

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

Prepared for
Riley-Purgatory-Bluff Creek Watershed District



WATERSHED DISTRICT November, 2016 (Revised March, 2017)

Certifications

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.



Scott Sobiech
PE #: MN 41338

11-8-2016

Date



Gregory John Wilson
PE #: MN 25782

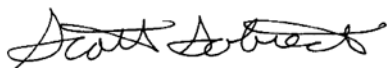
11-8-2016

Date

Revisions:

- Updated Lotus Lake analysis (Chapter 4) to reflect updated ravine erosion information provided by RPBCWD staff, additional stormwater routing and recent project information from Chanhassen, updated engineer's opinion of probable cost for the iron enhanced sand filter.
- Revised Red Rock Lake BMP analysis for RRL_4 and RRL_6, corrected some stormwater routings, and updated cost estimates to reflect revisions.
- Corrected engineer's opinion of probable cost for the unit price iron enhanced sand.
- Revised executive summaries to show annual phosphorus load reduction and cost per pound at the respective lake rather than at each proposed BMP location.

I hereby certify that this revised plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.



Scott Sobiech
PE #: MN 41338

3/16/2017

Date



PURGATORY CREEK **LOTUS LAKE** **SILVER LAKE** **DUCK LAKE** **ROUND LAKE** **MITCHELL LAKE** **RED ROCK LAKE** **LAKE IDLEWILD** **STARING LAKE**

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

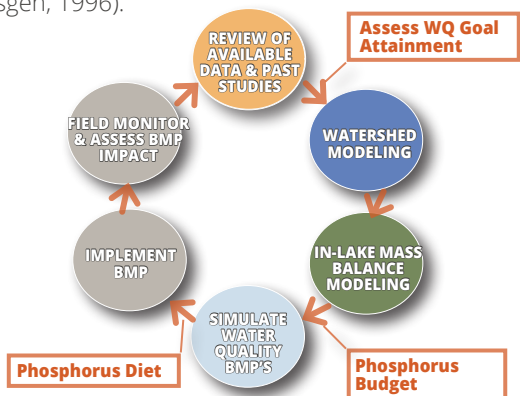
EXECUTIVE SUMMARY

STUDY PURPOSE AND GOALS

The goal of this study is to provide updated and consistent information about the water quality and biological integrity of the receiving waters in the Purgatory Creek watershed with a focus on the lower valley of Purgatory Creek and major lakes in the watershed. The assessment of the lower valley of Purgatory Creek incorporates the extensive efforts previously conducted to establish planning level streambank stabilization strategies. This study includes trend analyses and comparisons of water quality monitoring with state standards and District goals, water quality modeling calibrated for critical conditions and used to evaluate and recommend restoration measures based on the potential water quality benefits and estimated life-cycle costs, all while aligning with the District's "One Waters" strategy of resource management.

PROJECT APPROACH

The assessment of the Lower Valley of Purgatory Creek incorporates the extensive efforts previously conducted as part of the RPBCWD Water Management Plan, (CH2M HILL, 2011), CRAS report (Barr and RPBCWD, 2015), creek inventories by District staff (RPBCWD 2014), city of Eden Prairie Purgatory Creek - 2006 to 2013 Erosion Changes (Wenck 2014), and 2005 Purgatory Creek Use Attainability Analysis (Barr 2005) to establish planning level streambank stabilization strategies. The assessment relied on existing information and did not involve the collection of any new field data. In addition, the focus was on Purgatory Creek downstream of Staring Lake and reserved the assessment of the creek and wetlands upstream of Valley View Road for future efforts. The geomorphic assessment generally followed guidelines and techniques included in the Rosgen classification system (Rosgen, 1996).



RPBCWD'S 2011 GOALS

The 2011 WMP indicates the following water quality goals for the resources in Purgatory Creek Watershed

Resource	RPBCWD Goals ¹			MPCA Criteria
	TP (µg/l)	Chl a (µg/l)	SD (m)	
Lower Purgatory Creek ²	-	-	-	Stream Eutrophication Standard
Silver Lake	≤60	≤20	≤1.0	non-degradation
Duck Lake				Shallow Lake Standard
Mitchell Lake				
Red Rock Lake				
Staring Lake				
Lotus Lake	≤40	≤14	≥1.4	Deep Lake Standard
Round Lake				
Lake Idlewild	3	3	3	non-degradation

TP = Summer Average Total Phosphorus concentration
 Chl a = Summer Average Chlorophyll a concentration
 SD = Summer Average Secchi disc depth

¹ RPBCWD's 2011 Water Management Plan states the District "intends to achieve water quality that surpasses this minimum requirement. The result will be lakes with less pollution, better habitat, and more recreational opportunities than what would be afforded by using the water quality standards as the goal." The Plan also lists the water quality vision for all lakes to have a Secchi Depth ≥ 2.0 meters.

² The RPBCWD's Plan outlines goals aimed to protect and restore the creek (e.g. long-term goal 2,3,4, and 5).

³ RPBCWD's 2011 Water Management Plan does not explicitly list water quality goals for Lake Idlewild. Therefore the resource should be managed to improve water quality to fully support its designated uses consistent with the District goals. This should include a non-degradation goal for water quality.

WATERSHED PHOSPHORUS LOADING TO LAKES

The distribution of phosphorus sources indicates the importance of managing both external and internal phosphorus sources.

Lake	2015 Nutrient (Phosphorus) Loading, Percent Contribution by Source			
	Direct external (watershed) ¹	Internal ²	Indirect External ³	Atmospheric
Silver Lake	64	31	0	5
Duck Lake	40	55	0	5
Mitchell Lake	45	51	<1	4
Red Rock Lake	48	3	45	4
Staring Lake	48	41	10	1
Lotus Lake	28	68	0	3
Round Lake	56	41	0	3
Lake Idlewild	84	15	0	1

¹ Direct external represents the estimated phosphorus loads from the lakes subwatershed and erosional sources such as ravine and streambank

² Internal represents the estimated phosphorus loads from the various sources including groundwater, sediment release, carp and curlyleaf pondweed.

³ Indirect external represents the estimated phosphorus loads from upstream lakes.

The project approach utilized in this study includes four main steps of an adaptive management approach. After analyzing available water quality data and past studies, watershed modeling estimated total phosphorus loads reaching the lake while an in-lake phosphorus concentration model simulated the lake's response to various loading sources. With calibrated in-lake and watershed models, Best Management Practices (BMPs) were devised to improve or protect water quality levels for the resources.

WATER RESOURCE IMPROVEMENT OPPORTUNITY PROJECT

RECOMMENDED PHOSPHORUS REDUCTION MANAGEMENT STRATEGY

Recommended phosphorus reduction management strategy to protect, enhance and restore the health of Purgatory Creek lower valley and the lakes within the Purgatory Creek Watershed. Watershed and in-lake BMPs as well as other management strategies are needed to improve and protect the water resources within the watershed.

Additional System Wide Management Strategies:

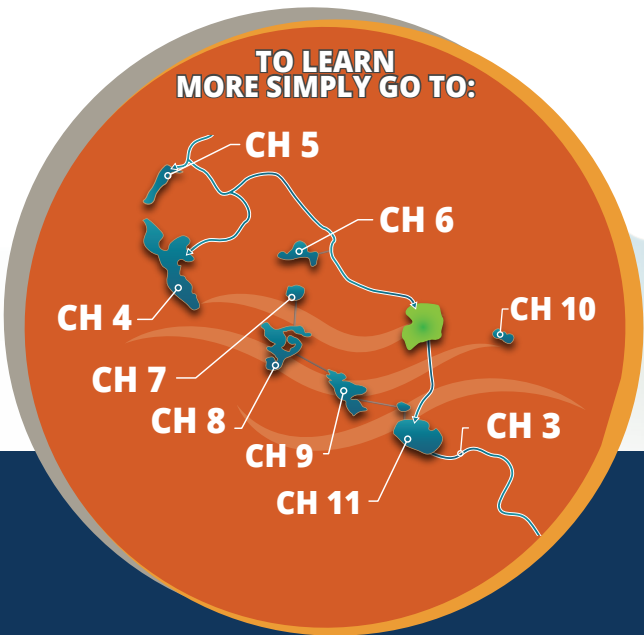
-  Watershed-Wide Volume Reduction and Detention
-  Carp Management
-  Aquatic Invasive Species Management
-  Shoreline Assessments and Vegetation Management
-  Water Quality/Biological Monitoring
-  Educate and Partner with Residents, Businesses, Cities, and Developers to Maximize Restoration and Protect Opportunities
-  Promote Cost-Share Opportunities and Enhance Education Outreach



LEGEND:

- # — Number of Recommended BMP's
- (\$X.XM) — Planning Level Opinion of Cost (Millions of Dollars)*

TO LEARN MORE SIMPLY GO TO:



*Planning level probable costs represent a point estimate within a +40%/-20% range



RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT
www.rpbcwd.org