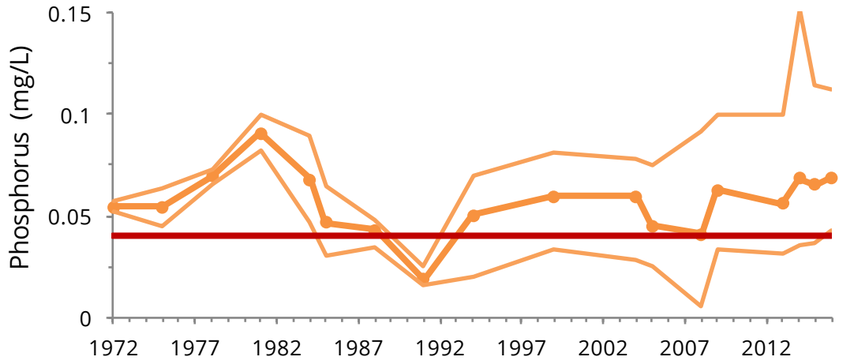
Lotus is classified as a “Deep Lake”, which means that it is over 15 feet deep and light can not reach the bottom in most of the lake. To be considered healthy by the MPCA, deep lakes need to be clear enough to see 1.4 meters down, and have very low TP and Chl-a levels.

Staff collect water samples on Lotus Lake during a beautiful summer day.

A loon enjoys a paddle on Lotus.

Water quality graphs 1972 - 2016

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



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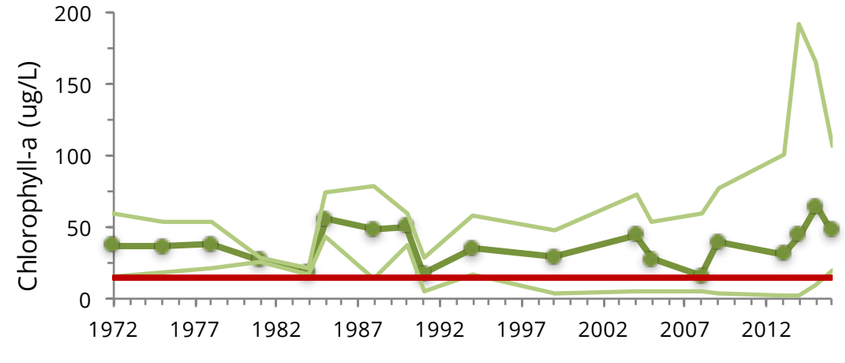

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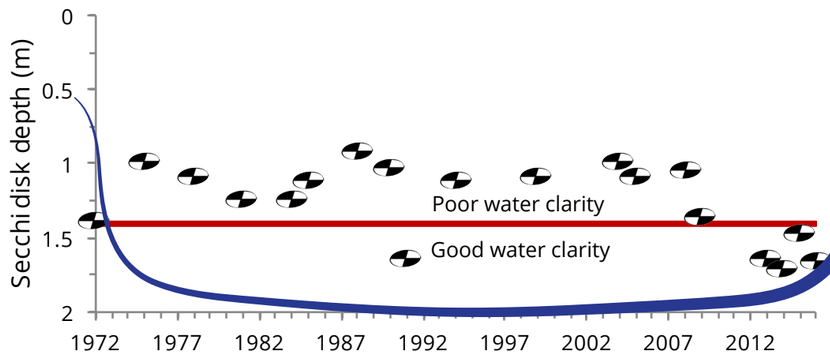

Water clarity is measured using a **Secchi Disk**, a black and white disk the size of a dinner plate. It is lowered into the water, and the depth at which it is no longer visible is recorded.

Summary table

	MPCA standard	1972 - 2015 max	1972 - 2015 min	1972 - 2015 average	2016 max	2016 min	2016 average
TP	<0.04 mg/l	0.15	0.01	0.06	0.11	0.043	0.069
Chl-a	<14 ug/l	192	2.7	35.5	106	20.5	47.1
Secchi	>1.4 m	4.2	0.3	1.3	2.8	0.85	1.7

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 Lotus Lake.

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.

What's happening

UPDATING THE WATERSHED MANAGEMENT PLAN

The plan guides district actions for a decade, and is currently being updated.

In 2016, the district embarked on a special outreach campaign to engage the community in updating the 10-Year Management Plan. This included public meetings, a survey, and tabling at local events. Over 500 residents shared their concerns about local waters. We gained insight into how residents use, and value water resources. This input helped frame the creation of the new plan's goals and strategies. Once completed, the plan will guide district actions over the next decade. The community can continue to engage with the district in this process in 2017. Join our email newsletter list to stay up to date! Subscribe at: rpbcwd.org

INVASIVE CARP UNDER CONTROL IN LOTUS LAKE

The district has wrapped up this season's carp monitoring on Lotus Lake, and good news, carp numbers are under control! Common carp, an invasive species to Minnesota water bodies, have a detrimental effect on our lakes and streams. They disturb sediment, reducing water quality and the presence of native plants. They also feed on macro invertebrates, which feed on algae. This can lead to excessive algal blooms on the lake which further impacts water quality.

District staff completed two types of carp monitoring in summer and autumn. They conducted surveys to estimate carp numbers, and set out nets to estimate carp reproduction. Electrofishing stuns fish momentarily, but doesn't harm them. Staff can then spot the carp, and capture them for measuring. Staff did not find any young carp in their trap nets. This means carp are spawning very little in Lotus, which is excellent news for the lake.

Dive deeper

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

Aquatic plants

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.

Paleolimnology

Ramstack J. M. and Edlund M. B. 2011. Historical water quality and ecological change of three lakes in the Riley Purgatory Bluff Creek Watershed District, MN.

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. U of M.

Watershed study

BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

Stormwater ponds

RPBCWD. 2013. Stormwater pond project.

Contact us

and find out how you can get involved

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Mitchell Lake

2016

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

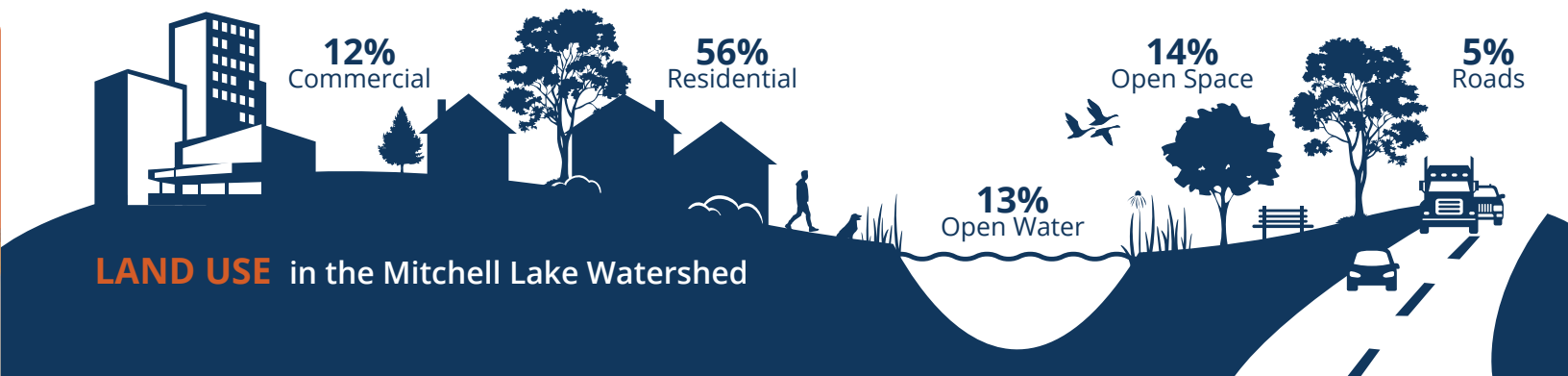
Located in Eden Prairie, Mitchell Lake is a part of the Purgatory Creek chain of lakes. During high water events it outflows through an overflow pipe to Red Rock Lake.

CHARACTERISTICS

Size	124 acres
Volume	729 acre-ft
Average depth	5.3 ft
Max depth	19 ft
Watershed size	937 acres
Land draining directly into	154 acres
MPCA lake classification	Shallow
Impairment listing	Mercury
Trophic status	Hypereutrophic
Common fish	Bluegill, Black Bullhead, Black Crappie, Northern Pike, Pumpkinseed
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Purple Loosestrife

WATERSHED BOUNDARIES

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



LAND USE in the Mitchell Lake Watershed

How healthy is Mitchell Lake?

After decades of failing to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA), Mitchell Lake has improved and been at or near standards for the last six years. Continued water sampling will help monitor whether the trend persists.

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 (Jun - Sept), the city of Eden Prairie visits Mitchell Lake to collect water samples and take measurements. The samples are tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). The city also measures how clear the water is using a disk that is lowered into the water until it can not be seen. These tests help indicate if the water is clean.

Mitchell 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 1 meter down, and have low TP and Chl-a levels.

An osprey looks out on Mitchell Lake, scanning the surface for signs of the fish it relies on for food.

Staff head out on a blustery day to take samples to monitor zooplankton, an important food for native fishes.

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

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

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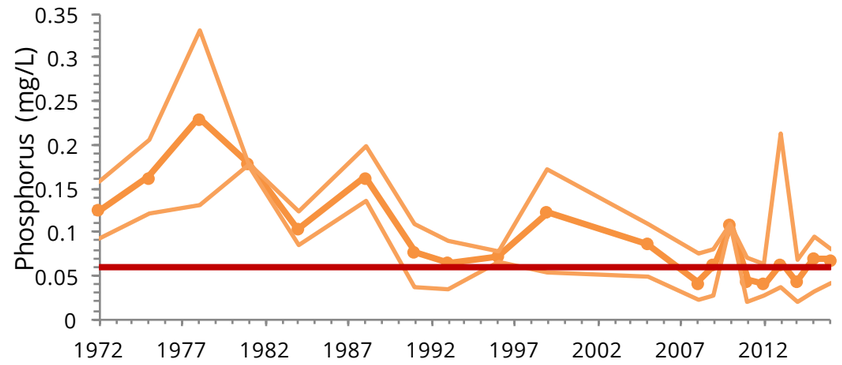
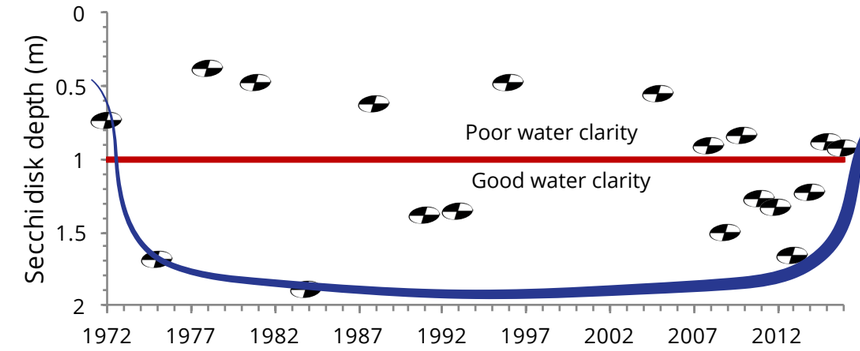
Water quality graphs 1972 - 2016

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

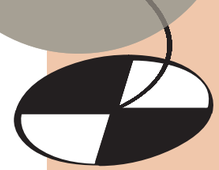


Phosphorus is a nutrient that plants and algae need for growth. It is often measured as total phosphorus (TP). Too much phosphorous can cause algae blooms.

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.



Summary table

	MPCA standard	1972 - 2015			2016		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.33	0.02	0.079	0.08	0.04	0.07
Chl-a	<20 ug/l	211	1	36.8	66.2	12.8	**33.0**
Secchi	>1 m	4.1	0.3	1.2	2.07	0.49	**0.95**

What's happening

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TIMBER LAKES ASSOCIATION TAKES ON SHORELINE RESTORATION

In 2015, the Timber Lakes Association received a cost-share grant from the watershed district to rejuvenate their shoreline buffer. The buffer had been severely damaged during the period of high water in 2014. In 2016, invasive species were removed, and 140 feet of shoreline were restored with native plantings. Cost-share funding is again available in 2017. Homeowners can receive up to $3,000 for projects that help protect and improve water resources. Associations and nonprofits can receive up to $20,000. Interested? Contact us at: 952-607-6481, or info@rpbcwd.org.

Dive deeper

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

Aquatic plants

Dunne, M. and Newman, R. 2017. Aquatic Plant Community of Lakes Lucy, Mitchell, Susan, Riley and Staring: Annual Report for 2016. University of Minnesota.

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

Stormwater ponds

RPBCWD. 2013. Stormwater pond project.

Paleolimnology

Ramstack J. M. and Edlund M. B. 2011. Historical water quality and ecological change of three lakes in the Riley Purgatory Bluff Creek Watershed District, MN.

Watershed study

Barr Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

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Red Rock Lake

2016

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Eden Prairie, Red Rock Lake is a part of the Purgatory Creek chain of lakes. During high water events it outflows through an overflow pipe to Staring Lake.

CHARACTERISTICS

Size	121 acres
Volume	615 acre-ft
Average depth	4.7 ft
Max depth	19 ft
Watershed size	1286 acres
Land draining directly into	332 acres
MPCA lake classification	Shallow
Impairment listing	Mercury
Trophic status	Eutrophic
Common fish	Bluegill, Northern Pike, Pumpkinseed, Yellow Perch
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil

WATERSHED BOUNDARIES

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

LAND USE in the Red Rock Lake Watershed

How healthy is Red Rock Lake?

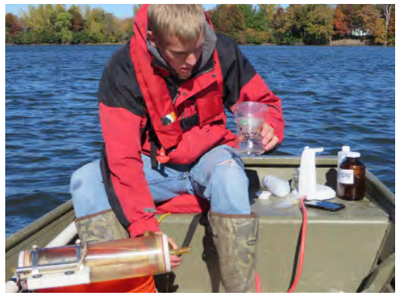
After decades of failing to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA), Red Rock Lake has improved and been at or near standards for the last six years. Continued water sampling will help monitor whether the trend persists.

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 (Jun - Sept), the city of Eden Prairie visits Red Rock to collect water samples and take measurements. The samples are tested for several compounds including total phosphorous (TP) and chlorophyll a (Chl-a). The city also measures how clear the water is using a disk that is lowered into the water until it can not be seen. These tests help indicate if the water is clean.

Red Rock 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.

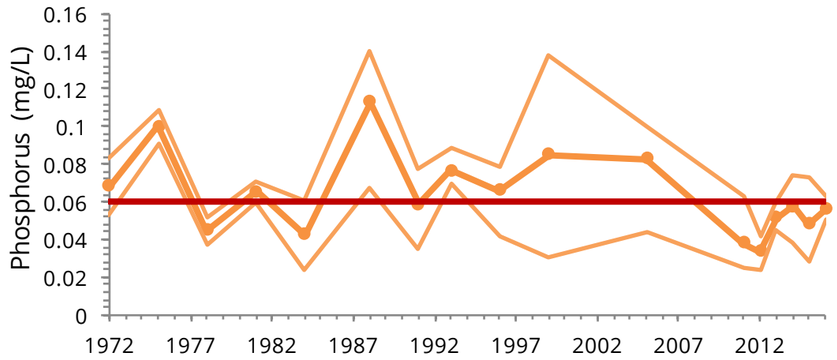
Water lilies are a common site on the lake.



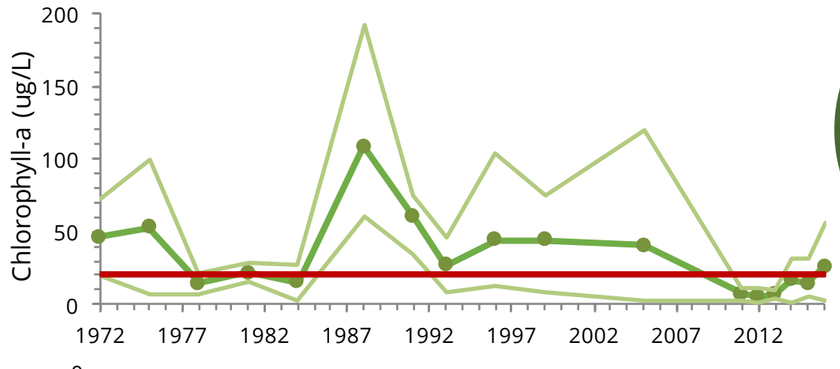
Staff collect water samples on Red Rock Lake.

Water quality graphs 1972 - 2016

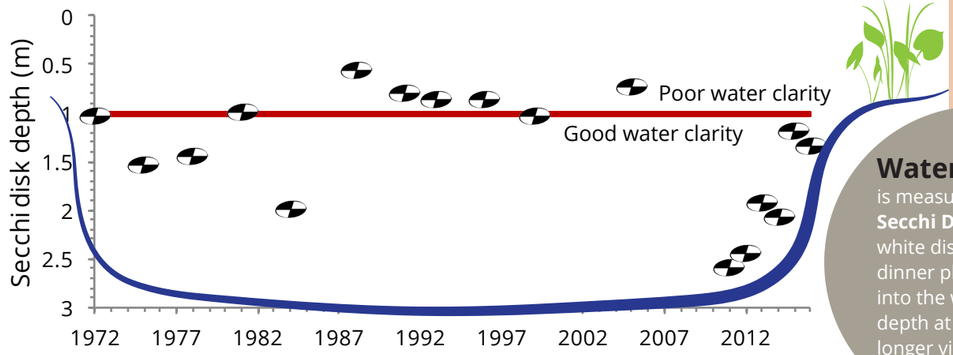
Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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.

Summary table

	MPCA standard	1972 - 2015 max	1972 - 2015 min	1972 - 2015 average	2016 max	2016 min	2016 average
TP	<0.06 mg/l	0.14	0.024	0.064	0.063	0.051	0.056
Chl-a	<20 ug/l	192	1.3	30.2	56.2	2.8	25.9
Secchi	>1 m	4.9	0.3	1.41	2.63	0.53	1.34

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

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

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What's happening

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GRANTS AVAILABLE FOR PROJECTS THAT HELP PROTECT CLEAN WATER

Decreasing pollution, beautifying your yard, and creating habitat are all possible through a cost-share grant with the watershed district. The district's cost-share grant program was created to help community members implement clean water projects. These could be projects that conserve water, like rainwater reuse systems, or projects that clean water, like raingardens.

Awards: up to $3000
(25% homeowner match)

Technical help available

Interested? Contact:
952-607-6481
mjordan@rpbcwd.org

Dive deeper

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

Aquatic plants
Freshwater Scientific Services. 2015. Aquatic Plant Community of Red Rock Lake.

Wenck Associates Inc. 2015. Red Rock Lake Plant Management Plan.

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Watershed study
BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

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Round Lake

2016

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Eden Prairie, Round Lake is a part of the Purgatory Creek Chain of Lakes. With a park and a trail system around the lake, it is a popular recreation spot.

CHARACTERISTICS

Size	30 acres
Volume	327 acre-ft
Average depth	11 ft
Max depth	37 ft
Watershed size	475 acres
Land draining directly into	105 acres
MPCA lake classification	Deep
Impairment listing	Mercury & Perfluorooctane
Trophic status	Eutrophic
Common fish	Bluegill, N. Pike, Yellow Bullhead, Yellow Perch
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES

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

LAND USE in the Round Lake Watershed

How healthy is Round Lake?

Round Lake has been monitored for over 40 years. In that time, it has often failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). However, there have been significant improvements since 2012 when the city of Eden Prairie conducted an alum treatment, and in 2016 it met all standards. Read more about alum on the back page.

During the growing season (June - September), the city of Eden Prairie visits Round Lake 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 parameters help indicate whether the water is clean.

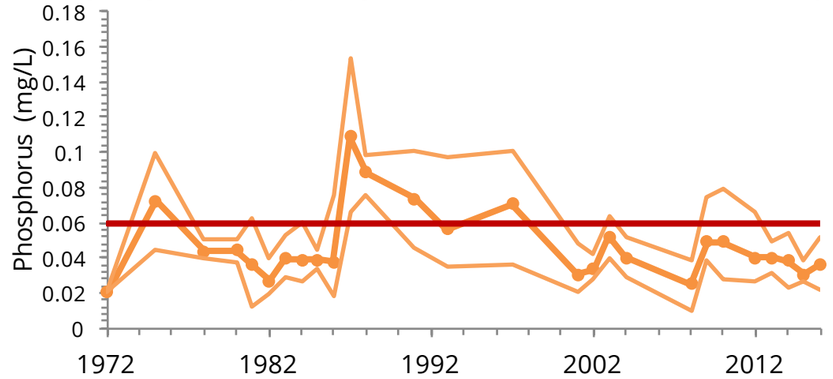
Round is classified as a “Deep Lake”, which means that it is over 15 feet deep and light can not reach the bottom in most of the lake. To be considered healthy by the MPCA, deep lakes need to be clear enough to see 1.4 meters down, and have very low TP and Chl-a.

Round Lake Park is a popular spot to visit, play, and explore.

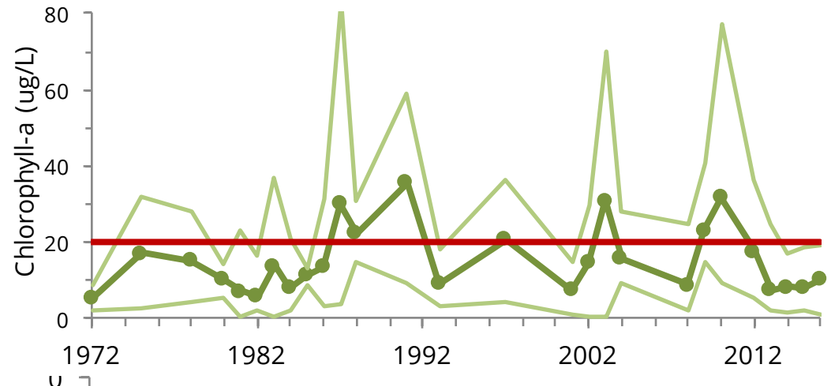
The park trail goes all the way around the lake.

Water quality graphs 1972 - 2016

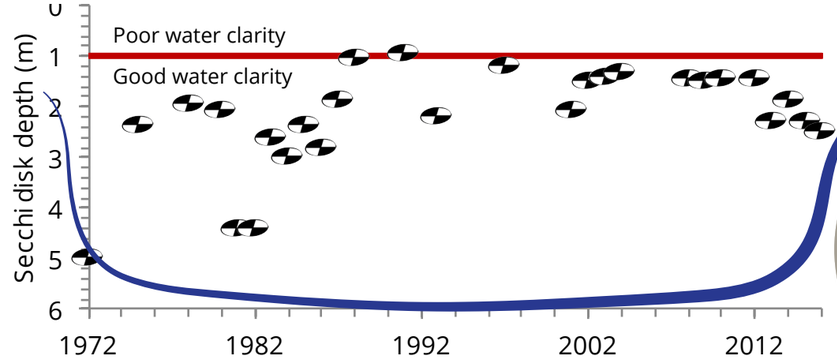
Points are growing season (Jun-Sep) averages. Thin lines are the min and max values for each year.



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 storm drains, is one of the main causes of pollution in urban areas. You can take simple actions to help protect Round Lake.

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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Build a raingarden

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Summary table

	MPCA standard	1972 - 2015			2016		
		max	min	average	max	min	average
TP	<0.04 mg/l	0.15	0.01	0.045	0.052	0.022	**0.036**
Chl-a	<14 ug/l	83	0.2	15.4	19.2	1	**10.3**
Secchi	>1.4 m	6.2	0.5	2.2	4.45	1.13	**2.5**

What's happening

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IMPROVED WATER QUALITY SINCE ALUM TREATMENT

In November of 2012, the city of Eden Prairie conducted an Alum treatment in Round Lake. Aluminum phosphate (Alum) is one method that can be used to help protect clean water. Alum reduces the growth of algae by trapping the nutrient phosphorus - algae's food source - in sediments. Like most other plants, algae require phosphorus to grow and reproduce. Decreasing available phosphorus decreases how much algae can grow, and the likelihood of a thick, green blooms in the summer. Water samples taken since the treatment show improvements for Round Lake! In fact, the lake met all three water quality standards in 2016 (see inside pages for data). Continued sampling will help monitor how the treatment responds over time.

An alum barge treating a lake.

Dive deeper

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

Aquatic plants
Blue Water Science. 2013 Aquatic plant surveys and water quality for Round Lake and two tributary ponds.

Watershed study
Barr Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Paleolimnology
Ramstack J. M. and Edlund M. B. 2011. Historical water quality and ecological change of three lakes in the Riley Purgatory Bluff Creek Watershed District, MN.

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Silver Lake

2016

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Located in Shorewood, Silver Lake sits at the edge of the watershed district. It is the only lake in the district that has wild rice, a rare plant to find in metro area lakes!

CHARACTERISTICS

Size	71 acres
Volume	190 acre-ft
Average depth	5 ft
Max depth	14 ft
Watershed size	407 acres
MPCA lake classification	Shallow
Impairment listing	Not Listed
Trophic status	Hypereutrophic
Common fish	Unknown
Invasive species	Curlyleaf Pondweed, Purple Loosestrife

WATERSHED BOUNDARIES

LAND USE in the Silver Lake Watershed

How healthy is Silver Lake?

Silver Lake water quality has been monitored since 1996. Since that time, it has consistently failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). In recent years, water quality has improved, but still does not meet standards.

During the growing season (June - September), district staff visit Silver 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. Find out more about each on the next page.

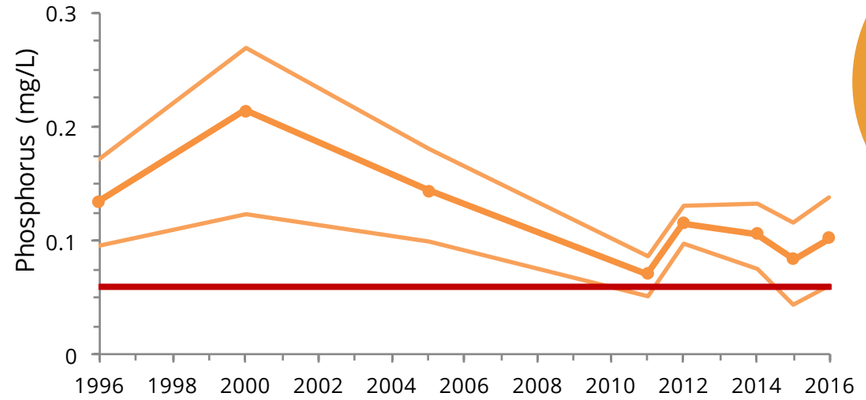
Silver is classified as a “Shallow Lake”, which means that it is generally less than 15 feet deep and light can reach the bottom in most of the lake. To be considered healthy by the MPCA, shallow lakes need to be clear enough to see one meter down, and have low TP and Chl-a levels. These shallow lake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

A staff members prepares to collect a water sample using a Van Dorn sampler.

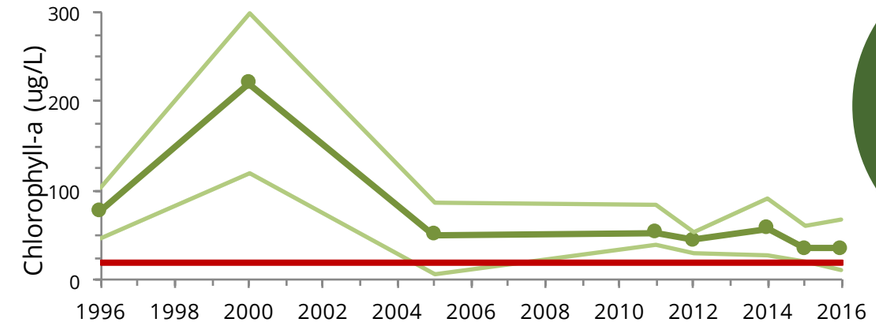
An egret hunts along the shores of Silver Lake.

Water quality graphs 1996 - 2016

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.



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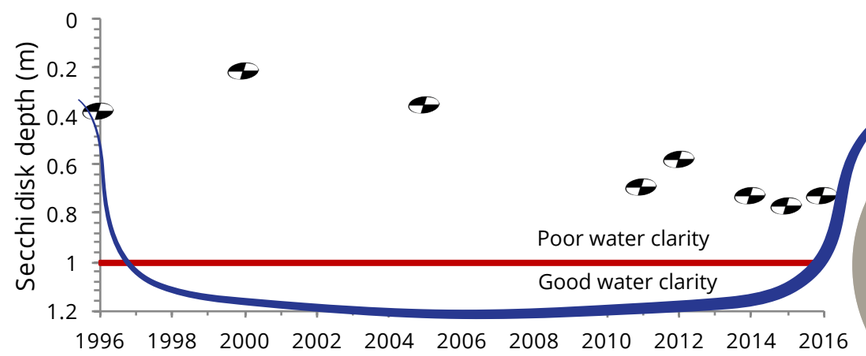

Water clarity is measured using a **Secchi Disk**, a black and white disk the size of a dinner plate. It is lowered into the water, and the depth at which it is no longer visible is recorded.

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

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	1996 - 2015			2016		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.27	0.05	0.12	0.14	0.061	0.102
Chl-a	<20 ug/l	300	8	74.6	67.6	11.6	35.6
Secchi	>1 m	1	0.2	0.6	1.1	0.7	0.5

What's happening

UPDATING THE WATERSHED MANAGEMENT PLAN

The plan guides district actions for a decade, and is currently being updated.

In 2016, the district embarked on a special outreach campaign to engage the community in updating the 10-Year Management Plan. This included public meetings, a survey, and tabling at local events. Over 500 residents shared their concerns about local waters. We gained insight into how residents use, and value water resources. This input helped frame the creation of the new plan's goals and strategies. Once completed, the plan will guide district actions over the next decade. The community can continue to engage with the district in this process in 2017. Join our email newsletter list to stay up to date! Subscribe at: rpbcwd.org

WILD RICE ON SILVER LAKE

Wild rice has been spotted on Silver Lake! Wild rice is uncommon in urban lakes. Northern wild rice is an aquatic grass native to the Great Lakes region, and usually found in Northern and Central Minnesota. It grows in shallow lakes, wetlands, and along streams in less than three feet of water. Wild rice, Minnesota's official state grain, is an important plant within the state. Not only is it an attractive source of food for migrating waterfowl, it is important agriculturally. Rice is a valuable crop culturally and economically. Wild rice needs clean water to flourish, and protecting Silver Lake will help promote this native Minnesota plant.

Dive deeper

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

Aquatic plants
Blue Water Science. 2014. Aquatic plant surveys for Silver Lake. Eden Prairie, MN.

Watershed study
BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Paleolimnology
Ramstack Hobbs J. M. and M. B. Edlund. 2015. Paleolimnological analysis of Silver Lake, Hennepin County, MN. St. Croix Watershed Research Station.

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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Staring Lake

2016

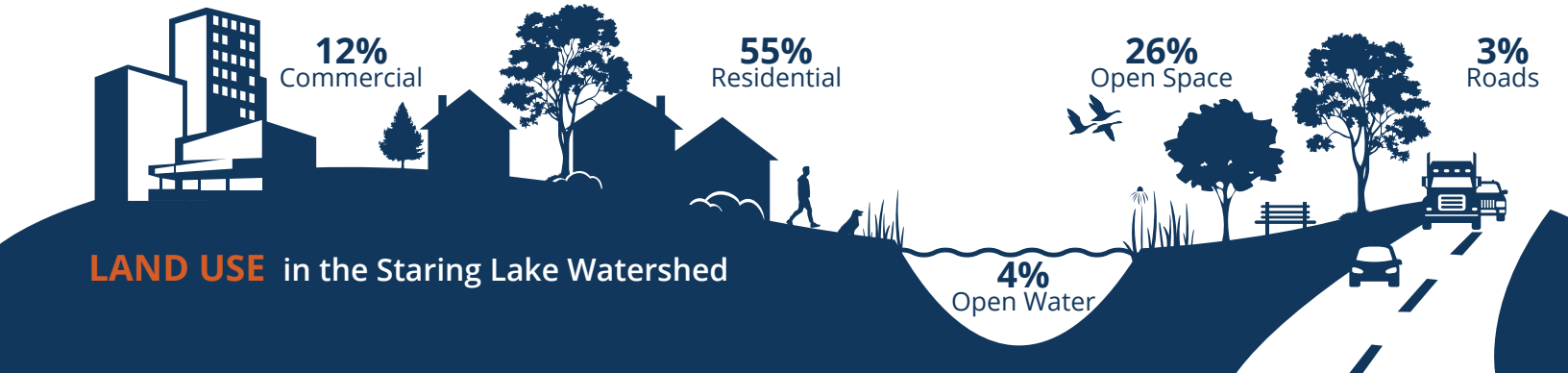
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Staring Lake is located in Eden Prairie, west of Flying Cloud Drive and north of Pioneer Trail. Staring has a public boat ramp and a fishing pier. The Eden Prairie Outdoor Center is also located on its shores, off of Staring Lake Parkway.

CHARACTERISTICS

Size	166 acres
Volume	1,220 acre-ft
Average depth	7 ft
Max depth	16 ft
Watershed size	10,206 acres
Land draining directly into	314 acres
MPCA lake classification	Shallow
Impairment listing	Mercury & Nutrients
Trophic status	Hypereutrophic
Common fish	Bluegill, Black Crappie, Black Bullhead
Invasive species	Curlyleaf Pondweed, Eurasian Watermilfoil, Common Carp

WATERSHED BOUNDARIES



LAND USE in the Staring Lake Watershed

How healthy is Staring Lake?

For the past 40 years, Staring Lake water quality has failed to meet 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 Staring Lake 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. All three of these parameters help indicate whether the water is clean.

Staring 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.

Common Carp are an invasive species. They can negatively impact water quality and lake health. The district works to manage carp in the lake.

Curlyleaf pondweed is another invader that the district works to manage. It can form dense mats and competes with native plants.

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

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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Reuse the rain
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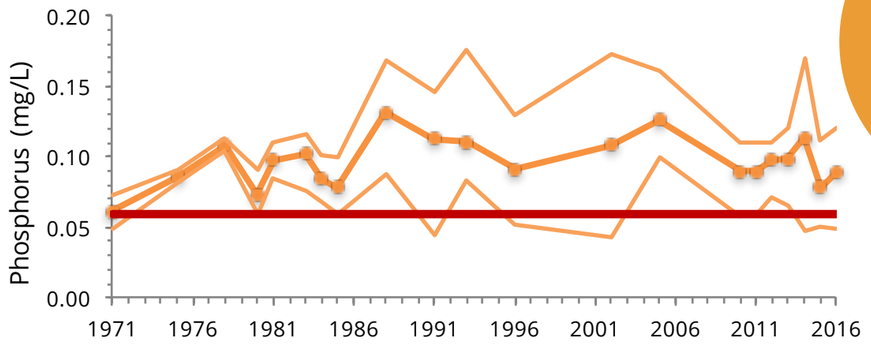
Water quality graphs 1971 - 2016

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



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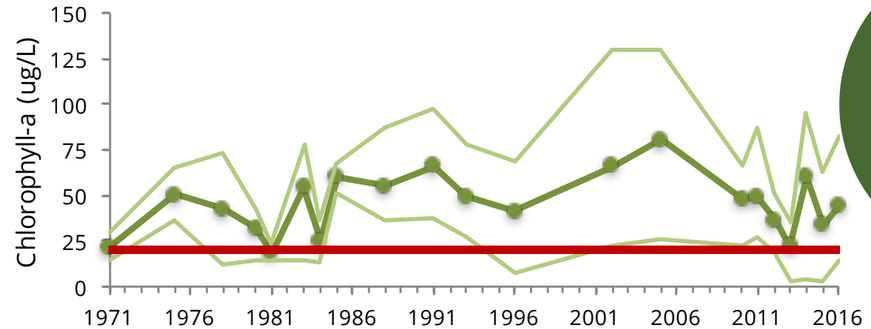

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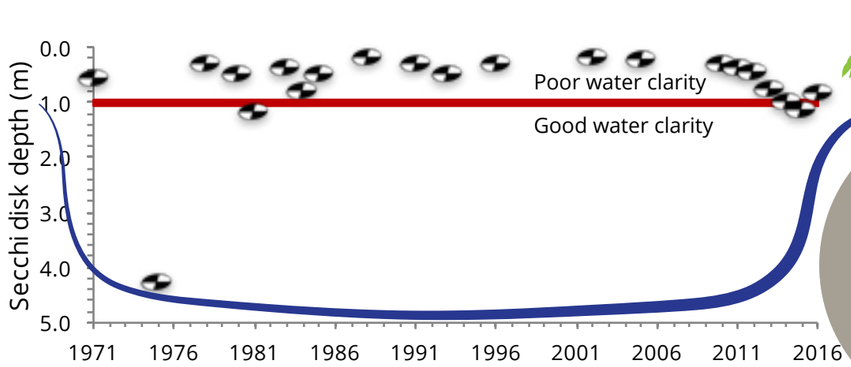

Water clarity is measured using a **Secchi Disk**, a black and white disk the size of a dinner plate. It is lowered into the water, and the depth at which it is no longer visible is recorded.

Summary table

	MPCA standard	Since 1971			2016		
		max	min	average	max	min	average
TP	<0.06 mg/l	0.175	0.043	0.098	0.12	0.049	0.089
Chl-a	<20 ug/l	130	2.7	47.3	82.8	14.2	44.3
Secchi	>1 m	4.3	0.2	0.8	1.8	0.6	0.8

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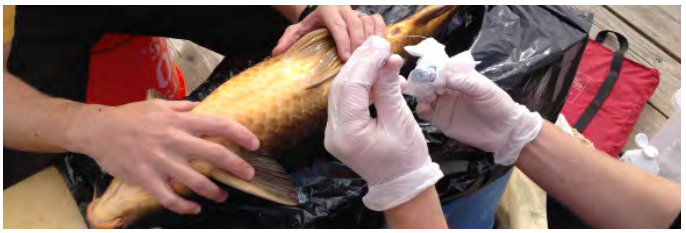
STARING LAKE CARP POPULATION ABOVE HEALTHY LEVEL

The district has wrapped up this season's carp monitoring on Staring Lake. It was discovered that this year, carp numbers surpassed the threshold at which they begin to harm the lake. Common carp, an invasive species to Minnesota water bodies, have a detrimental effect on our lakes and streams. They disturb sediment, reducing water quality and the presence of native plants. They also feed on macro invertebrates, which feed on algae. This can lead to excessive algal blooms on the lake which further impacts water quality. Since Staring Lake was above the threshold, the district is looking to hire commercial fisherman to net and remove the carp. In preparation, staff tagged 15 carp with radio transmitters (photo below). Carp tend to school together in the winter, and the transmitters will allow the fishermen to find large groups to target.



Dive deeper

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

Aquatic plants

Dunne, M. and Newman, R. 2017. Aquatic Plant Community of Lakes Lucy, Mitchell, Susan, Riley and Staring: Annual Report for 2016. University of Minnesota.

Freshwater Scientific Services. 2015. Staring Lake Eurasian Watermilfoil Early Detection and Rapid Response.

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

Assessments

BARR Engineering. 2016. Purgatory Creek Watershed Use Attainability Analysis.

RPBCWD & BARR Engineering. 2015. Creek Restoration Action Strategy.

RPBCWD. 2013. Stormwater pond project.

Carp management

Sorensen P, Bajer P and M Headrick. 2015. Development and implementation of a sustainable strategy to control common carp in the Purgatory 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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